

**SUPPLY CHAIN MANAGEMENT BEST PRACTICES, AGILITY, RISK
MANAGEMENT AND PERFORMANCE IN SMALL AND MEDIUM ENTERPRISES IN
SOUTH AFRICA**

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ABSTRACT

The strategic importance of small and medium enterprises (SMEs) and their role in stimulating economic growth and competitiveness in many countries are well documented in literature. The same applies to South Africa, where the SME sector has grown tremendously to become an important contributor to social and economic development through employment creation and constant input to the gross domestic product. However, in spite of these contributions, South African SMEs face numerous challenges, which negatively impact their prospects for growth and success. Some of these challenges include the limited access to financial capital, the lack of infrastructure and the lack of skills, which play a significant role in the high mortality rate of SMEs. One of the proposed solutions to address these operational challenges is the adoption of supply chain management strategies to strengthen the operational and long-term capabilities of SMEs. Thus, the purpose of this study was to investigate the relationships between supply chain management best practices, supply chain agility, risk management and supply chain performance in South African SMEs.

The study applied a quantitative approach in which a cross-sectional survey design was used to collect data to test direct and indirect relationships between different constructs (buyer-supplier collaboration, supply chain integration, total quality management, IT adoption, supply chain agility, supply chain risk management and supply chain performance). A structured survey questionnaire was developed using adapted measurement scales and administered to 407 randomly selected SME owners, managers and professional employees who had some knowledge about supply chain management. The collected quantitative data were analysed using the Statistical Packages for Social Sciences (SPSS version 24.0) and the Analysis of Moment Structures (AMOS version 24.0) statistical software. The actual data analyses techniques applied included descriptive statistics and inferential statistics using structural equation modelling. The latter included a Confirmatory Factor Analysis (CFA) to test the psychometric properties of measurement scales and the testing of the six hypotheses using the path analyses technique.

The results of the study showed positive and significant relationships between all supply chain management practices and supply chain agility. Specifically, buyer-supplier collaboration and total quality management exerted a moderate and significant influence on supply chain agility. Moreover, IT adoption had a strong positive and significant relationship with supply chain agility

while supply chain integration had a weak but significant relationship with the same factor. More results provided from the analysis confirmed the existence of a very strong and significant relationship between supply chain agility and supply chain risk management. In turn, supply chain risk management had a strong positive relationship with supply chain performance.

The study also takes note of its contributions to highlight its merits. From a theoretical perspective, it provides an in-depth examination of some driving factors to supply chain agility, supply chain risk management and supply chain performance within SMEs. Given that a study of this nature has not been performed before amongst South African SMEs, the results are an essential addition to the existing body of literature within the area of supply chain management within SMEs in developing countries such as South Africa. From a management perspective, the study suggests that specific attention should be directed to all of the four supply chain management practices (buyer-supplier collaboration, supply chain integration, IT adoption and total quality management) considered as possible avenues to address operational challenges in SMEs.

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LIST OF ABBREVIATIONS

AMOS	Analysis of Moment Structures
AVE	Average Variance Extracted
B2B	Business-to-Business
BSC	Buyer-Supplier Collaboration
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CPFR	Collaborative Planning, Forecasting, and Replenishment
CR	Composite Reliability
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
GDP	Gross Domestic Product
GFI	Goodness of Fit Index
Ha	Alternative Hypothesis
Ho	Null Hypothesis
HSV	Highest Shared Variance
IFI	Incremental Fit Index
IT	Information Technology
ITA	Information Technology Adoption
JIT	Just-In-Time
NFI	Normed Fit Index
R&D	Research & Development
RBV	Resource-Based View
RFID	Radio Frequency Identification
RMR	Route Mean Square Residual
RMSEA	Random Measure of Standard Error Approximation
SCA	Supply Chain Agility
SCI	Supply Chain Integration
SCM	Supply Chain Management

SCMBP	Supply Chain Management Best Practices
SCP	Supply Chain Performance
SCRM	Supply Chain Risk Management
SD	Standard Deviation
SEDA	Small Enterprise Development Agency
SEM	Structural Equation Modelling
SMEs	Small and Medium Enterprises
SPSS	Statistical Package for Social Sciences
TLI	Tucker-Lewis Index
TQM	Total Quality Management
VMI	Vendor Management Inventory
WMS	Warehouse Management System

CHAPTER 1

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

Small and medium enterprises (SMEs) have been viewed as a catalyst for economic growth in developing countries (Abor & Quartey 2010:223). SMEs consist mainly of the vast majority of enterprises in a majority of countries (Organisation for Economic Cooperation and Development 2014:1). As articulated by Olawale (2014:1013), SMEs are a massive generator of employment in that they contribute up to two-thirds of total employment globally. Chaudhary and Ahalawat (2014:471) advocate that SMEs are a key enabler of economic growth through their impact on the gross domestic product (GDP). In a survey conducted by Finscope (2010:1), it was reported that the SME sector had contributed an estimated 5.6 million businesses in the economy, which accounted for 11.6 million jobs created worldwide. This demonstrates that SMEs perform a central role in contributing to global economic growth and development.

In South Africa, the impact and strategic importance of SMEs has been well documented (for example, Urban & Naidoo 2012:146; Smit & Watkins 2012:6324; Neneh & Van Zyl 2013:118; Lekhanya & Mason 2014:39; Masutha 2015:1). This impact is mainly through the role of SMEs as an accelerator of growth, job creation and contribution to the reduction of poverty (Chimucheka & Rungani 2011:5509). Tlale (2015:17) advances that SMEs contribute to about 97.5 percent of the total number of businesses and 55 percent of the labour force in South Africa. In addition, SMEs have played an active part in strengthening the South African economy in that they contribute to almost 30 percent of the country's GDP (Liberta 2014:1). Moreover, the contribution of SMEs to South Africa's employment output lies between 70 and 80 percent (South Africa Web 2011:1). This once more highlights the importance of the SME sector as a driver of socio-economic growth and poverty alleviation.

Despite the consensus that SMEs contribute positively to the South African economy, they face some challenges that, to a certain extent, impair their productivity (Chiloane-Tsoka, Mabiza-ma-Mabiza & Mbohwa 2014:183). Notably, the lack of entrepreneurial skills training has proven to be one of the major drawbacks to the practical success of SMEs (Olawale & Garwe 2010:729). Furthermore, there has been a common trend which is the high business failure rate of numerous SMEs, with an estimated 60 percent collapsing during their first year and 60 percent in their second

year of operation (Ligthelm 2011:1; Cant 2012:1108). While it is acknowledged that there are many reasons behind the business failure of SMEs in South Africa, it is clear that constant investigations are necessary to evaluate possible initiatives to solve these problems. One suggestion in solving these operational challenges is for SMEs to adopt supply chain management best practices (SCMBPs) to strengthen their operational endurance.

Supply chain management (SCM) offers unique insights on how best practices in that area may be implemented to enhance a firm's performance objectives, which enable them to remain productive and competitive (Banerjee & Mishra 2015:1). Li, Ragu-Nathan, Ragu-Nathan, Subba and Subba-Rao (2006:107) identify strategic supplier partnerships, customer relationship management, level of information sharing and quality of information sharing as some of the many supply chain management best practices influencing performance and competitive advantages in firms. Singh, Sandhu, Metri and Kaur (2010:173) list technology usage, supply chain speed, customer satisfaction, supply chain integration and inventory management as possible supply chain management practices influencing organisational performance. Also, Tan, Lyman and Wisner (2002:614) identify supply chain integration, information sharing, supply chain characteristics, customer service management, geographical proximity and just-in-time (JIT) capability as critical supply chain management best practices. Another study by Randall, Gibson, Defee and Williams (2011:390) recognises various factors such as buyer-supplier collaboration, information technology (IT) adoption, supply chain integration, and total quality management (TQM) as sub-elements of supply chain management best practices. These insights confirm that supply chain management best practices embody a broad spectrum of elements.

It has been suggested by Banerjee and Mishra (2015:4), that if implemented efficiently, supply chain best practices influence supply chain agility. Supply chain agility is a key characteristic of competitive advantage and long-term sustainable performance improvement (Blome, Schoenherr & Rexhausen 2013:1297). Supply chain agility networks are well equipped to deal swiftly with distortion and constant changes in customers' demands (Ngai, Chau & Chan 2010:1). This enables the entire chain to consistently meet the needs and requirements of its customers without fail and maintain the performance objectives of the organisation (Yusuf, Gunasekaran, Musa, Dauda, El-Berishy & Cang 2014:531). Gligor, Esmark and Holcomb (2015:72) advance that supply chain agility is an essential factor for the competitive strategy of firms, especially in unstable and volatile

environments. Since it is viewed as a major enabler of performance in turbulent markets, the adequate implementation of agile practices may correlate to better prevention of possible disturbances and risks or threats that may affect the performance of a firm's supply chain activities (Sukati, Hamid, Baharun, Yusoff & Anuar 2012:275). Thus, supply chain agility determines the management of risk within a supply chain.

Managing risk within one's supply chain is critical in strengthening and minimising the level of vulnerability that could impede the effectiveness and efficiency of the entire supply chain (Rajesh & Ravi 2015:126). In their study on managing supply chain risk, Sodhi and Tang (2012:1) advocate that proactive and prompt operational strategies designed at handling risks are crucial in lowering and mitigating their occurrences. This implies that sufficient strategic actions are essential in managing and assessing the readiness of a firm's supply chain to meet both supplier and customer needs (Chopra & Sodhi 2014:73). Management of risk also enables businesses to cope with unexpected losses emanating from uncertain and volatile market developments. Also, organisations with well-structured policies and resource development strategies on risk alleviation are better equipped to achieve and maintain continuous performance improvement (Zsidisin & Wagner 2010:1). Hence, supply chain risk management (SCRM) is a crucial activity influencing supply chain performance.

According to Qrunfleh and Tarafdar (2014:345), supply chain performance has been viewed to be a positive enabler affecting firm performance since it enables firms in any supply chain to meet customer expectations and demands continuously. Supply chain performance has also been found to be a key indicator of business success through its contribution to achieving short and long-term performance objectives (Deshpande 2012:4). This emphasises the strategic significance of supply chain performance as an indicator of the success of a firm. Qrunfleh and Tarafdar (2014:340) acknowledge that supply chain performance is a central benchmark factor in measuring firm competitive advantage and sustainability. Besides, supply chain performance has a modest financial impact on the supply chain players since it is linked to lower costs associated with the supply chain management function (Li, Su & Chen 2011:44). This provides a picture of the value attached to supply chain performance in providing adequate support to an organisation's supply network, which enables each function or chain of activities to operate appropriately (Banomyong & Supatn 2011:20).

1.2 PROBLEM STATEMENT

The role and contribution of SMEs to both the global and local economy has been well documented (Chaudhary & Ahalawat 2014:471; Hamann, Smith, Tashman & Marshall 2017:1). However, despite their relative crucial nature, they are faced with some challenges that impair their ability to succeed in highly volatile and yet competitive markets (Olawale 2014:1013). South African SMEs are not an exception to failure as they are subject to various challenges, which continue to hinder their performance. One such problem is the inability of SMEs in the country to grow from their early stage. As highlighted by some scholars (for example, Scheers 2010:221; Cant & Wiid 2013:707), between 70 and 80 percent of SMEs in South Africa do not reach the growth and maturity stage in their lifespan. This high mortality rate within SMEs in South Africa could be attributed to impediments such as limited access to finance and support from government (Olawale & Garwe 2010:729; Kim, 2011:1), the inability to attract external capital (Gomes, Moshkovich & Torres 2010:19; Dalberg, 2010:1), the lack of management skills (Abor & Quartley 2010:224; Ebersole 2014:1), low production capacity (Lekhanya & Mason 2014:39), lack of adequate technology and the inability to adopt current business practices such as supply chain management in their strategy and operations (Organisation for Economic Cooperation and Development 2013:1). The multiplicity of these impediments illustrates the enormity of challenges that face SMEs in South Africa in their efforts to grow, achieve sustainable competitive advantages and post meaningful performance that leads to their long-term survival.

The impact of challenges linked to the inability of SMEs to adopt supply chain management practices cannot be underestimated. As indicated previously, this study identifies the implementation of SCMBPs as a strategic means to provide solutions to some of the highlighted challenges and their direct and indirect effects on supply chain performance. However, despite the large body of literature on the importance of SCMBPs, supply chain agility, SCRM and supply chain performance from different contexts and perspectives, there is a lack of current literature on these respective constructs in the South African context. None of the few and current studies that are available in the South African context (for example, Pretorius, Ruthven & Von Leipzig 2013:1; Voortman & Makhitha 2014:1; Peristeris 2014:1; Pristeris, Kilbourn & Walters 2015:1; Poee, Mafini & Loury-Okoumba 2015:1) examined the relationship between supply chain best practices, supply chain agility, SCRM and supply chain performance in SMEs. The present study is ground-

breaking since it is intended to test these relationships in this hitherto unexplored terrain. Considering the nature of SMEs in a developing country such as South Africa, the study stands out as an important economic contributor in the sense that SMEs can use the results for diagnosing supply chain performance related problems or developing initiatives for improving SME performance.

1.3 OBJECTIVES OF THE STUDY

1.3.1 Primary objective

The primary objective of this study was to investigate the relationships between supply chain best practices, supply chain agility, risk management and supply chain performance in South African SMEs.

1.3.2 Theoretical objectives

The following theoretical objectives were formulated:

- to conceptualise supply chain best practices, namely buyer-supplier collaboration, supply chain integration, IT adoption and TQM from literature;
- to conceptualise supply chain agility from literature;
- to conceptualise SCRM from literature; and
- to conceptualise supply chain performance from literature.

1.3.3 Empirical objectives

The following empirical objectives were formulated:

- to determine the influence of buyer-supplier collaboration on supply chain agility in South African SMEs;
- to establish the influence of IT adoption on supply chain agility in South African SMEs;
- to determine the influence of supply chain integration on supply chain agility in South African SMEs;
- to establish the influence of TQM on supply chain agility in South African SMEs;
- to determine the relationship between supply chain agility and SCRM in South African SMEs; and

- to establish the relationship between SCRM and supply chain performance in South African SMEs.

1.4 THE CONCEPTUAL FRAMEWORK

The conceptual research model of the present study is provided in Figure 1.1, highlighting the direct and indirect causal relationships between the constructs. The model consists of four predictor constructs (buyer-supplier collaboration, IT adoption, supply chain integration and TQM), that represents the supply chain management best practices. This is followed by two mediator constructs, namely, supply chain agility and SCRM and finally the outcome construct, which is supply chain performance.

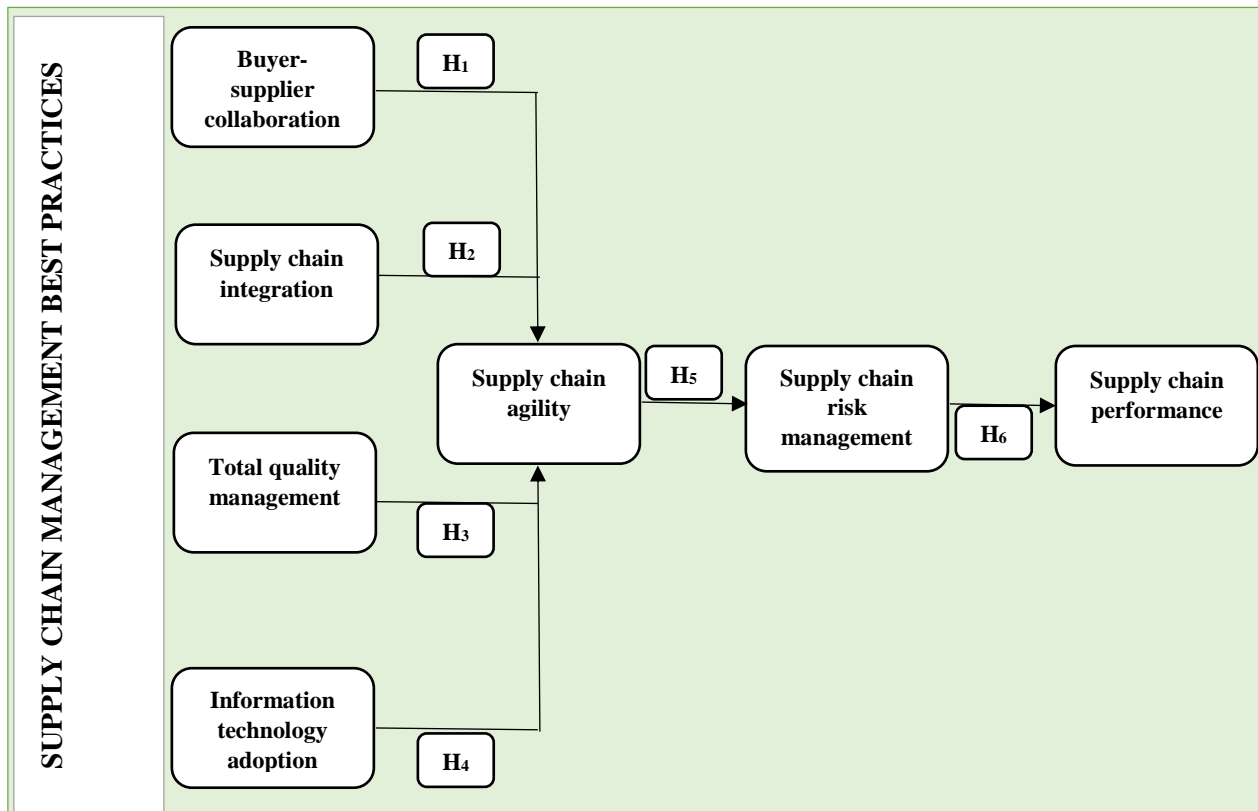


Figure 1.1: Conceptual framework

1.5 HYPOTHESES STATEMENT

Based on the conceptual research model (Figure 1.1), the following null and alternative hypotheses are stated:

H₀₁: There is no relationship between buyer-supplier collaboration and supply chain agility in South African SMEs.

H_{a1}: There is a positive relationship between buyer-supplier collaboration and supply chain agility in South African SMEs.

H₀₂: There is no relationship between supply chain integration and supply chain agility in South African SMEs.

H_{a2}: There is a positive relationship between supply chain integration and supply chain agility in South African SMEs.

H₀₃: There is no relationship between TQM and supply chain agility in South African SMEs.

H_{a3}: There is a positive relationship between TQM and supply chain agility in South African SMEs.

H₀₄: There is no relationship between IT adoption and supply chain agility in South African SMEs.

H_{a4}: There is a positive relationship between IT adoption and supply chain agility in South African SMEs.

H₀₅: There is no relationship between supply chain agility and SCRM in South African SMEs.

H_{a5}: There is a positive relationship between supply chain agility and SCRM in South African SMEs.

H₀₆: There is no relationship between SCRM and supply chain performance in South African SMEs.

H_{a6}: There is a positive relationship between SCRM and supply chain performance in South African SMEs.

1.6 LITERATURE REVIEW

The following section provides brief theoretical insights on the research theory and the constructs under consideration in this study.

1.6.1 Theoretical framework

The resource-based view theory provides an important theoretical foundation for this study. The origin of this theory can be traced back to strategic management and the initial work of David Ricardo in the 19th century (Wan, Hoskisson, Short & Yiu 2010:1335). Its foundation resides in an organisation's ability to make use of its core valuable, non-substitutable resources to gain a competitive advantage over competitors (Wernerfelt 1984:171; Rumelt 1984:1; Barney 1991:99). The theory advocates for the critical nature of a firm's intra-organisational resources as a key component to achieving a solid and sustainable competitive edge (Whipple, Wiedmer & Boyer 2015:5). The resource based-view theory was selected because this study seeks to examine the relevance of combining strategic input resources with the aim of ensuring and obtaining superior overall supply chain performance. To support this view, it is presupposed that the adoption and implementation of supply chain best practices could correlate with the enhanced agility of the organisation's supply chain. In turn, supply chain agility might then enable better management and mitigation of risk within the entire supply chain environment, resulting in much-enhanced supply chain performance.

1.6.2 Supply chain management best practices

Supply chain management is widely regarded as an organisation's ability to manage its activities to ensure that the correct materials/products or services are conveyed to customers/consumers at the right time, the right price, the exact quantity and quality and the correct designated location (Janvier-James 2012:196). Best practices may be perceived as those that are widely accepted as being most effective in providing core value to an organisation's strategies in terms of adhering to or meeting performance objectives (Chardine-Baumann & Botta-Genoulaz 2014:138). Supply chain management best practices refer to sets of factors or strategies that contribute to improving the performance of an organisation's supply chain (Randall *et al.* 2011:390). Supply chain management best practices perform a strategic role in the competitive aspirations of businesses (Banerjee & Mishra 2015:1). Examples of supply chain management best practices include, among others, supply chain integration, supply chain characteristics, customer service management, geographical proximity, JIT, business intelligence, logistics and distribution, supplier collaboration, lean, resilient and green supply chain (Govindan, Azevedo, Carvalho & Cruz-Machado 2014:212; Banerjee & Mishra 2015:4). However, this study directs attention to four

SCMBPs only, which are the following: *buyer-supplier collaboration*, *IT adoption*, *supply chain integration* and *TQM*. These were selected because they are the practices which are deemed important from a resource-based view standpoint as factors necessary to achieve successful agility of the entire supply chain if implemented effectively.

1.6.2.1 Buyer-supplier collaboration

Buyer-supplier collaboration refers to relationships between two or more partners which encompasses the sharing of resources, technologies, as well as core strategies (Ang 2008:1057). According to Whipple *et al.* (2015:2), organisations that engage in collaborative activities with their partners have a better competitive edge than those that opt to stand alone. Several researchers support this view (for example, Gupta & Polonsky 2014:615; Ho & Ganesan 2014:91) as they observe that the development of core collaborative partnerships between firms and their business associates is essential in stimulating better performance. In their study on performance implications of marketing exploitation and exploration, Ho and Lu (2015:1028) conclude that firms with clear and stable collaborative strategy efforts with key suppliers are better positioned to learn and gain strategic information from each other's expertise. This typically results in important performance outcomes, such as better new product development, enhanced operational effectiveness as well as healthier knowledge creation (Flynn, Huo & Zhao 2010:58; Cao & Zhang 2011:163).

1.6.2.2 IT adoption

IT pertains to a broad combination of software, technical equipment and infrastructure designed to control, plan, coordinate and support organisational decision-making processes (Cashman 2010:1; Bajdor & Grabara 2014:97). Wamba, Akter, Coltman and Ngai (2015:933) argue that IT adoption is a fundamental enabler of supply chain performance, based on its ability to inspire supply chain partners to cooperate and work synergistically. This creates superior operational value, which would not be attainable if operating in silos (Grover & Kohli 2012:226). Additionally, the fundamental nature of IT to supply chains is noteworthy as it facilitates the well-organised implementation of a firm's supply chain practices, such as order receiving and tracking, account establishment and maintenance, invoice and material transaction (Li 2012:59). Tseng, Wu and Nguyen (2011:259) add that IT adoption exerts a positive influence on a firm's performance in that it boosts the organisation's capacity to meet customers' requirements and expectations.

Therefore, IT adoption is a critical activity that empowers firms to attain higher levels of performance and competitive advantage (Chae, Koh & Prybutok 2014:305).

1.6.2.3 Supply chain integration

From a supply chain perspective, supply chain integration refers to the close alignment and coordination within a supply chain, often with the use of shared management information systems (Alfalla-Luque, Marin-Garcia & Medina-Lopez 2015:242). Supply chains are integrated with the simple objective of achieving continuous exchanges and sharing of materials and services, information, money and core strategic decisions with the view of maximising customers' value at the lowest possible price (Flynn *et al.* 2010:59). Supply chain integration has been defined as a multi-dimensional construct. The two main dimensions that emerge are (1) external integration, consisting of components such as customers and suppliers, which pertain to a firm's capability to synergistically merge its core strategies with those of its partners aiming at creating a collaborative process (Stank, Keller & Closs 2000:31); and (2) internal integration, which entails all indoor operational activities and processes taking place in the organisation. The basic purpose of combining these processes in such a way is to ensure that customers' expectations and requirements can be met (Flynn *et al.* 2010:59). Supply chain integration differs from supply chain collaboration in that the latter is more than just integrating information among business functions and partners (Wong, Boon-itt & Wong 2011:604). Although supply chain collaboration involves businesses working together to data share, it is also an interactive process that results in joint decisions and activities, with a typical example being the existence of multi-business teams from several disciplines in each organisation (Piboonrungrroj 2012:1).

1.6.3 Total quality management

According to Lee, Ooi, Tan and Chong (2010:74), TQM refers to an operational strategy designed to enhance the level of quality management within an organisation. It has been described as a management approach aimed at gathering organisational resources, with the objective of increasing and improving customers' satisfaction (Das, Kumar & Kumar 2010:196). In addition, Vanichchinchai and Igel (2011:3406) state that TQM is a key activity that capacitates firms in their quest to achieve adequate competitive advantages. Hung, Lien, Yang, Wu and Kuo (2011:213) regard TQM as a determinant of organisational learning, innovative performance and firm competitiveness. Similarly, a study by Zu, Robbins and Fredendall (2010:86) demonstrates that

the proper implementation of TQM strategies results in better performance outcomes in terms of robust supplier management, customer focus, process management as well as continuous management. This illustrates the influence of TQM in contributing to the growth of performance.

1.6.4 Supply chain agility

Braunscheidel and Suresh (2009:120) define supply chain agility as a firm's capacity to work together with its core suppliers and customers in a collaborative manner. The reason for this is to respond promptly to changes in the environment. Supply chain agility has been recognised to be a determinant of firms' competitive success in turbulent and volatile market conditions (Blome *et al.* 2013:1295). This view has also been accentuated by Sukati *et al.* (2012:275) who conclude that supply chain agility has an influence on the ability of organisations to survive in environments characterised by fierce competition. Moreover, Charles, Luras and Van Wassenhove (2010:722) identify agility as a key determining factor to achieve dependability and predictability in supply chains. Moreover, Mishra, Datta and Mahapatra (2014:90) in their investigation, found that supply chains that exhibit agile attributes tend to exhibit better performance in terms of flexibility, speed, quality and service. This points to the major contribution of supply chain agility as a catalyst to enhance competitive advantage and firm success.

1.6.5 Supply chain risk management

Risk in general has been attributed to uncertain or unpredictable events that hamper an entire supply chain (Qazi, Quigley & Dickson 2014:2). SCRM is defined as the management of risk occurring within a firm's supply chain, which is done through coordination among supply chain partners with the aim of achieving a sound level of profitability (Christopher & Lee 2004:388). Vilko, Ritala and Edelmann (2014:3) report that managing supply chain risk is principal in alleviating potential production problems, which culminates in improved supply chain performance. In a study by Cheng, Yip and Yeung (2011:3), collaborative efforts between supply chain members was found to be an important predictor to supply chain growth of businesses engaged in risk mitigation. Li, Fan, Lee and Cheng (2015:83) also confirm that SCRM has a positive influence on organisational financial performance. This portrays the strategic nature of risk management in the long-term sustainable success of supply chain players.

1.6.6 Supply chain performance

Supply chain performance refers to the degree to which a firm's entire chain network performs optimally in achieving superior performance outcomes regarding quality, delivery, responsiveness and cost, among others (Wu, Choi & Rungtusanatham 2010:117). According to Qrunfleh and Tarafdar (2014:344), supply chain performance is considered a significant determinant for organisations' success, which suggests that supply chains performing at the required level could contribute to satisfactory performance outcomes at an organisational level. Factors influencing supply chain performance include staff motivation (Deshpande 2012:4), supply chain flexibility and information security (Wu, Chuang & Hsu 2014:122), logistics integration and long-term relationships (Prajogo & Olhager, 2012:514) and information sharing (Kim, Ryoo & Jung 2011:667). Qrunfleh and Tarafdar (2014:341) stress that the attainment of performance objectives by a firm depends on the proper functioning of its supply chain. Hence, firm success is primarily linked to supply chain performance.

1.7 RESEARCH METHODOLOGY AND DESIGN

The present section provides a general overview of the methodology and approaches that were used to gather primary data to support the literature of the study. It consists of the description of research and sampling design, data collection methods and procedures, statistical analyses, ethical procedures and chapter classification.

1.7.1 Research design

According to Punch (2014:205), research design is a description of the way in which data will be collected and analysed. Ang (2014:98) suggests that a research design incorporates quantitative, qualitative and mixed methods designs. In this study, quantitative research using the cross-sectional survey design was used because the study seeks to test direct and indirect relationships between different constructs.

1.7.2 Sampling design

Sampling design is defined as a plan for a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population (Freeborn, Wooster & Roberts 2011:475). It encompasses target population, sampling frame, sample size and sampling method (Feldmann 2014:1).

1.7.2.1 Target population

A target population is viewed as the universe of units (individuals or objects) from which the sample is selected (Berndt & Petzer 2013:347). As such, the target population for this study was all SMEs existing in the Gauteng Province, South Africa.

1.7.2.2 Sampling frame

A sampling frame consists of a list of elements from which a sample may be drawn. It can also be referred to as working population (Zikmund, Babin, Carr & Griffin 2013:389). The sampling frame of the study consists of SME businesses located in the Gauteng Province. The list of these SMEs was obtained from the Small Enterprise Development Agency (SEDA) and SME databases from the municipalities in the region. These served as platforms for drawing the exact numbers of operating SMEs targeted in this study.

1.7.2.3 Sample size

The sample size is defined as the number or size of the sample from which the required information is obtained by the researcher (Kumar 2011:194). A number of supply chain studies conducted by Ismail, Jeffery and Van Belle (2011:1); Machirori (2012:1); Dubihlela and Omoruyi (2014:1019); Poole *et al.* (2015:1); and Hamann *et al.* (2015:1) used different sample sizes of between 249 and 612 respondents. Given these historical samples, the sample size of this study was pegged at $n = 700$ respondents.

1.7.2.4 Sampling procedure

According to Berndt and Petzer (2013:349), sampling is viewed as the process of choosing a sample with the view of drawing conclusions on the population selected. Furthermore, sampling can be done in two different ways by applying two distinct techniques, known as probability and non-probability sampling. This study adopted the probability sampling approach using the simple random probability sampling technique to select SMEs that are available and accessible (Espinosa, Bieski, de Oliveira Martins 2012:1363). This sampling procedure is suitable for this study because it facilitates easier selection of the sampling elements (Feldmann 2014:1). Moreover, it leads to reductions in the cost of collecting the data (Kabane 2011:297).

1.7.2.5 Measurement instruments

The study used a seven-section structured questionnaire to collect data. The sections in the questionnaire focused on information on the profiles of participating SMEs, demographic characteristics of individual respondents as well as constructs (buyer-supplier collaboration, supply chain integration, TQM, IT adoption, supply chain agility, risk management and performance).

Buyer-supplier collaboration was measured using a five-item scale adapted from Flynn *et al.* (2010:58) and Zacharia, Nix and Lusch (2011:591). Supply chain integration was measured by using a five-item scale derived from Stank, Keller and Daugherty (2001:29), Narasimhan and Kim (2002:303) and Flynn *et al.* (2010:58). TQM was measured using a five-item scale adapted from the continuous improvement scale (Hung *et al.* 2011:213). IT adoption was measured using a four-item scale derived from Jin, Vonderembse, Ragu-Nathan and Smith (2014:24). Supply chain agility was measured using a five-item scale adapted from Goldman, Nagel and Preiss (1994:1) and Youndt and Snell (2004:337). SCRM was measured using the five-item scale adapted from Scannell, Curkovic, Wagner and Vitek (2013:15). Supply chain performance was measured using a five-item scale adapted from Beamon (1999:275). Measurement scales are presented on a five-point Likert-type scale that is anchored by 1 = strongly disagree to 5 = strongly agree to express the degree of agreement. Measurement scales are listed in Appendix 1.

1.8 DATA ANALYSIS AND STATISTICAL APPROACH

The collected data was captured on an Excel spreadsheet, which was followed by sequences of cleaning procedures aimed at locating and correcting missing data entries. After that, the cleaned data was transcribed from Excel to the Statistical Package for Social Sciences (SPSS version 24.0), after which descriptive statistical analyses were conducted. A model fit analysis was conducted as well as confirmatory factor analysis (CFA) and path modelling (for testing hypotheses) through using the Analysis of Moment Structures (AMOS version 24.0) statistical software.

1.8.1 Reliability and validity

This section discusses how the psychometric properties of the measurement scales, namely, reliability and validity were ascertained in this study.

1.8.1.1 Reliability

According to Ang (2014:176), reliability refers to the degree to which measures are free from errors and therefore yield consistent results. In this study, reliability was ascertained through the use of two indices, namely, Cronbach's alpha value and the composite reliability value. Both Cronbach's alpha and composite thresholds should be equal to or greater than 0.7, as recommended by Fornell and Larcker (1981:39), Nunnally (1978:1) and Hair, Anderson, Tatham and Black (2006:55).

1.8.1.2 Validity

According to Scholtes, Terwee and Poolman (2011:239), validity is the degree to which the instrument measures the construct it purports to measure. There are two measurement properties in validity, namely, content validity and construct validity, the latter which can be categorised into convergent validity and discriminant validity (Moutinho & Hutcheson 2011:327). Content validity was ascertained through a pilot study and the review of the questionnaire items by a panel of experts in supply chain management. Convergent validity was determined by using item-to-total correlation values and item loading values (standardised regression weights), as indicated by Chinomona (2011:1). Discriminant validity was determined by the correlation matrix as recommended by Anderson and Gerbing (1988:411), who further mention that the acceptable threshold between constructs should be no higher than 0.7. Discriminant validity was further analysed by determining whether the AVE value is larger than the highest shared variance (SV) (Anderson & Gerbing 1988:412).

1.8.2 Research model fit assessment

The model fit of the study was determined by assessing the following indicators: Chi-square value, Comparative fit index (CFI), Goodness of fit index (GFI), Incremental fit index (IFI), Normed fit index (NFI), Tucker-Lewis index (TLI) and Random measure of standard error approximation (RMSEA), as prescribed by Bagozzi and Yi (1988:74).

1.9 ETHICAL CONSIDERATIONS

A brief overview of the primary ethical considerations is mentioned in the objective to underline the compliance with ethical concerns. During the research, the information that was provided by the SMEs was treated in confidence. This was mainly achieved through ensuring that the names

and addresses of the different organisations were kept anonymous. Moreover, participation in this study by SMEs was strictly on a voluntary basis and respondents were provided with full information about the merits and purpose of the study. This enabled SMEs to make informed decisions regarding their participation and contribution to the study. The respondents' rights to non-participation and protection from harm or victimisation were also adhered to since compliance with rules related to plagiarism is crucial in the completion of this study. Moreover, the research avoided any unethical practices that could compromise its validity.

1.10 OUTLINE OF THE STUDY

The present study is organised as follows:

Chapter 1: Introduction and background to the study. This chapter focuses on providing the background of the study and includes an outline of the problem statement, the research objectives and the research methodology to be employed.

Chapter 2: A literature review of supply chain management best practices. This chapter provides a review of the research theory that was used to ground the study. The resource based-view (RBV) theory was chosen as the underpinning theory for this study. Furthermore, the chapter also provides a review of the literature on supply chain management best practices in the SME sector. This mainly focuses on the identified practices (buyer-supplier collaboration, supply chain integration, IT adoption and TQM).

Chapter 3: A literature review on supply chain agility, risk management and performance. This chapter provides a literature review of the mediating constructs (supply chain agility, risk management and performance) in the SME sector.

Chapter 4: Hypotheses development. This chapter deals with the formulation of the research hypotheses.

Chapter 5: Research design and methodology. This chapter focuses on explaining the research methodology that is employed in the empirical portion of the study. The sampling method and data collection method are outlined. Data analysis and statistical techniques are also described.

Chapter 6: Data analysis and interpretation of results. In this chapter, an explanation of the analysis, interpretation and evaluation of the research results is provided.

Chapter 7: Conclusion and recommendations. This chapter presents the recommendations, which emanated from the main objectives and results of the study.

1.11 CONCLUSION

This chapter provides an overall review of the structure and issues that constitute this study. It begins by highlighting the introduction aimed at setting the tone of the study and providing it with direction. This is followed by the establishment of the core problem, which led to the decision to undertake the investigation. After that, the discussion moves on to establishing the different research objectives designed at focusing the narrative towards how the identified problem can be addressed. Further issues of the study discussed include amongst others' a brief review of literature about the constructs of the study as well as the methodology, which needs to be employed to conduct the research. The discussion concludes with an overview of the chapters of the entire thesis.

CHAPTER 2

A LITERATURE REVIEW ON SUPPLY CHAIN MANAGEMENT BEST PRACTICES

2.1 INTRODUCTION

The present chapter provides a discussion of literature on supply chain management best practices. In doing so, the analysis begins by highlighting the conceptual characteristics and core essence of the resource-based view theory selected as the appropriate theory for the study. The resource-based view was identified as a suitable theoretical framework due to its relevance and links to the purpose of the present study. The chapter focuses on supply chain management best practices, which emphasises a general perspective of all best practices uncovered by academics and management practitioners. The discussion shifts to specific selected supply chain management best practices, namely, buyer-supplier collaboration, supply chain integration, IT adoption and TQM. Issues that are discussed include the operational definitions, antecedent factors, significance or benefits, outcomes and the available measurement scales. The chapter concludes by recapping all salient themes about the strategic importance and contribution that the identified best practices have on supply chain performance. The selection of the listed practices is based on the views that are considered as integral components of sustainable supply chain management performance.

2.2 RESOURCE-BASED VIEW THEORY

The resource-based view (RBV) theory has received recognition as a relevant framework in explaining competitive business aspirations as well as performance appraisals (Barney, Ketchen & Wright 2011:1299). However, there seem to be conflicting reports regarding the exact origins of the theory. It is believed that the first prominent signs of the RBV emanate from the work of David Ricardo in the 19th century (William, Hoskisson, Short & Yiu 2010:1335). Initial work from Wernerfelt (1984:171) was recognised as ground-breaking in its essence because it provided a glimpse of an understanding of the theory's core function.

It appears that there is little or no consensus of the exactitude of the origins and subsequent emergence of the RBV theory. Nevertheless, there seems to be concurrence on the contribution and nature of the RBV theory. Ghapanchi, Wholin and Aurum (2014:140) advance that the essence of RBV theory resides on a firm's ability to merge its core, valuable and inimitable resources (tangible or intangible), which is essential in achieving sustainable competitive advantage and

operational success. This perspective was also certified by Barney and Clark (2007:22) who underline the significance of having valuable and unique resources as prerequisite issues to attain both temporary and sustainable competitive gains. As such, the RBV theory is regarded as one of the many relevant supply chain frameworks as it offers insights on how best supply chain organisations can utilise their core resources to reach the adequate/desirable level of performance sought (Almarri & Gardiner 2014:437). As such, the theory is relevant to the current study as it aims at examining the effects of the effective implementation of supply chain best practices (buyer-supplier collaboration, supply chain integration, IT adoption and TQM). As indicated by Pan, Pan and Lim (2015:402), a combination of strategic processes and resources is a critical attribute of the resource-based view. This is in conjunction with the purpose of this study, which is designed for exploring how the practical application of supply chain best practices can result in more agile supply networks. Subsequently, risk may be minimised and performance objectives improved.

2.3 SUPPLY CHAIN MANAGEMENT BEST PRACTICES

This section discusses literature on SCMBPs. The first subsection focuses on a general review highlighting the strategic significance of existing supply chain practices. Thereafter, an analysis of the following best management practices: buyer-supplier collaboration, supply chain integration, IT adoption and TQM is provided.

2.3.1 Previous literature on supply chain management best practices

The literature in SCM has received extensive attention from some academics and scholars (Yang 2013:1984; Hartono, Li, Na & Simpson 2010:399; Zhou, Shou, Zhai, Li, Wood & Wu 2014:624) underlining its importance and core value to organisations' competitive ambitions. According to Talib, Rahman and Qureshi (2011:269), supply chain management encompasses a set of key and strategic factors, also known as practices, designed at ensuring adequate combinations between supply chain members. Its purpose is to achieve the effective and efficient performance of a business's entire value chain. Shukla, Garg and Agarwal (2011:2068) advance that supply chain management best practices are activities intended to manage the overall operations as well as functions of a supply chain, which shows that supply chain management best practices embody a broad spectrum of activities and factors. These activities and factors could vary from one organisation to another, depending on their strategic relevance. Table 2.1 provides a concise representation of SCMBPs that are identified in previous literature.

Table 2.1: Supply chain management best practices

Authors	Supply chain management best practices
Donlon (1996)	<ul style="list-style-type: none"> • outsourcing, • supplier partnership, • cycle time compression, • information sharing, and • continuous process flow
Tan, Kannan and Handfield (1998)	<ul style="list-style-type: none"> • customer relations, • quality, and • purchasing
Alvarado and Kotzab (2001)	<ul style="list-style-type: none"> • inter-organisational systems (Electronic Data Interchange)
Tan, Lyman and Wisner (2002)	<ul style="list-style-type: none"> • supply chain characteristics, • geographical proximity, • JIT capability • supply chain characteristics, • customer service management, and • integration
Chen and Paulraj (2004)	<ul style="list-style-type: none"> • supplier base reduction, • supplier involvement, • cross-functional teams, • communication, and • long-term relationships
Min and Mentzer (2004)	<ul style="list-style-type: none"> • cooperation, • process combination, • risk and award sharing, and • agreed supply chain leadership
Li, Ragu-Nathan, Ragu-Nathan and Subba-Rao (2006)	<ul style="list-style-type: none"> • strategic supplier partnership, • customer relationship, • quality of information, and postponement
Singh, Sandhu, Metri, and Kaur (2010)	<ul style="list-style-type: none"> • technology use, • customer satisfaction, • supply chain speed, • inventory management, and • supply chain integration

Sources: Cook, Heiser and Sengupta (2011:105); Talib *et al.* (2011:270).

Table 2.1 emphasises the significance and critical nature that the abovementioned practices have in contributing to business success. Donlon (1996:439) identifies outsourcing, supplier relationship, cycle time compression, information sharing and continuous process flow as some of the SCMBPs. The table also shows that Tan, Kannan and Handfield (1998:2) identify supply chain characteristics, geographical proximity, JIT capability, supply chain characteristics, customer

service management, and integration as major SCMBPs. More recent results from Singh *et al.* (2010:173) identified technology use, customer satisfaction, supply chain speed, inventory management and supply chain integration. Therefore, SCMBPs encompass a broad spectrum of activities that contribute to enhancing the performance of firms' supply chain operations, which further results in a better competitive advantage.

This analysis found supporting evidence from Banerjee and Mishra (2015:10) who advance that proper comprehension of SCMBPs is paramount to reaping the benefits associated with their implementation. Furthermore, these practices are viewed as determinant factors enabling organisations to gain practical competitive advantages as well as enhanced performance in highly volatile supply chain environments (Cook *et al.* 2011:105). A study by Van Wassenhove and Martinez (2012:307) unpack the role and impact that SCMBPs have on business success. The investigation identified supply chain management best practices such as (1) demand forecasting, (2) inventory management, (3) information integration, (4) collaborations, and (5) resource sharing as predictor constructs that result in enhanced humanitarian logistics activities.

As previously mentioned, supply chain management best practice encompasses a large range of factors, which serve as an enabler of supply chain success. For this study in particular, focus is directed to buyer-supplier collaboration, supply chain integration, IT adoption and TQM. The selection of these practices is premised on the view that they are regarded as integral components of sustainable supply chain management performance (Wiengarten *et al.* 2010:463), with buyer-supplier collaboration being viewed as pertinent in ensuring synergistic working relationships with supply chain partners (Mahapatra, Das & Narasimhan 2012:406). While IT is regarded as an enabling factor crucial in linking supply chain components (Thomas, Defee, Randall & Williams 2011:655), supply chain integration offers a prominent connection between both information sharing and materials. This connection emphasises its strategic value to an organisation's overall supply chain performance (Prajogo & Olhager 2012:514). Lastly, TQM is well-known to be a major supply chain management philosophy aimed at striving towards waste reduction as well as the reliable quality of products/materials conveyed and manufactured within a supply chain network (Teeravaraprug, Kitiwanwong & SaeTong 2011:101). These reasons have been viewed as plausible enough to merit the selection of these practices as predictor constructs to the current study.

Section 2.3.2 provides an analysis of the literature on each of the identified supply chain management best practices.

2.3.2 Review of supply chain management best practices

In this section, a review of buyer-supplier collaboration, supply chain integration, IT adoption and TQM is conducted. The prominent elements that are addressed comprise: their definitions; antecedent factors influencing them; importance/benefits; outcome derived from their respective implementations and measurement scales.

2.3.2.1 Buyer-supplier collaboration

This subsection discusses issues about the definition of buyer-supplier collaboration and its antecedent factors. Amongst other points that are considered are its importance and measurement scales.

2.3.2.1.1 Definition of buyer-supplier collaboration

There has been increasing evidence of the importance that buyer-supplier collaboration has in the field of management from past studies (Autry & Golobic 2010:87; Wu *et al.* 2010:115). Buyer-supplier collaboration is defined as the ability that two or more supply chain partners have to work together with the objective to join supply chain related activities, which is essential to meeting customers' requirements and expectations (Fawcett, Wallin, Allred, Fawcett & Magnan 2011:38). Further literature has offered similar, if not identical descriptions of buyer-supplier collaboration; especially in a study conducted by Osarenkhoe (2010:204), who describes it as a synergistic working engagement between supply chain partners, with the purpose of exchanging proprietary knowledge and information, expertise as well as technologies. Editorial (2015:1) refers to buyer-supplier collaboration as a mutual interaction or relationship between supply chain networks, designed at obtaining the best value over a sustainable period.

In their investigation on supply chain collaboration, Cao, Vonderembse, Zhang and Raghu-Nathan (2010:6613) argue that engaging in collaborative relationships with supply chain partners refers to practices such as the sharing of crucial strategic information. This sharing pertains to the role that embarking on a collaborative drive with business associates has in contributing to ensure adequate competitive benefits. Supply chain literature also suggests that one of the key characteristics of

collaborative connections between members of organisations is the willingness to adjust their operational activities. This willingness facilitates the solving of common problems that one could not address in isolation (Claro & Claro 2010:222). This study adopted Ang's (2008:1057) definition of buyer-supplier collaboration that refers to relationships between two or more partners, and encompasses the sharing of resources, technologies, as well as core strategies.

2.3.2.1.2 Antecedent factors of buyer-supplier collaboration

Establishing the ideal level and degree of collaborative relationship between business partners could be the result of various factors. As such, a recent study conducted by Grudinschi, Sintonen and Hallikas (2014:84) found a variety of antecedent factors that influence decisions of buyer and supplier organisations that embark on a collaborative working drive. These include the setting of mutual goals and objectives, the organisation's internal governance and mutual trust as well as information exchange. It has been shown that effective sharing of information and quality communication between supply network members contributes to establishing superior inter-organisational learning, which results in the strengthening of collaborative attributes (Claro & Claro 2010:221).

Innovation practices centred on new product and strategic operation development play a critical part in allowing buyers and suppliers to join forces in order to meet market and customers' requirements (Jajja, Brah, Hassan & Kannan 2014:1033). Besides, customer orientation initiatives of businesses have been found to be a prerequisite element to collaborative efforts between supply chain members (Hofer, Hofer & Waller 2014:226). Based on this, it could be suggested that embracing or placing customers' expectations at the forefront of any business decision is of strategic importance. The importance stems from the view that it would enable all primary stakeholders to work collectively towards achieving their mutual goals. Information sharing has proven to be fundamental in its ability to ensure successful and sustainable collaborative interactions among firms (Vanhala 2011:36). Figure 2.1 shows the direct influence that trust, communication, as well as governance and administration have on buyer-supplier collaboration. For this study, attention is focused on trust and communication respectively.

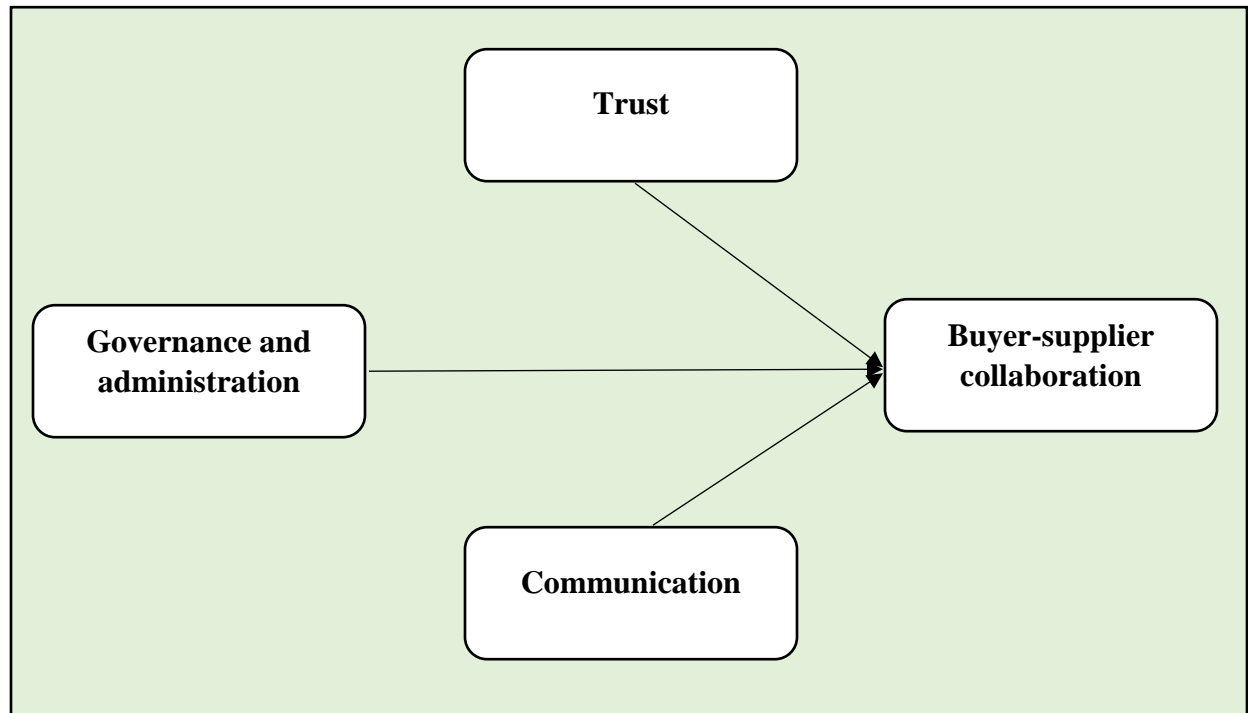


Figure 2.1: Framework for the drivers of factors of buyer-supplier collaboration
(Grudinschi *et al.* 2014:82)

Figure 2.1 reports that trust, governance and administration and communication are some of the many enabling factors of buyer-supplier collaboration. In this study, specific attention is paid to both trust and communication as antecedents of buyer-supplier collaboration.

Trust has been regarded as a prerequisite construct, important in securing effective and efficient collaborative initiatives in business-to-business (B2B) relationships (Merkert & O’Fee 2013:118). The cultivation of trust facilitates operations and reduces expenses and other operation-related costs. According to Gaur, Mukherjee, Gaur and Schmid (2011:1752), trust is a precondition to any fruitful collaboration engagement in any business structure as it enables organisations to deal with fundamental mutual challenges strategically. By implication, trust plays a vital role in facilitating proper buyer-supplier relationships as it establishes confidence and willingness to engage in good working relationships with supply chain partners. Trust is characterised by the mutual sharing of risks, challenges as well as operational benefits. Communication has also been found to be central to any successful buyer-supplier collaboration aspiration (Grudinschi *et al.* 2014:85). Furthermore, both internal and external communication activities with all stakeholders of businesses are vital to

achieving positive and effective collaborative relationships. This, in turn, contributes to improving business performance through the continuous and open sharing of key information across all members of a value chain (Vanhala 2011:22). The result is the view that communication between supply chain members is critical in ensuring adequate operational performance, which is relevant in the sense that communication across a supply chain network determines the efficiency and effectiveness of the value addition of the whole network. Hence, a contribution towards enhancing the performance of activities conducted within a supply chain is attained.

2.3.2.1.3 Importance/benefits of buyer-supplier collaboration

Buyer-supplier collaboration action plans are relevant in improving the knowledge base of partners' operation procedures, which is considered important in achieving competitive advantage (Revilla & Villena 2012:855). Moreover, an effective collaborative network among supply chain partners is described as the backbone of prominent buyer-supplier relationships (Yang 2013:1984). Given the derived review, collaboration within any firm's supply chain environment is a necessary driver to ensure the attainment of competitive aspirations. It has been reported by Hofer *et al.* (2014:227) that achieving proper collaborative alliances is essential to secure competitive advantage. This is attained through the benefits resulting from long-term relationships as well as performance outcomes based on mutual problem resolutions (Allred, Fawcett, Wallin & Magnan 2011:129).

According to Yan and Dooley (2014:59), buyer-supplier collaboration results in a much improved and sustainable supply chain performance. Additionally, an assessment from Cao and Zhang (2011:163) proposes that collaborative inter-networking activities between organisations correlate to a better exchange of knowledge, information and operational plans that lead to greater performance. Besides, collaboration and integration with tactical business players have been found to be meaningful practices designed for obtaining supply chain goals related to better on-time delivery, good quality, quantity and designated location (Flynn, Huo & Zhao 2010:58).

2.3.2.1.4 Outcomes of buyer-supplier collaboration

The importance of buyers-suppliers engaging in collaborative relationships and their role in contributing to supply chain performance is well emphasised. In that regard, it has been noted by Henke and Zhang (2010:41) that collaboration between chain members characterised by the

sharing of relevant, accurate and quality information, provides the basis of sound product development and innovation. This points to the critical nature of collaborative alliance efforts towards facilitating and assisting firms in their competitive action plans, which enables firms to be a step ahead of their competitors as well as to ultimately ensure sufficient levels of customer satisfaction (Jajja *et al.* 2014:1034).

As alluded to by Yang (2013:1984), routine collaborative practices result in much-enhanced knowledge and information sharing, as well as products and materials that flow between buyer and supplier. This again illustrates the core value attached to this SCM practice, which ensures that customers' orders and specifications are met. Comprehensive engagement and inter-change across supply chain networks enable a business to be well equipped to adapt to unforeseen supply disruptions which may hamper the operations' process (Srinivasan, Mukherjee & Gaur 2011:260). Furthermore, robust collaboration develops superior management quality from supply chain members as they are capable of cohesively crafting solutions to problems that might hinder the smooth running of daily activities (Lahiri, Kedia & Mukherjee 2012:20). Also, collaboration relationships, characterised by traits such as understanding of common operational problems and risks, as well as shared rewards, correlates in long-term benefits (Gaur *et al.* 2011:20; Lahiri & Kedia 2011:11).

2.3.2.1.5 Measurement scales of buyer-supplier collaboration

Buyer-supplier collaboration has received growing interest from some scholars (for example, Autry & Golicic 2010:87; Wu *et al.* 2010:115; Han, Trienekens & Omta 2011:321), which indicates its major impact on the discipline of supply chain management. Buyer-supplier collaboration has received different measurement reviews. These include, among others, the one conducted by Claro and Claro (2010:221), who define it as a multi-dimensional construct, with dimensions such as joint planning, joint problem resolution and flexibility in market adjustment. These respective dimensions were all adapted from initial work from Heide and Miner (1992:265) (joint planning); Heide and Miner (1992:265) and Lusch and Brown (1996:19) (joint problem resolution) and lastly Heide (1994:74) (flexibility in market adjustment). Other recent studies have measured it as a uni-dimensional construct. Jajja *et al.* (2014:1031) measured it using a seven-item scale derived from Flynn *et al.* (2010:58); Hoegl and Wagner (2005:530) and Swink, Narasimhan, and Kim (2005:427). Hofer *et al.* (2014:226) used a six-item scale from Cao and Zhang

(2011:163). Srinivasan *et al.* (2011:260) used a five-item scale adapted from Lahiri *et al.* (2012:10). For this study, buyer-supplier collaboration was measured using a five-item scale adapted from Flynn *et al.* (2010:58) and Zacharia, Nix and Lusch (2011:591).

2.3.2.1.6 Current findings on buyer-supplier collaboration in SMEs both locally and internationally

Healthy collaborative engagement between supply chain partners has been regarded to be a key factor to achieve competitive advantage (Cao & Zhang 2011:163). The importance of this supply chain practice has been highlighted in some studies. Amongst others, one study was conducted by Hoof and Thiell (2014:239), who advance that proper collaborative interaction between Mexican SME partners contributes to achieving efficient production processes, which in turn, leads to long-term, sustainable competitive advantage. Results of a study conducted on German SMEs by Clauß (2012:388), indicate that a critical collaboration approach between partners in the German SME sector is essential in assuring adequate innovative engagement between supply chain partners. As a result, these SMEs can either meet or exceed the customers' expectations consistently, which results in a more successful growth aspiration. Similar results from Mishra (2011:26) also emphasise the contribution that sustainable long-term collaborative relationships with both internal and external stakeholders have in facilitating the survival of SMEs in India. It appears then that buyer-supplier collaboration is an important strategic practice that contributes to business performance in general and SMEs in particular. From a South African perspective, some studies have focused their attention on the role that this supply chain practice has on the performance of SMEs (Muller, Vermeulen & Glasbergen 2011:1; Chinomona 2013:1). According to Mafini and Muposhi (2017:1), adequate environment-driven collaboration practices between business associates is regarded as an effective antecedent driver to SMEs' financial performance.

Moreover, collaboration across SMEs' supply chain activities has been found to be a driver to supplier performance appraisal (Mafini, Pooe & Loury-Okoumba 2016:259). This point found supporting evidence from Cao and Zhang (2011:163) who advocated that effective collaborative commitments amongst SME channel members are paramount to achieve a desirable level of supplier performance. Similar evidence derived from Mafini and Loury-Okoumba's (2016:617) study stressed that buyer-supplier collaboration is a crucial primary success factor to efficient business performance.

In reviewing the preceding body of literature on general definitions of buyer-supplier collaboration, it appears that the practice is a necessary supply chain procedure. This is mainly due to its core functionality, which enables supply chain partners to embrace mutual goals and objectives collaboratively, thereby ensuring problem resolution, which is key to assuring enhanced operational performance. Buyer-supplier collaboration has been regarded as an important activity influenced by an array of antecedent factors, which highlights its ability to contribute to the performance objective and the long-term success of a business. The literature reviewed shows the significant role of buyer-supplier collaboration in contributing to the performance objectives as well as competitive goals of any business, which therefore underlines its strategic value to operational strategies and risk management practices. It also appears that buyer-supplier collaboration has received notable attention from some recent studies (Ahi & Searcy 2013:329; Carter & Easton 2011:46). One of the key elements that resonate with the adoption of collaborative interaction with supply chain partners is the fact that it is considered as a core capability crucial to sustainable competitive advantage (Gold, Seuring & Beske 2010:230). The following section discusses issues on supply chain integration.

2.3.2.2 Supply chain integration

In this subsection, definitions, antecedent factors, the benefits/importance as well as the measurement of supply chain integration, are discussed.

2.3.2.2.1 Definition of supply chain integration

Supply chain integration has been recognised as one of many dominant factors contributing to business performance (Palomero & Chalmeta 2014:373). Its prominence is emphasised mainly by a large number of reviews from scholars such as Jayaram, Tan and Nachiappan (2010:6837) and Flynn *et al.* (2010:59). These scholars underscore that supply chain integration is the level at which organisations interconnect and align their business strategies in terms of the continuous flows of materials, products and information with their upstream and downstream supply chain partners. Whipple *et al.* (2015:2) view supply chain integration as the combination of internal and external resources from both organisations of supply chain partners. It aims to achieve effective synergistic operations processes, which is crucial to attaining an ideal competitive advantage. The Council of Supply Chain Professionals (2005:10) regards supply chain integration as an interactive approach

to different supply chain networks rather than having separated and disjointed functions in firms. According to Wong *et al.* (2011:605), supply chain integration is a multidimensional construct consisting of internal and external integration factors. Internal integration refers to the interconnectivity of all cross functions within an organisation's environment (Wiengarten, Humphreys, Gimenez & McIvor 2015:1). External integration is regarded as the integration between a firm's upstream (customers) and its downstream (suppliers) business associates (Wong *et al.* 2011:605). Supplier and customer integration encompasses the level at which a focal firm engages or conducts its routine operations with its suppliers (Lai, Wong & Cheng 2010:273). This is regarded as information sharing, joint collaborative strategic planning as well as new product development (Lai *et al.* 2010:277).

Customer integration also ensures a broader and more pertinent understanding of market requirements and specifications, which is critical in enabling businesses to respond effectively and efficiently to their customers' demands and meet their levels of satisfaction (Schoenherr & Swink 2012:99). This research will adopt the definition emanating from a supply chain perspective, which reviews supply chain integration as close alignment and coordination within a supply chain, often with the use of shared management information systems (Alfalla-Luque *et al.* 2015:242). Figures 2.2 and 2.3 provide a practical illustration of both internal and external supply chain integration.

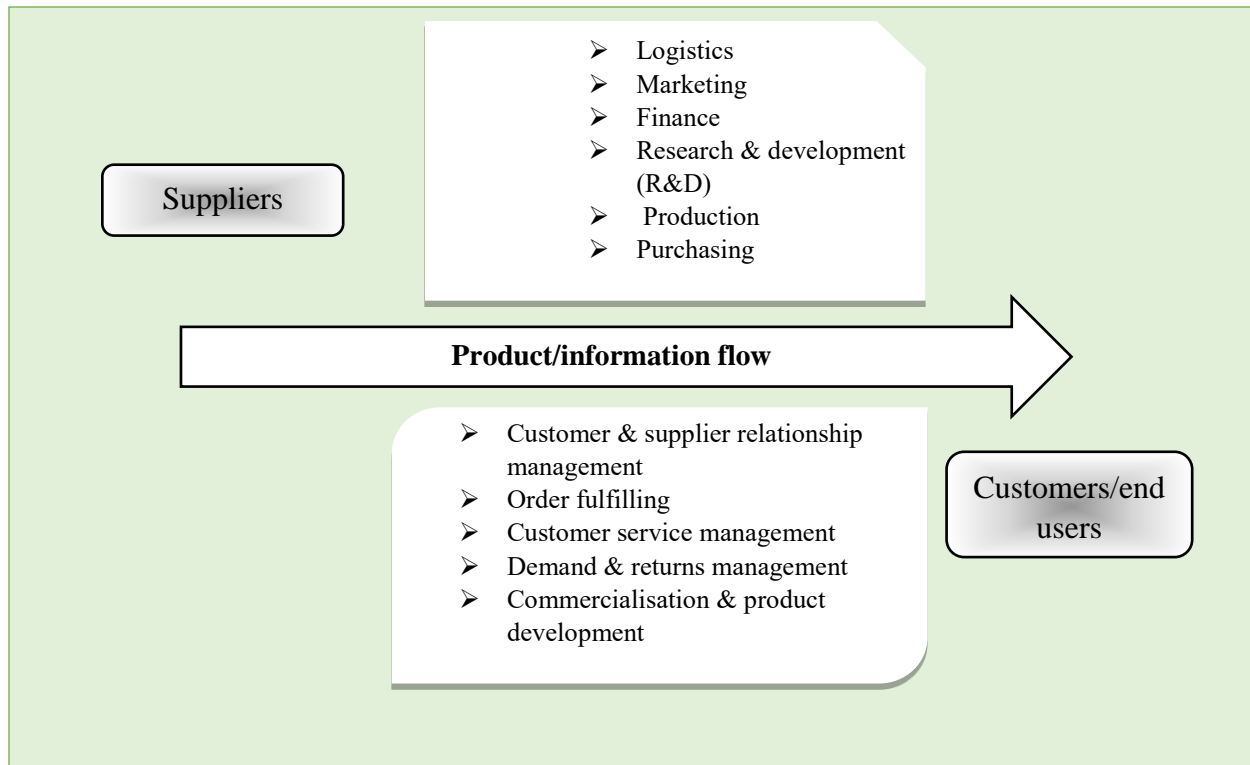


Figure 2.2: Internal integration (Naslund & Williamson 2010:16)

Figure 2.2 highlights the interaction that exists between the internal cross-functional areas within an organisation's supply chain environment. These include, amongst others, logistics, marketing, finance, research and development (R&D), production, purchasing, customer and supplier relationship management, order fulfilling, customer service and demand management and commercialisation and product development. Also depicted is the flow of information and products between organisations' suppliers and customers and end users/consumers and their functional operations. This, therefore, emphasises internal integration strategy.

As indicated by Naslund and Williamson (2010:16), one of the leading characteristics of internal integration is the smooth coordination and collaboration of all internal functions, which contribute to attaining customer satisfaction. Figure 2.2 also offers a practical illustration of the descriptions of the internal dimensions of supply chain integration, indicating that internal integration is an important strategic tool designed for obtaining good operational capabilities of core operational activities. This is even more effective because it calls for a more integrative strategic action of

different business functions in optimising the internal performance of activities confined within the business's scope of the function. Figure 2.3 refers to external supply chain integration dimensions, by initial work from Mentzer, DeWitt, Keebler, Min, Nix, Smith and Zacharia (2001:1). It also provides a distinction between internal and external supply chain integration.

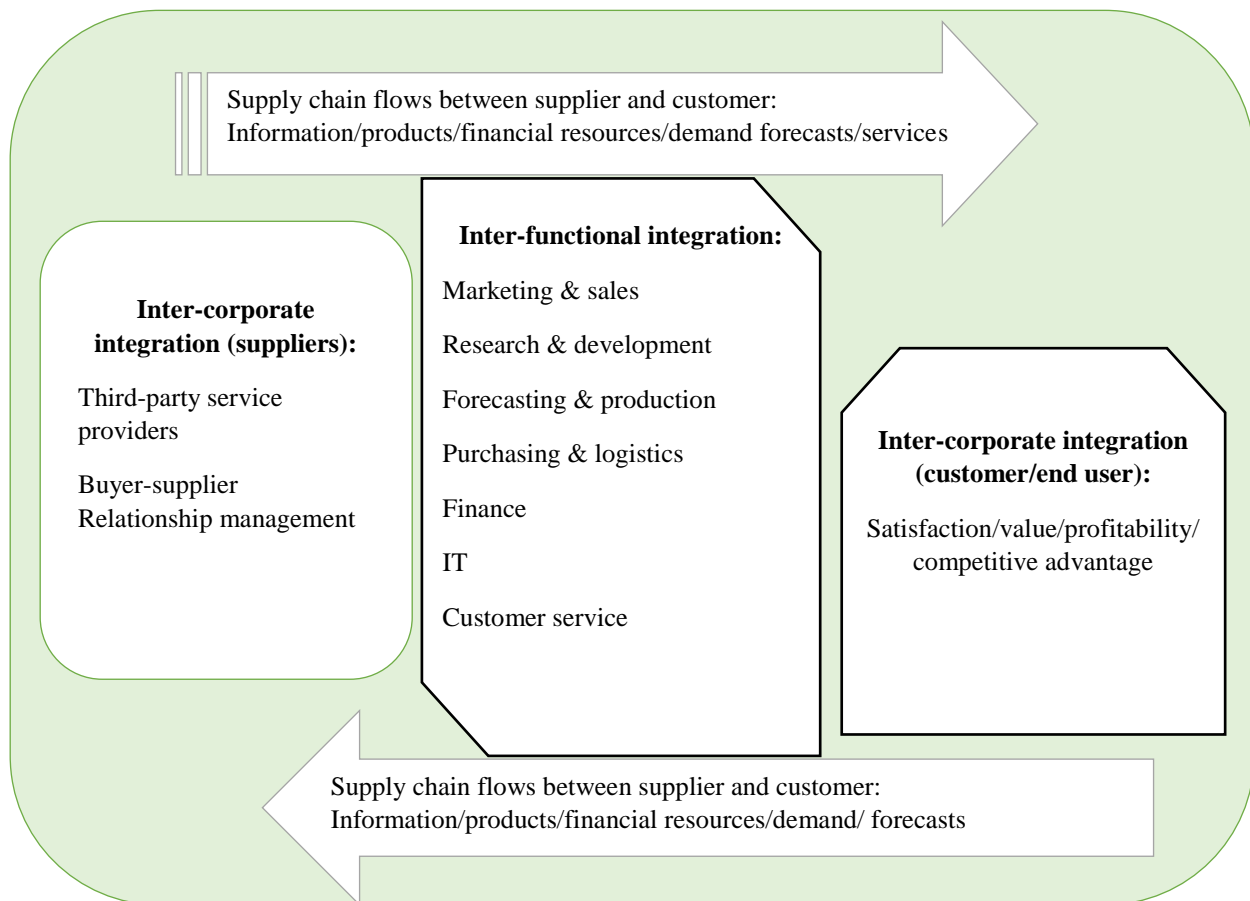


Figure 2.3: Mentzer model of external supply chain integration (Mentzer 2000:1)

Figure 2.3 presents a depiction of the relationship between external integration practices with an organisation's external supply chain network, highlighting the inter-connectivity between external business members (suppliers and customers). According to Naslund and Williamson (2010:17), it is crucial to achieve the required level of customer satisfaction, which could subsequently result in a desirable degree of profitability. Furthermore, these authors specify the characteristics of the interaction that occurs across the supply chain environment that is characterised by a cross-exchange of information, products/materials, financial resources, demand and forecasting processes. The flows take place from the inbound to outbound side of the value chain of activities

and vice versa. Supply chain integration is therefore a multifaceted construct in light of its core functional dimensions (internal and external integration), which play a role in shaping and contributing to the values of each element of an organisation's entire network of activities. External supply chain integration is considered a more inclusive philosophy that aims at effectively ensuring that businesses can improve their core operations to meet their customers and consumers' expectations and requirements by providing them with the best value for their money. Offering products of the right quality, quantity, delivered at the right time and place and ultimately at the best possible price is, therefore, essential to achieving success and the required level of competitive advantage sought.

2.3.2.2.2 Antecedents factors of supply chain integration

Supply chain integration has been widely considered as one of the most crucial elements of supply chain management (Flynn *et al.* 2010:65). Its role and strategic impact do not happen in isolation as it is, more often than not, influenced by various factors. Huo, Ye, Zhao and Shou (2016:132) found that IT systems are a key facilitator of integration practices because they enable supply chain members to coordinate their operations more efficiently.

A previous study conducted by Zhao, Huo, Selend and Yeung (2011:17) found that organisational commitment and employees' expertise and skill sets are promoting factors to firms' ability and capability to engage in more integrative work with their partners. The study points to the relevance of a shared strategic vision between businesses' top management and human capital in setting key success factor approaches, which may be crucial to the success of the organisation. Additionally, trust has emerged as a prerequisite factor, enabling the achievement of integrative routine processes among supply chain partners. Trust is also the certainty and confidence shared between each party which ensures that promises and obligations will be met in accordance with the stipulations set (Vijayasarathy 2010:494). Hence, trust has value as a backbone to any successful buyer-supplier relationship as it provides the basis for successful implementation of integration practices amongst supply chain partners. According to Yu, Jacobs, Salisbury and Enns (2013:346), successful integration of firms' supply chain partners calls for the proper and continuous exchange of information. The transfer of information is essential because it allows all parties to adequately manage all activities taking place within their supply networks. Furthermore, internal communication has been regarded as an underpinning antecedent that ensures better

implementation of operations (Welch 2012:246). Communication is further relevant in the sense that open communication efforts amongst employees gives them the platform to be abreast with all developments related to daily operations as well as strengthen their relationships (Mazzei 2014:82).

2.3.2.2.3 Importance/benefits of supply chain integration

Organisations which are more inclined to engage in integrative activities with their suppliers and customers tend to secure better information interchange, which subsequently enables the whole value chain network to enhance and achieve continuous flow of materials, products and data from points of origin to points of consumption (Wiengarten, Humphreys, McKittrick & Fynes 2015:25). This, therefore, contributes to achieving better performance of a supply chain as proper and more accurate information and expertise are conveyed between each chain of activities (Cao & Zhang 2011:163). As such, integrating every function of a firm through continuous information exchange between supply chain members is essential in maximising value addition within the organisation. Besides, integrated supply chains tend to result in sustainable cooperation initiatives in a business-to-business (B2B) environment (Ngai, Chau & Chan 2011:232). By implication, close and open engagement amongst supply chain partners could result in a more concise exchange of ideas as well as supply expertise required in dealing with day-to-day operations. This view found supporting evidence from Leuschner, Rogers and Charvet (2013:34) who mention that one of the significant characteristics associated with supply chain integration resides on its close-relatedness to both collaboration and coordination, thus stressing the core value that this practice possesses as an excellent contributor to supply chain performance objectives. Additionally, effective and efficient integration efforts between businesses call for strategic adoption of core internal and external strategic resources such as adequate relationship management (Barney 2012:3). As such, better management of such input resources leads to achieving a sustainable competitive edge through enhanced performance (Leuschner *et al.* 2013:38). Table 2.2 shows the significant nature and role that supply chain integration has as an enabler of business performance.

Table 2.2: Benefits of supply chain integration

Benefits of implementing supply chain integration
Minimal labour cost
Integration of tasks and information
Collaboration and coordination of supply chain members
Inventory management upgrades
Constant and continuous follow-up
Improved supplier and customer services (before and after sales)
Real-time and synchronisation of data and quality information in an organisation's microenvironment
Much enhanced logistics operations capability systems
Cost reduction
Development and identification of new business opportunities and ventures
Possibilities of further and sustainable performance improvement
Harmonisation of processes and workflow

Source: Palomero and Chalmeta (2014:376).

Table 2.2 illustrates the outcome of factors derived from the implementation of supply chain integration in an organisation's supply chain network. Some of these operational benefits include minimal labour cost, integration of tasks and information, collaboration and coordination of supply chain members. Other benefits include inventory management upgrades, constant and continuous follow-up, better-quality supplier and customer services (before and after sales), real-time and synchronisation of data and quality information in an organisation's microenvironment. Enhanced logistics operations capability systems, cost reduction, development and identification of new business opportunities and ventures, sustainable performance and harmonisation of processes and

workflow also qualify as benefits of supply chain integration. As well as the listed performance appraisals, one could further support the strategic role and relevance that supply chain integration has in contributing to a business's success. This view is supported by Whipple *et al.* (2015:2), who regard it as a fundamental cornerstone to securing a long-term competitive advantage.

Prajogo and Olhager (2012:514) describe supply chain integration as an important performance enhancement tool because of its ability to integrate activities that can foster logistics capabilities regarding products and materials exchanged, as well as higher coordination and collaboration of firms' routine procedures. Furthermore, Cheng, Law, Bjornsson, Jones and Sriram (2010:245) suggest that integrative practices are crucial in reducing operational costs and increasing responsiveness to both operational functions and changes. Sustainable performance is attainable through proper integration of businesses' cross-functional activities (Beheshti, Oghazi, Mostaghel & Hultman 2014:21). Coupled with linkages with external suppliers and customers, integration contributes to acceptable value creation to meet market requirements and expectations that a sole organisation may not achieve in isolation (Kocoglu, Imamoglu, Ince & Keskin 2011:1633).

2.3.2.2.4 Outcomes of supply chain integration

The significance of supply chain integration in the body of literature of supply chain management has been acknowledged (Huo *et al.* 2016:132) on the positive influence that it has on improving organisations' supply chain performance, which translates to competitive advantage (Kocoglu *et al.* 2011:1634). This exemplifies the critical nature and role that this variable has in affecting the success and long-term competitiveness of firms. Although the relevance of supply chain integration does not only limit itself to operational and strategic components of a business, it stretches to enhancing a conducive working atmosphere. In fact, there is a consensus that businesses that adopt integrative efforts tend to develop better collaborative working relationships, which is characterised by mutual and joint problem sharing and resolution (Świerczek 2014:89). This is key as it shows the extent to which adopting such practices brings about all organisations' players towards the achievement of a common goal that one could not have accomplished in isolation. As such, it enables the entire value chain to gain a sustainable competitive edge through swift responses to challenges emanating from Bullwhip and other market-related turbulences (Kotcharin, Eldridge & Freeman 2012:12). Moreover, Lotfi, Sahran, Mukhtar and Zadeh (2013:472) posit that effective integrated value chain activities lead to a sustained flow of

materials, products and information exchange, which subsequently contributes to adding value and meeting expectations of firms' customer bases. Moreover, integration of firms' network processes was found to yield greater performance outcomes in terms of competitive capabilities, which is underpinned by an increase in performance imperatives such delivery, cost, quality and flexibility (Prajogo & Olhager 2012:515). Thus, supply chain integration offers a sufficient basis for businesses to succeed if implemented properly.

2.3.2.2.5 Measurements of supply chain integration

Supply chain integration has been well researched, and reports from different investigations have provided an array of its measurements. One of many of these studies includes the one undertaken by Vijayasathy (2010:489) who viewed it as a multi-dimensional variable, with dimensions such as goods flow, information flow, planning and control, and organisation included in the study. Item-scales of the listed dimensions were adapted from Van Donk and Van der Vaart (2005:97). Jacobs, Yu and Chavez (2016:60) also measured it as a multi-dimensional construct, with internal and external integration as the main dimensions. Lastly, Yu *et al.* (2013:346) view supply chain integration as a multi-dimensional factor with sub-components that include internal integration and both customer and supplier integration. All items were initially adapted from Flynn *et al.* (2010:65); Zhao *et al.* (2011:17); and Frohlich and Westbrook (2001:185) respectively. Jayaram and Tan (2010:262) define it as a uni-dimensional variable, using a six-point item scale to measure information integration. In this study, supply chain integration is defined as a multi-dimensional construct, with internal and external integration being the main dimensions identified as suitable for the study's context. Internal integration will be assessed using a six-item scale while supplier and customer integration, being part of external integration, will be measured using seven and six-item scales. All these measurement instruments are adapted from Frohlich and Westbrook (2001:185); Narasimhan and Kim (2002:303); and Flynn *et al.* (2010:65).

2.3.2.2.6 Current results on supply chain integration in SMEs both locally and internationally

Integrating supply chain operations has been regarded as a key facilitator that contributes to a flawless operations function in SMEs in Denmark (Hvolby & Trienekens 2010:809). A further study conducted by Hamisi (2011:1270) highlighted the strategic importance of having an integration supply chain system enabling SMEs to reach their required level of performance.

According to that author, this plays a key role in their ability to survive. According to Lai *et al.* (2010:273), effective financial performance is attainable through proper integrative logistics and operational activities of firms' supply chains, which emphasises the role that integrated supply chain functions have in allowing SMEs to enrich their operational capabilities. It appears that there is a paucity of recent literature addressing the issue of supply chain integration in SMEs from a South African perspective, apart from few studies undertaken by Chinomona and Poee (2013:1) who investigated the issue from a logistics integration stance. These authors propose that coordinated logistics integration between SME partners contributes to their willingness to share information and business performance. The lack of current literature on supply chain integration from a South African perspective strengthens the relevance and worthiness of identifying this variable as supply chain best practice.

Supply chain integration has emerged as an important factor in the supply chain management philosophy, as supported by evidence from the literature that highlights the vast number of factors contributing to its direct and indirect significance to the success of any organisation's supply chain performance. It further transpires that supply chain integration influences and dictates the smooth running of any business's value chain of activities, mainly with the basic purpose to ensure sustained performance and competitive advantage, which are viewed as key indicators of a business's success. Furthermore, it arises that supply chain integration is important to a business's performance, due to its ability to bring together different business functions to enhance their value-adding capabilities. By achieving the required levels of performance and competitiveness is partially a result of supply chain integration in businesses. Lastly, the importance of supply chain integration has been well documented. However, it has been observed that there is limited recent literature addressing supply chain integration in a South African context, apart from very few studies focusing on other factors related to supply chain management, which thus reinforces the necessity of pursuing further the strategic impact that this variable has on the SME sector. The forthcoming section provides a discussion of literature related to TQM.

2.3.2.3 Total quality management

This section discusses topics related to the definitions of TQM, antecedents, significance and its measurements.

2.3.2.3.1 Definitions of total quality management

According to Lee *et al.* (2010:74), TQM is regarded as a business management strategy designed to enhance the quality, management and performance of a firm. Its core aim is to achieve competitive advantage. Teeravaraprug *et al.* (2011:101) provide a more refined and specific definition, namely, a manufacturing business strategy focused on assuring continuous and sustained operations through the effort and contribution of an organisation's primary stakeholders (suppliers, top management, employees and customers), with the purpose of meeting customers' expectations and requirements. Furthermore, Das, Kumar and Kumar (2011:196) view it as a philosophy consisting of a combination of organisations' core resources aimed at securing the satisfaction of both primary and secondary stakeholders. This view is further supported by Talib *et al.* (2011:275), who state that the primary goal of TQM is to ensure that customers' needs are either met or surpassed; this is achieved through the continuous development of business practices to enable the provision of quality goods and services. This study has adopted the definition of Lee *et al.* (2010:74), which refers to an operational strategy based on improving the level of quality management within an organisation. Also considered are results from a study conducted by Kumar, Garg and Garg (2010:36) that stretches the characteristics of TQM and its role and value to organisations' performance appraisal. Figure 2.4 illustrates the core characteristics derived from this supply chain practice. These are viewed as management commitment to continuous improvement, customer satisfaction, continuous operations and systems upgrades, teamwork, meaningful training initiatives, feedback and effective communication across supply chain networks.

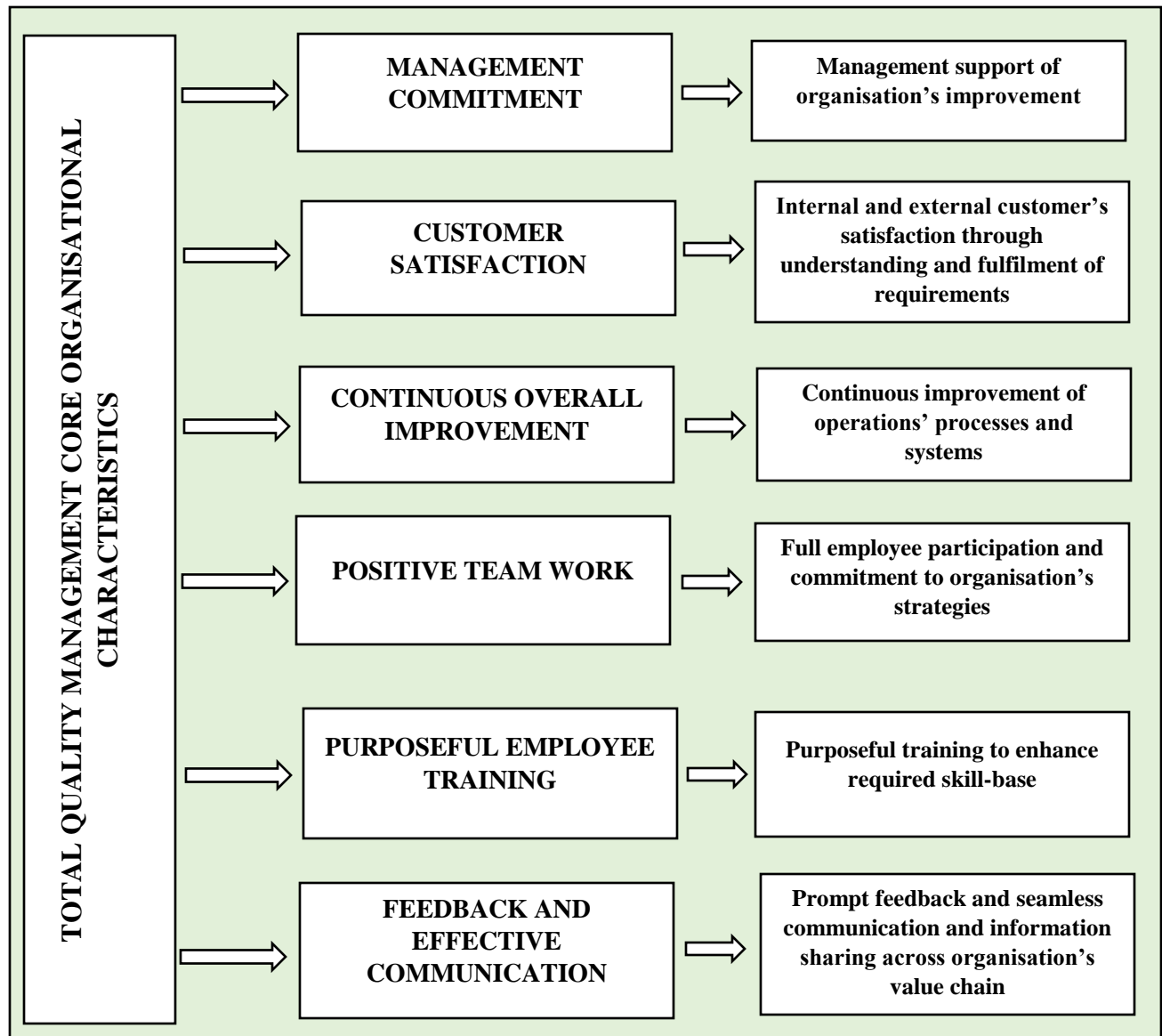


Figure 2.4: Strategic characteristics of TQM (Kumar, Garg & Garg 2010:36)

Figure 2.4 highlights the core characteristics that effective implementation of TQM practices yield as performance outcomes. The figure singles out those characteristics such as organisational commitment, customer satisfaction, continuous improvement, positive teamwork, employee training and feedback and communication. According to Kumar *et al.* (2010:36), TQM is a management philosophy that embodies an array of strategic processes that assists businesses in their constant quest to gain competitive excellence. As such, TQM is a multidimensional concept that involves some performance objective criteria, which businesses need to adhere to, to reach

acceptable levels of performance. The implementation of TQM could be regarded as essential in ensuring the production of quality products and services to organisations' stakeholders, since it resides on the continuous improvement of the operational functions of a business.

2.3.2.3.2 Antecedents of total quality management

TQM has received recognition as a key quality measurement yardstick, designed at ensuring better performance outcomes (Khani, Nor, Samani & Hakimpour 2012:334). Bearing in mind the relevance of the stated affirmation, it appears important to single out the possible driving factors that contribute to the prominence of this supply chain practice. In their study on antecedent factors of production and customer performance, Agus and Hassan (2011:1650) identified supplier relations, benchmarking activities, quality measurement and continuous process improvement as prominent precursors of positive TQM adoption, and crucial factors in assuring competitive objectives.

Valmohammadi and Roshanzamir (2015:167) determine that a strong and explicit organisational culture that lays out its strategies on quality driven practices has a relationship with proper implementation of quality processes and procedures. Adequate total quality activities are effectively carried out when all stakeholders view continuous quality improvement strategies as paramount to sustainable performance goals (Kaluarachchi 2010:41). Mahmud and Hilmi (2014:216) assert that organisational learning capability exerts a major influence on the implementation of an efficient level of TQM, which contributes to better operational performance.

2.3.2.3.3 Importance of total quality management

The practice of TQM is an essential management tool due to its positive impact on firm performance as well as its contribution to competitiveness through the enhancement of the quality of firms' products and services (Talib *et al.* 2011:277). The accurate application of TQM procedures results in a reduction of cycle time, the minimisation of delivery dependability and a much-increased operational response to customers' requirements in terms of prompt delivery and availability (Lee *et al.* 2010:74). Besides, TQM practices such as JIT have a relationship with supply chain competitive performance as achieved through its capability to meet customers' demands on time and permits the management of inventories by keeping them at a minimal low level (Vanichchinchai & Igel 2011:3406).

Zu, Robbins and Fredendall (2010:86) hold the view that TQM is a major strategic tool to achieve superior performance, as organisations strive to boost the quality of products and services, which is feasible through solid and sustainable investment in TQM practices. TQM has been found to be an effective enabler of enhanced environmental practices such as green purchasing and collaboration (Wiengarten & Pagell 2012:407). Further evidence shows that businesses that adopt TQM practices tend to be better equipped to ensure reduction of costs, increased flexibility and delivery in the market environment, which places great emphasis on environmental friendliness (Lopes de Sousa, Jabbour, Jabbour, Latan, Teixeira & de Oliveira 2014:39). As such, TQM influences both environmental and non-environmental orientated markets.

2.3.2.3.4 Outcomes of total quality management

There has been a consensus on the view that TQM is a management philosophy designed for promoting the sustainable upgrading of all organisations' functions. The influence that this management practice has on firm performance is noteworthy, as described in recent supply chain literature. Valmohammadi and Roshanzamir (2015:169), for instance, state that organisations which consistently apply TQM practices to meet and exceed their customers level of satisfaction through an increase in quality products and services stand a greater chance of becoming competitive. It has also been acknowledged that TQM-adopting supply chains tend to outperform their competitors regarding innovation and manufacturing capabilities (Konecny & Thun 2011:496); operation readiness (Yunis, Jung & Chen 2013:690); and superior quality of products and materials (Wang, Chen & Chen 2012:119). TQM is, therefore, a performance enabler in firms' supply chain environments, notably due to its positive effect on key business strategic goals, which are long-term profitability and competitive gain.

It was reported by Dubey, Gunasekaran and Ali (2015:120) that continued implementation of TQM enables environmentally driven businesses to accomplish suitable green imperatives. The application of suitable reverse logistics practices such as waste and carbon emission reduction and recycling is appropriate to achieve green objectives (Prajogo, Chowdhury, Yeung & Cheng 2012:123). In addition, adoption of quality procedures results in the production of quality products, fosters coordination amongst supply chain members and minimises the degree of variation of processes and systems (Wiengarten & Pagell 2012:407). TQM value to businesses can be seen as multifaceted because of the plurality of its impact and influence on organisations. Evidence to this

view can be found from Corredor and Goñi (2011:831) who suggest that businesses using TQM tend to benefit from enhanced quality products and services and satisfied, loyal customers. The result is a much-improved market share and increase in profit margins, thereby emphasising that TQM is a quality facilitator of firms' operational strategies and systems.

2.3.2.3.5 Measurements of total quality management

Regarded as a multifaceted philosophy that encompasses a large number of practices, TQM has often been conceptualised as a multidimensional construct (Pereira-Moliner, Claver-Cortés, Molina-Azorín & Tarí 2012:82). In their study, Das *et al.* (2010:195) follow the same line of reasoning by viewing TQM as a multidimensional variable, with components such as management commitment, supplier quality management, product innovation, benchmarking, employee involvement, reward and recognition, education and training, customer focus and product quality as dimensions suitable to measure the construct. These dimensions are adapted from a study conducted by Das, Paul and Swierczek (2008:52). Benavides-Velasco, Quintana-García and Marchante-Lara (2014:77) also view it as a multidimensional variable, with the following dimensions: leadership, employees, partnership and resources, processes, products and services. All these dimensions were derived from Camisón (1996:191); Claver-Cortés, Pereira-Moliner, Tarí and Molina-Azorín (2008:228); and Wang *et al.* (2012:119). Furthermore, it is a seven-dimensional construct (top management support, customer relationship, supplier relationship, workforce management, quality information, and product/service design and process management), designed from the work of Kaynak (2003:1). Anderson, Rungtusanatham, Schroeder and Devaraj (1995:637); Douglas and Judge (2001:158); and Flynn, Schroeder and Sakakibara (1995:659). In this study, TQM is defined and measured as a uni-dimensional construct using a six-item scale emanating from Das *et al.* (2010:195).

2.3.2.3.6 Current literature on TQM in SMEs both locally and internationally

TQM has been regarded as an important quality management concept, which enables the achievement of competitive advantage by organisations (Talib *et al.* 2011:269). As a strategic tool, TQM has been examined by Wang *et al.* (2012:120) who uphold that it contributes to the better performance of firms. Supporting evidence from a study conducted by Lam, Lee, Ooi and Lin (2011:1277) suggests that effective adoption of TQM practices results in better market

performance through the mediating role of learning operations. Further evidence of the value related to the steady adoption of TQM practices has been put forward by Fening (2012:1), who adds that SMEs that can adequately implement quality practices as part of their operational objectives stand a better chance of increasing their operational performance. This, in turn, leads to the sustainability of operations and business survival (Talib & Rahman 2010:249). It is noted therefore that TQM has been an important factor to SMEs' success.

From a South African perspective, TQM has also received great attention in some studies (for example, Barnes, Bessant, Dunne & Morris 2001:293; Brand 2006:1). More recent studies such as the one conducted by Rathilall and Singh (2011:8854), claim that proper implementation of TQM practices may contribute to increasing the performance of manufacturing SMEs. However, several misalignments of lean management practices, which include TQM amongst others, are also prevalent. Despite the significance of TQM, present investigations into the issue seem to be limited.

The practice of TQM is regarded as an important supply chain management practice aimed at continuously improving firms' operations to ensure the achievement of better performance, and ultimately, securing a sustainable competitive advantage. In evoking the issues regarding the drivers of TQM, the study notes that it is an important strategic practice influenced by some constructs. It was disclosed that TQM is an operational enabler, which along with other factors, plays a critical part in facilitating the attainment of business performance in highly competitive and turbulent market environments. It was observed that TQM is a facilitator to competitive advantage and performance in complex and volatile supply chain environments, since it facilitates continuous processes and systems improvement regarded as critical to meet the expectations of organisations' customers.

2.3.2.4 Information technology

Discussion on issues related to IT will uncover topics about the conceptualisation, drivers, importance, outcomes and measurements.

2.3.2.4.1 Definition of information technology

According to Badjor and Grabara (2014:97), IT can be defined as a structured system and network of collecting information from a sender to receiver, and operational processes of transmission of

data designed for use on a specific project. Kisielnicki, Grabara and Nowak (2005:10) describe it as a multilevel application, which enables the sharing or exchange of input and output data between different organisations' networks. Further developments are provided by Beynon-Davies (2009:22), who views it as the sharing of formal, informal and technical information and data between two or more individuals/organisations. Moreover, Abdullah (2009:10) presents a more concise explanation of IT and views it as alignment and grouping of software, hardware, and telecommunication network structure and design. It aims to ensure the unimpaired creation and distribution of data within a business's environment. This view is expanded on by Cashman (2010:22) who refers to it as a fully integrated and seamless system, consisting of operational and technical equipment, software and infrastructure that is managed and coordinated by individuals to assist in decision-making procedures.

In this study, IT is defined in accordance to Cashman's (2010:5) and Bajdor and Grabara's (2014:97) definitions, which pertain to a broad combination of software, technical equipment and infrastructure designed to control, plan, coordinate and support organisational decision-making processes.

Dima and Man (2013:25), advise that four key components characterise an IT system. These are known as (1) sender of information (primary and secondary); (2) transmission channels; (3) types/sets (database and directories) of information being conveyed; and (4) receiver of information. It is therefore paramount for firms to monitor and consistently ensure that these elements operate synergistically, to guarantee smooth coordination amongst each chain of activities, which is necessary for providing value to best customers (Vlăduțescu 2014:15). Table 2.3 presents a detailed depiction of the most relevant tasks that IT brings to an enterprise if implemented adequately.

Table 2.3: Tasks performed by an information technology (IT) system

Tasks performed	
Primary tasks	Secondary tasks
Gather information Information storage Processing of information Transmission/sharing of information Presentation of information	<ol style="list-style-type: none">1. Facilitates the implementation of firms' activities and operational processes, aimed at achieving strategic objectives.2. Enabling and fast-tracking continued communication between top and bottom levels of organisation's hierarchy.3. Facilitates transmission of feeds to ensure effective corrective actions throughout different functional areas of a business.4. Contribution to the entire production of businesses' products and services with the objective of providing additional value and securing competitive advantage.

Source: Bajdor and Grabara (2014:98).

Table 2.3 highlights the main tasks that effective adoption of IT comprises as a contribution to operational processes and activities in an organisation. These main tasks are viewed as implementation of firms' activities and operational processes aimed at achieving strategic objectives. Some of these objectives include enabling and fast-tracking continued communication between top and bottom levels of an organisation's hierarchy. Included in these objectives is facilitating transmission of feeds to ensure effective corrective actions throughout different functional areas of business and contributing to the entire production of companies' products and services. Moreover, it is also crucial to underline the core value that these different practices can have in assisting, not only each business function but also the entire value chain through sharing of quality information and data as well as required feeds and strategic decisions. The above discussion demonstrates that IT adoption is a practice that influences the practical use of strategic operations and action plans. Its value-adding contribution to the smooth running of supply chain

members is integral to the process of ensuring a flawless conveyance of information and other relevant operation data.

2.3.2.4.2 Antecedents of information technology

IT adoption has been determined as one of many major enabling factors to business productivity (Pan, Pan & Lim 2015:401). However, its prominence as a contributor to supply chain performance could rely on some drivers as indicated in Figure 2.5.

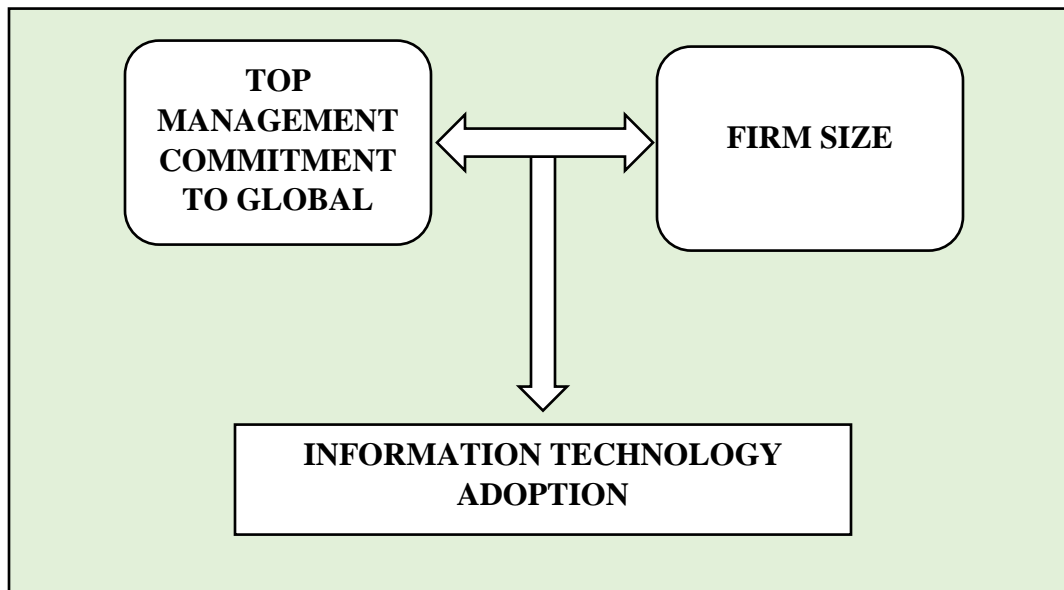


Figure 2.5: Drivers of IT (Jin & Kang 2013:57)

As indicated in Figure 2.5, a firm's commitment to global sourcing and its actual size are key antecedent factors to the adoption of IT. Jin and Kang (2013:59) contend that strong strategic involvement from top-level executives can spark the implementation of IT-related practices and applications. These include electronic data interchange (EDI), system handling real-time order and JIT, which may be implemented in the effort to ensure better coordination and integration of information sharing across different parallel supply chain members. These authors further advance that effective and efficient implementation of these IT practices rests on the readiness of an organisation. When considering resources, more prominent corporations have a broad spectrum of supply networks which makes for a perfect, synergistic, coordinated exchange amongst different chains of possible activities. Furthermore, it is common knowledge that big and successful

businesses have sufficient capital resources to invest in IT and subsequently are in a position to reap the benefits linked with its adoption. This notion finds supporting evidence from Kushwaha (2011:9), who suggests that along with other driving factors, IT implementation is also dependant on five factors, namely:

- customer or supplier dependency;
- firm's IT readiness;
- external or market-related pressure to adopt;
- business's structural sophistication or technological advancement; and
- relevance and quality of information.

The present section provides an elaboration on literature about antecedent factors of IT adoption in the supply chain. In fact, it was found that the strategic relevance of IT resides on its interaction with different practices or factors. This, therefore, contributes to a better understanding of the role IT has in an organisation's supply chain performance appraisal.

2.3.2.4.3 Importance of information technology

IT has been reported to be an important topic in supply chain literature through its effect and role in promoting the right exchange of information and data throughout a firm's supply chain network (Singh & Teng 2016:290). This, therefore, pertains to the strategic position and influence that this supply chain principle has in assuring a consistent value addition to each function within an organisation. Figure 2.6 illustrates the role and contribution that adoption of IT has on a business's supply chain environment.

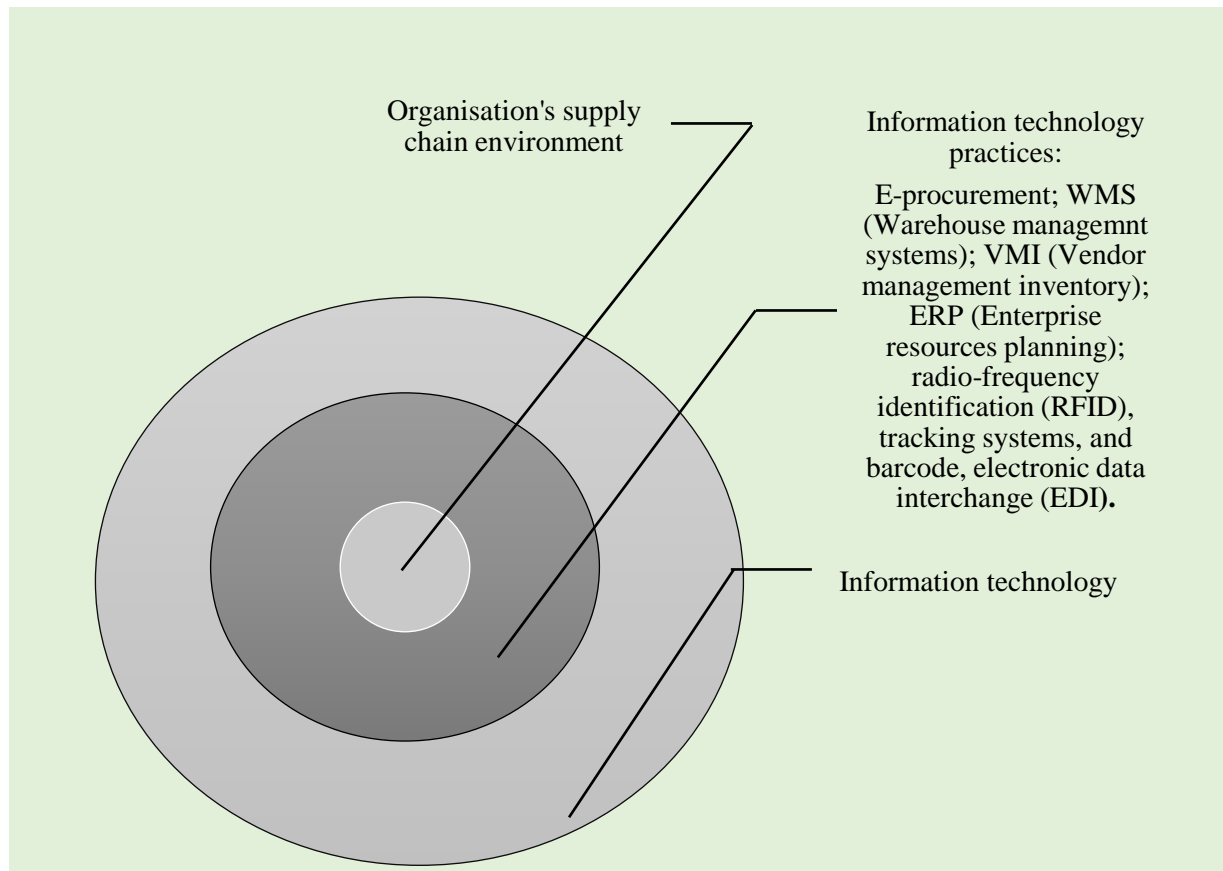


Figure 2.6: IT's role in firm's supply chain (Dolci, Maçada & Grant 2013:5)

Figure 2.6 highlights the influence that IT has on a firm's environment. It also depicts the strategic IT practices, namely, E-procurement, WMS, VMI, ERP, RFID, tracking systems, bar-coding and EDI, which organisations can adopt in their efforts to foster and ensure efficient operational processes. These information technologies are necessary components designed to facilitate and assist different business' functions to operate smoothly. As a result, the entire network chain of activities will have a logical flow of material and information/data from the upstream to downstream value chain (Ronchi, Brun, Golini & Fan 2010:131; Shiau & Lee 2010:382).

According to Hazen and Byrd (2012:8), adequate implementation of IT tools such as EDI and RFID have an impact on enhancing business performance regarding the following benefits:

- efficiency, which refers to cost and cycle reduction, and higher production;
- effectiveness, which relates to better decision-making procedures, planning and management of core resources as well as flawless delivery scheduling; and

- reliance, which involves upgrading the flexibility of a product portfolio to meet customers' demands.

IT is regarded as one of many pillars of sustainable organisations' supply chain performance outcomes (Marinagi, Trivellas & Sakas 2014:587) owing to its ability to facilitate constant coordination and collaborative interchange amongst supply chain partners, crucial in reducing transactional costs. Pan *et al.* (2015:401) validate that appropriate utilisation of IT contributes to higher performance outcomes, in that it enables businesses to have products and services available to their respective target markets.

Khan (2013:165) stresses that the positive incorporation of IT tools and elements is of utmost relevance in supply chain organisations to reach the level of competitive advantage sought. This points to the importance of investing heavily in IT practices to sustain a firm's productivity. Figure 2.7 depicts the results of the proficient adoption of IT procedures in an organisation's supply chain. The literature discussed on IT has a central strategic role in a firm's supply chain environment, mainly due to the operational benefits that result from its effective adoption as a functional tool to facilitate process implementation.

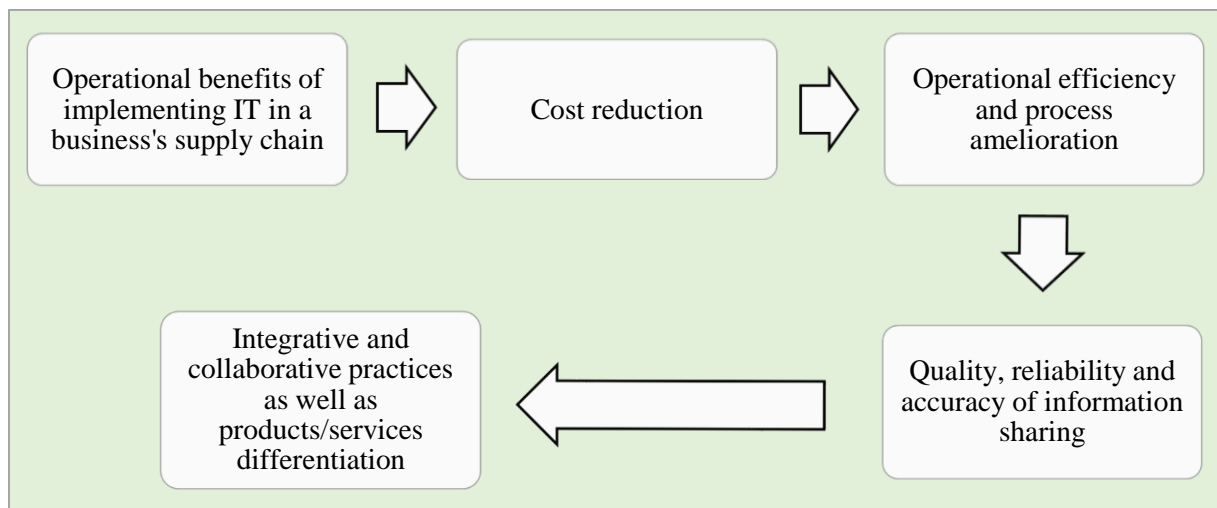


Figure 2.7: Benefits of IT adoption in business's supply chain (De Barros, Ishikiriya, Peres & Gomes 2015:698)

Figure 2.7 illustrates the importance of implementing IT practices and the strategic benefits that result from a concise and proper adoption. In accordance with De Barros *et al.* (2015:698), IT offers an array of operational benefits if adopted correctly. These include, amongst others:

- reducing cost;
- processing improvement;
- conveying relevant information across the supply chain;
- fostering integration and collaboration relationships; and
- broadening business' product portfolio through differentiation of products and services.

The above discussion strengthens the consensus that IT is a major role player; it enables supply chain performance in terms of outcomes that derive from its application as part of the operational procedures.

2.3.2.4.4 Outcomes of information technology

Recent developments in current supply chain literature have made mention of the critical nature and role that proper adoption of IT practices has in shaping firms' competitive aspirations (Khan, Artail, Malik & Niaz 2014:6). IT has been found to be a defining factor in supply chain integrative efforts because of its role in enabling different organisational partners to engage in knowledge sharing as well as collaboration (Acar & Uzunlar 2014:746). Fawcett *et al.* (2011:38) confirm that a substantial investment in IT tools and procedures is essential for achieving positive and sustainable levels of competitiveness. Adoption of information practices has been viewed to be vital in assuring supply chain agility efforts (Jacques 2012:10). As supply chain agility procedures are attainable with up to date, current and efficient information, data and other advanced technologies need to allow better flexibility to adjust to unpredictability in market changes and fluctuations (Acar & Uzunlar 2014:747).

IT resources and tools are defined as positive drivers and enablers of business capabilities to meet their production schedules, customers' expectations and requirements, productivity and ultimately, competitive strategies (Dao, Langella & Carbo 2011:68). Moreover, IT practices such as quick-connect electronic interface have been acknowledged to facilitate cooperative engagement between supply chain members in the manufacturing sector (Ye & Wang 2013:372). This provides sufficient connection of different production areas to ensure synchronisation of the entire production process, which results in better operational procedures. Similar results were disclosed about the benefits of rigorous implementation of IT.

As indicated by Jin and Kang (2013:60), constant improvement of operational and production performance outcomes is feasible through the adequate adoption of IT applications. They further speculate that IT allows for comprehensive cost reduction through continual information sharing, which correlates to better JIT efforts and shorter replacement cycle times. IT connectivity has received further support from Liu, Ke, Wei and Hua (2013:1455) to be a fundamental contributor to integrative actions of data exchange and communication between all organisations' participants. Adoption of IT is relatively important as it not only boosts the competitive performance of firms but also assists and participates in the smooth operational development of the whole value chain.

2.3.2.4.5 Measurement of information technology

IT has emerged as a vibrant factor in the field of supply chain management (Tso, Yau & Cheung 2010:122). Some scholars have provided different measurements of IT adoption, as attempted by Malaquias, Malaquias and Hwang (2016:195) who measured IT as a uni-dimensional construct using three measurement instruments adapted from Ongori and Migiro (2010:930) and Kannabiran and Dharmalingam (2012:186). Mao, Liu, Zhang and Deng (2016:1062) measured it as multidimensional, with dimensions such as IT infrastructure resources using four items adopted from Weill, Subramani and Broadbent (2002:57) and Lu and Ramamurthy (2011:931); IT human resources, using five items derived from Bhatt and Grover (2005:253) and Zhang (2005:1); and IT relationship resources using four items adopted from Bhat *et al.* (2005:253) and Chen, Wang, Nevo, Jin, Wang and Chow (2014:326). For this study, IT adoption is measured using a five-item scale derived from Jin, Vonderembse, Ragu-Nathan and Smith (2014:24).

2.3.2.4.6 Current literature on information technology (IT) in SMEs both locally and internationally

The importance and strategic relevance of IT as an enabler of business operational success have been elaborated on by Heeks (2010:625). The author further reveals that proper adoption of IT as an operational enabler contributes swiftly to improving firms' value chain effectiveness. Another study conducted by Bahrami, Ghorbani and Arabzad (2012:59) confirms the relative significance that IT has as a critical success factor to business performance and long-term competitive advantage. As indicated by Awa, Ukoha and Emecheta (2012:573), about 15 to 30 percent of Austrian and Danish SMEs invest considerably in adopting IT as part of their operational strategies, designed to enhance their operational activities. However, despite the available

evidence on the adoption of IT by some SMEs, it appears that conflicting reports from an Indian perspective are worth noting. According to Kannabiran and Dharmalingam (2012:186), only 17 percent of SMEs have the required capability to implement stable IT processes. This was further explained by the lack of finance and technical/know-how capacity and ability (Packalen 2010:1). From a Chinese perspective, this lack of adoption was related to the relatively small size of SMEs (Yulong-Li 2011:489).

The value of IT has attracted considerable attention over the years (Kyobe 2011:255). This is due to its impact on the competitive advantage and survival of South African SMEs and has been viewed to be paramount to a firm's success (Ongori & Migiro 2010:93). Furthermore, Ismail, Jeffrey and Van Belle (2011:1) advance that proper IT processes are fundamental for SMEs' operational processes in retail, manufacturing and service industries. The authors further indicate that fair use of IT results in operational benefits, which include, among others, collaboration practices and enhanced production procedures consisting of elements such as ERP, JIT, etc. (Modimogale & Kroeze 2009:504). IT utilisation appears to be a proficient operational tool, designed to allow businesses the capability to effectively oversee their operational processes, which subsequently enables a better diffusion of core resources required in attaining their strategic goals. Moreover, IT is an important supply chain best practice that has an indelible strategic impact on supply chain performance. Its value is relevant as it enables and ensures intra and inter-organisational connectivity through continuous sharing, exchange and visibility of data, materials and capital resources from the point of origin to the point of consumption. Current literature has highlighted the strategic influence and role that IT has in ensuring SMEs' competitive edge and business survival. Further results have emphasised the core challenges linked to the implementation of this crucial success factor. In addition, one of the leading underlying problems includes the lack of financial resources as well as a knowledge-base.

2.4 CONCLUSION

This chapter provides a literature review of supply chain management best practices. The study identifies buyer-supplier collaboration, supply chain integration, IT adoption and TQM as the leading supply chain management best practices. It also refers to the resource-based view (RBV) theory as a suitable theory to ground the study. Its selection is due to its linkage to supply chain best management practices of the study as this research aims at ascertaining the strategic value of

combining input resources. It identifies supply chain management best practices and their direct and indirect effects and influence on mediating and outcome constructs.

A noteworthy issue arising from the literature is that each best practice is regarded as an effective and efficient contributor and enabler of a business's performance. That places them as paramount factors to achieve long-term and sustainable competitive advantages. The significance of the selected practices to supply chain performance is emphasised. Moreover, it emerged that buyer-supplier collaboration is an enabling factor, which positively influences firms' performance as well as competitive goals and aspirations. It was further recognised that supply chain integration is important to business performance because of its ability to dictate the synergistic operations of a business's value chain of activities that are viewed as central to ensuring its sustainable performance and competitive advantage. Still, IT has been defined as the facilitator and coordinator to supply chain processes because it enables a business to oversee its operational processes effectively, which facilitates an uninterrupted flow of core resources required to attain its strategic goals. Lastly, TQM was identified as a critical factor that exerts a significant impact on supply chain performance outcomes, and is linked to its core value of continuous augmentation of supply chain processes, procedures and systems. TQM is important in order to gain sustainable competitive advantages and performance in complex and volatile supply chain environments. The next chapter focuses on a literature review on supply chain agility and risk management in the SME sector.

CHAPTER 3

SUPPLY CHAIN AGILITY, RISK MANAGEMENT AND PERFORMANCE

3.1 INTRODUCTION

This chapter reviews literature centred on supply chain agility and risk management as well as supply chain performance. This section is crucial because it provides a view of existing results and other relevant knowledge-based elements about these respective constructs. The information is crucial to the understanding of the strategic characteristics, dynamics and significance of these constructs to the issues under consideration in this study.

The chapter begins by exploring issues related to supply chain agility. The points addressed include establishing the definition of the constructs and its several determinants. Other sub-topics of discussion consist of highlighting the importance and outcomes of supply chain agility and previous research perspectives. It then focuses on reviewing the literature on SCRM, focusing on topics such as definition, importance, antecedent and outcome factors, and previous research results. The discussion concludes with a review of supply chain performance. Similar to the structural layout of the last chapter, issues such as the definition, importance, drivers, outcomes and previous research results are discussed.

3.2 SUPPLY CHAIN AGILITY

This section is a literature review focusing on supply chain agility. The issues highlighted include the definition/conceptualisation of supply chain agility from different perspectives, followed by determinants, outcomes as well as the importance of the construct and previous research premises.

3.2.1 Conceptual definitions of supply chain agility

Supply chain agility has received considerable attention from a number of supply chain management scholars and practitioners alike (for example, Vickery, Droge, Seita & Sambamurthy 2010:7025; Chiang, Kocabasoglu-Hillmer & Suresh 2012:49). DeGroote and Marx (2013:909) view it as an organisation's ability and capability to detect and swiftly respond to changes in their markets. Braunscheidel and Suresh (2009:119) offer a more detailed view, which includes the joint coordination of firms' primary stakeholders such as suppliers and customers, which enables them to adjust, handle and provide an efficient response to market changes.

Yusuf, Gunasekaran, Adeleye and Sivayoganathan (2004:379) provide a general description and refer to supply chain agility as a production system characterised by a nexus of dimensions such as technologies, human capital and information designed at ensuring a prompt adjustment and reply to customers' sudden alteration of orders. Indicators of supply chain agility include speed, flexibility and responsiveness, which shows that supply agility stems from meaningful collaborative initiatives between business stakeholders (Gligor & Holcomb 2012:438). Liu, Ke, Wei and Hua (2013:1453) attest that the proper adaptation and response to changes in customers' needs is a determinant of coordinative strategies amongst supply chain members. Thus, supply chain agility is defined as a strategy that calls for a synergistic organisation of supply chain activities and processes to assure that environmental turbulence is addressed smoothly (Yusuf *et al.* 2014:532).

3.2.1.1 Characteristics of supply chain agility

In their study on a multidisciplinary approach to supply chain agility, Gligor, Holcomb and Stank (2013:1) propose that some factors have been identified as its key elements which exhibit its actual attributes. These characteristics are viewed as:

- **Alertness**, which refers to the ability of a supply chain to promptly identify any potential change and distortion that may occur (Zhang 2011:303);
- **Accessibility** is regarded as the capability to obtain vital and important data and other strategic information, which are required to tackle identified changes in customers' requirements through the alertness process (Tsheng & Lin 2011:3693; Lu & Ramamurthy 2012:931);
- **Decisiveness** is viewed as an organisation's ability to make concise and appropriate strategic decisions to contain and deal with changes in the marketplace (Bradshaw, Young, Russell & Burge 2010:65);
- **Swiftness** is described as a business's capability and ability to make informed and timely adoptions and execution of deals and procedures to respond to and meet market-related specifications (Sporis, Milanovic, Jukic, Omrcen & Molinuevo 2010:65); and
- **Flexibility** is defined as the aptitude to constantly adapt operational processes and other strategies to meet specific change within a value chain, as a response to a market instruction regarding change (Wong, Chaouachi, Lau & Behm 2011:408).

The above attributes provide useful insights into understanding the core and essence of supply chain agility, which encompasses traits of alertness to potential upcoming distortion and accessibility of relevant information required to deal with such identified problems. Furthermore, the value chain of the network needs to be decisive, precise and accurate in its implementation of strategies as well as ensuring an adequate adjustment of procedures aimed at addressing changes in market requirements.

Figure 3.1 proposes a depiction of the characteristics of supply chain agility. Wieland and Wallenburg (2013:304) identify visibility and speed as one of many core dimensions of supply chain agility.

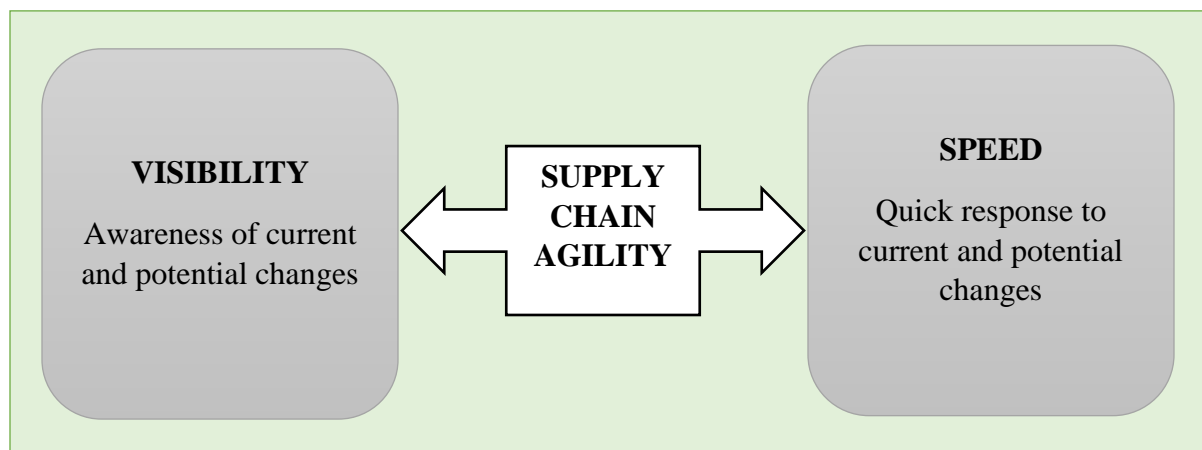


Figure 3.1: Supply chain agility characteristics (Wieland & Wallenburg 2013:304)

Figure 3.1 presents the aspects of supply chain agility, which consist of visibility; for businesses to be aware of current market developments that could affect their operations. Also reported as a key characteristic, is speed capability, which is to respond swiftly to those identified and possible changes. According to Wieland and Wallenburg (2013:310), functional supply chain agility networks need to be able to demonstrate a certain degree of awareness to possible changes that may emanate from its marketplace. The authors further suggest that once identified, a firm has to be able to react smoothly and timeously towards addressing these alterations to guarantee an acceptable level of customer satisfaction. It emerges from the addressed literature that supply chain agility must systematically be able to have an overview of current market developments and be

able to detect and mitigate possible discrepancies that could hinder the efficient running of supply chain operations.

3.2.2 Determinant factors of supply chain agility

The strategic relevance of supply chain agility has been well documented. Chiang *et al.* (2012:51) single out buyer-supplier relationships and internal operations activities such as flexibility and tactical sourcing as critical drivers of agility. This fact is supported by pointing out the critical nature of engaging in strong alliances with supply partners to ensure better problem resolution tactics. Acceptable agility is achievable through operational performance benefits such as adequate sourcing strategies and flexible manufacturing processes (Heric & Singh 2010:10). Similar results derived from Narayanan, Narasimhan and Schoenherr (2015:140) reinforce the ability of firms to attain the required level of agility through outsourcing drives, which allows for tactical control of production strategies. This is essentially designed for obtaining the best value of products to match businesses expectations.

IT has been regarded as a prominent antecedent factor of supply chain agility (Bottani 2010:251). Its role and contribution to supply chain effectiveness in dealing with sudden demand variation has been confirmed across the supply chain sphere (Tallon & Pinsonneault 2011:463). IT is regarded as being able to facilitate the adequate integration of information and quality data from the external to the internal environment of an organisation, which enables better execution of manufacturing processes and thus enhances the efficiency of the entire supply chain network (Vickery *et al.* 2010:7026). Additionally, Ngai *et al.* (2011:232), in their study on IT and supply chain agility, confirmed that the most common determinant factors of supply chain agility include, amongst others, (1) collaborative relationships with business associates; (2) internal integrative processes; and (3) IT.

Moreover, IT assimilation refers to an organisation's ability to share and convey information systems to different supply partners, which facilitates the regular communication of business activities across the network (Liang, Saraf, Hu & Xue 2007:59). It was further reported by Yan and Sengupta (2011:376), that IT assimilation influences agile implementation practices since it enables a concise diffusion of information and connectivity across a firm's supply chain environment. Improving the efficiency and effectiveness of the entire supply chain is paramount

to its ability to respond to fluctuations in customers' demands (Liu *et al.* 2013:1455). Table 3.1 presents an overview of the most prominent enablers of supply chain agility.

Table 3.1: Determinant factors of supply chain agility

Determinant factors of supply chain agility
Integration of products/operations processes/information
Buyer-supplier synergy
Supply chain integration
Buyer-supplier relationships (coordination and collaboration)
Supplier quality
Information quality
Supply chain connectivity

Source: Gligor and Holcomb (2011:438).

Table 3.1 reports on the antecedent factors of supply chain agility. Amongst those includes integration of products/operations processes/information, buyer-supplier synergy, supply chain integration, buyer-supplier relationships, supplier quality, information quality and supply chain connectivity. This is important, as these enabling factors are some of the many major supply chain practices that contribute to competitive advantage.

According to Gligor and Holcomb (2011:444), there are four broad groups of antecedents of supply chain agility, which consist of the following:

- **Strategy**, which includes approaches such as collaboration relationships;
- **Infrastructure**, encompassing factors such as internal information integration;
- **Foundation**, involving process integration; and
- **Mechanism**, comprising market environmental factors.

Again, it is perceived that achieving agile practices results from an accumulation of strategic input activities, which emphasises the core competencies of businesses and their competitive aspirations.

3.2.3 Outcome factors of supply chain agility

Supply chain agility has been described as a practice which can give a crucial competitive edge to businesses that can ensure a good adoption of their core characteristics (Mishra, Datta & Mahapatra 2014:90). The authors further support that agile business operations result in adequate operational capabilities highlighted by delivery of quality products and shorter production lead-times. Supply chain agility has also been found to increase an organisation's responsiveness and awareness of perceived supply distortion in the market environment (Blome *et al.* 2013:1295), which thus, on account of the stated empirical results, could correlate to proper decision-making procedures to conform to market requirements.

Furthermore, effective agile practices are regarded as essential contributors to firm performance regarding outcomes such as lower operational costs, increased speed and dependability, and enhanced product portfolios (DeGroot & Marx 2013:911). Taking into account those above, one could further assert that such performance outcomes yielded from agile-characterised operations, enable businesses to become highly competitive, in that firms can provide timely and consistent responses to customers' expectations and requirements. This view receives support from Ngai *et al.* (2011:233) who argue that businesses that adopt agile procedures are more likely to sustain their competitive aspirations because the essence of supply chain agility resides on its drive to continuously identify market disruptions and provide prompt attention to them.

Liu *et al.* (2013:1454) note that the importance of supply chain agility is not only restricted to its operational capabilities, but also to its effect on increasing the profits of an entire supply chain network. This is important because it contributes to the value creation of each chain of activities by ensuring that each operation performed across the supply chain, regarding responding to market changes, is done swiftly. Thus, supply chain agility is an important facilitating factor to business performance and sustainable competitive advantage. The next section provides a discussion on the nature of supply chain agility.

3.2.4 Importance of supply chain agility

Supply chain agility is seen to be a key factor that defines the success and survival aspirations of any organisation that operates in highly volatile and turbulent market spheres (Sukati, Hamid, Baharun, Yusoff & Anuar 2012:274). As suggested by Eckstein, Goellner, Blome and Henke

(2015:3028), supply chain agility is a paramount strategic tool to achieving long-term sustainable competitive dominance through its effect on operational performance, such as on-time delivery, quality products and dependability of services. Agile adaptability of firms has been recognised as valuable in defining market performance as well as firm performance (Whitten, Green & Zelbst 2012:28). These empirical results exemplify the critical nature and core value that proper adoption of agile practices have in determining the performance of businesses. In their study on performance outcomes of supply chain agility, Gligor *et al.* (2015:71) posit that supply chain agility calls for a prompt readjustment of core activities to ensure minimisation of waste to enable adequate operational processes. Subsequently, performance in meeting market demands is improved exponentially.

Organisations that devote their core resources to ensure effective implementation of agile processes are likely to reap the operational benefits related to speed, proactive innovation, profitability and flexibility, which are viewed as important cornerstones of agile practices (Yusuf *et al.* 2014:531). Moreover, effective implementation of agility calls for firms to monitor the performance of their primary stakeholders (suppliers, distributors and manufacturers) to reduce costs in manufacturing activities and operational procedures that are critical in improving customer satisfaction and reaching operational excellence (Ngai *et al.* 2011:237). Figure 3.2 offers a depiction of the strategic role that supply chain agility plays as part of an organisation's operational strategy.

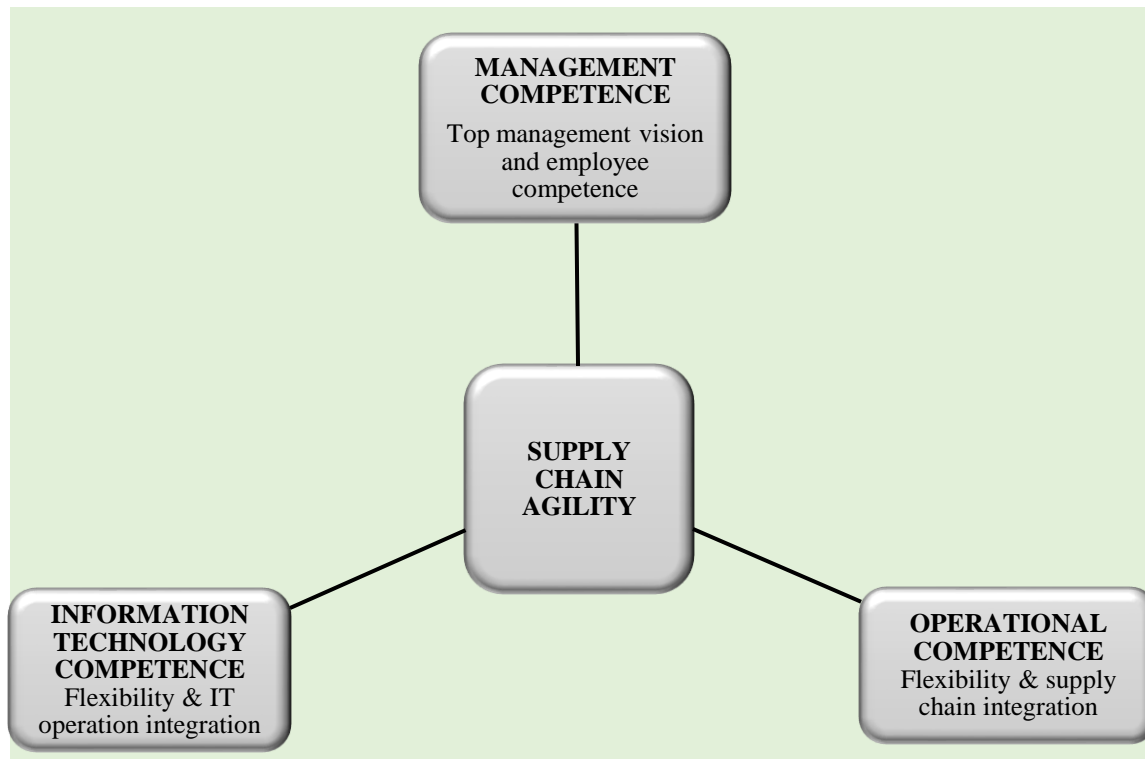


Figure 3.2: Importance of supply chain agility (Ngai *et al.* 2011:237)

Figure 3.2 demonstrates the criticality of supply chain agility on organisations' management, IT and operational competencies. It further shows the core capability derived from the adoption of supply chain agility and its strategic prominence to the vision of an organisation's strategy (Ngai *et al.* 2011:237). In extracting the pertinent themes of Figure 3.2, supply chain agility seems to be at the epicentre of the strategic vision of any business. Supply chain agility plays a role in influencing the decisions made by top level and middle management as well as operational levels of a hierarchical business structure. Each level of the hierarchy has to ensure the proper implementation of agile practices such as flexibility, quality, speed, procurement, market promotion, effective manufacturing and prompt delivery across the supply chain network (Liu *et al.* 2013:1454). The combination of these core strategies, if done effectively, could enable the organisation to detect any alterations in the market smoothly and address them quickly, which may provide a thorough foundation for attaining a sustainable competitive edge, inimitable by competitors (DeGroote & Marx 2013:909). Sub-section 3.2.5 discusses literature about previous research results on supply chain agility.

3.2.5 Previous research results related to supply chain agility

This section focuses on reviewing major empirical results regarding supply chain agility. One of the main areas of concern is related to the distinctive comparison that exists between agile and lean supply chains, which has received massive attention due to their similarity as components of supply chain concepts.

3.2.5.1 Lean versus agile supply chain

Current developments in the supply chain field have provided some conflicting perspectives regarding lean and agile supply chains. Some schools of thought overlap between these two practices, which are in essence related but strategically distinct (Cabrita, Duarte, Carvalho & Cruz-Marchado 2016:1306). Soltan and Mostafa (2015:476) further point out that despite the large body of literature about these two practices, there seems to be little or no consensus regarding their core characteristics and nature. Attempts have been made to distinguish between the two, which offers some insights into understanding and separating these two constructs. In fact, according to Haq and Boddu (2014:6), lean and agile are two strategically distinct supply chain practices. With the former being viewed as a competitive drive to respond to external competition and the latter, a response to market change. Moreover, agile adoption has been found to be suitable when customers' demands are constantly changing, coupled with the large volume of product portfolios offered by firms: lean has been found to be appropriate in events where there is stable and constant customer demand for organisations' products as well as a shallow variety of products provided (Mostafa, Dumrak & Soltan 2013:44).

The main distinctive characteristics of these factors reside in the fact that agile is concerned with firms' abilities to respond to market changes regarding the demands of customers. Lean is about businesses' capabilities to reduce and eliminate waste throughout their operational processes (Soltan & Mostafa 2015:478). This waste can be categorised, indicated by Mostafa *et al.* (2013:48) as:

- obvious waste which is the waste that emanates from inventory, machine failures, reverse operations; and
- less obvious, which refers to delivery and operational process times, etc.

Pakdil and Leonard (2014:4587) further emphasise that a lean supply chain is more concerned with reducing to a minimum all processes that do not add strategic value to an entire chain of activities. In order to achieve this, waste reduction and being responsive to customers' needs and wants have to be maintained. Businesses that adopt lean principles are set to gain cost reduction, increased productivity, lower inventory levels and on time delivery (Wyton & Payne 2014:42). As alluded to in the previous sections, supply chain agility is mainly related to ensuring that organisations' customers are fully satisfied by meeting their demands. One of the main strategies of an agile supply chain is about diversifying the operations process of a firm as so to assemble and deliver products to customers (Konecka 2010:10). Table 3.2 presents a summary of the significant characteristics of agile and lean supply chains.

Table 3.2: Characteristics of lean and agile supply chains

LEAN SUPPLY CHAIN	AGILE SUPPLY CHAIN
Waste reduction or elimination	Unpredicted demands
The proper and sound utilisation of core resources	An adequate response to market changes
Steady customers' demand and lower product variation	Product variation

Source: Cabrita *et al.* (2016:1308).

Table 3.2 presents the main characteristics of lean and agile supply chains. It can be observed that these two practices are distinct because lean supply chains focus on waste reduction, adequate utilisation of core resources and constant customers' demands and lower product variation. Agile supply chains, however, consist of unpredictability of customers' demands, efficient response to market changes and product differentiation. Over and above this, it emerges that leanness and agility are two distinctive but related supply chain practices, which aim at enhancing the performance and value addition prospect of the whole supply chain. Furthermore, as advised by Soltan and Mostafa (2015:477), these two paradigms can be merged into one concept known as leagility, because of their interconnectedness. As recommended by Purvis and Gosling (2014:100),

successful application of this paradigm resides in its core strategic structure where both practices cannot be implemented simultaneously. The authors further suggest that leagility is effective in establishing a decouple point of a supply chain that divides the customers' orders side to the planning side. Lean practices should, therefore, to be implemented from the upstream side whereby all in-house operational processes take place since they are designed to reduce seven types of waste known as motion, wait, process, inventory, over-production, defects and transportation (Elmoselhy 2013:599). This leads to the achievement of the best possible value for customers by providing products/services at the right time, place, exact quality and quantity requested, while agile processes need to be centred on the downstream side of the supply chain which deals mostly with all out-house activities.

The above discussion indicates that supply chain agility is a major strategic factor that contributes to meeting the requirements and expectations of firms' customers. Moreover, it has been found that an agile supply chain is an important premise, which has attracted great attention from some authors in supply chain literature. The plurality of supply chain agility supports this fact. Further to that was the nexus that this practice has with the collaborative approach, which works as an enabler of the efficient adoption of agile processes, notwithstanding the characteristics that emerge from a sound execution of agile activities. It was also determined that proper implementation of agility practices is dependent on a large number of enabling constructs, which contribute to the success of business operations as well as ensuring that customers' needs and expectations are met.

Furthermore, it was found that supply chain agility is a key contributor to firm performance. It also enables the attainment of sustainable competitive advantage, which is essential to ensuring business success and survival. Moreover, it can be highlighted that supply chain agility plays an important role in ensuring effective competitive advantage of firms that implement it successfully. It appears throughout this discussion that agility is closely related to lean supply chain management, mainly because of its ability to contribute to operational performance through waste reduction and market responsiveness. The next section focuses on reviewing literature on SCRM.

3.3 SUPPLY CHAIN RISK MANAGEMENT

This section of the chapter focuses on a review of literature about SCRM. Topics that are discussed include, amongst, others the definition of SCRM, followed by determinants, outcomes as well as the importance of the construct and previous research studies on the concept.

3.3.1 Definitions of supply chain risk management

The concept of SCRM has received considerable attention in the literature, and despite its relative importance, it appears that there is no consensus on one acceptable definition (Sodhi, Son & Tang 2012:10). However, it is important to provide a distinction of supply chain risk before attempting to review the literature about the essence of SCRM. According to Peck (2006:127), supply chain risk refers to any disruptions emanating from within or outside a firm's environment, which contribute to the disruption of its operational activities such as delivery, information sharing, and materials and products flow to end at the consumer.

Furthermore, Heckmann, Comes and Nickel (2015:122) define it as series of impending incidents that have a negative impact on business, in which little response to them can be implemented to mitigate their occurrence. SCRM can be defined as an organisation's awareness and identification of possible and potential problems, defaults and other pertinent risks that may impair the appropriate functioning of a supply chain (Monroe, Teets & Martin 2014:6). The goal is to adopt effective strategies and processes across the supply chain to mitigate and alleviate their future occurrence.

Besides, past studies have offered similar views regarding the construct, such as the work of Tang (2006:451), who views it as a firm's ability to manage its operational risks, based on collaborative and alliance strategies with its supply partners. Scannell, Curkovic, Wargner and Vitek (2013:15) describe it as the process of recognising, analysing, minimising potential/possible risks through an effective and efficient management drive from different members of a supply chain. Sub-sections 3.3.1.1 and 3.3.1.2 briefly highlight the core characteristic of SCRM as well as the different types of risks identified.

3.3.1.1 Characteristics of supply chain risk management

According to Heckmann *et al.* (2015:121), there are six distinct characteristics that anchor SCRM. Figure 3.3 provides a depiction of these respective factors.

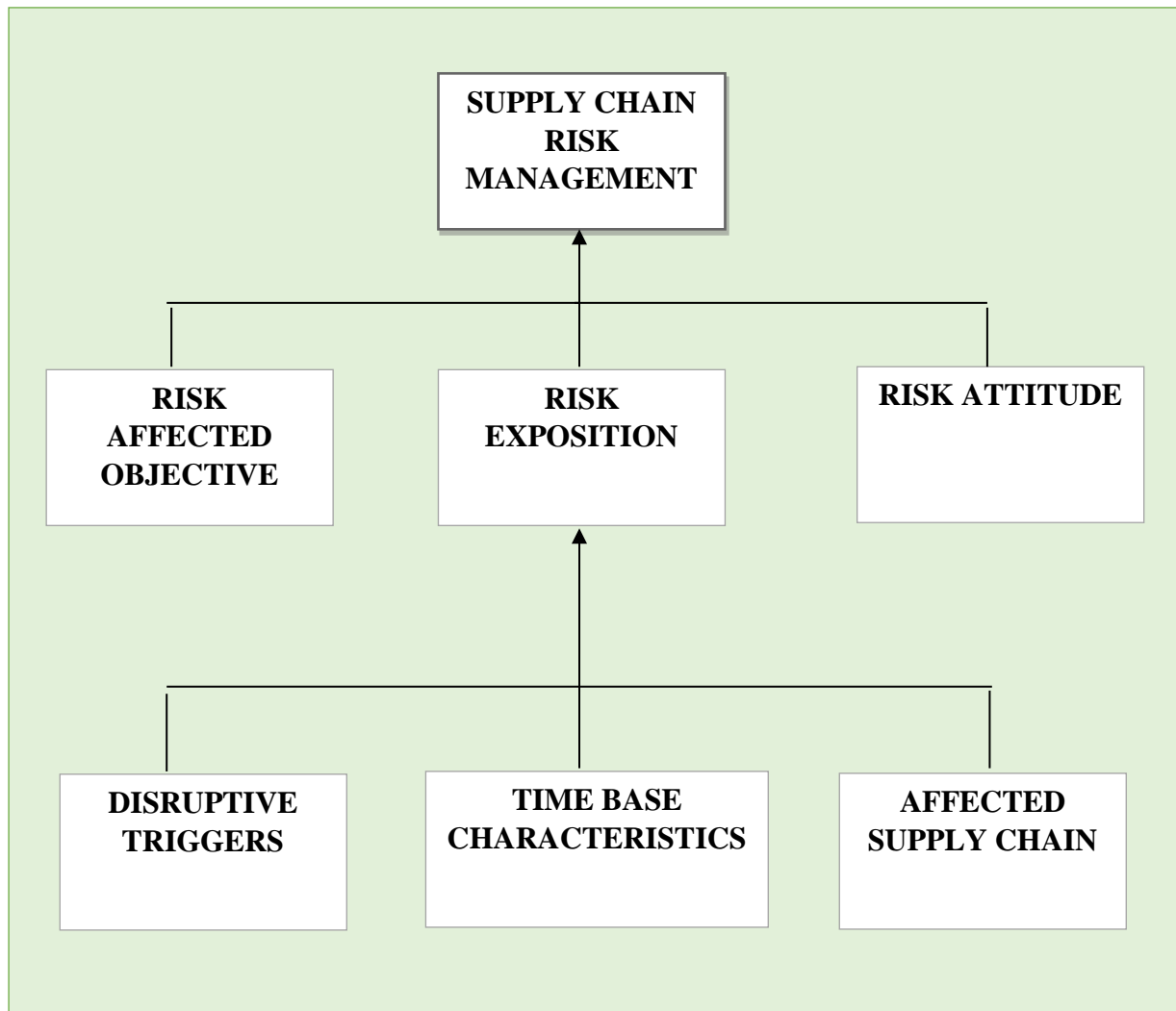


Figure 3.3: Characteristics of supply chain risk management (Heckmann *et al.* 2015:121)

Figure 3.3 presents the factors that characterise SCRM. These include risk affected objectives, which are risk exposition and risk attitude, followed by disruptive triggers, namely, time-based characteristics and affected supply chain. According to Heckmann *et al.* (2015:122), understanding these practices is very important for a business since it enables it to maintain control over potential and perceived problems that could occur within a supply chain environment. The authors further explain that risk is related to calls for planning, monitoring and controlling distortions that may impair operational activities. Risk exposition describes the capabilities to identify and elevate the issues found. Risk attitude denotes the subjective perception and reactive or proactive attitude that organisations have towards recognising and acting on the disturbance (Scott, Raymond &

Shockley 2010:34). Disruptive triggers refer to those problems/disturbances that occur and trigger the whole process of alleviating the risk (Heckmann *et al.* 2015:124). Merz, Hiete, Comes and Schultmann (2013:1077) view an affected supply chain as those parts of the supply networks that distortions emanate from and where specific attention must be paid to address them. Aharon, Do, Reddy and Tao (2011:1177) describe time-based characteristics as the time-space determination of when the potential risk has occurred, which is important as it allows an organisation to deal with or take preventive measures to handle the risk.

The discussed literature shows that SCRM is a methodical procedure that encompasses a range of key steps that have to be followed. SCRM ensures that problems that could affect the effective running of organisations' supply chains be dealt with swiftly to enhance operational performance and achieve the desired level of competitive advantage. The following sub-section presents the different types of risks occurring within a supply chain.

3.3.1.2 Types of risks occurring within a supply chain

Supply chain risk has been defined as encompassing a number of types that directly influence the operational performance of a value chain. Table 3.3 shows a review of the identified risks.

Table 3.3: Types of supply chain risks

Risks	Description
Demand	Uncertainty in downstream activities related to customers/consumers demands between supply chain members
Due date	Fluctuations of expected dates of completion or meeting customers/consumers requests and requirements
Cost management	Cost disruption dictated by market regulations
Operational risk	Improbability of customer supply
Disruption	Acts of God including earthquakes, flooding, thundering, etc., and human disaster, including financial meltdown, acts of terrorism and employees' strikes or protests

Risks	Description
Internal	Machine malfunctions, information technology disruptions
Purchasing	Related to upstream supply chain activities pertaining to sourcing of raw materials and other component parts

Source: Thun and Hoenig (2011:242); Cheng and Wu (2013:634).

As observed in Table 3.3, Thun and Hoenig (2011:242) and Cheng and Wu (2013:634) identify demand, due date, cost management, operational risk, internal factors and purchasing as potential risks that exist within a firm's supply chain environment and could impede its performance.

The concept of SCRM could be broadly categorised into two main groups. These can be operational risks and disruption risks (Wakolbinger & Cruz 2011:4063). Operational risk encompasses all in-house disturbances from supply-demands mishaps to human or process failures across the supply chain (Bhattacharyya, Datta & Offodile 2010:25). Risk disruption on the other end refers to all uncontrollable problems that occur outside the scope of activities of an organisation, with the basic example being an Act of God (Lockamy & McCormack 2010:593). It could, therefore, be suggested that managing and monitoring operation flow could be paramount in determining one's ability and capability to prevent risks from occurring. However, adopting contingency measures to cope effectively with unprecedented events derived from Acts of God could provide room for better management of risks. The following segment of this chapter focuses on antecedent factors of SCRM.

3.3.2 Determinants of supply chain risk management

The SCRM factor is important to business operational efficiency as articulated in the previous sections. However, it appears that some factors trigger proper management of organisations' potential risks, such as the ones identified by Chen, Sohal and Prajogo (2013:2194) who found supplier, internal and customer collaborations as great antecedent factors to supply chain risk. This is due to their respective effects in mitigating risks related to demand, supply and operational processes. Thun and Hoenig (2011:244) argue that purchasing strategy focused on unique sourcing is an enabler to risk because of the reliance factor that businesses are subject to. These authors further advocate that the complexity and efficiency of operational processes also contribute to

supply chain risk. Accordingly, the appearance of risks within a supply chain is a correlation of many factors and they, amongst other things, have an important influence on the competitiveness of businesses. Section 3.3.3 offers a discussion of the outcome elements about SCRM.

3.3.3 Outcomes of supply chain risk management

Results derived from the research of Chen *et al.* (2013:2187) show that consistent risk occurrence has a detrimental effect on firms' supply chain performance. Moreover, supply chain risks have been found to disrupt customers' demands because of their negative impact on the inbound side of the value chain, resulting in an inconsistency of required timing, quantity and quality of products offered (Kumar, Tiwari & Babiceanu 2010:3717). This, therefore, emphasises the importance of having good core strategic plans in place that are aimed at monitoring and protecting the possible occurrence and impact of such negative risks.

However, recent contrary studies have reported valuable insights into the strategic influence that adoption of risk management practices has on supply chain success. In fact, Bandaly, Satir and Shanker (2014:2007) advocate that effective risk management processes and practices are paramount to ensuring a good overview of upstream, downstream and in-house supply chain activities. This is key as it enables a proper operational procedure through adequate minimisation of perceived threats that could negatively affect business performance. The importance and role of supply chain management are addressed in the following section.

3.3.4 Importance of supply chain risk management

Potential glitches occurring within an organisation's scope of operations have been reported to have a considerable effect on financial performance and survival perception (Chaudhuri & Singh 2012:303). This highlights the critical value associated with the adoption of policies designed to swiftly manage possible problems that could prevent the success of a supply chain. Businesses equipped with proficient policies and strategies designed for mitigating and preserving the smooth running of their activities are known to be best adapted to sustain their operations (Wagner & Neshat 2010:122). The present study suggests that managing operational risks is critical to firms' survival and success. Moreover, SCRM has been advocated to be an applicable approach to monitor and detect potential problems that businesses can encounter (Aqlan 2015:2).

It is also regarded as an important factor in supply chain literature (Thun & Hoenig 2011:243), owing to the strategic value it brings to organisations by giving a platform to tackle any disruptions through proper operational processes such as prudent supplier selection (Srinivasan, Mukherjee & Gaur 2011:260). Similarly, the following are suggestions from Scannell *et al.* (2013:19) who propose some operating factors as key assessment areas to minimise or reduce supply chain risks. These include:

- supplier quality requirements;
- inventory buffering;
- alternative plans or procedures;
- flexible sourcing initiatives;
- forward integration; and
- developing a supplier base.

One could argue that the relevance of adopting risk management policies represents a major defining key success factor to competitive advancement (Vilko, Ritala & Edelman 2014:4). The subsequent section discusses a review of existing literature about SCRM.

3.3.5 Previous research results related to supply chain risk management

Similar to the previous sections, this segment highlights some of the research on SCRM, which stretches the relevance and critical nature of the variable. As such, Behnezhad, Connett and Nair (2013:80) determined that risk management is fundamental to a firm's success and risk minimisation is equally as important as their occurrence. They further submit to the critical nature of uncontrollable risks such as environmental, political and economic risks as a serious threat to an organisation's survival. Other supply chain literature attempts to provide mechanisms to handle these uncontrollable risks. Some strategic points have been suggested as ways to alleviate the consequences that these disruptions can have on supply chain performance. Table 3.4 presents these mitigating strategies.

Table 3.4: Operational strategies to deal with uncontrollable supply chain risks

Operational strategies
Flexible supplying sources/asset and information sharing/postponement initiatives
Flexible operational processes and procedures
Effective engagement of organisation's executives
Competent suppliers and supply chain partners

Source: Christopher and Holweg (2011:63); Geissbauer and Householder (2011:24); Singh (2011:6).

Table 3.4 states some operational strategies designed for handling supply chain risks, which consist of the flexibility of assets or supply; information shared as well as postponement initiatives. The flexibility of operational processes and procedures; top management commitment and support and capable and reliable suppliers and business associates are other factors mentioned.

Grötsch, Blome and Schleper (2013:2842) propose two distinct strategies to deal with both controllable and uncontrollable risks, which are proactive and reactive approaches. They view them as the ability of a supply chain to plan and forecast its activities to detect any potential risks that may occur, as far as the former is concerned. With regard to the latter approach, the authors define it as a reactive mechanism triggered by the occurrence of a certain problem. Their analysis highlights the critical nature of implementing reliable operational techniques and procedures when dealing with risks, which may negatively influence business performance.

In his study on software applications for risk assessment, Alqan (2015:2) recommends a detailed risk mitigation framework encompassing both qualitative and quantitative research approaches. Figure 3.4 depicts those assessment methods.

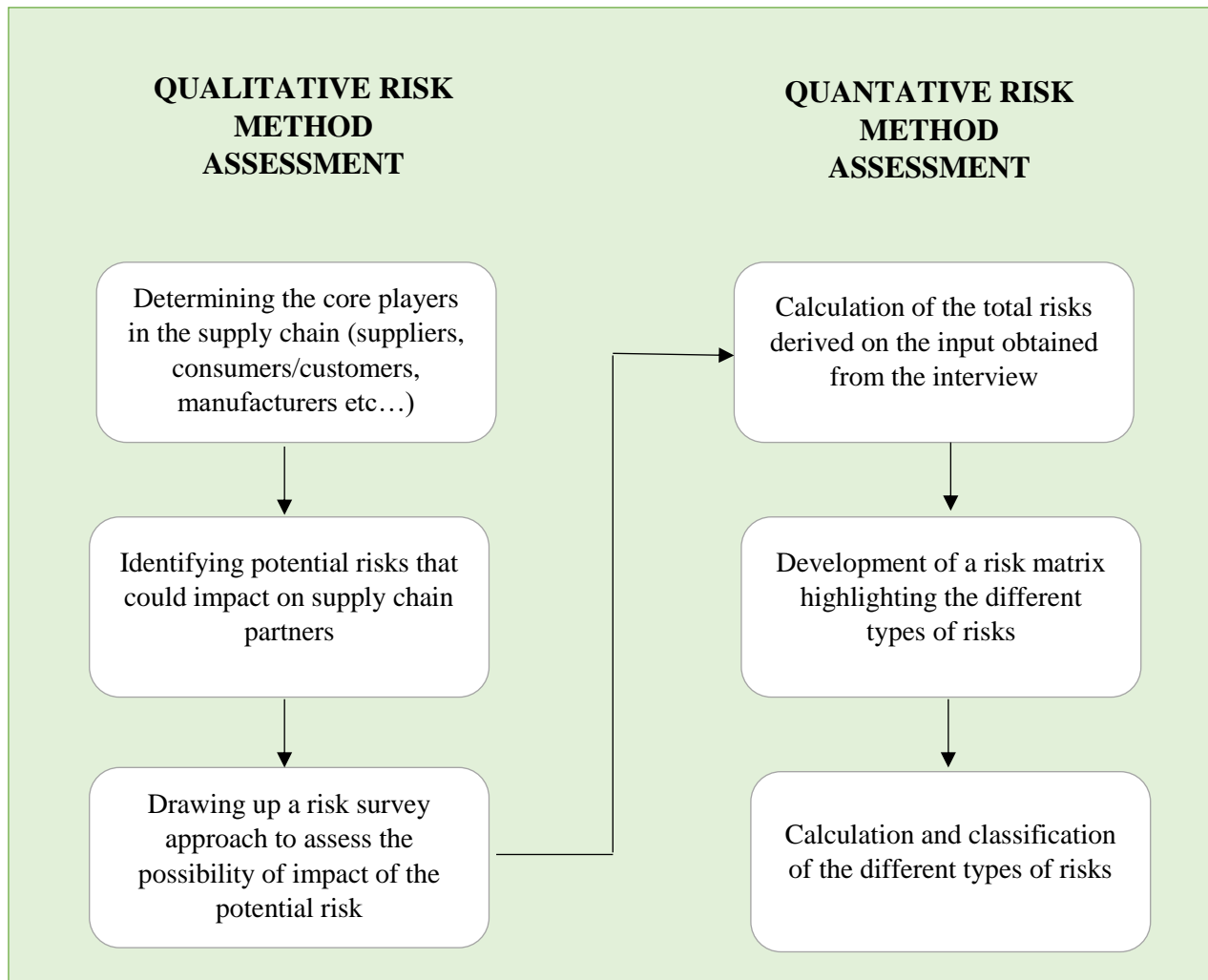


Figure 3.4: Risk assessment methods (Alqan 2015:1)

Figure 3.4 shows the risk assessment methods as proposed by Alqan (2015:1), which are made up of two distinct quadrants: a qualitative and quantitative assessment approach. According to the author, a qualitative assessment is derived from the qualitative research methodology approach, which focuses on surveys and interviews to gather data. Conversely, the quantitative section is related to the quantitative approach that deals with practical analysis through probability. In this segment, data gathered from structured interviews and surveys are assessed and computed to understand the cause of risks and draw up corrective measures, if applicable, to mitigate them or be properly prepared to handle such disruptions.

A major issue arising from the discourse is that SCRM is an important tool that enables businesses to monitor their operations consistently. The aim is to manage perceived problems that could

impede the proper operation of the entire supply chain network. In addition, managing risks is an important task that organisations strive to achieve. Identifying the reasons for these events is thus paramount to ensuring proper operational development and a firm's success. There are some alleviating frameworks and procedures identified to deal with the negative effects that these operational challenges could have on the survival of businesses. The next section deals with a review of literature about supply chain performance.

3.4 SUPPLY CHAIN PERFORMANCE

In this section, a literature discussion about supply chain performance is performed. Issues that are discussed include the definition, determinants, outcomes, importance of the construct and previous research studies.

3.4.1 Definitions of supply chain performance

Supply chain performance has been defined by some scholars, such as Gunasekaran, Patel and Tirtiroglu (2001:71) and Beamon (1998:281), who refer to it as the effectiveness and efficiency of an organisation's entire operation. Croom and Johnston (2003:539) and Eng (2004:97) define it as the assessment of tangible and intangible performance factors. In support of this view, Qrunfleh and Tarafdar (2014:344), underscore that supply chain performance is evaluated by its operational flexibility and integration as well as its ability and capability to respond to customers' demands promptly. Lastly, Corsten and Felde (2004:448) view it as the return on both assets and sales derived from the effectiveness of operations. In light of the literature reviewed, it can be mentioned that supply chain performance encompasses a wide variety of factors and attributes that characterise it. Section 3.4.2 addresses issues regarding the antecedent factors of supply chain performance.

3.4.2 Antecedent factors of supply chain performance

As highlighted in the previous discussion, this study is of the view that supply chain performance is an important factor to firms' survival. However, it appears logical to examine the drivers that enable the proper performance of firms' supply chains. Gaur, Mukherjee, Gaur and Schmid (2011:10) posit that collaborative engagement between supply chain partners regarding risk sharing as well as business ventures influence supply chain performance. Other research has reported that healthy partnerships characterised by high levels of quality amongst members

contribute to improving performance. Chang, Tsai and Hsu (2013:36) identify information sharing, supply chain integration and relationship partnerships as effective determinant factors to supply chain performance. Information sharing and alliances between suppliers are key enablers that contribute to achieving adequate levels of performance across an organisation's value chain of activities (Sukati *et al.* 2012:225).

Prajogo and Olhager (2012:515) found that integrating forward and backwards logistics operations across the supply chain, results in the reduction of lead times, costs and risks. This leads to a much-enhanced customer's response and satisfaction, which subsequently results in enhanced supply chain performance. Furthermore, the transfer of quality and real-time information, as well as forecasting activities have been found to be important facilitators of supply chain performance (Brandon-Jones, Squire, Autry & Petersen 2014:55). This is based on their ability to enhance the exchange of critical data and ensure adequate operational planning to better cater to customers' demands and needs (Schoenherr & Speier-Pero 2015:120). Section 3.4.3 discusses issues related to the outcomes, importance derived from an effective achievement of supply chain performance, as well as previous research studies regarding the construct.

3.4.3 Outcomes, important factors and previous research results of supply chain performance

The impact of supply chain performance on organisational performance has been studied in detail in recent studies. Gunasekaran, Papadopoulos, Dubey, Wamba, Childe, Hazen and Akter (2017:308) argue that substantial supply chain performance has a positive influence on the performance appraisal of firms' market share. This is essentially due to businesses' capabilities to reduce their operational costs regarding prompt delivery of required quality and quantity of products/services (Whitten *et al.* 2012:30). Qrunfleh and Tarafdar (2014:345) highlight consistently that proper integrative strategies of the value chain result in better response to customers' requirements, translated by prompt delivery of needed products and services, thereby improving business performance.

The value derived when businesses perform consistently is noteworthy, mainly through the operational benefits derived there from, which leads to competitive advantage and long-term success (Sambasivan, Siew-Phaik, Mohamed & Leong 2013:339). Besides, the ability of a supply

chain to reach adequate levels of performance has been regarded as the ultimate strategic objective of every business when venturing into uncharted terrains (Wu, Chuang & Hsu 2014:122). This emphasises the crucial role that supply chain performance plays as a key determinant of business success as well as the survival prospect. Similarly, Whitten *et al.* (2012:32) mention that firms' competitive advantage aspirations lie in their capabilities to ensure that their supply chain can yield performance outcomes such as on-time delivery, the right quality and quantity of products and achieve cost reduction of production.

Different studies have provided insights into what factors might be considered to best assess the performance of an organisation's supply chain. Li, Ghadge and Tiwari (2016:79) point out that it can be assessed using three indicators, namely: service level, inventory cost reduction, and the bullwhip effect. The variation regarding the reduction of both effects of bullwhip and inventory as well as an increase in customer service is fundamental to ensure performance improvement (Wang & Disney 2016:691). Other studies found financial elements as suitable indicators to measure the performance of a firm's supply chain. Moreover, non-financial performance objectives such as output, resources and flexibility factors have also been identified as measurement indices of supply chain performance (Wu *et al.* 2014:125).

The above discussion indicates that the ability of organisations to operate at the required and desired level of their performance results from an accumulation of various input factors. All of these contribute distinctly to improving the value creation of each element of a firm's supply chain. Besides, supply chain performance is an important yardstick to evaluate a firm's success, since it has a central role as a contributor to competitive advantage.

3.5 CONCLUSION

This chapter provides a discussion on the respective mediating constructs of this study, which are supply chain agility, risk management and performance. It emerges that supply chain agility is an essential enabler for a firm's performance since it contributes to the resilience of the supply chain through ensuring that businesses can meet customers' demands in turbulent competitive markets. Current development of recent literature offers a distinctive contrast between agility and lean supply chain management. It has emerged that these two practices, similar in their characteristics, are different in their operational attitude. Lean supply chains are more regarded as in-house operation tools aimed at minimising waste and ensuring robust production processes while agility

is about the outbound resilience side of a supply chain. SCRM has been found to be an important strategy designed at managing and assuring that potential impediments can be swiftly identified and mitigated efficiently, with the purpose of being able to obtain a competitive advantage through inimitable performance outcomes. Moreover, there have been some operational strategies introduced to assist organisations to better deal with the ever-constant risks that are detrimental to the proficient functioning of businesses. Lastly, obtaining the required level of performance sought has been a major prerequisite driver of businesses, which places the spotlight on the crucial role of supply chains in achieving business success. The next chapter discusses the conceptual framework and the formulation of hypotheses of the study.

CHAPTER 4

CONCEPTUAL FRAMEWORK AND HYPOTHESES FORMULATIONS

4.1 INTRODUCTION

This chapter aims to formulate hypotheses derived from the theory and constructs of the study. The relevance of the present study is that the stated hypotheses provide a suggestion of the causal relationships between the constructs. In order to capture the essence and significance of the purpose of this section, the chapter begins with a depiction of the conceptual framework of the study, which highlights the predicting constructs identified as buyer-supplier collaboration, supply chain integration, TQM and IT adoption. Thereafter, the chapter directs attention to the mediating constructs, which are supply chain agility and SCRM, as well as the outcome variable, supply chain performance. After that, the discussion focuses on developing hypotheses of possible relationships that exist between the various constructs. The discussion concludes with an analysis of the relationship between SCRM and supply chain performance.

4.2 CONCEPTUAL FRAMEWORK

This section presents the conceptual framework of the study. Figure 4.1 outlines the predictor constructs, which are buyer-supplier collaboration, supply chain integration, TQM and IT adoption, followed by the two mediators, which are supply chain agility and SCRM and the outcome variable, namely, supply chain performance.

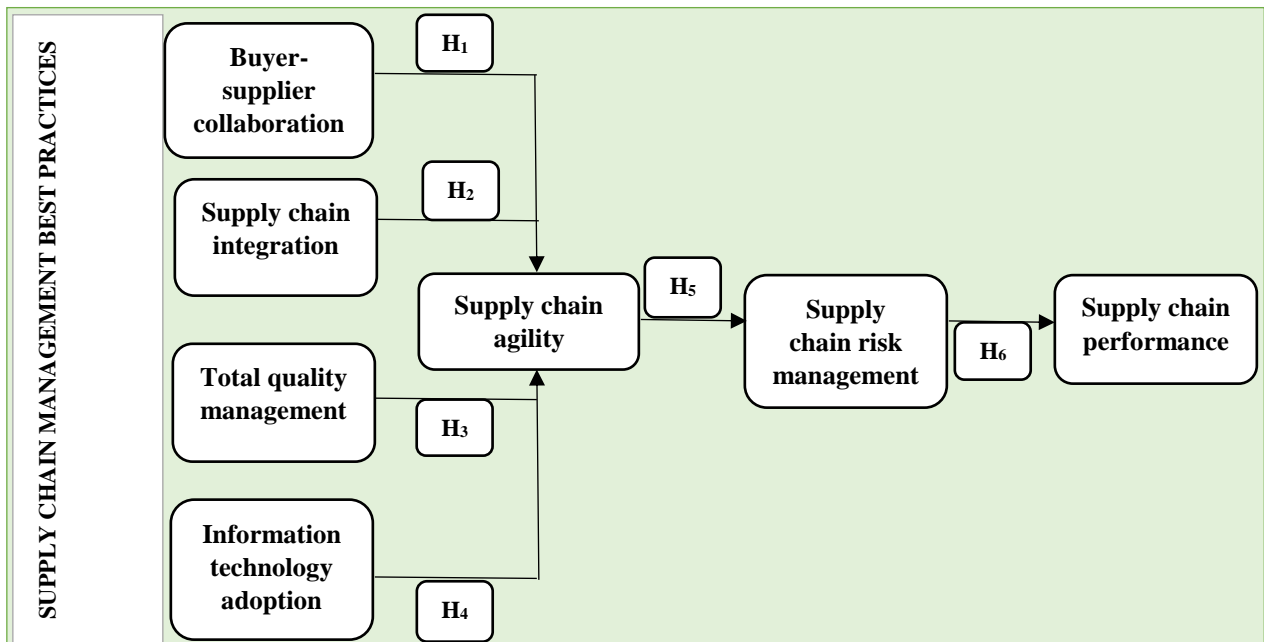


Figure 4.1: Conceptual framework

4.3 HYPOTHESES DEVELOPMENT

This section formulates both null and alternative hypotheses derived from the conceptual framework.

4.3.1 Buyer-supplier collaboration and supply chain agility

In today's business environment characterised by a high level of competitiveness, achieving competitive advantage is viewed as an essential strategic tool to ensure success and survival. One of the critical enablers to attaining such a required competitive edge resides on the adoption of proper collaborative alliances across an organisation's supply chain (Holcomb & Hitt 2007:464). The strategic role that collaborative approaches played between business parties have received support from Narayanan, Narasimhan and Schoenherr (2015:140). These authors further propose that supply chain agility is only evident if supply chain partners can conduct their business operations collaboratively and synergistically.

Moe (2014:14) proposes that the key to sustainable supply chain agility lies in a business's capability to collaborate systematically with its stakeholders, which exemplifies the link and influence that these two constructs share. Furthermore, Heric and Singh (2010:10) consider that the agile performance of a firm's supply network is attainable through collaborative efforts, which thus shows the critical nature that collaboration amongst supply chain parties has in achieving enhance agile performance. This is done through the continuous exchange of information, top management's engagement of strategic policies, and mutual sharing of problems and other discrepancies that could not be addressed in isolation.

According to Zacharia, Nix and Lusch (2009:101), buyer-supplier collaboration calls for a good comprehension of each party's deficiencies and operational challenges threatening their success. This results in better and smoother responsiveness to market challenges and an unexpected variance in customers' orders. Similarly, continued bilateral involvement across a supply chain network facilitates complete flexibility and the response rate of volatile market expectations and requirements, which thus correlates in superior agile performance (Narayanan *et al.* 2015:142). Collaboration efforts in a buyer-supplier sphere facilitate the application of the integration of core resources designed at responding swiftly to turbulent market impediments (Yang 2014:107), which

thus relates to the strategic value that efficient collaboration has to determine good agile practices. This is carried out through joint product development and exchange of day-to-day operation information (Rigby, Day, Forrester & Burnett 2000:178).

In addition, a continuous collaboration between business associates regarding joint decision-making processes has been found to contribute to better contingency solutions and responses to changes and challenges occurring in the business environment (Fayezi, Zutshi & O'Loughlin 2010:11). A recent study by Narayanan *et al.* (2015:143) suggests that buyer-supplier collaboration has an influence on supply chain agility through the mediating role of trust. The collaborative interchange between partners has been found to be a central enabler of a trusting relationship, which leads to superior mutual working involvement amongst firms' members. The result is better integration of operational processes aimed at consistently mitigating potential disturbances derived from unstable market environments (Dyer & Chu 2003:57; Zacharia *et al.* 2009:110). Based on the above, the following null and alternative hypotheses were formulated:

H₀₁: There is no relationship between buyer-supplier collaboration and supply chain agility in South African SMEs.

H_{a1}: There is a positive relationship between buyer-supplier collaboration and supply chain agility in South African SMEs.

4.3.2 Supply chain integration and supply chain agility

Supply chain integration has been described as a compelling enabling factor that contributes to the effectiveness of managing a firm's supply chain (Huo, Zhao & Zhou 2014:552). Integration is the concise, synergistic working alliance amongst business parties through the mutual sharing of information and management of operational processes with the aim of offering the best value to their customers/consumers (Qi, Huo, Wang, Yan & Yeung 2017:164). Narasimhan, Talluri and Das (2004:91) further suggest that integrated supply chain activity enables a proper flow of data and other leading information across a value chain, which facilitates the responsiveness of an organisation's changing market demands and allows for better forecasting activities to meet and address potential expectations of customers.

Moreover, adequate supply chain integration has been shown to provide a constant flow of information between supply chain members, which has been found to be essential in adjusting

production planning and ensuring flexibility to adapt to suppliers' requirements (He, Lai, Sun & Chen 2014:263). Another study by Wang, Tai and Wei (2006:41) reports that integrating a business's supply chain process has a crucial impact on enabling all involved business parties to have clear visibility and prompt reactions to identified distortions.

In her study on supplier integration and business performance, Danese (2013:1033) acknowledges the significance of adopting an integrative approach as a core strategy for business success. The author further asserts the dominant role that such a strategy plays in mitigating the negative influence of the bullwhip effect. This analysis has been supported by Fayezi, Zutshi and O'Loughlin (2013:175), who state that a higher level of an organisation's agile performance is achievable through an integrative approach of all members of a firm's supply chain network. Furthermore, Chan, Ngai and Moon (2017:489) argue that the integration of resources allows operational functions to be flexible in providing a sufficient response to unexpected market fluctuations, through firms' capabilities to broaden their product portfolios to better cater for customers' expectations.

According to Swafford, Ghosh and Murthy (2008:289), firms can achieve acceptable levels of agility through proper integration of information as well as core and complementary resources. In addition, the authors stress that integration of day-to-day proprietary information provides support to implementing JIT operation schedules, which has been regarded as basic in effective responses to market discrepancies. Additionally, Braunscheidel and Suresh (2009:121) conclude that an organisation's integrative strategy across its value chain of activities with internal and external stakeholders has a positive influence on supply chain agility. This is reflected through its ability and capability to ensure flexible responses to volatile demands and adoption of joint planning between supply chain partners to boost the visibility of market requirements and expectations (Swafford *et al.* 2006:170). As such, the following null and alternative hypotheses were formulated:

H₀₂: There is no relationship between supply chain integration and supply chain agility in South African SMEs.

H_{a2}: There is a positive relationship between supply chain integration and supply chain agility in South African SMEs.

4.3.3 Total quality management and supply chain agility

The relevance of TQM has offered great insights into its impact on supply chain agility. According to Zelbst, Green, Abshire and Sower (2010:638), the strategic role it plays by enabling accurate manufacturing flexibility, which further enhances better production processes, and subsequently correlates to the efficient responsiveness of unexpected customers' demands variations is critical. The same authors argue that TQM is a cornerstone to attain the required level of agile practices, which is essential to obtaining the ideal level of competitiveness in turbulent market environments. Similarly, Youseff, Zubair, Sawyer and Whaley (2002:301) advise in their analysis that the adoption of TQM practices is crucial for organisations to attune to customers' expectations through the proper exchange of important information across different members of a firm's supply chain.

Vinodh, Devadasan, Reddy and Ravichand (2010:7160) maintain that agile characteristics are only predominant in a firm's supply chain network if all components of the TQM philosophy are adequately adopted. Furthermore, TQM has been found to revamp the ability of businesses to attune to market demands swiftly, through improving the flexibility of their operational processes (Vinodh & Kumar 2011:343). In support, an initial report by Gomez-Gras and Verdu-Jover (2005:847) confirms that TQM is an antecedent construct to a firm's capability to achieve a reasonable degree of agile attributes required to handle sudden changes emanating from external environmental factors.

The essence of TQM calls for sustainable enhancement of all supply chain members, with the aim of enabling businesses to respond promptly to perceived challenges and problems (Alolayyan, Ali, Idris & Ibrehem 2011:1372). The creation of synergistic engagement amongst value chain elements contributes to solving identified problems. Furthermore, TQM has been viewed to be an active enabler of agile operations because it manages to reduce or minimise lead and cycle times and maximise inventory safety stock, which is required to respond timeously to market needs (Wakchaure, Nandurkar & Kallurkar 2014:4). As derived from the foregone discussion, the study formulated the following hypotheses:

H₀₃: There is no relationship between total quality management and supply chain agility in South African SMEs.

H_{a3}: There is a positive relationship between total quality management and supply chain agility in South African SMEs.

4.3.4 Information technology adoption and supply chain agility

Adoption of technology advancement has received considerable attention from some scholars (for example, Overby, Bharadway & Sambamurthy 2006:120; Swafford, Ghosh & Murthy 2008:288). It especially exerts a positive influence on enabling agile operation practices in highly volatile and turbulent marketplaces (Bottani 2010:251). This point has been further developed by Wailgum (2008:48) who stresses that the implementation of technology tools such as electronic resources planning (ERP) contributes to ensuring that businesses are well equipped to respond efficiently to market requirements. The practice of ERP leads to a sufficient acceleration of transfer of quality information, minimisation of cycle time as well as the lead time of products or processes required for both production and customers' response purposes (DeGroote & Marx 2013:910). IT implementation has been found to be a leading strategic driver, which assists businesses to have an overview of operational challenges and stimulates better coordination of proprietary resources designed at coping accurately with variations in supply and demand (Van Oosterhout, Waarts & Van Hillegersberg 2006:132).

It was proposed that organisations which embrace technology as part of their operational procedures stand a better chance of improving the quality of their performance outputs regarding the exchange of useful and relevant data and information (Hartono, Li, Na & Simpson 2010:399). This results in the facilitation of agile practices related to the appropriate reaction to market requirements and demand, and also, availability of real-time information feeds (Vickery *et al.* 2010:7025). Furthermore, it has been acknowledged that proper IT adoption is a prominent factor in ensuring sustainable agile characteristics of supply chain firms (Gligor & Holcomb 2012:440). This is mainly due to the dominant role it plays in facilitating adequacy of decision-making procedures by providing primary forecasting information, data feeds and manufacturing systems needed to meet partners' expectations (Gorla, Somers & Wong 2010:2017). Literature has described the implementation of IT tools as fundamental in attaining agile performance criteria such as flexibility and speed in reacting to and handling customers' ever-changing orders (White, Daniel & Mohdzain 2005:400).

The results derived from a study conducted by Ngai *et al.* (2011:236) show that IT acts as a bond to good coordination as well as synergistic working activities that require responsibility and capability amongst supply chain members. The authors further emphasise this significance by the fact that IT allows a swift flow of dual communication across the board and facilitates coherent management of inventory. These performance outcomes are achievable through systems such as radio frequency identification (RFID), portals monitoring and integration of activities, all of which are crucial in allowing the prompt delivery and flexibility of operations, thus denoting agile practices (Fink & Neumann 2007:440).

Moreover, IT systems applications are regarded to support information consolidation, which allows an uninterrupted flow of transactions between supply chain partners (Liu, Ke, Wei & Hua 2013:1455). This, in turn, enables the adequate flexibility of operations that results in enhanced visibility of inventory operations, customers' orders and products, which is subsequently crucial in reacting acutely to variances from markets (Zhu, Kraemer, Gurbaxani & Xu 2006:515). Proper investment in IT programmes such as an automated order process has been supported to be instrumental in reacting to variations in supply and demand (Roberts & Grover 2012:231). Additionally, one of the key advantages of using information systems is that it allows businesses to become more proactive through the conveyance of on-time data and information, which is crucial in ensuring a prompt response to possible change (Zelbst, Sower, Green & Abshire 2011:26). The study formulates the following null and alternative hypothesis in this regard:

H_{o4}: There is no relationship between IT adoption and supply chain agility in South African SMEs.

H_{a4}: There is a positive relationship between IT adoption and supply chain agility in South African SMEs.

4.3.5 Supply chain agility and supply chain risk management

Evaluation of perceived problems within a supply chain network has been viewed to be of strategic importance to business survival (Fredericks 2005:555). Swafford, Ghosh and Murthy (2006:170) attest to the fact that organisations which can display agile characteristics regarding flexibility of operational process and planning, are better poised to mitigate potential unforeseen threats from occurring. This result has received support from Skipper and Hanna (2009:406) who affirm that supply chain agility is a yardstick that heightens a firm's ability and capability to effectively

manage possible risks that could hamper the effectiveness of their entire value chain network. Similarly, Osipova and Eriksson (2013:392) advocate that adequate management of risk within an organisation is a determinant of a good foundation of agile practices, highlighted by the flexibility of operational processes and strategies. Moreover, recent literature has confirmed that supply chain agility is an overriding enabling factor which assists businesses in their capabilities to manage, control and prevent probable problems (Lenfle & Loch 2010:32; Koppenjan, Veeneman, van der Voort, Heuvelhof & Leijten 2011:740). According to Braunscheidel and Suresh (2009:119), agile organisations can cope with turbulent market environments. The authors further contend that such benefits derived from agile adoption, enable firms to develop management tactics that allow for a more proactive approach to disruptions. Therefore, this study provides the following hypotheses:

H₀₅: There is no relationship between supply chain agility and SCRM in South African SMEs.

H_{a5}: There is a positive relationship between supply chain agility and SCRM in South African SMEs.

4.3.6 Supply chain risk management and supply chain performance

The ever-increasing pressure that organisations have been put under through globalisation of different markets has forced businesses to become more aware and proactive to glitches that could reduce their performance (Brindley 2004:22). Bearing that in mind, Ritchie and Brindley (2007:303) suggest that managing a firm's supply chain risk is preeminent in minimising the possibility of occurrence of risks and possible problems that could threaten efficient performance outcomes. Moreover, adoption of risk management approaches has been found to be an integral part of performance adjustment strategies, required to achieve business growth and sustainable success (Wagner & Bode 2008:308).

Appropriate management of risks within a firm's value chain has been found to enable organisations to become less vulnerable to market fluctuations, which subsequently enhances the proactivity to respond to unforeseen disturbances (Wieland & Wallenburg 2012:891). Furthermore, Ergun, HeierStamm, Keskinocak and Swann (2010:111) emphasise the strategic role that adequate risk management procedures play in facilitating the practical limitation of damages caused by Acts of God. Risk Management procedures provide a prompt response to operational practices and other contingency plans, thus maintaining sustainable long-term performance

appraisal (Wieland & Wallenburg 2012:891). Besides, reasonable management of risks, related to unstable demand flows across supply chain networks is fundamental in ensuring consistent agile responses to disturbances. This, in turn, correlates with the much-enhanced effectiveness of an organisation's supply chain performance (Charles, Lauras, & Wassenhove 2010:722).

According to Pagach and Warr (2010:1), businesses that can manage their risks as part of their proactive operational strategies, are more likely going to better their performance. This point is supported by McShane, Nair and Rustambekov (2011:644) who advocate that correct SCRM practices have a positive influence on performance enhancement. Similarly, the long-term performance of a firm's value chain network is only achievable if there is a firm basis of contingency plans (Quon, Zeghal & Maingot 2012:264) designed at mitigating or preventing the adverse effects of such unanticipated anomalies. As such, the following hypotheses can be formulated:

H₀₆: There is no relationship between SCRM and supply chain performance in South African SMEs.

H_{a6}: There is a positive relationship between SCRM and supply chain performance in South African SMEs.

4.4 CONCLUSION

This chapter provided a discussion of the main hypotheses, which offered the empirical foundation of the present study. In capturing the pertinent issues of the chapter, the study developed six hypotheses, which consist of both null and alternative hypotheses. This was meant to establish the exact nexus that exists between the respective constructs. The first four hypotheses pertain to the role and importance that the supply chain management best practices (buyer-supplier collaboration; supply chain integration; TQM; and IT adoption) all have individually on supply chain agility. Further to that, has been the empirical elaboration on the fact that supply chain agility exerts a significant impact on firms' ability to swiftly manage any potential problems that may disrupt the proper functioning of an entire supply chain. Lastly, SCRM has been found to contribute to the improved performance of an organisation's supply chain. The forthcoming chapter focuses on the research methodology, which is applied in the study.

CHAPTER 5

RESEARCH METHODOLOGY

5.1 INTRODUCTION

The purpose of this chapter is to provide a detailed discussion of the research methodology that is employed for this study. The chapter is of a critical nature because it allows for a basis to understand the various techniques and methods considered in the study. It begins with a discussion of the two major types of reasoning known as inductive and deductive. The discussion switches focus to an elaboration of the research paradigms (Positivism, Phenomenological and Post-positivism). Moreover, the chapter addresses the research approaches available as well as strategies. It further outlines the sampling design of the study, which showcases how the respondents were recruited. The discussion outlines the research design procedures aimed at addressing the different methods used to collect primary data and the statistical analyses utilised to derive meaning from the data. Figure 5.1 provides an overall picture of the framework of the points of discussion.



Figure 5.1: Framework of methods and methodologies (Hakansson 2013:1)

5.2 TYPES OF REASONING IN RESEARCH

Reasoning, as emphasised by Goel and Dolan (2004:109), is an intellectual process which involves the derivation of conclusions from information exchanged. These authors further stress that cognitive argumentative standpoints (regarded as premises) offer a basis for reaching some level

of consensus (also viewed as premises). Reasoning research arguments can thus be divided into inductive and deductive. An explanation of inductive and deductive reasoning is provided in Section 5.2.1.

5.2.1 Inductive versus deductive reasoning

According to Hayes, Heit and Swendsen (2010:278), inductive reasoning refers to the elaboration of predictions about an existing problem, situation or phenomenon. They opine that an inductive philosophy calls for a set of intellectual and reflective factors designed for analysing, making judgements, as well as scientific problem-solving attributes and acceptable decision-making processes. Deductive reasoning is viewed as a valid and more objective line of cognitive reasoning about a valid premise (Goel & Dolan 2004:110). As further argued by Hayes *et al.* (2010:279), inductive reasoning emphasises elements of a more subjective approach to argumentation, which is characterised by little or no basis of validity, but rather perceived as plausible, if anything (Goel & Dolan 2004:110). Therefore, inductive reasoning is more suitable for a qualitative investigation (Heit & Rotello 2010:805; Hayes *et al.* 2010:278). In this study, a deductive theory is regarded as more appropriate because the theory provides support to and follows quantitative research approaches. This is because the study seeks to test causal direct and indirect relationships between different constructs. Besides this, the study fits into norms of deductive reasoning, which place attention on the accuracy and validity of a cognitive stance (Heit & Rotello 2010:805), in this instance, solving research problems using statistical procedures. Section 5.3 discusses the research philosophies that underpin the study.

5.3 RESEARCH PHILOSOPHIES

Research philosophies are regarded as the foundation of a research project and set the tone for the rationale of the project regarding its validity and suitability (Hakansson 2013:4). There several identified research philosophies, which include, amongst others: Positivism, Interpretivism (Hakansson 2013:1), Post-positivism (Henderson 2011:341) and Phenomenology (Mangan, Lalwani & Gardner 2004:565).

Positivism is an objective research approach, which directs its emphasis to the objectivity of factual components of life (Lien, Pauleen, Kuo & Wang 2014). Mangan *et al.* (2004:567), argue that the foundation of the positivist approach resides on its core value when analysing phenomena and

internal and external facts. Positivism calls for a scientific method to understand real life problems (Heppner, Wampold & Kivlighan 2008:7). In contrast, post-positivism refers to a paradigm which focuses on determining and explaining the true meaning of a phenomenon or real-life occurrence in social contexts (Henderson 2011:342). Ryan (2006:12) underscores that post-positivism incorporates both theories and practical data analyses of facts, designed for establishing social concerns. Phenomenology is a philosophy that entails a proper understanding of life experience engagements (Oiler 1982:178). One of the outstanding characteristics of this paradigm is to emphasise better comprehension of individuals' social life experiences (Lopez & Willis 2004:726). Furthermore, phenomenological research involves more reliability and validity of the entire process of evaluating a human's understanding of their life experiences (Lien *et al.* 2014:191). Phenomenology is linked to qualitative studies, as indicated by Gallagher (2012:7), who suggests that this philosophy is centred on observing individuals' perceptions of a specific matter. Interpretivism is regarded as a paradigm which focuses on understanding the differences between individuals and elements related to social factors and sciences (Bryman 2008:22). The author further stresses that the philosophy entails a concise and in-depth understanding of subjective interaction and behaviour from individuals in social phenomena. Interpretivism has also been found to be associated with qualitative studies, as confirmed by Goldkuhl (2012:135).

The above discussion denotes that research paradigms form the fundamental basis for any objective research study. However, as alluded to previously in Section 5.2.1, this study is built on a deductive approach, and it appears logical that the suitable philosophy thereof is post-positivism. This is because the research applies the attributes of post-positivism, such as using statistical approaches to explain social science issues through extensive data collection and analysis (Henderson 2011:343). As such, the purpose of the study is to determine the proposed relationships between the constructs of the study (supply chain management best practices and supply chain agility; supply chain agility and SCRM; and supply chain performance), which blends with the post-positivism paradigm. Section 5.4 addresses the research approaches of this study.

5.4 RESEARCH APPROACHES

There are three broad methodologies in social research, which have been consistently applied over the years. They include the qualitative, quantitative and mixed methods approaches. Qualitative research methodology refers to the subjective analysis and interpretation of wording and meaning

over the quantification of objective analysis and data collection of social components (Zou, Sunindijo & Dainty 2014:318). The qualitative research approach is an effective method to represent participants' real-time views and perceptions of a certain social fact (Ponteretto 2005:128). It has been found to be most prominent in sociology, psychology, anthropology, engineering, nursing and cultural fields in which first and participants' views are required (Flick 2014:14). In contrast, the quantitative method is an objective, statistical-based approach to research (data analysis and collection), which encompasses the adoption of deductive reasoning to ground the research with an appropriate theory (Bryman 2008:20). This method is most appropriate when assessing beliefs and attitudes of respondents towards particular research patterns or phenomena (Muijs 2010:6). Furthermore, a mixed method is more of an integrative approach, which combines both qualitative and quantitative methodologies (Zou *et al.* 2014:320). The essence of this methodology hinges on the assumption that the combination is more of a complementary one, as the loopholes in both approaches are compensated for by the other's strong points (Neuman 2011:5).

According to Ostlund, Kidd, Wengstrom and Rowa-Dewar (2011:369), the mixed methods approach, which draws upon the relative strengths of both qualitative and quantitative methods, is most suitable for nursing and health sciences due to the complexity and critical nature of the identified field. Because the current investigation is grounded on deductive reasoning and the post-positivism paradigm, a quantitative research approach was chosen. Also, the fact that the study seeks to ascertain direct and indirect relationships among research constructs further provided the link with the quantitative approach. Moreover, the quantitative method is widely regarded as reliable and valid in that it allows for the unbiased interpretation of results through concise analysis of the collected data (Zou *et al.* 2014:319). It was also intended that the results of the study be generalised to other environments and contexts. Muijs (2010:7) affirms that quantitative research is suitable when numerical variances are tested, such as descriptive statistics as is the case in this study, and when an investigation intends to test hypotheses. Section 5.5 provides a discussion of the research strategies of the study.

5.5 RESEARCH STRATEGIES

Research strategies could be regarded as a roadmap designed at specifying the strategic approach of any research investigation. As indicated by Hakansson (2013:6), standard research strategies

available to quantitative research studies include, among others, *ex-post facto*, cross-sectional, longitudinal surveys, experimental and case study research strategies. The selection of the stated strategies is centred on the fact that this study uses a quantitative approach, as clarified in Section 5.4.

Ex-post facto is defined as after-effect/fact research, subject to an analysis of the causal reasons for a problem once the problem/fact has occurred (Simon & Goes 2013:1). These authors further stress that *ex-post facto* utilises secondary data and is regarded as a method of determining the cause of a specific problem. *Ex-post facto* has been increasingly used in several fields such as education (for example, Jarde, Losilla & Vives 2012:97; Tuckman & Harper 2012:1), transport economy (for example, Hidalgo, Pereira, Estupiñán & Jiménez 2013:133), and criminality (Broughton 2011:719; West & Lee 2011:9). Therefore, the *ex-post facto* approach is suitable for any study that seeks to establish the underlying cause of a problem after its occurrence.

A longitudinal survey is defined by Ployhart and Vandenberg (2010:97) as a method that deals with repeating observations for a particular variable or group of respondents over a particular period. Salkind (2006:22) views it as a strategy designed for examining the characteristics of various subject matter. Longitudinal surveys are increasingly employed in psychological studies, which investigate trends variance as well as sociology, where life events/patterns over a specified period are investigated (Flick 2014:20).

According to Sekaran and Bougie (2013:102), an experimental research strategy is a method that is more deductive and focuses on establishing the causal relationships of a phenomenon. Moreover, the experimental method involves the control of factors that could directly or indirectly affect the outcomes of an experiment (Hakansson 2013:6). The experimental method has been used in studies related to psychology as well as political sciences (Creswell 2013:25). Case studies are strategies that aim at gathering data and information on a particular subject/problem (Sekaran & Bougie 2013:110). Additionally, Yin (2009:6) states that case studies are research methods that investigate current phenomena, using different data collection approaches. Furthermore, Yin (2013:6), argues that case study research methodologies are most suitable when a study seeks to determine questions such as “*how or why*”, in studies whereby the researcher has limited or no control over events and when circumstances of a real-life problem have to be investigated. The cross-sectional approach is defined as a descriptive survey method that focuses on assessing

frequencies of research constructs and their subsequent relationships (Hakansson 2013:6). The method gathers data and other relevant information from the target population over a single fixed period (days/weeks/months) to provide precise responses to the research questions (Sekaran & Bougie 2013:98).

From the operational characteristics of the identified research strategies, the cross-sectional research survey strategy was selected the most suitable for this study. This method examines the frequencies and subsequently proposed relationships of a specific research, which is very much in line with the context of this investigation that aims at ascertaining the direct and indirect links existing between supply chain management best practices, supply chain agility, risk management and performance. Furthermore, the particularity of the data collection process over a specific period allows it to be a cost and time efficient strategy. Section 5.6 presents a discussion on the research design of the present study.

5.6 RESEARCH DESIGN

A research design is viewed as the action plan that indicates how a specific research project has to be conducted (Punch 2013:206). According to Creswell (2009:31), there are several basic research design approaches applicable to quantitative research studies. These include experimental methods, descriptive, correlations, observations, and surveys.

The experimental method is described by Creswell (2014:41) as a process seeking to establish if a particular process influences an outcome. It involves a researcher's ability to provide two distinct treatments to two different focus groups and analyse their respective performance outcomes. According to Leedy and Ormrod (2001:10), there are three distinct types of experimental research methods: (1) pre-experimental, which is viewed as an independent variable which has little influence over a randomly unselected research group; (2) true-experimental, which is defined as a method that is characterised by a level of validity derived from an increased degree of control from an experiment (Campbell & Stanley 1963:20); and (3) quasi-experimental, based on the selection of research respondents on a non-random basis (Williams 2011:3).

The descriptive method involves the study of the descriptive characteristics of a study's population or phenomenon. It is more inclined to provide answers to questions about the "*what*" as opposed to the "*when/how/and why*" (De Vaus 2013:22). Leedy and Ormrod (2001:3) regard correlation

research as a method that analyses the variances between the characteristics of two separate groups. Furthermore, Bold (2001:12) stresses that this method is focused on establishing if two or more research constructs are related. In contrast, the observational method refers to the objective observation of respondents' behavioural patterns (Williams 2011:3). The survey research method refers to the provision of trends, patterns and perceptions of a sample of a specific target population under investigation. This method employs structured questionnaires, observations or interviews as techniques to gather primary data from the identified sample population (Zou *et al.* 2014:318). Drawn from this view, the survey method was deemed suitable for the purpose of this study. This was because the present survey mainly sought to investigate the relationships that exist between different constructs through assessing the perceptions and views from target respondents of the study, in line with the core characteristics of the survey method (Creswell 2014:20). Moreover, the survey method enables a faster and more convenient collection of data, as well as adequate statistical-oriented analysis of gathered information. It also leads to a better generalisation of results across larger scopes of studies (Nardi 2015:12).

5.6.1 Literature review

A literature review is regarded as a methodical process of assembling relevant information and data, which are crucial in determining the significance of a particular study (Creswell 2014:57). It is viewed as a leading strategy, which sets the tone for more in-depth examination of previous results and establishes hitherto unexplored areas of research (Cooper 2010:10). The literature review is important because it allows studies to be grounded theoretically, which is key to ensuring the proper formulation and analysis of hypotheses (Sekaran & Bougie 2013:50). As indicated previously, the literature review is an integral part of any research study. As such, chapters two and three of this study were dedicated to reviewing the literature about the predicting, mediating and outcome constructs of the study (supply chain management best practices; supply chain integration; SCRM and supply chain performance).

Chapter Two was dedicated to reviewing the literature on current and previous supply chain management best practices. These include, amongst others, practices such as outsourcing, supplier partnerships, geographical proximities, supply chain speed, customer service management, etc. Further to that, was the emphasis on the significance of the identified four practices (buyer-supplier collaboration, supply chain integration, IT adoption, and TQM) used in this study.

Chapter Three focused on a review of literature relating to supply chain agility, supply chain risks management, and supply chain performance. The factors that anchored the core of the discussion of these two chapters highlight the importance, characteristics and antecedent factors as well as outcome factors of these respective constructs. The review of these chapters was centred on information and other data drawn from search engines such as Google Scholar, Science direct, JStor, and Ebsco-host and Emerald. Resources available at the Vaal University of Technology's library were also used. This included hard-printed copies of textbooks as well as electronic copies, dissertations and thesis studies in the field of logistics and supply chain management.

5.6.2 Empirical research

The empirical research approach of this study encompasses the sampling design, the formulation of the measurement items in the form of structured research questionnaires, and the data collection approach and analysis procedures. The next subsections discuss these respective topics.

5.6.2.1 Sampling design

Sampling design refers to a plan for the numeric description of trends, attitudes, or opinions of a population by studying a sample of that population (Freeborn *et al.* 2011:475). It encompasses the target population, sampling frame, sample size and sampling method (Feldmann 2014:1). Figure 5.2 provides a visual depiction of the sampling design framework.

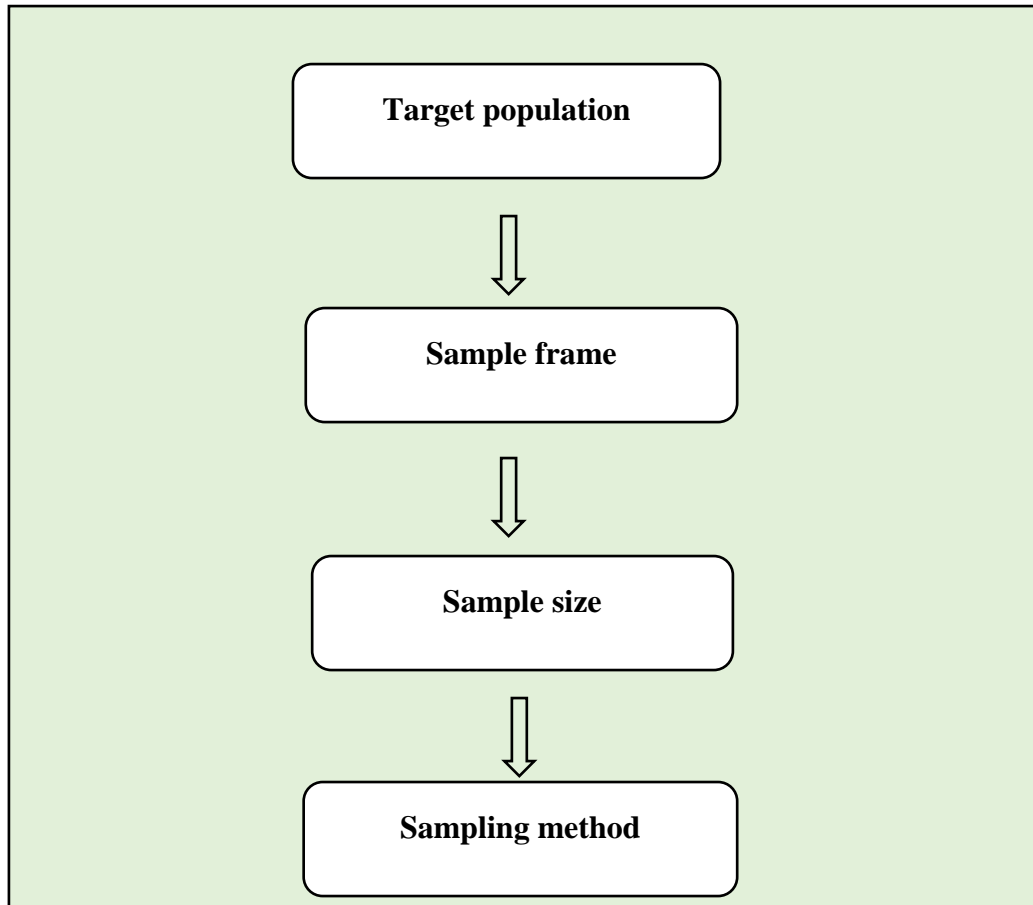


Figure 5.2: Sampling design framework

5.6.2.1.1 Target population

A target population is viewed as the universe of units (individuals or objects) from which the sample is selected (Berndt & Petzer 2013:347). As such, the target population for this study consists of all SMEs existing and in operation in the Gauteng Province, South Africa.

5.6.2.1.2 Sample frame

A sampling frame comprises a list of elements from which a sample may be drawn. It can also be referred to as working population (Zikmund, Babin, Carr & Griffin 2013:389). The sampling frame of the study consists of SMEs located in the Gauteng Province. The list of these SMEs was obtained from the Small Enterprises Development Agency (SEDA) and SME databases from the

municipalities in the region. These served as platforms for drawing the exact numbers of operating SMEs targeted in this study, which is also useful in estimating the actual sample size.

5.6.2.1.3 Sample size

Sampling size is defined as the number or size of the sample from which the required information is obtained by the researcher (Kumar 2011:194). The historical sample size approach is regarded as the most appropriate method to determine the sample size of this study. This is because it offers an indication of the suitable estimation of the size of a sample, which is derived from past supply chain literature. Table 5.1 presents the estimated sample sizes derived from previous studies in supply chain management.

Table 5.1: Historical sample size from previous studies

Title of study	Author(s) and year of publications	Sample size used
Supply management, supply flexibility and performance outcomes: an empirical investigation of manufacturing firms	Lio, Hong and Rao (2010)	288
Green supply chain initiative	Wooi and Zailani (2010)	600
Supply chain management practices in the electronics industry in Malaysia	Pandiyan, Sundram, Ibrahim and Govindaraju (2011)	600
An investigation and identification of lean supply chain performance measures in the automotive SMEs	Behrouzi and Wong (2011)	580
A hierarchical model of the impact of RFID practices on retail supply chain performance	Vlachos (2014)	300
Why do SMEs go green? An analysis of wine firms	Hamann, Smith, Tashman and Marshall (2015)	500

As observed in Table 5.1, several supply chain related research studies focusing on the SME sector used different sample sizes confined between 288 and 600. Given these historical samples, the sample size of this study was pegged at $n = 700$ respondents, in which the three levels of organisational, managerial positions (owners, managers and professional employees who had some knowledge about either logistics or supply chain management), are the focus of the investigation.

5.6.2.1.4 Sample approach

According to Berndt and Petzer (2013:349), sampling is viewed as the process of choosing a sample with the view of concluding on the population selected. Furthermore, sampling can be implemented by applying two distinct techniques, known as probability and non-probability sampling. Probability sampling is defined as a technique used to identify a specific sample (object or people) from a targeted population, from which a survey needs to be conducted (Nugent 2010:5). Probability sampling methods consist of simple random, stratified, systematic, and cluster sampling techniques (Zikmund *et al.* 2010:395). These techniques are defined as follows:

- Simple random sampling: Every respondent of a targeted population is viewed to have the same opportunity and probability to be selected for a survey, which denotes that each sample is selected individually (Malhotra & Birks 2007:19).
- Stratified sampling: In this technique, a targeted population is divided into different groups known as strata, and each stratum is then subdivided into distinct subgroups called strata. The basis of stratification resides on that the repartition must be mutually exclusive so that every element of a selected population needs to be allocated to one specific stratum (Hansen, Hurwitz & Madow 1953:638).
- Systematic sampling: It refers to the selection of a sample by randomly starting from any given point. Thereafter, consecutively choosing elements of a sample from that starting point (Levy & Lemeshow 2013:17).
- Cluster sampling: A targeted population is partitioned into different groups known as clusters. Then, a group is chosen using a simple random technique (Scheaffer, Mendenhall III, Ott & Gerow 2011:30).

Wretman (2010:31) refers to non-probability sampling as a judgment-based approach of selecting a sample from a convenient basis. Examples of non-probability sampling approaches include convenience, judgmental, snowballing, and quota. These techniques are also defined as follows:

- Convenience sampling: In this technique, respondents of a study are conveniently selected by their accessibility and proximity to the researcher (Robinson 2014:25).
- Judgement sampling: This is regarded as closely related to convenience sampling in that the sample is chosen based on the researcher's expert knowledge and understanding of the population (Robinson 2014:30).

- Snowball sampling: This is more of a referral approach in that a random sample of respondents is selected and interviewed. After that, subsequent groups are chosen depending on their identification by the interviewed group (Malhotra & Briks 2007:17).
- Quota sampling: This is regarded as a two-phase judgement technique in which a population is subdivided into specific groups or quota. Then, sample elements are judgementally or conveniently selected by the researcher (Robinson 2014:35).

It appears that the sampling techniques offer various options in the collection of data, depending on which method is identified as appropriate. Both sampling approaches have pros and cons related to their implementation. Probability sampling methods consist of four distinct techniques, all with a different set of strengths and weaknesses. The simple random technique is notably regarded as being easily understood, and the results derived from its adoption are projectable. However, it has been found to be expensive, has a lower precision, and it is difficult to set a sample frame. Systematic sampling enhances the representation of results, is easy to adopt, and a sample frame is usually not a necessity. Its main weakness is that it is prone to lower representation based on the “order” in the sampling frame in some cases. Stratified sampling is found to be a precise technique. Nevertheless, it is difficult to choose stratification elements and is expensive to conduct. Cluster sampling is cost effective and easy to implement but it is also difficult to interpret and compute and lacks preciseness.

Regarding non-probability sampling methods, it was discussed that they comprise four main techniques. Convenience sampling is less expensive and time effective. It is subject to bias and lacks representation of its sample. Judgement sampling is cost and time effective, as well as suitable for exploratory research designs. However, its results can be marred by subjectivity and a lack of generalisation. Snowball sampling is suitable for estimation of complex characteristics, although, it is time-consuming. Lastly, quota sampling is controllable. Nonetheless, it is prone to a level of bias and lacks representation of results.

For this study, and drawn from the observed review, the simple random sampling technique was found to be suitable as it is more relevant for studies that incorporate statistical processes (Feldmann 2014:10). It is also ideal for surveys that require face-to-face, email, telephone and mail techniques for collecting data (Lohr 2010:8).

As mentioned in the previous chapters, the selection process of participating SMEs was drawn from different lists obtained from the SEDA and municipalities (Johannesburg Metropolitan, Tshwane and Emfuleni Local) in the Gauteng Province that availed themselves to contribute to the completion of this study. An estimated total of about 1250 SMEs were identified and were each allocated a number, ranging from 1 to 1250. The numbers were put together in separate pieces of paper in a box with a sequential order from 1 to 1250. Afterwards, the box was shuffled to ensure the impartiality and randomness of the selection process. Thereafter, 700 papers were selected indiscriminately from the box which represented the selected SMEs considered in the study.

5.6.3 Measurement instrument

This study uses a structured research questionnaire to collect data from the targeted sample. The questionnaire is made up of seven sections, ranging from section A to H. Section A focuses on information on the profiles of participating SMEs with issues such as type and nature of the business, number of employees and years in operation being highlighted. Section B pertains to the demographic characteristics of individual respondents, in which gender, race, age group and highest academic qualification are the focus areas. Sections C to E addresses questions assessing the constructs (buyer-supplier collaboration, supply chain integration, TQM, IT adoption, supply chain agility, SCRM and supply chain performance) of the study.

Section C on buyer-supplier collaboration is measured using a five-item scale adapted from Flynn *et al.* (2010:58) and Zacharia, Nix and Lusch (2011:591). In section D, supply chain integration is measured by using a five-item scale derived from Stank, Keller and Daugherty (2001:29), Narasimhan and Kim (2002:303) and Flynn *et al.* (2010:58). Section E has a five-item scale adapted from the continuous amelioration scale (Hung *et al.* 2011:213), which measures TQM. IT adoption is measured through the use of a four-item scale derived from Jin, Vonderembse, Ragu-Nathan and Smith (2014:24) in section F. Section G deals with supply chain agility and is assessed using a five-item scale adapted from Goldman, Nagel and Preiss (1994:1) and Youndt and Snell (2004:337). Section H concentrates on SCRM, with a five-item scale adapted from Scannell, Curkovic, Wagner and Vitek (2013:15) measuring the construct. Lastly, section I addresses supply chain performance, using a five-item scale adapted from Beamon (1999:275). All the measurement scales are presented on a five-point Likert-type scale that is anchored by 1 = strongly disagree to

5 = strongly agree to express the degree of agreement. The measurement scales used in this study are listed in Appendix 1.

The actual adaptation of the questions was essentially made on the adjustment of the sentences. The process of shortening and rephrasing some of the words and phrases thereof was done to fit the context of the study best. As suggested by Reichenheim and Moraes (2007:665), it is necessary that the essence and meaning of the questions in adjusting the sentences remain the same to ensure adequate understanding from the targeted respondents. As such, very few changes were made to complicate the wording of the sentences. This was because the original sentences were straightforward and had very little or no ambiguity, the latter which might have confused the respondents.

5.6.4 Data collection procedure

As indicated in section 5.5.1.2, a structured questionnaire was chosen to be the method to gather data for this study. The questionnaires were self-administered by the researcher using a drop-and-collect method in which selected SMEs were approached to participate in the survey. Those questionnaires were subsequently retrieved once duly completed. One of the main advantages of using the drop-and-collect method as pointed out by some authors (for example, Fowler 2013:61; De Vaus 2013:55) resides on its ability to provide a better response rate from the participants of the survey.

The collection of data was conducted between April and July 2017. The extended period of three months was attributed to a large number of questionnaires, which were to be distributed (700). These 700 questionnaires were printed through the resources made available by the research directorate at a South African University of Technology. Respondents who could not complete the questionnaires on sight were given two weeks, depending on the flexibility of their schedules. Additional resources provided by the Higher Degrees Research Department of the University of Technology in the form of financial means were used to cover the travelling expenses.

Table 5.2 presents the response rate of the survey, which ascertains the actual number of responses of the respondents to the survey. According to Fan and Yan (2010:132), a response rate is the number of properly completed survey units over the total determined sample size.

Table 5.2: Response rate

Total number of questionnaires administered	700
Total number of questionnaires returned	456
Unusable responses	49
Valid questionnaires retained	407
Usable response rate (percentage)	58

Table 5.2 highlights the allotment of the questionnaires distributed during the survey. A total of 700 questionnaires were issued to all targeted SMEs. From the initial 700 questionnaires, 456 were returned, of which an estimated 49 questionnaires were found to be improperly completed. These questionnaires had errors ranging from the double selection of entries on constructs such as gender (selection of both male and female), to Likert-type scale errors (1 and 4 simultaneously). The final number of valid questionnaires available for analysis was 407, which represented a response rate of 58 percent. This response rate is considered acceptable by McGuirk and O'Neill (2016:246).

5.6.5 Data analysis and statistical approach

The analysis of the collected data was conducted in two ways. The first step was to ascertain the descriptive statistics, which was followed by the assessment of study model fit as well as CFA and path modelling. The first phase of the analysis commenced with capturing the collected data into an Excel spreadsheet where the data was cleaned to identify and correct missing data entries. Afterwards, the cleaned data was imported from Excel to SPSS (version 24.0), after which descriptive statistical analysis was conducted. A model fit analysis was conducted as well as CFA and path modelling (for testing hypotheses) through the use of AMOS (version 24.0) statistical software.

5.6.5.1 Descriptive statistics properties

Descriptive statistics refer to the assessment of primary data through properties such as mean, mode, variance, median and standard deviation (Zikmund *et al.* 2010:486). In this study, descriptive statistics used include frequencies, mean scores and standard deviations. The descriptive analysis of this study is centred on determining the profile of targeted SMEs as well as the demographic elements of respondents.

5.6.5.2 Confirmatory factor analysis

According to Joreskog and Sorbom (1979:1), CFA refers to the systematic analysis of measurement variances and facilitates the assessment of associations, which consist of latent constructs estimated after correction for measurement errors. Marsh, Morin, Parker and Kaur (2014:85) view reliability tests, assessment of validity and model fit assessment as critical component phases of CFA. Based on these views, this study followed the same phases of psychometric testing of the measurement scales.

5.6.5.2.1 Reliability

According to Ang (2014:176), reliability is defined as the degree to which measures are free from errors and therefore yield consistent results. In this study, reliability is ascertained through using three indices, namely, Cronbach's alpha value, the composite reliability value, and item-to-total correlation.

- **Cronbach's alpha**

The Cronbach alpha (α) coefficient was originally developed by Lee Cronbach in 1951 and refers to the assessment of the internal consistency of construct items or scales and is usually stated in values confined between 0 and 1 (Tavakol & Dennick 2011:53). One of the main advantages of using the Cronbach alpha as a reliability psychometric test resides on its level of objectivity, especially in providing statistical references that are subjected to very few questions (Yang & Green 2011:377). As such, as suggested by Fornell and Larcker (1981:39) and Nunnally (1978:1), Cronbach alpha thresholds should be equal to or greater than 0.7 for a measurement instrument to be regarded as meeting the internal consistency level and therefore, be concluded as reliable. The results emanating from the Cronbach alpha (α) coefficient are presented in Chapter Six, section 6.4.

- **Composite reliability**

Composite reliability has been found to be an alternative tool also aimed at examining internal consistency of research constructs (Peterson & Kim 2013:6). It can be ascertained through the following formula, as recommended by Fornell and Lacker (1981):

$$(CR): CR_{\eta} = (\sum \lambda_{yi})^2 / [(\sum \lambda_{yi})^2 + (\sum \epsilon_i)]$$

Composite Reliability = (square of the summation of the factor loadings) / {(square of the summation of the factor loadings) + (summation of error variances)}.

As mentioned by Chinomona (2011:99), in his study on non-mediated channel powers and relationship quality, CR values vary from 0.5 to 0.7, depending on the type of research. This view is supported by Nunnally (1967) who confirmed that the acceptable threshold index for a basic research study is 0.5, while 0.6 was found for exploratory research (Nunnally 1967). The latter index was further adjusted to 0.7 by Nunnally (1978) and recommended by Hair, Anderson, Tatham and Black (2006:55). The results of the CR analysis are provided in Chapter Six, section 6.4. of this study.

- **Item-to-total correlations**

Item-to-total correlations are a psychometric measure used to judge the reliability and consistency of measurement scales (Churchill 1979:64) According to Nunnally (1978:1), item to total correlations scores should be equal or greater than a threshold value of 0.5 for the constructs to meet the cut-off level of reliability. Examples of other psychometrics assessment of reliability of scales include the split-half reliability coefficient and the Kuder-Richardson Formula 20 (K-R 20) (Huck 2004:80). The results of the item to total correlations are discussed in Chapter Six, Sections 6.1 and 6.4.

5.6.5.2.2 Validity

According to Scholtes *et al.* (2011:239), validity is the degree to which the instrument measures the construct it purports to measure. There are two measurement properties of validity known as construct and content validity, with the former categorised into convergent validity and discriminant validity (Moutinho & Hutcheson 2011:327).

- **Construct validity**

Construct validity has been defined by Peter (1981:134) as the level at which a specific measure measures what it is intended to measure. As indicated by Moutinho and Hutcheson (2011:327), construct validity is divided into convergent validity and discriminant validity.

Convergent validity denotes the correlation that exists between different measurement instruments and the constructs they need to measure (Peter 1981:140). In this study, convergent validity was

ascertained through the use of item-to-total correlation values and item loading values (standardised regression weights), as supported by Chinomona (2011:1), whereas, discriminant validity calls for the distinction of measures. This implies that each item scale must offer various loadings to different constructs (Malhotra 1996:10). Thus, discriminant validity is ascertained through the correlation matrix, as confirmed by Anderson and Gerbing (1988:411) who further mention that the acceptable threshold between constructs should be no greater than 0.7. Discriminant validity was further determined by confirming whether the average variance extracted (AVE) value is larger than the highest shared variance (SV) (Anderson & Gerbing 1988:412). Furthermore, Bagozzi and Yi (1988:74) suggest that discriminant validity can be ascertained through the use of the Pearson correlation matrix. This study intends to employ both approaches to determine discriminant validity.

- **Content validity**

Content validity is defined as the level at which a specific measurement item offers a precise definition of a construct (Polit & Beck 2006:490). A prominent study by Lawshe (1975:363) concludes that one of the chief verification methods of content validity is through expert judgement. This view finds supportive evidence from Cooper and Schindler (2014:1) who stress that in-depth scrutiny of research measurement items by a panel of experts in that field of study is paramount to determine the relevance of the instruments. This study, therefore, conforms to the highlighted prerequisite, in that a review of the questionnaire led by a panel of academics who are experts in the supply chain management field assessed and reviewed the validity of the content of the questionnaire items of the study. Their input was used to improve the questionnaire through suitable modifications to the wording, length and structure of the questions.

5.6.5.2.3 Research model fit assessment

A research model fit is regarded as the determination of the interaction that exists between latent constructs of a research model and the analysis of the relevant hypothesised relationships and covariance with the identified latent constructs (Schreiber, Stage, King, Nora & Barlow 2006:330). The assessment of a study model fit is dependent on several indices (Hooper, Coughlan & Mullen 2008:53). These include amongst others: Chi-square value, Comparative fit index (CFI), Goodness

of fit index (GFI), Incremental fit index (IFI), Normed fit index (NFI), and a Random measure of standard error approximation (RMSEA), as prescribed by Bagozzi and Yi (1988:74).

Chi-square value (χ^2) is aimed at evaluating the inconsistency between the sample and covariance matrices (Hu & Bentler 1998:2). There have been conflicting reports regarding the acceptability of a research model Chi-square ratio (Hooper *et al.* 2008:54). However, prominent recommendations by Wheaton, Muthen, Alwin and Summers (1977:84), and Tabachnick and Fidell (2007:6) indicate an acceptable ratio ranges between 2 and not more than 5. Schreiber *et al.* (2006:330) provide a more precise determination of the Chi-square value (χ^2), of equal to 2 or no higher than 3. RMSEA analyses the fitness of the model about selected parameters and covariance matrices (Bryne 1998:10). It was reported that the cut-off value of RMSEA should be equal to or no greater than 0.08 (Browne & Cudeck 1993:137). CFI differentiates the covariance matrix anticipated by the model to the observed covariance matrix and further compares the null model with the observed covariance matrix. GFI is the ratio derived from observed covariance explained by the model. IFI addresses components related to parsimony and sample size (Bollen 1990:260). NFI analyses the model through the evaluation of the Chi-square values of both null and alternative model (Bentler & Bonnet 1980:588). The acceptable threshold values of these respective indices are estimated at between 0.9 to 1 (Bollen 1990:256; Hu & Bentler 1998:5). The results of the analysis of the study model fit assessment are presented in Chapter Six, Section 6.4.

5.6.5.3 Path modelling

Path modelling is defined as a statistical approach designed for examining the direct or indirect relationships that exist between distinct constructs through the assessment of their respective correlations ratios (Mitchell 1992:124). As advocated by Schreiber *et al.* (2006:330), this process applies to the adoption of structural equation modelling (SEM). For this study, the analysis of path modelling and hypotheses testing derived from the implementation of SEM was done using AMOS (version 24.0) software. The results of this analysis are shown in Chapter Six, Section 6.4.

5.7 ETHICAL CONSIDERATIONS

The process of completion of this study as well as the distribution of the questionnaires to the target population was done ethically. The process of gathering data and other relevant information from SMEs was concerned with privacy and anonymity, as indicated by Mason (1986:1), which

emphasises compliance with the criteria of confidentiality. This was achieved by ensuring that the names and addresses of the different organisations are kept anonymous. Moreover, voluntary participation in the survey by the selected respondents was achieved primarily by providing them with full information about the merits and purpose of the study, which subsequently enabled the various respondents to understand the value of the investigation. Respondents were able to make informed decisions regarding their participation and contribution to the study. As suggested by Myers and Venable (2014:803), the respondents' rights to non-participation and protection from victimisation were followed. Furthermore, compliance with rules related to plagiarism was enforced through acknowledging the respective in-text sources that were used in the study in the reference list. The entire thesis was subjected to a plagiarism test using Turn-it-in software, which assessed the degree of similarity of all in-text and reference list sources as a way to ensure the originality of the research undertaken.

5.8 CONCLUSION

This chapter is intended to discuss the methodology employed to collect data and conduct this study. The first topic that constituted the discussion was research reasoning (inductive versus deductive), in which deductive research reasoning was found suitable for the study due to its affinity to the quantitative research approach. The research philosophies were also discussed, and it was found that post-positivism was the most appropriate philosophy applicable to the study. The quantitative research approach was identified as suitable for the study because the investigations are grounded on the deductive reasoning and post-positivism paradigms. A cross-sectional analysis was determined to be the strategy that was suitable for conducting the study. Further to that was the determination of the study target population (SMEs), sample frame (operating SMEs confined to the Gauteng Province) and the sample size ($n = 700$). Notwithstanding the data collection procedure and analysis approach used to analyse the collected data. The discussion concludes with the ethical considerations followed throughout the research.

CHAPTER 6

DATA ANALYSIS RESULTS AND INTERPRETATION

6.1 INTRODUCTION

The previous chapter provides a detailed overview of the methods and techniques that have been considered to conduct the analysis of the collected data. It was highlighted that the research made use of a structured questionnaire to gather information about the context of the study from targeted SMEs. It took approximately three months from the time the questionnaires were issued in June 2017, to the time they were collected in September 2017. The researcher utilised the drop and collect method to distribute the questionnaires to all participating SMEs. The primary purpose of this chapter is therefore to provide an in-depth analysis of the data obtained and provide confirmation of the proposed hypotheses.

Once retrieved, the questionnaires were all individually checked to determine those that had been improperly completed, which allowed for the determination of the response rate. The actual analysis process started with assessing the results of the pilot study, followed by the descriptive properties of the respondents' data as well as the research constructs. The data was first coded on a Microsoft Excel Spreadsheet, which was then exported to SPSS (Version 24.0) format to conduct the analysis. Further analysis included determining the reliability and validity of the constructs. The assessment of the research model fit and hypotheses testing was then done through AMOS (version 24.0) software.

The chapter begins with a determination of the response rate of the survey, which will then be followed by the descriptive statistical analyses.

6.2 RESULTS OF THE PILOT STUDY

Before the primary survey was conducted, the research instrument was subjected to a panel review, a pre-test and a pilot study. According to Mohorko and Hlebec (2016:79), a pre-test of the questionnaire involves improvement of selected item-scales through the reduction of potential errors and adequate alignment to the context of a study. It is conducted to enhance the quality of the entire questionnaire to ensure that the information requested from the survey is clearly presented and understood without any ambiguity to the respondents (Burns & Kho 2015:198). This is important because it facilitates the improved comprehension of the context of a study. The

adjustment of items is based on the retention of their core meaning, because the understanding of meaning is influenced by various external factors, such as social or cultural background (Adair, Holland, Patterson, Mason, Goering & Hwang 2011:38).

A panel of three academics who specialise in supply chain management at a South African University of Technology were requested to review the questionnaire. Aspects that were dealt with included the sentencing structure, whereby the wording of the questions was modified to ensure that the questionnaire was able to capture the required information accurately. The review was further conducted to ensure that the context of the study remains as transparent as possible in guiding the respondents in their understanding of the survey.

The sample questionnaire was then pre-tested using a predetermined sample of 15 (n=15) SME firms that were conveniently selected because of their proximity to the researcher's location. Constructive feedback was obtained from the returned questionnaires, which indicated a number of minor issues that still needed to be addressed. These ranged from complex and technical terminologies to acronyms that were used which made some questions vague. Further revisions were subsequently effected in line with the feedback provided.

After effecting the revision of the questionnaire, a pilot study was undertaken to test for content validity and reliability of the questionnaire. The pilot study was effected through selecting 40 (n=40) SMEs which were conveniently chosen in the Vaal Triangle region. This decision was taken to ensure that businesses operating in this region did not form part of the final survey. A total of 37 (n=37) usable questionnaires were used in the analysis of pilot data. Table 6.1 presents the results of the analysis of the pilot study.

Table 6.1: Results of the Pilot test

Scale	Means	Std. Dev.	Average item-total correlation	Cronbach Alpha before deletion	Number of items	Number of items deleted	Number of remaining items	Revised Cronbach Alpha
Section B	4.38	0.632	0.686	0.863	5	0	5	0.945
Section C	4.35	0.650	0.683	0.772	5	1	4	0.820
Section D	4.60	0.516	0.702	0.869	5	0	5	0.869
Section E	4.56	0.616	0.817	0.921	4	0	5	0.921
Section F	4.55	0.537	0.743	0.895	5	0	5	0.895
Section G	4.58	0.598	0.724	0.881	5	0	5	0.881
Section H	4.64	0.532	0.743	0.935	5	0	5	0.935

Table 6.1 shows that the respondents of the pilot study strongly agreed with the questions posed in the survey. This is because of the average mean score for all scales was $\bar{x}=4.52$; $SD=0.583$. Regarding the average item-total-correlation, the analysis found that scores for all scales were above the required minimum threshold of 0.5, as suggested by Churchill (1979:64), with sections B, C, D, E, F, G and H registering values of 0.686, 0.683, 0.702, 0.817, 0.743, 0.724 and 0.743 respectively. It is important to note that only Section C (supply chain integration) had an item removed (*Our business integrates the majority of its operations processes from raw material through to delivery*), due to a low item-to-total correlation value ($SCI_3=0.359$), which subsequently improved the Cronbach alpha score of the construct from 0.772 (before the purification process) to 0.820 (after removal of the item). Thus, the total number of items in that scale was trimmed from five at the commencement of the pilot process, to four on completion. All of the other items used to measure their respective constructs were found to be acceptable. The results further revealed that all constructs were reliable as they met the required cut-off value of 0.7 (Bagozzi & Yi 1988:74), with buyer-supplier collaboration, TQM and IT adoption scoring 0.863; 0.869; and 0.921; and supply chain agility, supply risk management and supply chain performance registering values of 0.895, 0.881 and 0.935.

6.3 RESULTS OF THE MAIN SURVEY

The main survey was conducted between April and July 2017. This section discusses the results of this survey regarding the descriptive statistics and inferential statistics.

6.3.1 Descriptive statistics

This section pertains to the results emanating from the descriptive statistics of the first part of the analysis. It includes outcome results about the demographic profile of all participating SME owners or managers, which consists of constructs such as gender, race, age category and highest academic qualification (Section B of the questionnaire). This is followed by the SMEs' operational characteristics, which consist of type and nature of the business, the number of employees as well as years in operation (Section A of the questionnaire).

6.3.1.1 Demographic results

The demographic results of the first part of the analysis are presented in Table 6.2. These include findings related to gender, race, age category and highest academic qualification.

Table 6.2: Descriptive statistics results

VARIABLE AND CATEGORY	FREQUENCY (n)	PERCENTAGE (%)
Gender		
Male	243	59.7
Female	164	40.3
Total	N= 407	100
Race		
African	200	49.1
White	113	27.8
Indian/Asian	60	14.7
Coloured	34	8.4
Total	N= 407	100
Age		
18-25 years of age	9	2.2
26-35 years of age	91	22.4
36-45 years of age	179	44
46-55 years of age	114	28
56> years of age	14	3.4
Total	N= 407	100
Highest level of education		
Matric	20	4.9

VARIABLE AND CATEGORY	FREQUENCY (n)	PERCENTAGE (%)
Diploma	116	28.5
Degree	176	43.2
Postgraduate	74	18.2
Other	21	5.2
Total	N= 407	100

6.3.1.1.1 Gender of respondents

The results from Table 6.2 and Figure 6.2 show that 243 of all respondents participating in this survey are male, while, 164 are female. This equates to percentages of 59.7 and 40.3 respectively. Figure 6.1 provides a graphical illustration of these results.

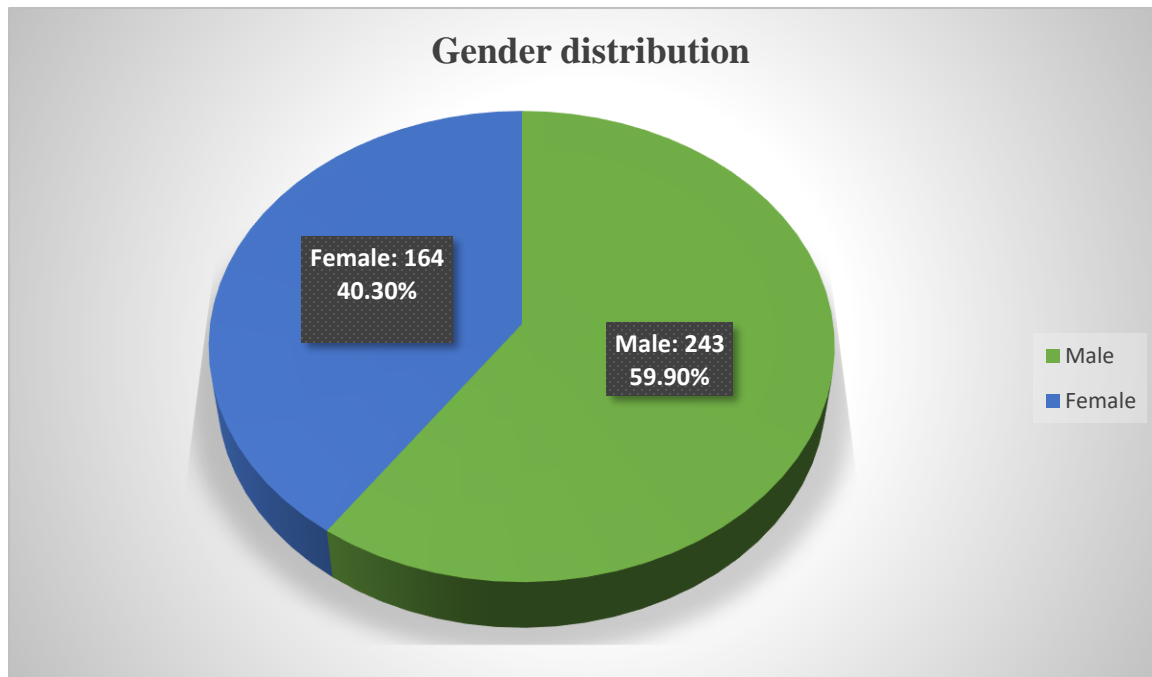


Figure 6.1: Gender distribution of respondents

6.3.1.1.2 The racial distribution of respondents

Regarding the race distribution of the respondents, interesting results have been shown. Out of the 407 participants, 200 were African which represents 49.1% of the sample. The white race (n=113) appeared to be the second highest representation of the sample, with a percentage of 27.8. This

follows with Indian/Asian (n=60) which accounts for 14.7% and Coloured (n=34) for 8.4%. The discussed results are reported in Figure 6.2.

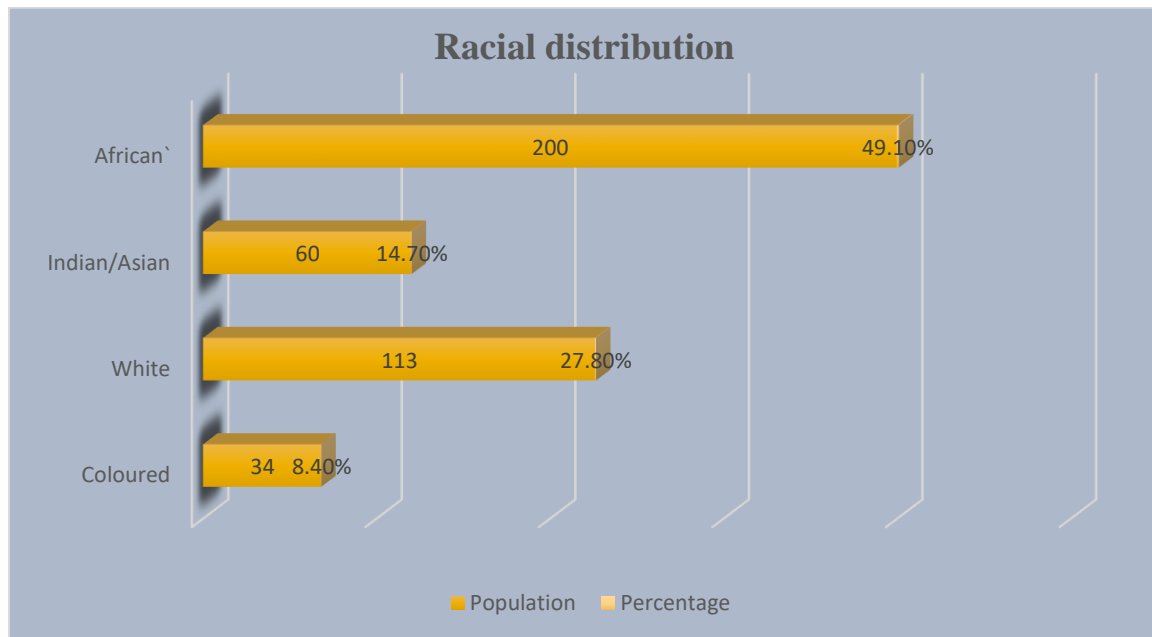


Figure 6.2: Racial distribution of respondents

6.3.1.1.3 Age distribution of respondents

In terms of the age distribution, the results show that a large portion of the SMEs' employees were aged between 36-45 years (n=179: 44%). This is followed by 46-55 years of age (n=114: 28%). A total of 14 respondents (n=14) were aged more than 56 years, which equates to a percentage of 3.4. A total of nine respondents were aged between 18-25 years of age, which represents 2.2% of the sample. These results can be observed in Figure 6.3.

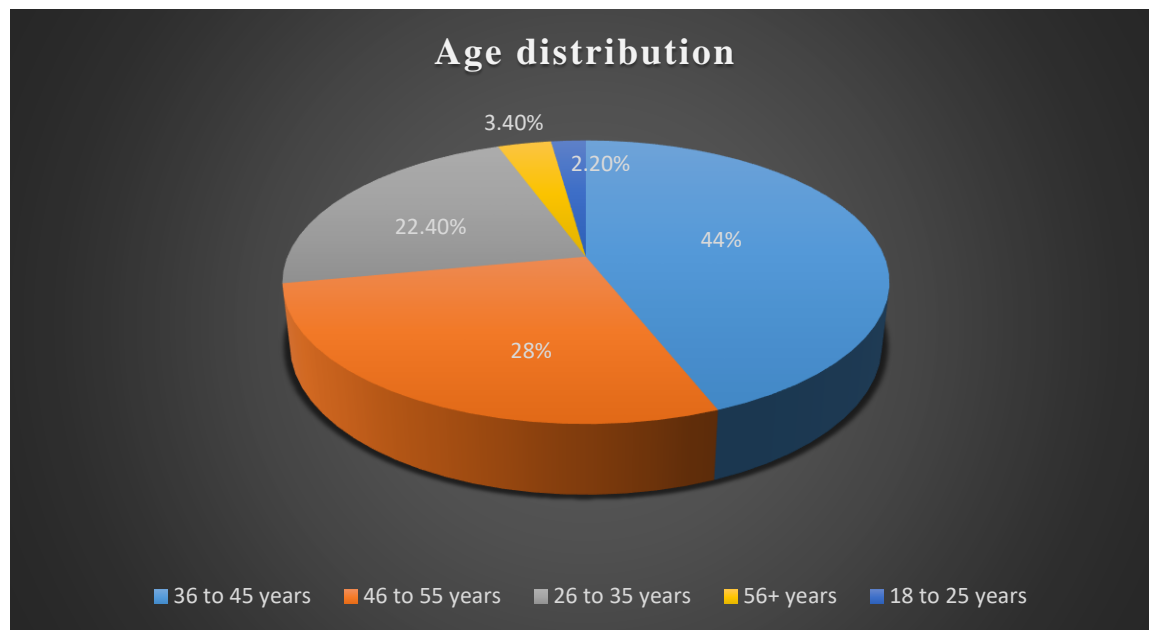


Figure 6.3: Age distribution of respondents

6.3.1.1.4 Highest academic qualification of respondents

Out of the 407 questionnaires distributed, the analysed results show about 176 (n=176) personnel operating in the sampled SMEs were holders of degrees, which account for a percentage of 43.2. Besides, 28.5% (n=116) were holders of diplomas, while, 74 and 21 respondents had a postgraduate or any other qualification, which accounts for percentages of 18.2 and 5.2 respectively.

6.3.1.2 Profile of participating SMEs

The second part of the analysis was about the profile of all SMEs that were part of the survey. The subsequent results are presented in Table 6.3. The main constructs that were identified consisted of type and nature of the business, number of employees as well as their years in operation.

Table 6.3: Profile results

VARIABLE AND CATEGORY	FREQUENCY (n)	PERCENTAGE (%)
Type of business		
Cooperative	38	9.3
Sole proprietor	73	17.9
Close corporation	51	12.5
Private business	172	42.3
Partnership	73	17.9
Total	N= 407	100
Nature of business		
Mining	4	1
Manufacturing	148	36.4
Retail	111	27.3
Transport	26	6.4
Tourism	9	2.2
Finance/insurance	60	14.7
Agriculture	41	10.1
Other	8	2
Total	N= 407	100
Number of people employed		
1-9	31	7.6
10-19	20	5
20- 49	75	18.4
50-100	151	37.1
101-200	130	32
Total	N= 407	100
Number of years in operation		
Less than 2 years	30	7
2 to 5 years	120	29.4
5 to 10 years	136	33.4
More than 10 years	121	30
Total	N= 407	100

6.3.1.2.1 Type of business

From the results detailed in Table 6.3, it can be concluded that the majority of SMEs are private businesses (n=172), which corresponds to 42.3%. This is followed by the sole proprietor (n=73) and partnership (n=73) with a combined percentage of 34.4 between the two categories. The other

categories of SMEs were found to be close corporations (n=51: 12.5%) and cooperatives with a total of 38 firms (n=38), which accounts for a percentage of 9.3.

6.3.1.2.2 Nature of business

Of the 407 SMEs which participated in this survey, 148 (n=148) were of a manufacturing nature, which amounts to 36.4%. Furthermore, the retail sector appeared to be a significant presence with 111 (n=111) representing a percentage of 27.3 of the sampled SMEs. Finance (n= 60) and agriculture (n=41) found themselves as the other sectors of predominance with a combined percentage of 24.8. Tourism (n=9: 2.2%) and other unidentified sectors (n=8; 2%) were also found as types of SMEs. Lastly, mining businesses were the least represented in the survey, with only 4 (n=4: 1%) businesses participating in this research. These results illustrate that the manufacturing sector is the prevailing sector from which the SMEs that participated in this analysis operate. This deduction finds supporting evidence from Terziovski (2010:892) and Abor and Quartey (2010:1450) who mention that the manufacturing sector is an important and prevalent segment that SMEs thrive in. These results are reported in Figure 6.4.

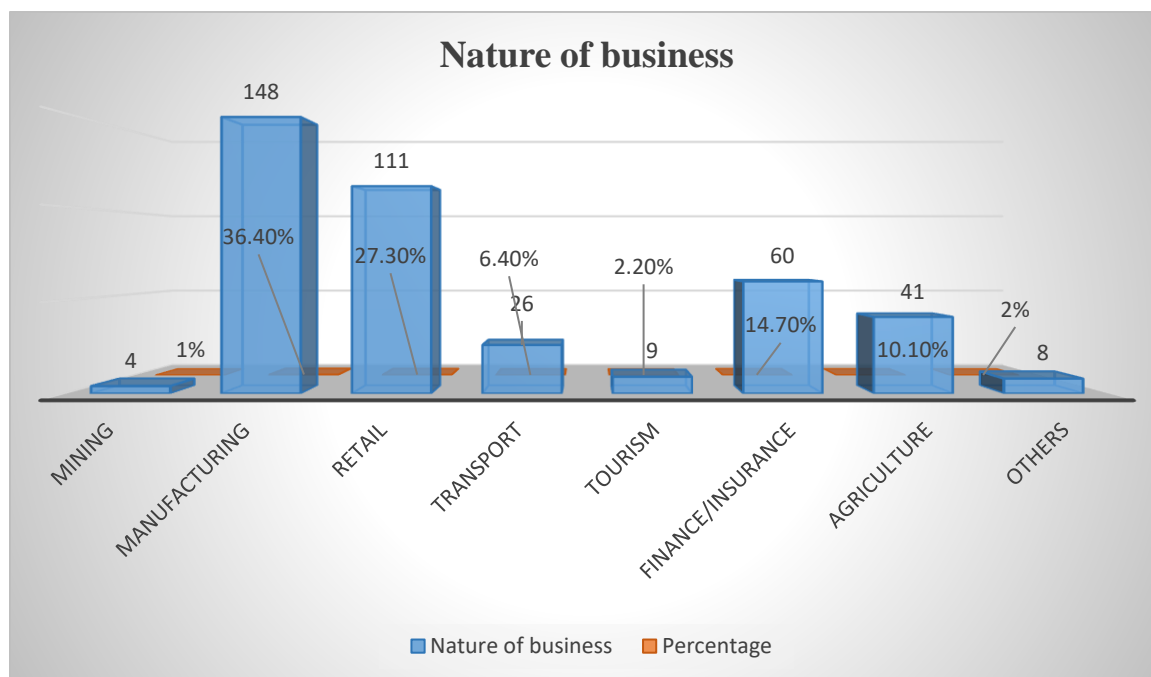


Figure 6.4: Nature of business of SMEs

6.3.1.2.3 Number of people employed

In terms of the evaluation of the workforce of SME firms, insightful readings were obtained. Of the 407 firms, it was found that a vast portion of the SMEs (n=151) employed between 50 and 100 employees, which correlates to a percentage of 37.1. In addition, 32% of the entire representation of interviewed firms had 101 to 200 employees (n= 130), whereas different firms had a combined workforce of less than 80 workers, with 75 (n=75) employing 20 to 49; 31 (n=31) hiring 1 to 9; and 20 (n=20) having 10 to 19 employees. These all account for respective percentages of 18.4, 8 and 5. This result depicts that on average SMEs that participated in this study have a labour force which is comprised of between 50 and 100 employees. These figures, therefore, underline the consensus regarding the economic impact of the SME sector on the South African economy (Mahembe 2011:1; Urban & Naidoo 2012:146). Its contribution to employment generation has an estimated ratio of around 60 percent (Kongolo 2010:2288; Ngeek & Smit 2013:3043). These results are reported on in Figure 6.5.

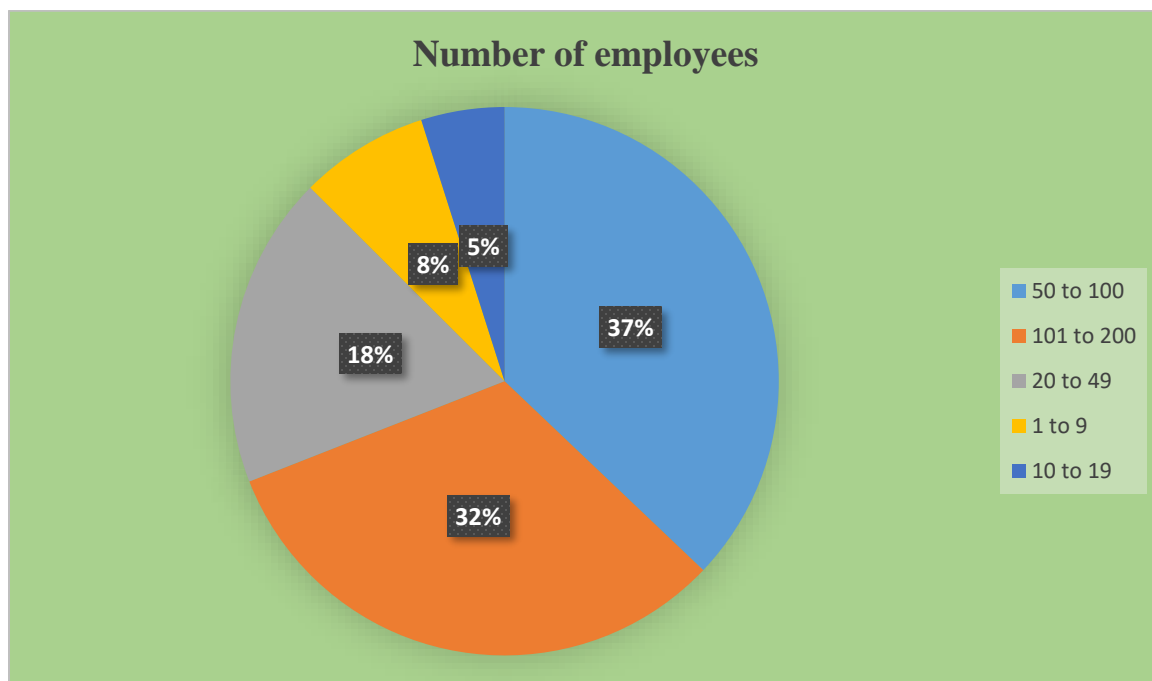


Figure 6.5: Number of employees of SMEs

6.3.1.2.4 Number of years in operation

Regarding the number of years in operation, it was observed that 33.4% of SMEs (n=136) had been in business for 5 to 10 years, whilst 29.7% (n=121) were in operation for more than 10 years, and 29.4% (n=120) for 2 to 5 years. Lastly, 30 firms (n=30) had been in business for less than 2 years, which amounts to a percentage of 7. It appears then that the bulk of SMEs have been conducting their business operations for a period of 5 to 10 years.

The results can be observed in Figure 6.6.



Figure 6.6: Years in operation of SMEs

6.3.1.3 Descriptive statistics about research constructs

This section presents the outcomes related to the analysis of the descriptive statistics related to the constructs of the study. This analysis was mainly done to ascertain the views that the participating SMEs have towards the constructs (*buyer-supplier collaboration, supply chain integration, TQM, IT adoption, supply chain agility, SCRM and supply chain performance*) of the study.

6.3.1.3.1 Descriptive statistics for buyer-supplier collaboration

The results of the descriptive analysis for buyer-supplier collaboration are presented in Table 6.4.

Table 6.4: Buyer-supplier collaboration

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Standard deviation	Mean (\bar{x})
BSC1	Our business collaborates with its major suppliers in terms of solving logistics and product quality problems	5 1.2%	5 1.2%	17 4.2%	174 42.8%	206 50.6%	0.739	4.40
BSC2	Our business collaborates with its partners in terms of sharing business information.	5 1.2%	18 4.4%	17 4.2%	168 41.3%	199 48.9%	0.846	4.32
BSC3	Our business collaborates with its suppliers in planning logistics and production schedules.	4 1%	7 1.7%	12 2.9%	160 39.3%	224 55%	0.728	4.46
BSC4	Our business collaborates with its major supply chain partners in setting operational strategies and objectives.	3 0.7%	10 2.5%	18 4.4%	170 41.8%	206 50.6%	0.751	4.39
BSC5	Our business collaborates with its suppliers in terms of sharing operational and industry knowledge.	5 1.2%	20 4.9%	14 3.4%	149 36.6%	219 53.8%	0.863	4.37
Overall scale							0.633	4.388

Table 6.4 provides detailed results about the respondents' perceptions of the effective implementation of buyer-supplier collaboration. The results show that approximately 93.4% (n=380) of the SMEs either agree or strongly agree that they collaborate with their major suppliers in terms of solving logistics and product quality problems (Item 1). The mean score of \bar{x} =4.40; SD=0.739 supports these results, which indicates a strong degree of agreement to the statement as the loading is confined between 4 and 5. However, about 17 (n=17) firms were neutral on this statement, and a combined 10 (n=10) SMEs either strongly disagreed or disagreed. This accounts for percentages of 4.2 and 2.4 respectively. Similar results were obtained with regard to item 2, as about 90.2% (n=367) of SMEs either agreed or strongly agreed that they collaborate with their partners in terms of sharing business information (Item 2). This is further supported by the mean

score of $\bar{x}=4.32$; $SD=0.846$, which indicates once again the strong degree of agreement to the question stated. However, roughly 5.6% ($n=23$) of the population were in disagreement (either strongly disagree/disagree) with the statement, and about 17 ($n=17$) respondents being neutral, accounting to a percentage of 4.2.

With regard to Item 3, results showed that an estimated 94.3% ($n=384$) of SMEs were in strong agreement with the statement that they collaborate with their suppliers in planning logistics and production schedules. The mean score of $\bar{x}=4.46$; $SD=0.728$ further supports these outcomes, which indicates agreement with the above result. Yet again, 12 ($n=12$) and a combined 10 ($n=10$) SMEs were neutral and in disagreement (either strongly disagree/disagree) with the statement, which contributed to percentages of 2.9 and 2.7 respectively. Meanwhile, Item 4 indicated that 50.6% ($n=206$) of the SMEs strongly agreed that they collaborate with their major supply chain partners in setting operational strategies and goals. This result is supported by the mean score of $\bar{x}=4.39$; $SD=0.751$, which illustrates a strong level of agreement with the statement. Additionally, 41.8% ($n=170$) of the total number of SMEs that participated in the survey agreed with the statement posed.

About 4.4% ($n=18$) of the SMEs had no specific opinion, and only 3.2% ($n=25$) were in disagreement with the statement. Lastly, of the 407 participating SMEs, 368 ($n=368$) responded positively to the fact that they collaborate with their suppliers regarding the sharing of operational and industry knowledge (Item 5), which thus represents a ratio of 90.4%, with the mean highlighting a degree of agreement to the above view with a score of $\bar{x}=4.37$; $SD=0.863$. Approximately 6.1% ($n=25$) of the businesses disagreed with the statement, and 3.4% ($n=14$) had no opinion. Therefore, overall, the results show that SMEs have collaborative relationships with their supply chain partners, since a mean score of $\bar{x}=4.39$; $SD=0.633$ was attained for the entire scale.

The above results demonstrate that the majority of SMEs have strong collaborative engagements with their supply chain partners, especially with regards to strategic operations planning as well as problem-solving. These results find supporting evidence from Soosay, Claudine and Hyland (2015:613), who argue that useful collaborative work amongst supply chain partners leads to sustainable supply chain performance and competitive advantages stemming from the establishment of long-lasting trust, problem resolution capability and integrated operational

processes. Furthermore, Ferreira, Silva, Strauhs and Soares (2011:1412) submit that the collaborative-driven approach amongst SMEs contributes to the establishment of meaningful cooperation and coordination of business operations across a firm's value chain. Therefore, adequate collaborative practices between SMEs' business associates are key to reaching a desirable level of competitiveness (Kumar, Singh & Shankar 2016:455). Thus, collaborative relationships between supply chain partners are an outstanding success factor to both SME performance as well as long-term success.

6.3.1.3.2 Descriptive statistics for supply chain integration

The results of the descriptive analysis for supply chain integration are presented in Table 6.5.

Table 6.5: Supply chain integration

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Standard deviation	Mean (\bar{x})
SCI1	Our business has an integrated communication network with all its business functions to enable an effective sharing and flow of information across all departments.	4 1%	3 0.7%	10 2.5%	160 39.3%	230 56.5%	0.680	4.50
SCI2	Our business shares production plans and schedules with its suppliers.	11 2.7%	9 2.2%	20 4.9%	180 44.2%	187 45.9%	0.872	4.29
SCI4	Our business shares forecasting activities with its major suppliers to ensure adequate inventory management.	3 0.7%	23 5.7%	14 3.4%	176 43.2%	191 46.9%	0.841	4.30
SCI5	Our business shares market-related information with its major suppliers and customers.	6 1.5%	11 2.7%	15 3.7%	179 44%	196 48.2%	0.821	4.36
Overall scale Note: SCI3 was deleted during scale purification							0.650	4.36

Table 6.5 presents the results regarding the SMEs' perceptions of supply chain integration. Five measurement items were used to assess the views of respondents. Out of the 407 participating SMEs, 95.8% (n=390) of the respondents either agreed or strongly agreed that they integrate the

majority of their operations processes from raw materials through to delivery (Item 1). This result is validated by the mean, which indicates a score of $\bar{x}=4.50$; $SD=0.680$ which is confined within 4.5 to 5, which thus signifies a strong degree of agreement to the above view. Besides, 2.5% (n=10) were neutral while 1.7% (n=7) SMEs were in disagreement with Item 1. Regarding Item 2, 45.9% (n=187) of the SMEs strongly agreed to sharing production plans and schedules with their suppliers while 44.2% (n=180) were in agreement with the sentence. Further evidence of the level of agreement to the statement is revealed by the mean, which showed a score of $\bar{x}= 4.29$; $SD=0.872$, which represents a strong degree of agreement towards the view that SMEs share production plans and schedules with their suppliers. About 4.9% (n=20) and 4.9% (n=20) of respondents were neutral and in disagreement with the statement respectively.

In contrast, 10.4% (n=42) of the SMEs were in disagreement (either strongly disagree/disagree) with the statement while 4.4%(n=18) were neutral. Furthermore, 46.9 % (n=191) of respondents strongly agreed and 43.2% (n=176) agreed to the view that SMEs share forecasting activities with their major suppliers to ensure adequate inventory management (Item 4). This strong level of agreement is supported by the mean score of $\bar{x}=4.30$; $SD=0.821$, whereas 6.4% (n=26;) of the SMEs did not agree (either strongly disagree/disagree) and 3.4% (n=14) did not have any opinion.

Lastly, Item 5 revealed that 48.2%(n=196) of the SMEs were in strong agreement with sharing market-related information with their major suppliers and customers, and 44% (n=179) agreed to the statement. This strong degree of agreement is supported by the mean result, which shows a score of $\bar{x}=4.36$; $SD=0.821$. However, 4.2% (n=17) and 3.7% (n=15) of the SMEs disagreed (either strongly disagree/disagree) and were neutral to the sentence. As drawn from the presented results, the majority of SMEs are in strong agreement with the integration of their supply chain activities, as indicated by the overall mean score of $\bar{x}=4.359$; $SD=0.650$.

The results of this study point to the contribution of integrating SME supply chain activities towards increasing operational performance, which ensures a continuous flow of operations. This view was similarly echoed by Ralston, Blackhurst, Cantor and Crum (2015:2) who suggest that integration of the processes and operations of firms is crucial in improving their operational performance through practices such as prompt delivery, continuous flow of quality and relevant information. The effective integration of supply chain networks also results in the improved ability

of businesses to accurately meet the expectations and requirements of customers (Narasimhan, Swink & Viswanathan 2010:355). Adequate integrative processes across business partners facilitate the proper sharing of knowledge as well as core competencies that lead organisations to enhance their core business capabilities (Wiengarten, Humphreys, Gimenez & McIvor 2016:361).

6.3.1.3.3 Descriptive statistics for total quality management

The results of the descriptive analysis for TQM are presented in Table 6.6.

Table 6.6: Total quality management

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Standard deviation	Mean (\bar{x})
TQM1	Our business continuously reviews the quality standard of its production and operations processes on a regular basis.	2 0.5%	4 1%	9 2.2%	119 29.2%	273 67.1%	0.633	4.61
TQM2	Our production equipment is thoroughly checked in order to improve its overall productivity.	1 0.2%	2 0.5%	10 2.5%	124 30.5%	270 66.3%	0.587	4.62
TQM3	Our business takes into consideration customers' complaints as input to improve the quality of our products and services.	-	1 0.2%	12 2.9%	123 30.2%	271 66.6%	0.554	4.63
TQM4	Our production times are maintained through just-in-time strategy to facilitate quick responses to customers' enquiries.	-	11 2.7%	14 3.4%	117 28.7%	265 65.1%	0.692	4.56
TQM5	Our business is actively engaged in providing quality training courses to our employees.	4 1%	7 1.7%	9 2.2%	112 27.5%	275 67.6%	0.713	4.59
Overall scale							0.517	4.604

Table 6.6 reveals the results of the analysis related to TQM, which used a five item-scale to measure the perceptions of SMEs. Item 1 showed that 67.1% of the respondents (n=273) strongly agreed that they continuously review the quality standard of their production and operations processes on a regular basis, with 29.2% (n=119) being in agreement. The strong level of agreement was confirmed by the mean score of \bar{x} = 4.61; SD=0.633. Nevertheless, 2.2% (n=9) of

the SMEs were found to have neutral views, and 1.5% (n=6) disagreed with the statement. Of the 407 firms interviewed, 66.3% (n=270) were found to be in strong agreement with the view that their production equipment is thoroughly checked to increase their productivity (Item 2), and 30.5% (n=124) agreed. The agreement of the stated outcome was substantiated by the mean score of $\bar{x}=4.62$; $SD=0.587$. However, 2.5% (n=10) of SMEs had no opinion and 0.7% (n=3) disagreed (either strongly disagree/disagree).

A total of 65.1% (n=271) of SMEs strongly agreed that they take into consideration customers' complaints as input to strengthen the quality of their products and services (Item 3). This is further supported by a mean score of $\bar{x}=4.63$; $SD=0.554$. Besides, 30.2% (n=123) of the SMEs agreed with the statement while 3.4% (n=14) were neutral and 0.2% (n=1) were in disagreement. Moreover, 65.1% (n=256) of the SMEs that took part in the survey agreed that their production times are maintained through the JIT strategy to facilitate quick responses to customers' enquiries (Item 4). This result is supported by a mean score of $\bar{x}=4.56$; $SD=0.692$. A total of 28.7% (n=117) of SMEs agreed with the view, whilst, 3.45% (n=14) and 2.7% (n=11) had no opinion and disagreed respectively with the sentence. Furthermore, regarding the question focusing on whether SMEs actively engage in providing quality training courses to their employees (Item 5), the results reveal that 67.6% (n=275) were strongly in agreement, which was further confirmed by a mean score of $\bar{x}=4.59$; $SD=0.713$. Additionally, 27.5% (n=112) agreed, while 2.7% (n=11) were in disagreement (either strongly disagree/disagree) and 2.2% (n=9) were neutral to the statement. Thus, SMEs are in strong agreement with the implementation of TQM, since a total mean score of $\bar{x}=4.604$; $SD=0.517$ was attained.

The above results demonstrate that SMEs tend to implement TQM practices as part of their strategies to elevate the quality of their operations. This view is supported by Vanichchinchai and Igel (2011:3405) who stress that the key value of implementing TQM practices such as the frequent quality assessment of firms' operations is supreme if competitive advantages are to be achieved. The adoption of TQM enhances the organisations' ability to foster the quality of their internal operations procedures, which is imperative in ensuring that customers' requirements and expectations are met (Lai, Yeung & Cheng 2012:1284). This, therefore, further highlights the importance of using TQM as a strategic route to consistently monitor and assure superior product and service performance.

6.3.1.3.4 Descriptive statistics for technology adoption

The results of the descriptive analysis for technology adoption are presented in Table 6.7.

Table 6.7: Information technology adoption

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Standard deviation	Mean (\bar{x})
IT1	Our business has invested adequately in obtaining new technology systems to facilitate the production process.	1 0.2%	8 2%	13 3.2%	121 29.7%	264 64.9%	0.676	4.57
IT2	Our business intends to acquire new information technology systems to share information amongst different departments.	3 0.7%	6 1.5%	10 2.5%	132 32.4%	256 62.9%	0.689	4.55
IT3	Our business emphasises the adoption of technologically-related processes amongst staff.	1 0.2%	6 1.5%	13 3.2%	130 31.9%	257 63.1%	0.655	4.56
IT4	Our business makes use of sophisticated technology to conduct its operations.	2 0.5%	9 2.2%	17 4.2%	109 26.8%	270 66.3%	0.723	4.56
Overall scale							0.617	4.56

Table 6.7 presents the results of SMEs' views on the adoption of IT, which was measured using a four item-scale. It was observed that a large proportion of SMEs (64.9%; n=264) strongly agreed that they have invested adequately in obtaining new technology systems to facilitate the production process (Item 1), while 29.7% (n=121) agreed to the statement. The mean score of $\bar{x}=4.57$; SD=0.676 justifies the high degree of agreement. However, it appears that only 3.2% (n=13) of SMEs had a neutral position and 2.2% (n=9) disagreed (either strongly disagree/disagree) to the initial statement. Regarding the question to determine whether businesses intend to acquire new IT systems to share information amongst different departments (Item 2), over 62.9% (n=256) strongly agreed, and 32.4% (n=132) agreed. This is further acknowledged by a mean score of $\bar{x}=4.55$; SD=0.689. Contrasting readings of the results can be observed, where only 2.5% of SMEs (n=10) had no opinion to the statement and 2.2% (n=9) disagreed (either strongly

disagree/disagree). Regarding the question of whether SMEs emphasise the adoption of technologically related processes amongst their staff (Item 3), about 63.1% (n=257) strongly agreed, which was supported with a mean score of $\bar{x}=4.56$; $SD=0.655$. Besides, 31.9% (n=130) were found to just agree, which contrasts with 3.2% (n=13) of the SMEs, suggesting that they have no opinion on the matter and a combined 1.7% (n=7) are all in disagreement (either strongly disagree/disagree). Furthermore, on the issue that SMEs make use of sophisticated technology to conduct their operations (Item 4) approximately, 93.1% (n=379) were in agreement. This is further supported by a mean score of $\bar{x}=4.56$; $SD=0.723$, which indicates a strong level of agreement toward the question. Then again, 4.2% (n=17) had a neutral opinion regarding the statement and a combined 2.7% (n=11) were in disagreement (either strongly disagree/disagree).

Drawn from the presented results, it was noted that a large majority of SMEs make use of IT devices or practices as part of their daily operations. The general mean score of $\bar{x}=4.56$; $SD=0.617$ supports this view. Such effective adoption of IT is aimed at synchronising business activities, ensuring a smooth flow of information shared and elevating business productivity and performance. This view is supported by Pan, Pan and Lim (2015:401), who stress that IT implementation contributes greatly to enhancing a business's productivity because it facilitates the quality exchange of relevant and up-to-date data needed in production processes. Tseng *et al.* (2011:258) concur that IT tools and processes enable the interconnectedness of supply chain networks through their abilities to maximise the accuracy of information flow across departments. Marinagi *et al.* (2014:586) describe IT as a critical component designed at providing an effective integration of production function, with its capability to facilitate productivity through on-time deliveries (tracking of deliveries/identification of shorter routes), and warehouse management procedures (Turek 2013:1).

6.3.1.3.5 Descriptive statistics for supply chain agility

The results of the descriptive analysis for supply chain agility are presented in Table 6.8.

Table 6.8: Supply chain agility

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Standard deviation	Mean (\bar{x})
SCA1	Our organisation is well-equipped to respond to possible changes in its customers'/consumers' demands.	1 0.2%	2 0.5%	19 4.7%	129 31.7%	256 62.9%	0.632	4.57
SCA2	The production process of our business is flexible enough to forecast potential threats from the market.	2 0.5%	5 1.2%	20 4.9%	148 36.4	232 57%	0.694	4.48
SCA3	Our business strives to ensure timely introduction of new products to meet market requirements and expectations.	1 0.2%	4 1%	15 3.7%	133 32.7%	254 62.4%	0.640	4.56
SCA4	Our business has the necessary technological and technical capabilities to incorporate additional changes to meet customers' expectations.	2 0.5%	5 1.5%	14 3.4%	134 32.9%	252 61.9%	0.671	4.55
SCA5	Our business has the capability to meet customers' expectations in a timely manner in terms of on-time delivery.	1 0.2%	1 0.2%	7 1.7%	128 31.4%	270 66.3%	0.558	4.63
Overall scale							0.538	4.56

Table 6.8 shows the results regarding SMEs' perceptions on adoption of supply chain agility. About 62.9% (n=256) of respondents agreed to the fact that they are well-equipped to respond to possible changes in their customers'/consumers' demands (Item 1). This is further supported by a mean score of \bar{x} =4.57; SD=0.632. Besides, 31.7% (n=129) were in agreement to the aforesaid statement. A total of 4.7% (n=19) SMEs were neutral while 0.7% (n=3) were in disagreement. Regarding the question to determine whether SMEs' production processes are flexible enough to forecast potential threats from the market (Item 2), 57% (n=232) of the SMEs were strongly in agreement, and 36.4% (n=148) just agreed. The disparity of ratios between the two segments is cemented by a mean score of \bar{x} =4.48; SD=0.694, which supports the strong level of agreement.

Further to that was the fact that 4.9% of the SMEs (n=20) had no opinion pertaining to the stated sentence, and 1.7% (n=7) did not agree at all. To the question regarding whether SMEs strive to ensure the timely introduction of new products to meet market requirements and expectations (Item 3), roughly 95.1% (n=387) were in agreement, with the greater percentage (62.4%) leaning towards strong agreement. Moreover, this is further supported by a mean score of $\bar{x}=4.56$; $SD=0.640$, whereas 15 SMEs (3.7%) had a neutral stance on the question, and just 5 (1.2%) disagreed.

Regarding the question to establish if SMEs have the necessary technological and technical capabilities to incorporate additional changes to meet customers' expectations (Item 4), 252 (n=252: 61.9%) strongly agreed, with 134 (n=134: 32.9%) agreeing. A mean score of $\bar{x}=4.55$; $SD=0.671$ validates the degree of strong agreement. However, 14 (3.4%) were neutral whilst, 7 (2%) were in disagreement with the statement. Moreover, 66.3% (n=270) of respondents strongly agreed with the fact that their business has the capability to meet customers' expectations in a timely manner in terms of on-time delivery (Item 5). A total of 31.4% (n=128) of firms agreed. The difference in percentages between strongly agree and agree is confirmed by a mean score of $\bar{x}=4.63$; $SD=0.558$, though just 7 (1.7%) were neutral, with only 2 (n=0.4%) in disagreement.

The presented results imply that the supply chains of SMEs are agile enough to cope adequately with potential challenges and disparities that could impair the effective operations of their businesses. This is justified by a total mean score of $\bar{x}=4.557$; $SD=0.538$. This view has been strengthened in a study conducted by Liu, Ke, Wei and Hua (2013:1453) who underline the strategic relevance of agile operations and procedures as a means to allow better responsiveness of firms' productivity in the form of continuous deliveries and the exchange of information and data across supply chain networks. Furthermore, efficient agility results in more collaborative engagement within a firm's value chain network, which therefore leads to ensuring that customers' and consumers' expectations are met, which subsequently correlates with enhancing their degree of satisfaction (Chiang, Kocabasoglu-Hillmer & Suresh 2012:49). Thus, the relevance of SMEs' drive toward equipping themselves of strategies aimed at responding properly to changing market requirements is solidified.

6.3.1.3.6 Descriptive statistics for supply chain risk management

The results of the descriptive analysis for SCRM are presented in Table 6.9.

Table 6.9: Supply chain risk management

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Standard deviation	Mean (\bar{x})
SCRM1	Our business strives to reduce or minimise potential internal or external operational problems that can negatively affect its operations.	5 1.2%	7 1.7%	6 1.5%	110 27%	279 68.5%	0.568	4.65
SCRM2	Our business openly shares information with its suppliers and customers to find mutual strategies to deal with possible operational deficiencies.	8 2%	12 2.9%	13 3.2%	102 25.1%	272 66.8%	0.853	4.52
SCRM3	Our business consistently monitors the operations of our suppliers to minimise potential distortions in supply/deliveries.	7 0.7%	7 0.7%	8 2%	113 27.8%	272 66.8%	0.772	4.56
SCRM4	Our business has proper contingency plans to mitigate/handle sudden market changes.	2 0.5%	6 1.5%	17 4.2%	106 26%	276 67.8%	0.688	4.59
SCRM5	Our business minimises risks related to customers' demands by adopting the late product differentiation approach.	4 1%	6 1.5%	15 3.7%	101 24.8%	281 69%	0.723	4.59
Overall scale							0.598	4.583

Table 6.9 details the results of the analysis of SMEs' perceptions of SCRM. Item 1 indicates that 68.5% (n=279) strongly agreed to the view that they strive to reduce or minimise potential internal or external operational problems that can negatively affect its operations, with 27% (n=110) only agreeing. The mean score of \bar{x} =4.65; SD=0.568 corroborates the level of agreement. However, contrasting results showed that only 2.9% (n=12) were in disagreement and 1.5% (n=6) were neutral. Regarding the fact that SMEs openly share information with their suppliers and customers to find mutual strategies to deal with possible operational deficiencies (Item 2), 66.8% (n=272) strongly agreed, supported by a mean score of \bar{x} = 4.52; SD=0.853. Besides, 25.1% (n=102) of

firms agreed, while 4.9% (n=20) were in disagreement and 3.2% (n=13) were neutral. Concerning the statement about whether companies consistently monitor the operations of their suppliers to minimise potential distortions in supply/deliveries (Item 3), 272 firms (n=272: 66.8%) strongly agreed, which is confirmed by a mean score of $\bar{x}=4.56$; $SD=0.772$, whilst 27.8% (n=113) agreed to the question, 2% (n=8) of businesses had a no opinion stance and 1.4% (n=14) were in disagreement (strongly disagree/disagree).

Regarding Item 4 which pertains to the view that businesses have proper contingency plans to mitigate/handle sudden market changes (Item 4), 67.8% (n=276) strongly agreed, and a mean score of $\bar{x}=4.59$; $SD=0.688$ further confirmed this result, which indicates a degree of agreement. Moreover, 26% (n=106) agreed to the statement, while 4.2% (n=17) had a neutral point of view and 2% (n=8) disagreed. In addition, 69.8% (n=281) of SMEs strongly agreed that they minimise risks related to customers' demands by adopting a late product differentiation approach (Item 5), which is supported further by a mean score of $\bar{x}=4.59$; $SD=0.723$ and 24.8% (n=101) agreed. Also, 3.7% (n=15) of the participating SMEs were neutral and 2.5% (n=10) were in disagreement (strongly disagree/disagree).

The above results show that the majority of SMEs are engaged in activities and processes that enable them to consistently minimise and manage real or potential risks occurring within their supply chains. A total mean score of $\bar{x}=4.5833$; $SD=0.598$ approves this view. It could further be contended that proper management of risks is necessary in enabling SMEs to enhance their productivity (Tang & Musa 2011:25). Tummala and Schoenherr (2011:474) established that it is important for firms to monitor possible unexpected problems and discrepancies as this is important in positioning them in the market. Contingency plans should be developed that prepare the firm to deal with and handle the unpredictability of markets' expectations. The effectiveness of firms in managing potential challenges has been regarded as critical in improving the seamless flow of operations and ultimately in achieving competitive advantage (Colicchia & Strozzi 2012:403).

6.3.1.3.7 Descriptive statistics for supply chain performance

The results of the descriptive analysis for supply chain performance are presented in Table 6.10.

Table 6.10: Supply chain performance

Item code	Item description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Standard deviation	Mean (\bar{x})
SCP1	Our supply chain enables us to react and meet our customers' requirements effectively.	-	4 1%	3 0.7%	112 27.5%	288 70.8%	0.540	4.68
SCP2	Our supply chain enables us to consistently respond adequately to changes in our customers'/consumer's orders.	-	6 1.5%	4 1%	122 30%	275 67.6%	0.583	4.64
SCP3	Our supply chain enables us to adapt and produce new products.	1 0.2%	6 1.5%	10 2.5%	120 29.5%	270 66.3%	0.638	4.60
SCP4	Our supply chain helps us to improve the performance of our products.	-	8 2%	8 2%	109 26.8%	282 69.3%	0.625	4.63
SCP5	Our supply chain enables us to improve customer service related to product complaints.	-	7 1.7%	5 1.2%	106 26%	289 71%	0.593	4.66
Overall scale							0.532	4.64

Table 6.10 presents the results on the perception of SMEs regarding supply chain performance. A five item-scale was used to measure the construct. Regarding Item 1, an estimated 70.8% (n=288) of SMEs were found to have strongly agreed to the view that their supply chains enable them to react and meet their customers' requirements effectively (Item 1). A mean score of \bar{x} =4.68; SD=0.540 validated this point. Besides, 27.5% (n=112) agreed to the statement, with less than 1% (n=3: 0.7%) having a neutral point of view and just 1% (n=4) disagreeing. Concerning the statement on whether SMEs' supply chains enable them to consistently respond adequately to changes in their customers'/consumer's orders (Item 2), 67.6% (n=275) strongly agreed, and 30% (n=122) agreed to the statement. The strong degree of agreement is supported by a mean score of \bar{x} =4.64; SD=0.583. Moreover, 1.5% (n=6) and 1% (n=4) of firms disagreed and had no opinion respectively.

Of the 407 SMEs that participated in the survey, 270 (n=270: 66.3%) strongly agreed, and 120 (n=120: 29.5%) agreed to the view that SMEs' supply chains enable them to adapt and produce new products (Item 3). A mean score of $\bar{x}=4.60$; $SD=0.638$ provided support to the degree of agreement, while 10 firms (2.5%) had a neutral stance and 7 (1.7%) were in disagreement. As to whether SMEs' supply chains enable them to improve the performance of their products (Item 4), 69.3% (n=282) strongly agreed, as further confirmed by a mean score of $\bar{x}=4.63$; $SD=0.625$, which indicates a strong degree of agreement. Additionally, 26.8% (n=109) agreed to the statement, with only 2% (n=8) having no opinion and 2% (n=8) disagreeing with the sentence. Lastly, 71% (n=289) also strongly agreed to the fact that SMEs' supply chains enable them to improve customer service related to product complaints (Item 5). This result was confirmed by a mean score of $\bar{x}=4.66$; $SD=0.593$, which validates the strong degree of agreement. A total of 26% (n=106) of firms agreed, with 1.7% (n=7) disagreeing and 1.2% (n=5) having a neutral stance.

It can therefore be said that the majority of SMEs meet their customers and consumers' expectations and requirements. This view is validated by the total mean score of $\bar{x}=4.643$; $SD=0.532$, which in turn contributes to the boosting of their respective performances. This argument resonates with results from Deshpande (2012:5) who found that high level performance of an organisation's entire supply chain has a positive relationship with the performance of each firm operating within the whole business environment. This has an effect on the flexibility of products conveyed upstream and downstream throughout the supply chain. Better supply chain performance is also associated with the steady flow of information, data and raw materials and component parts within each segment of a firm's production process (Qrunfleh & Tarafdar 2014:340), which subsequently contributes to greater firm productivity, which therefore correlates to sustainable operational performance (Whitten, Green & Zelbst 2012:28).

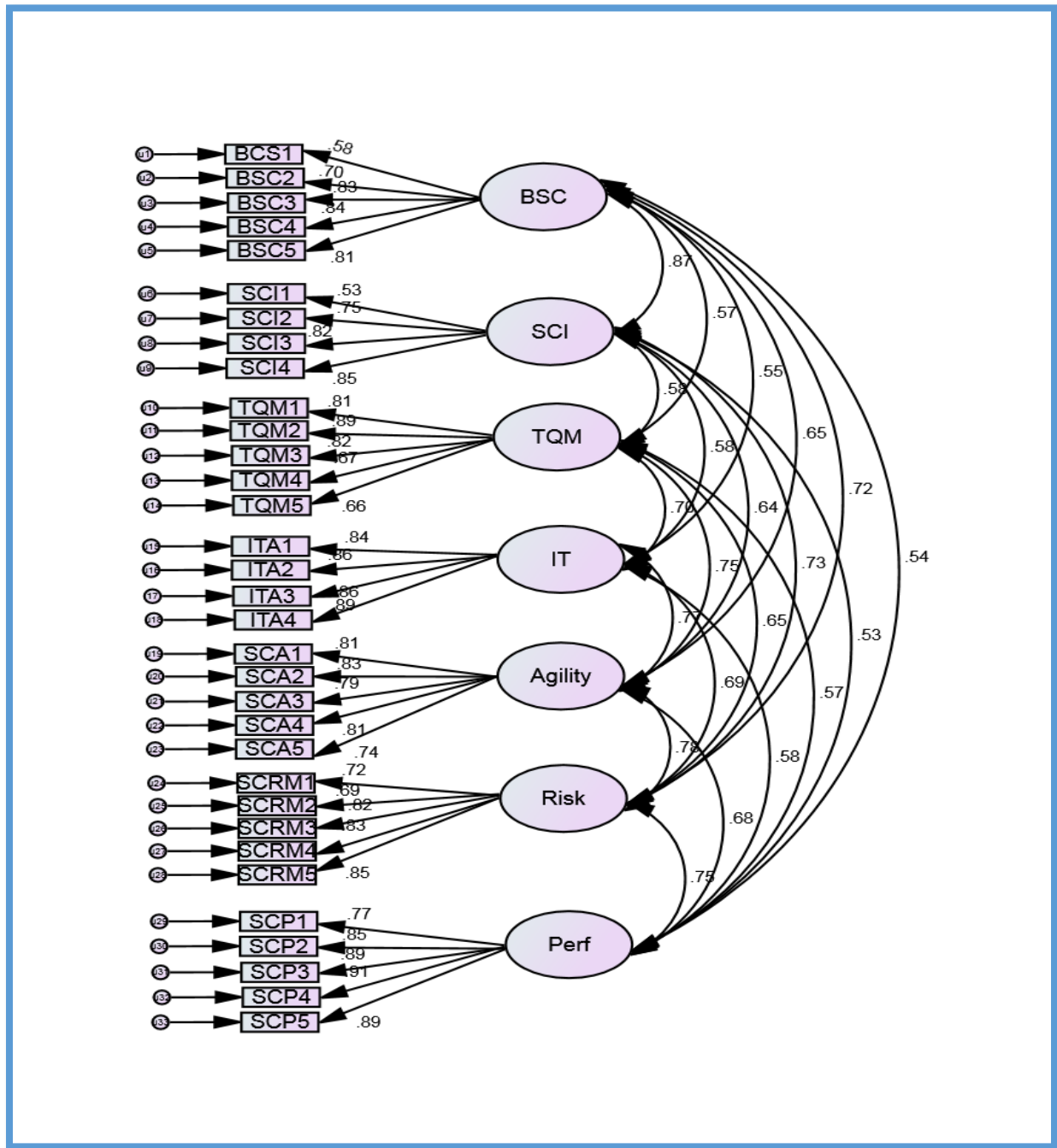
6.4 INFERENCE STATISTICS

This section presents the inferential statistics, which are the results related to the testing of the hypotheses suggested for the study.

6.4.1 Confirmatory factor analysis

This section provides results of the CFA, which was designed to assess the psychometric properties of the measurement scales used in this study. This includes, amongst other factors, reliability, validity, as well as model fit. The results of the analysis are presented in Table 6.11. As such,

Figure 6.7 presents the CFA model of the study, which indicates the relationship that each latent construct has with the observed constructs.



BSC= Buyer-supplier collaboration; SCI= Supply chain integration; TQM= Total quality management; IT= Information technology adoption; SCA= Supply chain agility; SCRM=Risk; SCP= supply chain performance

Figure 6.7: Confirmatory factor analysis model

As indicated by Schreiber, Stage, King, Nora and Barlow (2006:325), CFA is conducted to establish the relationship between latent constructs and their respective observed constructs. It was noted that all observed constructs (measurement items) have factor loading above 0.5, which then indicates consistency with the nature of the latent constructs. These results and more are noted in Table 6.11.

Table 6.11: Psychometric properties analysis results

Research constructs		Factor Loadings	Cronbach Alpha α Value	Item-to-total correlation	C.R. value	AVE value	Highest shared variance
Buyer-supplier collaboration	BSC ₁	0.577 ^c	0.863	0.514	0.87	0.58	0.58
	BSC ₂	0.700 ^c		0.665			
	BSC ₃	0.831 ^c		0.759			
	BSC ₄	0.837 ^c		0.762			
	BSC ₅	0.815 ^c		0.730			
Supply chain integration	SCI ₁	0.526 ^c	0.820	0.450	0.83	0.56	0.44
	SCI ₂	0.747 ^c		0.624			
	SCI ₄	0.820 ^c		0.701			
	SCI ₅	0.861 ^c		0.696			
Total quality management	TQM ₁	0.812 ^c	0.869	0.729	0.88	0.68	0.48
	TQM ₂	0.895 ^c		0.805			
	TQM ₃	0.817 ^c		0.761			
	TQM ₄	0.673 ^c		0.620			
	TQM ₅	0.657 ^c		0.597			
Information technology adoption	ITA ₁	0.843 ^c	0.921	0.813	0.92	0.75	0.48
	ITA ₂	0.858 ^c		0.812			
	ITA ₃	0.893 ^c		0.839			
	ITA ₄	0.858 ^c		0.807			
Supply chain agility	SCA ₁	0.813 ^c	0.895	0.761	0.89	0.64	0.49
	SCA ₂	0.828 ^c		0.784			
	SCA ₃	0.793 ^c		0.732			
	SCA ₄	0.809 ^c		0.761			
	SCA ₅	0.738 ^c		0.681			
Supply chain risk management	SCRM ₁	0.720 ^c	0.881	0.644	0.88	0.62	0.49
	SCRM ₂	0.693 ^c		0.650			
	SCRM ₃	0.821 ^c		0.777			
	SCRM ₄	0.832 ^c		0.747			
	SCRM ₅	0.852 ^c		0.803			

Research constructs		Factor Loadings	Cronbach Alpha α Value	Item-to-total correlation	C.R. value	AVE value	Highest shared variance
Supply chain performance	SCP ₁	0.773 ^c	0.935	0.756	0.94	0.74	0.46
	SCP ₂	0.847 ^c		0.842			
	SCP ₃	0.888 ^c		0.842			
	SCP ₄	0.910 ^c		0.864			
	SCP ₅	0.887 ^c		0.836			
^c significance level $p<0.001$; BSC= buyer-supplier collaboration; SCI= supply chain integration; TQM= total quality management; ITA= information technology adoption; SCA= supply chain agility; SCRM= supply chain risk management; SCP= supply chain performance							

6.4.1.1 Reliability Analysis

Reliability has been defined as a measure of the consistency of constructs over time and the assessment of the internal stability of item-scales (Scholtes, Terwee & Poolman 2011:237). A number of studies (Fornell & Larcker 1981:39; Fraering & Minor 2006:284) have concluded that the checking of reliabilities is performed through the use of the indicators such as Cronbach's alpha test (Cronbach α), composite reliability test and total-item correlations. This study adhered to these suggestions and thus measured reliability using three indicators, namely, Cronbach's alpha test (Cronbach α), composite reliability test and item-to-total correlations.

6.4.1.1.1 Cronbach's alpha test results

According to Churchill (1979:64), the degree of reliability of a variable should be confined within 0 to 1, with a value closer to 1 meeting a sufficient reliability threshold. This view was further compounded by Bagozzi and Yi (1988:74) who established that a construct is deemed reliable when the Cronbach alpha result is equal to or greater than 0.7. The results in Table 6.11 demonstrate that all of the constructs of this study (Buyer-supplier collaboration, supply chain integration, TQM, IT adoption, supply chain agility, SCRM and supply chain performance) were reliable. This is because their respective Cronbach values (Buyer-supplier collaboration=0.863; Supply chain integration= 0.772; TQM=0.869; IT adoption=0.921; Supply chain agility=0.895; SCRM=0.881; Supply chain performance=0.935) are all above the expected threshold of 0.7, which therefore conforms to the criteria of reliability, as emphasised by Nunnally and Bernstein (1994:1).

6.4.1.1.2 Composite reliability test results

As indicated in Section 6.4.1.1.1, the determination of the reliability of constructs was a threefold process, consisting of Cronbach's alpha test, composite reliability and average variance extracted (AVE). The measurement of composite reliability was performed as per the suggested formulae provided by Fornel and Lacker (1981):

$$(CR): CR_{\eta} = (\sum \lambda_{yi})^2 / [(\sum \lambda_{yi})^2 + (\sum \epsilon_i)]$$

Composite Reliability = (square of the summation of the factor loadings) / {(square of the summation of the factor loadings) + (summation of error variances)}.

Table 6.12 presents detailed calculations of the composite reliability of each construct. It is important to note that factor loading values (Table 6.11) were taken into consideration in the calculation of the composite reliability of the constructs.

Table 6.12: Composite reliability calculation

<p>Composite reliability (CR) of buyer-supplier collaboration (BSC) $(\sum \lambda_{yi})^2 = [(0.577+0.700+0.831+0.837+0.815)]^2 = (3.76)^2$; $(\sum \lambda_{yi})^2 = 14.13$ $(\sum \epsilon_i) = [(1-0.577^2) + (1-0.700^2) + (1-0.831^2) + (1-0.837^2) + (1-0.815^2)]$ $(\sum \epsilon_i) = 2.12$ Therefore, CR of BSC will be: $[14.13 / (14.13+2.12)] = 0.87$</p>
<p>Composite reliability (CR) of supply chain integration (SCI) $(\sum \lambda_{yi})^2 = [(0.861+0.820+0.747+0.526)]^2 = (2.954)^2$; $(\sum \lambda_{yi})^2 = 8.72$ $(\sum \epsilon_i) = [(1-0.861^2) + (1-0.820^2) + (1-0.747^2) + (1-0.526^2)]$ $(\sum \epsilon_i) = 1.75$ Therefore, CR of SCI will be: $[8.72 / (8.72+1.75)] = 0.83$</p>
<p>Composite reliability (CR) of total quality management (TQM) $(\sum \lambda_{yi})^2 = [(0.812+0.895+0.817+0.673)]^2 = (3.197)^2$; $(\sum \lambda_{yi})^2 = 10.22$ $(\sum \epsilon_i) = [(1-0.812^2) + (1-0.895^2) + (1-0.817^2) + (1-0.673^2)]$ $(\sum \epsilon_i) = 1.41$ Therefore, CR of TQM will be: $[10.22 / (10.22+1.41)] = 0.88$</p>
<p>Composite reliability (CR) of information technology adoption (ITA) $(\sum \lambda_{yi})^2 = [(0.858+0.893+0.858+0.843)]^2 = (3.452)^2$; $(\sum \lambda_{yi})^2 = 11.91$ $(\sum \epsilon_i) = [(1-0.858^2) + (1-0.893^2) + (1-0.858^2) + (1-0.843^2)]$ $(\sum \epsilon_i) = 1.01$ Therefore, CR of ITA will be: $[11.91 / (11.91+1.01)] = 0.92$</p>
<p>Composite reliability (CR) of supply chain agility (SCA) $(\sum \lambda_{yi})^2 = [(0.738+0.809+0.793+0.828+0.813)]^2 = (3.981)^2$; $(\sum \lambda_{yi})^2 = 15.85$ $(\sum \epsilon_i) = [(1-0.738^2) + (1-0.809^2) + (1-0.793^2) + (1-0.828^2) + (1-0.813^2)]$ $(\sum \epsilon_i) = 1.82$ Therefore, CR of SCA will be: $[15.85 / (15.85+1.82)] = 0.89$</p>
<p>Composite reliability (CR) of supply chain risk management (SCRM) $(\sum \lambda_{yi})^2 = [(0.852+0.832+0.821+0.693+0.720)]^2 = (3.918)^2$; $(\sum \lambda_{yi})^2 = 15.35$ $(\sum \epsilon_i) = [(1-0.852^2) + (1-0.832^2) + (1-0.821^2) + (1-0.693^2) + (1-0.720^2)]$ $(\sum \epsilon_i) = 1.91$ Therefore, CR of SCRM will be: $[15.35 / (15.35+1.91)] = 0.88$</p>

Composite reliability (CR) of supply chain performance (SCP)			
$(\sum \lambda_{yi})^2 = [(0.773+0.847+0.888+0.910+0.887)]^2 = (4.305)^2$; $(\sum \lambda_{yi})^2 = 18.53$			
$(\sum \epsilon_i) = [(1-0.773^2) + (1-0.847^2) + (1-0.888^2) + (1-0.910^2) + (1-0.887^2)]$			
$(\sum \epsilon_i) = 1.28$ Therefore, CR of SCP will be: $[18.53 / (18.53+1.28)] = 0.94$			

The combined results provided by both Tables 6.11 and 6.12 show that the composite reliabilities of all constructs (buyer-supplier collaboration=0.87; supply chain integration=0.83; TQM=0.88; IT adoption=0.92; supply chain agility=0.89; SCRM=0.88; supply chain performance=0.94) were above the recommended minimum threshold of 0.7, which is suggested by Hulland (1999:195). This further confirms the adequacy of the internal reliability amongst research constructs.

6.4.1.1.3 Item-to-total correlations

As indicated in section 6.4.1, item-to-total correlations were also used to determine reliability. According to Nunnally (1978:1), item-to-total correlation scores should be equal to or above the 0.5 cut-off level of reliability. The loadings of all constructs met the minimum threshold of 0.5, with buyer-supplier collaboration ranging from 0.514 to 0.762; supply chain integration from 0.45 to 0.701; TQM from 0.597 to 0.805; IT adoption from 0.807 to 0.839; supply chain agility from 0.681 to 0.784; SCRM from 0.644 to 0.803 and supply chain performance from 0.756 to 0.864. This further demonstrates the adequacy of reliability in this study.

6.4.1.2 Computation of highest shared variance

This section presents the results about the calculation of the highest shared variance (HSV). The results of the analysis are represented in Table 6.13.

Table 6.13: Computation of highest shared variance

Variables	Highest correlation with other variables	Square of the highest correlation	Highest shared variance
Buyer-supplier collaboration (BSC)	0.766	0.58	0.58
Supply chain integration (SCI)	0.666	0.44	0.44
Total quality management (TQM)	0.693	0.48	0.48
Information technology adoption (ITA)	0.696	0.48	0.48
Supply chain agility (SCA)	0.702	0.49	0.49

Supply chain risk management (SCRM)	0.702	0.49	0.49
Supply chain performance (SCP)	0.676	0.45	0.45

As observed in Table 6.13, the assessment of the HSV of a construct was calculated by squaring its highest correlation value with the other constructs. It was then revealed that buyer-supplier collaboration had the highest shared variance of all constructs with a score of 0.58, followed by both supply chain agility and SCRM with identical scores of 0.49, as well as TQM, IT adoption with 0.48; supply chain performance and supply chain integration with values of 0.45 and 0.44 respectively.

6.4.1.3 Validity Analysis

According to Scholtes, Terwee and Poolman (2011:237), validity refers to the point at which scale items measure what they are intended to ascertain from a construct. Validity analysis has been viewed to be a three-step process, consisting of indicators, namely, content, convergent and criterion validity (Easterby-Smith, Thorpe & Lowe 2002:1). In this study, specific attention was paid to construct and content validity.

6.4.1.3.1 Construct validity

Construct validity refers to the ability of a specific measure to correlate with another measure that it is supposed to correlate with (Churchill 1979:64). Construct validity is measured through the use of convergent and discriminate validity.

6.4.1.3.2 Convergent validity

Convergent validity has been defined as the degree to which the measures of a construct converge adequately on the constructs they are deemed to assess (Peter 1981:113). To determine convergent validity, this study made use of factor loadings provided in Table 6.11 as well as the Average Variance Extracted (Table 6.12). The results of the study indicate that all factor loadings related to the items measuring each construct were all above the recommended minimum threshold of 0.5, as suggested by Anderson and Gerbing (1988:411). Buyer-supplier collaboration had item loadings ranging from 0.577 to 0.837; supply chain integration ranging from 0.526 to 0.61; TQM ranging from 0.657 to 0.895; supply chain agility from 0.738 to 0.828; SCRM from 0.693 to 0.852;

and supply chain performance ranging from 0.773 to 0.910 respectively. However, it should be highlighted that item 3 (SCI₃=0.359), which reads as follows: “*Our business integrates the majority of its operations processes from raw material through to delivery*”, had an insignificant loading, and was subsequently deleted during the process of data purification, which led to a reanalysis of the data. This denotes that that Item 3 (SCI₃) was thus not considered for further analysis. It further suggests that all of the item loadings were accepted and converged well on the constructs they were intended to measure, which therefore implies that each item loading measured at the very least 50 percent of what they were supposed to measure. This, then, provides conformance to the criteria of convergent validity.

6.4.1.3.3 Calculation of Average Variance Extracted

As stated in section 6.4.1.3.3, the Average Variance Extracted (AVE) was used as the second indicator for convergent validity. The literature has shown that the AVE is designed at reflecting the total variance observed in a construct (Fraering & Minor 2006:284). As such, Fornel and Lacker (1981:39) propose the following formulae as a method to calculate the AVE index:

$$V\eta = \Sigma \lambda_{yi}^2 / (\Sigma \lambda_{yi}^2 + \Sigma \epsilon_i)$$

AVE = {(summation of the squared of factor loadings) / {(summation of the squared of factor loadings) + (summation of error variances)}}.

Table 6.14 presents detailed steps of the calculations of the AVE of the research constructs. Again, it is important to note that the factor loadings (Table 6.11) were considered as part of the analysis.

Table 6.14: Average variance extracted calculation

<p>Average Variance Extracted (AVE) of buyer-supplier collaboration (BSC) $(\Sigma \lambda_{yi})^2 = (0.577^2 + 0.700^2 + 0.831^2 + 0.837^2 + 0.815^2)$ $(\Sigma \lambda_{yi})^2 = 2.88$ Therefore, AVE of BSC will be: $[2.88 / (2.88 + 2.12)] = 0.58 (0.60)$</p>
<p>Average Variance Extracted (AVE) of supply chain integration (SCI) $(\Sigma \lambda_{yi})^2 = (0.861^2 + 0.82^2 + 0.747^2 + 0.526^2)$ $(\Sigma \lambda_{yi})^2 = 2.25$ Therefore, AVE of SCI will be: $[2.25 / (2.25 + 1.75)] = 0.56 (0.60)$</p>
<p>Average Variance Extracted (AVE) of total quality management (TQM) $(\Sigma \lambda_{yi})^2 = (0.812^2 + 0.895^2 + 0.817^2 + 0.673^2 + 0.657^2)$ $(\Sigma \lambda_{yi})^2 = 3.01$ Therefore, AVE of TQM will be: $[3.01 / (3.01 + 1.41)] = 0.68 (0.70)$</p>

<p>Average Variance Extracted (AVE) of information technology adoption (ITA)</p> <p>$(\sum \lambda_{yi})^2 = (0.858^2 + 0.893^2 + 0.858^2 + 0.843^2)$</p> <p>$(\sum \lambda_{yi})^2 = 2.98$ Therefore, AVE of ITA will be: $[2.98 / (2.98 + 2.12)] = 0.75$</p>
<p>Average Variance Extracted (AVE) of supply chain agility (SCA)</p> <p>$(\sum \lambda_{yi})^2 = (0.738^2 + 0.809^2 + 0.793^2 + 0.793^2 + 0.828^2 + 0.813^2)$</p> <p>$(\sum \lambda_{yi})^2 = 3.17$ Therefore, AVE of SCA will be: $[3.17 / (3.17 + 1.82)] = 0.64$</p>
<p>Average Variance Extracted (AVE) of supply chain risk management (SCRM)</p> <p>$(\sum \lambda_{yi})^2 = (0.852^2 + 0.832^2 + 0.821^2 + 0.693^2 + 0.693^2 + 0.720^2)$</p> <p>$(\sum \lambda_{yi})^2 = 3.1$ Therefore, AVE of SCRM will be: $[3.1 / (3.1 + 1.91)] = 0.62$</p>
<p>Average Variance Extracted (AVE) of supply chain performance (SCP)</p> <p>$(\sum \lambda_{yi})^2 = (0.773^2 + 0.847^2 + 0.888^2 + 0.910^2 + 0.887^2)$</p> <p>$(\sum \lambda_{yi})^2 = 3.72$ Therefore, AVE of SCP will be: $[3.72 / (3.72 + 1.28)] = 0.74$</p>

As shown in Table 6.13, the AVE values for all constructs (buyer-supplier collaboration=0.58; supply chain integration=0.56; TQM=0.68; IT adoption=0.75; supply chain agility=0.64; SCRM=0.62; supply chain performance=0.74) were greater than the required threshold of 0.5 (Anderson & Gerbing 1988:411). This once again supports the acceptable degree of convergent validity.

6.4.1.3.4 Discriminant validity

Discriminant validity has been defined as the premise that different research constructs are found to be distinct from one another. In other words, separate measurement instruments, designed at assessing one distinct construct, cannot assess another different construct (Malhotra 1996:1). As recommended by Bagozzi and Yi (1988:74), discriminant validity was ascertained in this study through the use of correlations computed during the CFA. Further suggestions by Fornell and Larcker (1981:39) show that discriminant validity is assessed by determining whether the value score of AVE is higher than the threshold of 0.5 and subsequently above the highest shared variance (SV) score. This study will adopt the two approaches to ascertain discriminant validity. The results of the correlation analysis are presented in Table 6.15.

Table 6.15: Correlations between constructs

Research Construct	Construct Correlation						
	BSC	SCI	TQM	ITA	SCA	SCRM	SCP
Buyer-supplier collaboration (BSC)	1.000						
Supply chain integration (SCI)	0.766**	1.000					
Total quality management (TQM)	0.566**	0.587**	1.000				
Information technology adoption (ITA)	0.502**	0.553**	0.660**	1.000			
Supply chain agility (SCA)	0.582**	0.585**	0.693**	0.696**	1.000		
Supply chain risk management (SCRM)	0.654**	0.666**	0.627**	0.624**	0.702**	1.000	
Supply chain performance (SCP)	0.505**	0.514**	0.627**	0.543**	0.633**	0.676**	1.000
** Correlation is significant at the 0.01 level (2-tailed)							

Table 6.15 presents the correlation matrix of the constructs considered in this study. It is shown that there were positive correlations across the individual paired constructs, which were found to be below the cut-off value of 1 ($r=0.766$; $p<0.01$ to $r=0.0.676$; $p<0.01$), which thus confirmed the presence of discriminant validity of the scale items, as recommended by Bagozzi and Yi (1988:74).

As reported in Table 6.11, the AVE values of the constructs indicated 0.58 for buyer-supplier collaboration; 0.56 for supply chain integration; 0.68 for TQM; 0.75 for IT adoption; 0.64 for supply chain agility; 0.62 for SCRM and 0.74 for supply chain performance. The values for Highest Shared Variance revealed 0.52 for buyer-supplier collaboration; 0.51 for supply chain integration; 0.56 for TQM; 0.59 for IT adoption; 0.57 for supply chain agility; 0.53 for SCRM and 0.57 for supply chain performance. It was noted that besides being well above the recommended threshold of 0.5, AVE values were also greater than their corresponding Highest Shared Variances. This, therefore, confirms discriminant validity.

6.4.1.3.5 Content validity

Content validity is defined as the level at which a specific measurement item offers a precise definition of a construct (Polit & Beck 2006:490). The assessment of the validity of the content of the constructs of the study was conducted through a panel review of the questionnaire led by a panel of academics who are experts in the supply chain management field at a South African University of Technology. The stated panel of academics had an in-depth assessment and reviewed the validity of the contents of the questionnaire items of the study to ensure proper conformity with the criteria of content validity, as highlighted by Lawshe (1975:363). Furthermore, the pilot study (refer to Section 6.1) was also conducted to confirm the content validity of the study.

6.4.1.4 Model fit analysis

According to Hair, Anderson, Tatham and Black (2006:11), assessing the fitness of a research model calls for a relationship with several indicators/indices of fitness. As suggested by Cheung and Rensvold (2002:233), the following indicators may be used to ascertain the fitness of a research model: Chi-square value over degrees of freedom (χ^2/df); Goodness-of-Fit Index (GFI); Comparative Fit Index (CFI); Incremental Fit Index (IFI); Tucker-Lewis Index (TLI); the Normed fit index (NFI); Root mean square residual (RMR); and the Root Mean Square Error of Approximation (RMSEA). Table 6.15 reports on the results of the model fit assessment.

Table 6.16: Model fit results

Model fit indices	(χ^2/df)	RMSEA	RMR	GFI	CFI	IFI	TLI	NFI
Acceptable threshold values	Between 1 to 3 [≤ 3.0]	Equal to or below 0.08 [≤ 0.08]	Below 1 (the closer to 0, the better)	Equal to or greater than 0.90 [≥ 0.9]	Equal to or greater than 0.90 [≥ 0.9]	Equal to or greater than 0.90 [≥ 0.9]	Equal to or greater than 0.90 [≥ 0.9]	Equal to or greater than 0.90 [≥ 0.9]
Sources	Schreiber, Stage, King, Nora and Barlow (2006:330)	Browne and Cudeck (1993:137)	Hu and Bentler (1995:76)	Bollen (1990:256)	Bollen (1990:256)	Bollen (1990:256)	Bollen (1990:256)	Bollen (1990:256)
Results obtained	2.748 (2066.623/752)	0.078	0.303	0.920	0.90	0.970	0.930	0.950

Table 6.16 highlights the total results of the model fit analysis, which shows that the chi-square value over degrees of freedom (χ^2/df) was 2.748, which is in line with the required threshold, as indicated by Schreiber, Stage, King, Nora and Barlow (2006:330). In addition, the RMSEA value was 0.078, which met the acceptable threshold value below 0.08 as suggested by Browne and Cudeck (1993:137). Hu and Bentler (1995:76) indicate that the RMR value should be below 1 (with any value closer to 0, considered as acceptable). The results of the analysis indicate a value of 0.033, which corresponds to the degree of acceptability. Besides, GFI, CFI, IFI, TLI and NFI all had values of 0.92; 0.90; 0.97; 0.93 and 0.95 respectively. These figures are therefore in line with the acceptable thresholds of above 0.9, as recommended by Bollen (1990:256).

As shown in the above discussion, all of the fit indices within the research model met the indicated thresholds, which implies that the data was able to fit the model of the study.

6.5 STRUCTURAL EQUATION MODELLING (SEM) RESULTS

The structural equation modelling (SEM) was designed to determine the fitness of the proposed research model to the data structures, as well as the testing and significance of subsequent hypotheses derived from the model. These respective components are discussed in the following subsections:

6.5.1 SEM Model Fit Assessment

As addressed in subsection 6.4.3, research model fit is ascertained by combining a number of indices, namely: Chi-square value over degrees of freedom (χ^2/df); Goodness-of-Fit Index (GFI); Comparative Fit Index (CFI); Incremental Fit Index (IFI); Tucker-Lewis Index (TLI); the Norm fit index (NFI); Root Mean Square Residual (RMR); and the Root Mean Square Error of Approximation (RMSEA) (Cheung & Rensvold 2002:233). The results of the analysis are reported on in Table 6.17.

Table 6.17: SEM model fit results

Model fit indices	(χ^2/df)	RMSEA	RMR	GFI	CFI	IFI	TLI	NFI
Acceptable threshold values	Between 1 to 3 [≤ 3.0]	Equal to or below 0.08 [≤ 0.08]	Below 1 (the closer to 0, the better)	Equal to or greater than 0.90 [≥ 0.9]	Equal to or greater than 0.90 [≥ 0.9]	Equal to or greater than 0.90 [≥ 0.9]	Equal to or greater than 0.90 [≥ 0.9]	Equal to or greater than 0.90 [≥ 0.9]
Sources	Schreiber <i>et al.</i> (2006:330)	Browne and Cudeck (1993:137)	Hu and Bentler (1995:76)	Bollen (1990:256)	Bollen (1990:256)	Bollen (1990:256)	Bollen (1990:256)	Bollen (1990:256)
Results obtained	2.94 (2880.686/978)	0.071	0.45	0.951	0.911	0.902	0.908	0.901

The results in Table 6.17 show that all of the indicator values obtained from the analysis are in line with the expected thresholds, with the Chi-square over degrees of freedom having a value of 2.94 ($\chi^2/df=2880.686/978$). A result of 0.45 for RMR and 0.951 (GFI), 0.911 (CFI), 0.902 (IFI), 0.908 (TLI) and 0.901 (NFI). Moreover, RMSEA registered a ratio of 0.071. This validates that these values are in agreement with the identified acceptability ratios.

6.5.2 Hypotheses test results

The results of the hypotheses testing are presented in Table 6.18.

Table 6.18: Results of structural equation model analysis

Suggested Path	Null hypothesis (Ho)	Alternative hypothesis (H)	Path coefficients	Decision	
				Null Hypothesis	Alternative Hypothesis
Buyer-supplier collaboration → Supply chain agility	Ho ₁	H ₁	0.303***	Rejected	Accepted
Supply chain integration → Supply chain agility	Ho ₂	H ₂	0.164***	Rejected	Accepted
Total quality management → Supply chain agility	Ho ₃	H ₃	0.413***	Rejected	Accepted
Information technology adoption → Supply chain agility	Ho ₄	H ₄	0.545***	Rejected	Accepted
Supply chain agility → Supply chain risk management	Ho ₅	H ₅	0.765***	Rejected	Accepted

Supply chain risk management → Supply chain performance	H ₀₆	H ₆	0.708***	Rejected	Accepted
Significance level <0.05; * significance level <0.01; *** significance level <0.001 **					

As shown in Table 6.18, all six suggested null hypotheses (H₀₁, H₀₂, H₀₃, H₀₄, H₀₅, H₀₆) were rejected. This is because all alternative hypotheses had respective path coefficient scores of H₁= 0.303; H₂= 0.164; H₃= 0.413; H₄= 0.545; H₅= 0.765; H₆= 0.708, which were further supported at a 90% level of confidence ($p < 0.01$). The subsequent discussion of the stated results is outlined in section 6.5.3.

6.5.3 Discussion of results of the study

This section discusses the results of the study, based on the following formulated empirical objectives:

- to determine the influence of buyer-supplier collaboration on supply chain agility in South African SMEs;
- to establish the influence of IT adoption on supply chain agility in South African SMEs;
- to determine the influence of supply chain integration on supply chain agility in South African SMEs;
- to establish the influence of TQM on supply chain agility in South African SMEs;
- to determine the relationship between supply chain agility and SCRM in South African SMEs; and
- to establish the relationship between SCRM and supply chain performance in South African SMEs.

6.5.3.1 Hypothesis 1: There is a positive relationship between buyer-supplier collaboration and supply chain agility in South African SMEs

The results of the analysis indicate that buyer-supplier collaboration does indeed exert a positive influence on supply chain agility in South African SMEs. The results supported and accepted the stated hypothesis (H₁), as observed in Table 6.18. This result is due to the moderate, positive and significant relationship between buyer-supplier collaboration and supply chain agility (0.303; $p < 0.01$). This result demonstrates that buyer-supplier collaboration is an important supply chain management best practice since it contributes positively to the ability of SMEs to reach the

required level of operational agility. This may allow decent flexibility of their supply chain operations, which leads to better management of unforeseen challenges, which could have damaged the effective flow of SMEs' operations.

Supporting evidence, as submitted by Thun (2010:30), highlights the fundamental role of buyer-supplier collaboration in ensuring sustainable competitive advantage of firms. Furthermore, a report by DeGroote and Marx (2013:910) discloses that collaborative interaction between business associates contributes to meeting customers' unexpected change in demands. It also enables supply chain partners to participate in proactive mutual problem solving and the development of strategies for prompt responses to market fluctuations (Barve 2010:12). Besides that, collaborative relationships amongst SMEs' supply chain networks, characterised by practices such as mutual problem solving and information sharing, have been regarded as key to achieving strategic agility since they stimulate the quick introduction of new products as well as the increased diversity of products and services offered (Narayanan, Narasimhan & Schoenherr 2015:141).

The results of this study point to the importance of collaborative interactions between different SMEs in strengthening the effectiveness of their operations and strategies. As observed by Xesha, Iwu and Slabbert (2014:37), the ability of South African SMEs to engage with key business associates collaboratively has proven to be a key success factor to competitive ambitions. This view emphasises how South African SMEs benefit by engaging in collaborative activities with key supplying firms. As stated by Krause, Schutte and Du Preez (2012:203), SMEs that have been actively engaged in partnership relationships tend to enhance their technical know-how and expertise, which leads to better decision-making, innovation and flexibility within their operations. However, despite the available evidence, it appears that there is a degree of reluctance by some South African SMEs to solidify their collaborative interactions with other business stakeholders further (Abor & Quartey 2010:218). This could be attributed to some well-documented factors such as lack of skilled personnel, access to capital and cash flow problems, amongst others (Department of Trade & Industry 2012:1; Ramukumba 2014:19). Nevertheless, the study endorses that South African SMEs' collaborative interactions with supply chain partners allow them to become more productive since they facilitate mutual problem resolution, possibly resulting in performance development, which might not be achievable when operating in isolation.

6.5.3.2 Hypothesis 2: There is a positive relationship between supply chain integration and supply chain agility in South African SMEs

The results of the analysis confirm the existence of a significant relationship between supply chain integration and supply chain agility, although, the relationship was found to be weak (0.164; $p < 0.01$). This implies that supply chain integrative efforts somehow enable SME operations to achieve a certain level of agility. Simply elaborated, the result establishes that more integration of supply chain activities correlates to a minimal, although important, increase in the agility of SME operations designed at adapting to volatile market demands.

This fact resonates with work conducted by Wong *et al.* (2011:604), who put forward the view that supply chain integration is an essential enabling factor to firm performance. Further evidence (Fayezi & Zomorodi 2015:1129) stresses that a logical integrative process across business' functions is paramount to equip firms with the necessary information and knowledge to respond to customers' requirements. Several authors (Ngai *et al.* 2011:232; Blome, Schoenherr & Eckstein 2013:1295; Yang 2014:104) support this view as they disclose that the cross-integration of SME functions aids the exchange of relevant market-related information across a supply chain network, which results in improving the efficiency and flexibility of operations to manage better and mitigate unexpected and potential market disruptions. Moreover, the integrative business drive has enabled the implementation of strategies such as JIT which has been acknowledged as effective in ensuring the good responsiveness of operational processes (Talib *et al.* 2010:26; Droge, Vickery & Jacobs 2012:251).

Despite the importance of the relationship established in the previous literature, supply chain integration has a far lower impact on the achievement of agile operations and processes amongst SMEs in South Africa. This could be attributed to the view that integrating business functions and procedures call for meaningful investment in training and development as well as capital. This is associated with having sufficient financial capabilities as well as in-depth knowledge and understanding of strategic planning by SMEs' internal stakeholders. However, most South African SMEs suffer from a lack of finance and core development, hence they fail to transition from start-off to maturity phases (Olawale & Garwe 2010:729): they cannot, therefore, invest resources towards activities such as supply chain integration. Furthermore, Chinomona and Pooe (2013:1) observe that there are scant recent investigations into integration processes from a South African SME perspective. These views might provide insights into the relevance of this result, which also

correlates with the lack of innovation by some South African SMEs to embrace integration as part of their core activities and strategies. Nonetheless, it is important to acknowledge the strides made by some SMEs in embracing and developing their operational strategies as they seek to improve and sustain their survival and competitive aspirations. The integration of the logistics capability of South African SMEs facilitates the flawless transportation of raw materials, products and parts from firms' production plants to their retail customers (Chinomona & Pooe 2013:6). This leads to various benefits, including the continuous flow of information shared between business parties, which is critical because it ensures the availability of real-time and quality information and data, guaranteeing that SME operations are agile enough to meet the ever-changing demands of unstable markets.

6.5.3.3 Hypothesis 3: There is a positive relationship between total quality management and supply chain agility in South African SMEs

The analysis revealed that TQM exerts a positive and significant influence on supply chain agility. This is because a moderate relationship was found between the two constructs (0.413; $p < 0.01$). The result demonstrates that the implementation of TQM practices within the SME sector contributes, to some extent, to their capability to reach a substantial level of resilience in their operational activities.

The results of this study are consistent with the report by Misiko (2014:15) who advised that the adoption of TQM practices, such as top management commitment, training and development and utilisation of technology (tools/devices), influences firm performance. This suggests that decisions based on relevant inputs and adequate expertise facilitate better decision-making processes and timely reactions and responses to market changes. More evidence from Harraf, Wanasika, Tate and Talbott (2015:677) echoes that quality practices such as JIT offer businesses sufficient operational flexibility to respond swiftly to customers' orders. Furthermore, Zimon (2016:5) argues that quality management processes play an integral role in increasing the quality of goods and services provided, which in return, minimises potential discrepancies which subsequently enhances firms' efficiency (Calvo-Mora, Ruiz-Moreno, Picón-Berjoyo & Cauzo-Bottala 2014:769).

This study confirms by these results that TQM is a critical supply chain management best practice for supply chain agility in SMEs. In South African SMEs', adherence to the imperative of quality has become an important factor in today's business environment (Njenge, Vermeulen & Pretorius 2015:217). Supplying quality products and services to customers is commonly regarded as vitally important to meet customers' expectations and standards (Beneke, Flynn, Greig & Mukaiwa 2013:218). The desire to satisfy customers and consumers consistently through the provision of high-quality goods concurs with the result of this study. A study conducted by Omoruyi and Mafini (2016:43) has consistently revealed that SMEs' conformance to quality practices is central to the provision of quality products and services to meet customers' expected demands.

More evidence of the implementation of quality practices by South African SMEs emerges from Takawira (2015:3) who observes that manufacturing SMEs engage in quality training and the development of employees. They do this with the intention to ensure the availability of a skilled workforce, equipped to maximise the efficiency of production processes. This point is fundamental to SMEs' readiness to adhere to quality standards, and further facilitate the smooth alteration of production procedures to meet sudden changes to customers' orders. Thus, South African SMEs' commitment to quality standards through training and development of human capital needs be reinforced if they are to remain competitive in their respective industries. Baloyi (2013:86) recommends that SME owners and executives in South Africa should embark on a strategic awareness drive. This would serve to introduce effective quality training and development initiatives that merge both training and quality skill development to enhance responsiveness and the flexibility of SMEs' operations.

6.5.3.4 Hypothesis 4: There is a positive relationship between information technology adoption and supply chain agility in South African SMEs

The results of the analysis reveal that the above hypothesis is supported and accepted. This is mainly due to a strong positive and significant relationship between IT adoption and supply chain agility (0.545; $p < 0.01$). It implies that the proper introduction of IT processes offers SMEs a better chance to achieve agility in their operations. In other words, the higher the implementation of IT processes by SMEs, the better their operations practices would be.

The above view has been echoed by DeGroote and Marx (2013:909) who reveal that the use of IT systems enables firms to smoothly coordinate SMEs' operations and oversee a prompt response to their value chain networks. Accordingly, Tallon and Pinsonneault (2011:463) suggest that IT processes such as information advancement, sharing and IT integration are major antecedent factors to an agile supply chain. This is because they ensure seamless coordination and fast reaction process to customers' demands. Besides, IT has proven to be an enabler to achieve agile performance because of its contribution in the management and quick processing of large amounts of input data within a supply chain environment (Vickery *et al.* 2010:7025; DeGroote & Marx 2013:910). This subsequently enhances the effectiveness of firms' supply chain operations by meeting customers' expectations of quality products and services delivered. Furthermore, Yang (2014:107) asserts that IT implementation has a positive impact on supply chain agility since it allows a comprehensive application of operational procedures as well as reduction of lead-time across each component of a supply chain.

The above analysis confirms that IT is a fundamental supply chain management best practice as it contributes to the attainment of agile procedures in SMEs. This outcome could be supported by the view that there is a consensus on the fact that IT systems are regarded as a cornerstone to a firm's success. The adoption of IT is the glue which connects and supports SMEs' operational networks with systems such as ERP, WMS (warehouse management system), and RFID (Radio-frequency identification). These systems serve as enabling tools designed for increasing the overall efficiency and productivity of operational functions. The proper utilisation of these IT tools can also allow better response rates as well as the flexibility of their entire supply chain environment. Mpofu, Milne and Watkins-Mathys (2011:1) place the spotlight on the specific attention that South African SMEs have given to IT processes as a facilitator to their success. More evidence from Adeniran (2011:7) emphasises the critical nature attached to IT implementation in sectors such as manufacturing and information communication technology. The same report supports the role of sustained application of IT in expanding the operations process, which is important because it assists SMEs to monitor and optimise the operation's success adequately. Gareed and Naicker (2015:1) further opine that IT allows firms to develop their scope of activities, which ensures smooth communication across business functions and consequently leads to more flexibility of production procedures. Therefore, adoption of IT is of strategic importance in that not only does

it facilitate the efficient running of daily operations but it ensures that the SMEs are abreast of current and future market trends and variations in customer demands.

6.5.3.5 Hypothesis 5: There is a positive relationship between supply chain agility and SCRM in South African SMEs

The study found that supply chain agility exerts a positive and significant influence on SCRM. The results of the analysis support and accept the stated hypothesis (0.765; $p < 0.01$). This result suggests that agile SMEs are more poised to manage potential risks and other disturbances that could negatively impact their operations. In parallel, Lavastre, Gunasekaran and Spalanzani (2012:831) advocate that agile firms are more equipped to manage potential supply chain risks. By implication, the agility of firms in their operational activities places businesses in a position to become more flexible, which allows operations to be proactive enough in mitigating unforeseen challenges. Besides, supply chain agility is a key enabler of a firm's ability to manage possible and present risks and discrepancies (Braunscheidel & Suresh 2009:119). Agility traits, characterised by alliance engagement between supply chain partners can result in mitigating delivery problem and delays (Thun & Hoenig 2011:242). This indicates the role of agility in enabling SMEs to maintain their performance levels.

The results of the study imply that supply chain agility is a factor that enables South African SMEs to manage the current and potential risks occurring within their supply chains. Ngai *et al.* (2011:232) consistently mention that competition presently has shifted from being production based to supply chain performance based, which signifies the role and position that supply chain agility enjoys in facilitating desirable outcomes. This means that reaching the desired level of flexibility would enable SMEs operating in South Africa to become more adept at managing possible disturbances, which may hinder their performance. In confirming this view, Sayed and Sunjka (2016:122) suggest that agile operations, characterised by factors such as the availability of facilities and relationship management, are critical in contributing to the effective management of risk. This supports the view that South African SMEs should invest in enhancing and upgrading fixed capital and business-to-business (B2B) relationship management. Such activities would ease SMEs' control and accessibility of products to current and potential target markets. By so doing, firms would be able to alleviate risks associated with a shortage of stock and lateness of delivery of supplies. Furthermore, SMEs should be able to monitor and oversee their day-to-day routine

operations in an attempt to provide greater insight into the provision of accurate forecasting methods to ensure better management of unexpected threats. Mansfield (2013:3) adds that visibility of operations is an important strategic tool that can assist South African SMEs to properly manage risks hindering their competitiveness and growth. SMEs should, therefore, base their operational strategy on their ability to manage internal and environmental threats.

6.5.3.6 Hypothesis 6: There is a positive relationship between SCRM and supply chain performance in South African SMEs

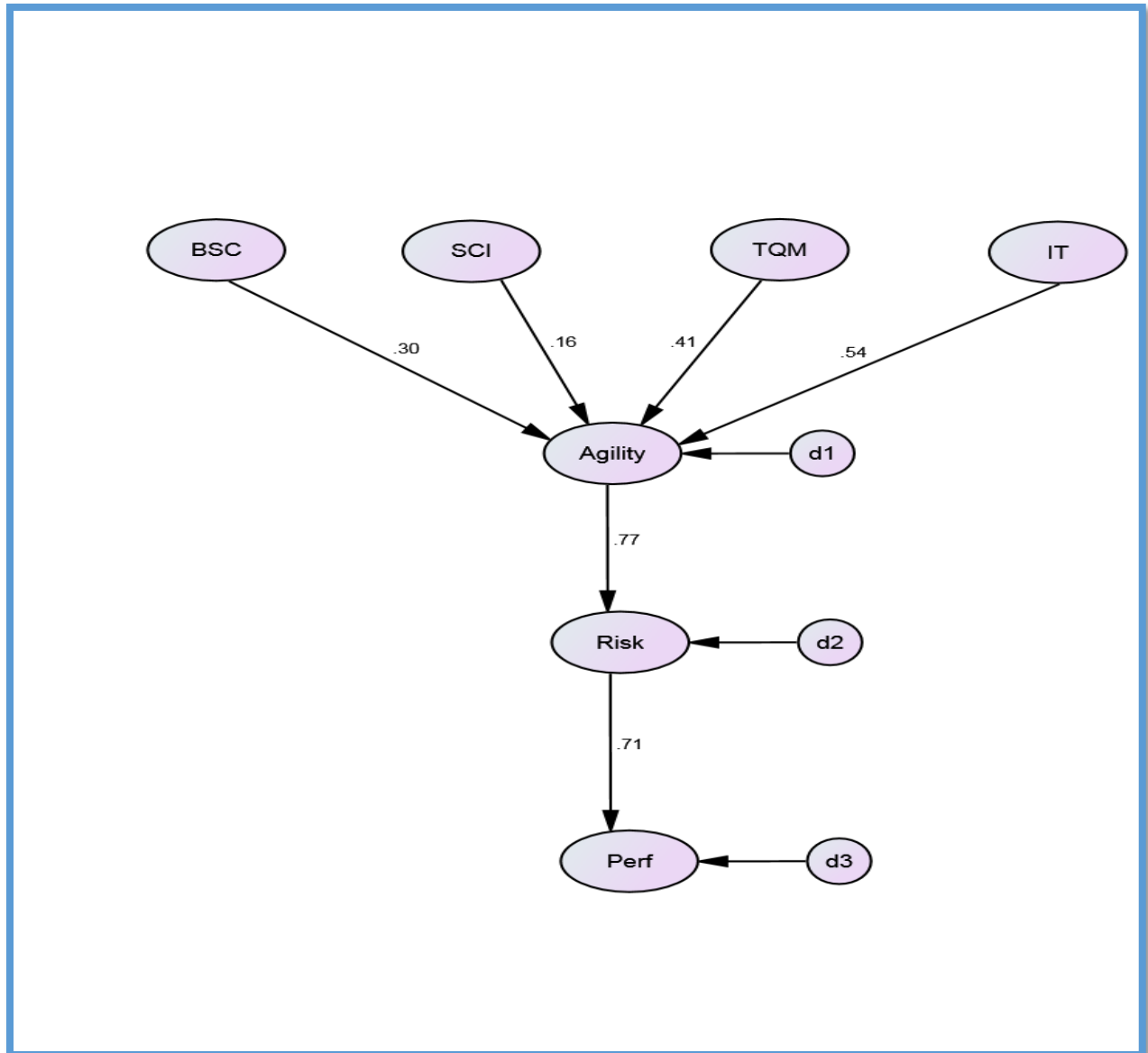
The results of the analysis revealed that SCRM exerts a positive and significant influence on supply chain performance. Hypothesis 6 therefore was accepted due to a strong and positive relationship (0.708; $p < 0.01$) that was found between the two constructs. The results demonstrate that the competent management of current and possible risks allows SMEs to maximise their operational performance. These results are supported by Juttner and Maklan (2011:249) who argue that the good management of operational challenges and risks contributes to improving business performance. Management of risks enables businesses to conduct their operational strategies proactively, which is key in increasing business performance (Lavastre *et al.* 2012:828). Additionally, Manab, Kassim and Hussin (2010:239) point out the critical role that the comprehensive analysis and control of firms' operations play in minimising the failure of supply chain activities. Organisations have to have contingency plans and procedures in place to quickly reduce the negative impact that unexpected disruptive events are likely to cause.

The current study indicates that SCRM is a leading strategic driver to achieve the required level of performance of SMEs operating in South Africa. This assumption could be attributed to the view that risk management is fundamental to South African SMEs because it mitigates any threats and challenges which may negatively affect SMEs' performance. Such outcomes assist SMEs to allocate resources to tackle potential risk areas precisely. In his report on the structured approach to risk management for South African SMEs, Smit (2012:300), stresses that risk management should be recommended as a strategic policy by owners and management. This reduces the negative effects related to the inadequate assessment of potential risks and subsequently increases performance. South African SMEs could benefit largely from the adoption of continuous market and operational forecasting. This approach could prove relevant in the sense that it would enable SMEs to effectively analyse their respective markets to take calculated risks, thereby contributing

to better return on investments and performance management (Aye, Balcilar, Gupta & Majumdar 2015:66). A report obtained by Sayed and Sunjka (2016:12) provides insightful conclusive remarks on key recommendations for effective avenues to which South African SMEs should direct their strategies. These include, amongst others, the introduction of outsourcing procedures and the development of long-term buyer-supplier relationships. These issues could be viewed as important in the sense that they provide some practical ways upon which South African SMEs can build in their attempt to position themselves to ensure better growth prospects.

6.6 STRUCTURAL MODEL

Figure 6.8 presents the study's structural model with the integrated results as well as path coefficients for the respective relationships between the research constructs.



BSC= Buyer-supplier collaboration; SCI= Supply chain integration; TQM= Total quality management; IT= Information technology adoption; Agility= Supply chain agility; Risk= Supply chain risk management; Perf= supply chain performance

Figure 6.8: Structural Model with Path Coefficients

The structural model (Figure 6.8) of the study highlights the relationships between the constructs. Buyer-supplier collaboration exerts a moderate and significant relationship ($r = 0.303$; $p < 0.01$) with supply chain agility. Similarly, it was found that TQM has a moderate and significant relationship with supply chain agility ($r = 0.413$; $p < 0.01$). Figure 6.8 also shows that supply chain integration has a weak but significant relationship with supply chain agility ($r = 0.164$; $p < 0.01$).

However, IT adoption was found to have a strong positive and significant relationship with supply chain agility ($r = 0.545$; $p < 0.01$). In addition, IT adoption is a critical supply chain management best practice and supply chain integration a least effective one to SMEs. This is due to the evidence of strengths of the beta values, with buyer-supplier collaboration and TQM appearing to be fair practices. More results provided in Figure 6.7 confirm the existence of a very strong and significant relationship between SCRM and supply chain risk performance ($r = 0.708$; $p < 0.01$). Furthermore, supply chain agility occupies a strong positive relationship with SCRM ($r = 0.765$; $p < 0.01$). These results confirm the importance of supply chain agility as a key predicting variable to SCRM and supply chain performance through the mediating influence of SCRM. This result implies that supply chain agility exerts indirect influence on supply chain performance through its influence on SCRM, which subsequently mediates supply chain performance in SMEs.

6.7 THE LINK BETWEEN THE RESOURCE-BASED VIEW THEORY AND THE RESULTS OF THE STUDY

This section discusses the linkage of the results of this study to research theory, which is the Resource-based view (RBV). As mentioned in the first chapter, the RBV theory is based on the premise that an organisation must acquire core and critical resources, which are difficult for competition to imitate. A resource itself is an economic or productive factor required to accomplish an activity, or as a means to undertake an enterprise and achieve the desired outcomes. The organisation then builds a sustainable competitive advantage based on these resources.

In the study, it was found that the buyer-supplier collaboration factor exerts a moderate, positive and significant effect on supply chain agility (0.303 ; $p < 0.01$). This result is in line with the RBV in the sense that buyer-supplier collaboration is an intangible resource to an SME. Effective collaboration between buying and supplying partners calls for a mutual commitment and the sharing of knowledge and expertise, which makes it an indispensable resource. This view was supported by Narayanan, Narasimhan and Schoenherr (2015:140) who suggest that the exchange of organisations' competencies and processes is a core competence that enables them to respond swiftly to market requirements. This supports the importance of obtaining valuable intangible resources to achieve an acceptable level of competitiveness. It is therefore conceivable that the cultivation of meaningful interaction between business partners plays a significant role in increasing SME technical knowledge and skills set, which is vital to ensure adequate performance.

The results of the analysis confirmed the existence of a significant but weak positive relationship between supply chain integration and supply chain agility (0.164; $p < 0.01$). This result resonates with the view by Sáenz, Revilla and Acero (2018:3) that coordination of tangible supply chain procedures finds its essence in the RBV. The integration of activities such as order processing and distribution channels facilitates the monitoring of order-to-delivery specifications, thereby leading to the meeting of market requirements. Integrative engagements between business partners or business functions allow for the alignment of investment, production materials or information systems to offer quality products and services, which in turn result in reaching the expected level of competitive edge. The fact that supply chain integration is directed towards the achievement of specific required results, in this case, supply chain agility, makes the RBV theory applicable to this study.

The study found that TQM exerts a positive and significant influence on supply chain agility (0.413; $p < 0.01$). This result is in line with a survey by Misiko (2014:14), which concluded that TQM is a driver of long-term sustainable competitive aspirations. The application of TQM is essential as it enables businesses to incorporate practices needed to improve the quality of services provided. Such a process follows the view of the RBV in that quality consciousness becomes an essential resource from which required outcomes are realised as businesses can raise the quality of their outputs and subsequently boost their overall performance consistently.

The study found that the application of IT systems leads to improved supply chain agility (0.545; $p < 0.01$). This result is related to the RBV as firms' investment in core technological systems such as software (warehouse management system) are taken to be resources that assure the efficiency of supply chain procedures. As suggested by Lu and Ramamurthy (2011:931), developing IT capability with components such as IT infrastructure is beneficial to increasing the responsiveness of firms. IT is therefore an essential tangible resource, which if applied expertly, can lead to competitive advantages that cannot be replicated by the competition.

The study found that supply chain agility exerts a positive and significant influence on SCRM (0.765; $p < 0.01$). As recommended by Colicchia and Strozzi (2012:403), the readiness of firms to respond quickly to market change and demonstrate the flexibility of activities enables them to become proactive to market uncertainties and ensure minimal supply chain disruptions. In line with the RBV theory, supply chain agility then becomes an intangible resource as it has been

proven that it leads to a broad spectrum of benefits to the business, one of which is the ability of the business to manage its supply chain risks effectively.

The study found that SCRM exerts a positive and significant influence on supply chain performance (0.708; $p < 0.01$). This demonstrates that proper management of current and possible risks allows SMEs to maximise their operational performance. Such control of potential disturbances is facilitated by the incorporation of inter-organisational evaluation methods to take proactive measures to minimise the adverse effects of volatile markets. This is only feasible if businesses are well vested with core capabilities such as enterprise resource systems to reduce transaction time. Tang and Musa (2011:25) further describe the ability of firms to reduce process cycle time as a massive strategic tool which is designed to foster the overall performance of their supply chain. Therefore, the ability to manage supply chain risks is another intangible resource from which competitive advantages can be drawn for the success of the firm.

In view of the foregone discourse of the results of the study, it could be posited that these findings adhere to the rationale of the RBV theory. The results of the study support the acquisition and development of core and unique resources (tangible or intangible) to achieve a sustainable competitive advantage in SMEs. In this case, all factors considered in this study, namely, supply chain management practices, supply chain agility and SCRM are taken to be resources that lead to a desirable outcome in the form of supply chain performance. This suggests that attaining the required level of performance by SMEs depends on their development of tangible critical resources such as TQM, IT adoption systems and engagement of integrative functions and operations. The execution of organisation process (intangible) is done in the form of building stable buyer-supplier collaborative relationships, establishing agility within all operations to maintain flexibility of activities and prompt response to a volatile market, as well as management of potential risks and other uncertainties that may occur within a supply chain network.

6.8 CONCLUSION

Chapter Six dealt with the implementation of the analysis of all elements related to the collection and analysis of data as stipulated in Chapter Five. The main themes, which constituted the focus area of the chapter, included the determination of reliability, validity through CFA and structural equation modelling (SEM). Cronbach's alpha test (Cronbach α), the composite reliability test and total-item correlations were used to assess the reliability of the constructs. Construct and content

validity were also ascertained through the use of convergent and discriminant validity. Discriminant validity was ascertained using inter-factor correlations. This was then followed by a determination of the model fit. Indicators used to ascertain the fitness of a research model for both CFA and SEM include, amongst others: Chi-square value over degrees of freedom (χ^2/df); Goodness-of-Fit Index (GFI); Comparative Fit Index (CFI); Incremental Fit Index (IFI); Tucker-Lewis Index (TLI); The Norm fit index (NFI); Root mean square residual (RMR); and the Root Mean Square Error of Approximation (RMSEA). The results show that the data fit the research model for both CFA and SEM. The chapter concludes with the testing of the hypotheses of the study. It is reported that all six suggested null hypotheses (H_{01} , H_{02} , H_{03} , H_{04} , H_{05} , H_{06}) were rejected, with the six alternative ones accepted. This is because all path coefficient scores ($H_1=0.303$; $H_2=0.164$; $H_3=0.413$; $H_4=0.545$; $H_5=0.765$; $H_6=0.708$) indicate a 90 percent level of confidence ($p<0.01$). Of the six-suggested relationships, supply chain agility scored the highest beta value ($r=0.765$; $p<0.01$), representing its strong linkage to SCRM. The next chapter offers final remarks that are drawn from the results presented as well as recommendations, which are designed to improve future studies.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

This final chapter discusses the conclusions and recommendations of the study. It first provides a review of the study before outlining the conclusions drawn from the results obtained from the data analysis, which addressed its objectives. Conclusions are based on the theoretical and empirical objectives. In addition, the chapter provides practical recommendations to SMEs on how they can improve their operations based on the factors considered in this study. Recommendations are provided for each of the constructs. The chapter further provides some suggestions and directions for future research that stem from this study. It discusses the study's theoretical and practical implications, which communicates how it contributes to literature, theory and practice. Lastly, it acknowledges the limitations of the study that have arisen from challenges encountered during the completion of the investigation.

7.2 OVERALL REVIEW OF THE STUDY

The main aim of this study was to investigate the relationships between supply chain best practices, supply chain agility, risk management and supply chain performance in South African SMEs. The identified best practices included buyer-supplier collaboration, supply chain integration, TQM and IT adoption. This thesis consisted of seven chapters, with Chapter One setting the tone of the research that established the background of the study, then highlighting the core problem that motivated the need to undertake this research. Other issues discussed in the chapter include the formulation of the research objectives (primary, theoretical and empirical), research methodology, design and ethical considerations. Chapter Two dealt with a review of the literature on supply chain management best practices. A discussion on the theory used to ground the study (the resource based-view) was also done. Chapter Three also reviewed literature related to the mediators (supply chain agility, and risk management) and the outcome variable (supply chain performance) of the study. Chapter Four addressed the development of hypotheses, which consisted of six null and alternative hypotheses. Chapter Five focused on the methodology employed to gather and analyse the data. Chapter Six was about the actual data analysis and interpretation of results obtained. Chapter Seven, the last chapter presents the final, conclusive remarks regarding the results. It also

provides recommendations designed to enhance the results and limitations encountered in the completion of the thesis as well as the implications of the study.

7.3 CONCLUSIONS RELATED TO THE THEORETICAL OBJECTIVES

This section provides conclusive observations based on the following theoretical objectives stated in this study, which were:

- to conceptualise supply chain best practices, namely buyer-supplier collaboration, supply chain integration, IT adoption and TQM from literature;
- to conceptualise supply chain agility from literature;
- to conceptualise SCRM from literature, and
- to conceptualise supply chain performance from literature.

7.3.1 Conclusions on literature related to supply chain management best practices

The literature reviewed showed that supply chain management best practices are activities meant to manage the operations as well as functions of a supply chain. It was further revealed that supply chain management best practices are effective in providing core value to an organisation's strategies regarding adhering to or meeting performance objectives. It was also shown that supply chain management best practices could be perceived as those sets of factors or strategies that contribute to improving the performance of an organisation's supply chain. These practices perform a strategic role in the competitive aspirations of businesses. The literature identified examples of supply chain management best practices as including, among others, supply chain integration, supply chain characteristics, customer service management, geographical proximity, JIT, business intelligence, logistics and distribution, supplier collaboration, lean, resilient and green supply chain. However, this study focused its attention on four selected supply chain management best practices, namely: buyer-supplier collaboration; IT adoption; supply chain integration; and TQM. This decision was premised upon their perceived relevance to the resource-based view (RBV) theory, which was suitable for the study, as factors necessary to achieve effective agility of the entire supply chain if implemented effectively.

7.3.2 Conclusions on literature related to supply chain management best practices of the study

As suggested in Chapter One, section 6.1.2, the study focused on four supply chain management best practices identified as: buyer-supplier collaboration; supply chain integration; TQM; and IT adoption. This section addresses conclusions drawn from the literature on each of these practices.

7.3.2.1 Conclusions on the literature related to buyer-supplier collaboration

Literature referred to buyer-supplier collaboration as the ability that two or more supply chain partners have to work together to join supply chain related activities which is essential to meet customers' requirements and expectations. The literature further promoted that collaborative engagement between buyers and suppliers calls for a synergistic working engagement between supply chain partners, with the purpose of exchanging proprietary knowledge and information, expertise as well as technologies. The view also emerged that buyer-supplier collaboration is a mutual interaction between supply chain networks designed for obtaining the best value over a sustainable period.

The literature identified a variety of antecedent factors influencing buyer and supplier decisions. These include the setting of mutual goals and objectives, an organisation's internal governance and mutual trust as well as information exchange. It was also shown that the active sharing of information and quality communication between supply network members contributes to establishing superior inter-organisational learning, which further strengthens collaboration. Furthermore, the literature showed that innovation practices centred on new product and strategic, operational developments play a critical part in allowing buyers and suppliers to join forces, to meet market and customers' requirements. Business's customer orientation initiatives emerged as a prerequisite element towards collaborative efforts between supply chain members.

Another dominant theme from the literature was on the outcomes of buyer-supplier collaboration, which were found to lead to several desirable outcomes. One of them relates to enhancing the knowledge base of partners' operational procedures, which is considered to be a major characteristic of competitive advantage. The literature further emphasised that collaboration within any firm's supply chain environment leads to the attainment of competitive aspirations and securing competitive advantage as this results in benefits realised from long-term relationships as well as performance outcomes that depend on mutual problem resolutions. Routine collaborative

practices further result in enhanced knowledge and information sharing, promoting products and materials flow between buyer and supplier. Other literature revealed that full engagement and inter-change across supply chain networks enable a business to be well equipped to adapt to unforeseen supply disruptions, which disturb the operations process. It further emerged that meaningful collaboration develops superior management quality from supply chain members as they are capable of cohesively developing solutions to problems that have the potential to hinder the smooth running of operations.

7.3.2.2 Conclusions on literature related to supply chain integration

The literature viewed supply chain integration as the combination of internal and external resources from both organisations' supply chain partners, with the aim to achieve effective synergistic operations processes crucial to attaining an ideal competitive advantage. It also emerged that supply chain integration is a multidimensional construct consisting of internal and external integration factors. Internal integration refers to the interconnectivity of all cross functions within an organisation's environment while external integration is regarded as the integration between a firm's upstream (customers) and its downstream (suppliers) business associates. As indicated in Section 1.6.2.3, this study defined supply chain integration as close alignment and coordination within a supply chain, often with the use of shared management information systems.

The literature identified IT systems as a key facilitator of integration because they enable supply chain members to coordinate their operations more efficiently. Likewise, it emerged that organisational commitment and employees' expertise and skill sets are promoting factors to a firms' ability and capability to engage in more integrative work with their partners. In most of the studies reviewed, close and open engagement amongst supply chain partners resulted in the improved exchange of ideas as well as expertise required in dealing with day-to-day operations.

The literature acknowledged the positive outcomes associated with supply chain integration that leads to an undisturbed flow of materials, products and information exchange, which subsequently contributes to adding value and meeting expectations of a business's customer base. It was further found that it leads to more excellent performance outcomes regarding competitive capabilities, which is underpinned by an increase in performance objectives such as delivery, cost, quality and flexibility. The study also reviewed literature which linked supply chain integration to improved supply chain performance.

7.3.2.3 Conclusions on literature related to total quality management

The literature reviewed regarded TQM as a business management strategy designed for enhancing the overall quality, management and performance of a firm to achieve competitive advantage. Supplier relations, benchmarking activities and quality measurement were identified as prominent precursors to positive TQM adoption, and as basic factors to assure competitive objectives. Other studies reviewed found linkages between organisational learning capability and the implementation of TQM, which contributes to better operational performance.

The literature attested that TQM is a principal management tool due to its positive impact on firm performance that contributes to competitiveness through the improvement of the quality of firms' products and services. It emerged that the application of TQM procedures results in the reduction of cycle time and the minimisation of delivery dependability, which leads to improved operational responses to customers' requirements regarding prompt delivery and availability. It was revealed that TQM practices such as JIT have a relationship with the competitive performance of a firm's supply chain through its capability to meet customers' demands on time that allows for the efficient management of inventories by keeping them at a minimal level. Further emerging from the literature was the argument that organisations that consistently apply TQM practices to meet and exceed their customers' level of satisfaction stand a greater chance of becoming competitive. It was confirmed that TQM-adopting supply chains tend to outperform their competitors in terms of innovation and manufacturing capabilities, operation readiness and superior quality of products and materials.

7.3.2.4 Conclusions on literature related to information technology adoption

The literature described IT as a multilevel application, which enables the sharing or exchange of input and output data between different organisation networks. Further literature indicated that IT involves the sharing of formal, informal and technical information and data between two or more individuals/organisations. Regarding its adoption, the literature stressed that a firm commitment to global sourcing and its actual size are key antecedent factors along with a robust strategic involvement from top-level executives. The literature further pointed to electronic data interchange (EDI), system handling real-time orders and JIT as examples of IT applications intended to ensure better coordination and integration of information sharing across different parallel supply chain members.

The literature highlighted the role of IT as a promoter of information and data exchange throughout a firm's supply chain network. It revealed that IT is regarded as one of the many pillars of sustainable organisations' supply chain performance outcomes because of its ability to facilitate consistent coordination and collaborative interchange amongst supply chain partners, crucial in reducing transactional costs. Other sources of literature reiterated that IT is a defining factor in supply chain integrative efforts because it helps different supply chain partners to engage in knowledge sharing as well as collaboration. Also emerging from the literature was the view that a large investment of resources in IT tools and procedures is essential in achieving positive and sustainable levels of competitiveness.

7.3.3 Conclusions on literature related to supply chain agility

The literature viewed supply chain agility as an organisation's ability and capability to detect and swiftly respond to changes in their markets. It emerged that agility includes the joint coordination of firms' primary stakeholders such as suppliers and customers, with the intention to adjust, handle and provide an efficient response to market changes. The study defined supply chain agility as a strategy that calls for a synergistic organisation of supply chain activities and processes to ensure that environmental turbulences are handled smoothly.

The reviewed literature identified IT, collaborative relationships with business associates and internal integrative processes as the prominent determinants of supply chain agility. As regards its outcomes, it showed that supply chain agility increases an organisation's responsiveness and awareness of perceived supply distortion in the market environment which correlates with right decision-making to meet market requirements. This subsequently results in better business performance.

7.3.4 Conclusion on literature related to supply chain risk management

In the literature, it emerged that there is no consensus on one acceptable definition of the concept of SCRM. However, the study defined SCRM as an organisation's awareness and identification of possible and potential problems, defaults and other pertinent risks that may impair the proper functioning of a supply chain. It revealed that SCRM is aimed at adopting effective strategies and processes across the supply chain to mitigate and alleviate their future occurrence. Most of the sources cited in the study unanimously and broadly categorised SCRM into two main groups,

which are operational risks and disruption risks. Operational risk encompasses all in-house disturbances from supply-demand mishaps to human or process failure across the supply chain while disruption risk refers to all uncontrollable problems that occur outside the scope of activities of an organisation, the basic example being Acts of God.

The literature detected that supplier, internal and customer collaborations are amongst the major drivers of supply chain risk due to their respective effects in mitigating risks related to demand, supply and operational processes. The literature revealed that supply chain risks might be minimised through a robust procurement strategy focused on unique sourcing as well as being equipped with good policies and strategies designed for mitigating and preserving the smooth running of their activities known to be best adapted to sustain their operations.

7.3.5 Conclusion on literature related to supply chain performance

Literature did not provide a universal definition of supply chain performance. However, the study defined it as the effectiveness and efficiency of an organisation's entire operational activities. The literature showed that supply chain performance is influenced by the collaborative engagement between supply chain partners regarding risk sharing as well as business venture influences. Other research reports reviewed in this study showed that healthy partnerships characterised by high levels of quality amongst members contribute to improving performance. Also, information sharing, supply chain integration and relationship partnerships were identified as effective determinant factors to supply chain performance. The literature further revealed that higher supply chain performance enables a firm to gain greater market share as it enhances businesses' capabilities to reduce their operational costs such as the prompt delivery of required quality and quantity of products/services.

7.4 CONCLUSIONS RELATED TO THE EMPIRICAL OBJECTIVES

Similar to the previous section on conclusions related to theoretical objectives, the following section provides conclusions based on the empirical objectives, which were set as follows:

- to determine the influence of buyer-supplier collaboration on supply chain agility in South African SMEs;
- to establish the influence of IT adoption on supply chain agility in South African SMEs;

- to determine the influence of supply chain integration on supply chain agility in South African SMEs;
- to establish the influence of TQM on supply chain agility in South African SMEs;
- to determine the relationship between supply chain agility and SCRM in South African SMEs; and
- to establish the relationship between SCRM and supply chain performance in South African SMEs.

7.4.1 Conclusions on the relationship between buyer-supplier collaboration and supply chain agility

In respect to the first relationship explored in this investigation, the study concludes that buyer-supplier collaboration exerts a moderate, positive and significant influence on SMEs' ability to achieve sustainable levels of agility in their supply chain operations. This result is supported by DeGroote and Marx (2013:910) who suggest that collaborative working environments between supply chain partners facilitate firms' capabilities to respond effectively to market demands. This gives credence to the critical value associated with engaging in mutual exchanges and interactions amongst businesses in enabling synergy and coordinated responses to upstream or downstream demands. Additionally, Heric and Singh (2010:12) suggest that linking with business associates is overriding in ensuring the sound responsiveness of supply chain operations. This comes through firms' abilities to share relevant market information confidently, as well as expertise to solve mutual problems. Ngai *et al.* (2011:232) argue that collaboration between supply chain partners is a key enabling factor to supply chain agility. Therefore, buyer-supplier engagement in collaborative working relationships is a prerequisite factor to achieve supply chain agility in SMEs.

7.4.2 Conclusions on the relationship between supply chain integration and supply chain agility

The investigation provided the view that supply chain integration has a weak, yet positive and significant relationship with supply chain agility in SMEs. However, despite its weak influence, the fact remains that a positive and significant relationship between the two constructs was found. This fact found supporting evidence from Fayezi and Zomorodi (2015:1129) who assert that integrative processes across business' functions are important in equipping firms with the necessary information and knowledge to respond to customers' requirements. Yang (2014:104)

concur that cross integration of firms' functions enables the exchange of relevant market-related information across a supply chain network, which results in improving the efficiency and flexibility of operations to manage better and mitigate unexpected and potential market disruptions (Blome *et al.* 2013:1295). This thus highlights the importance that the integration of supply chain functions has in contributing to the success and competitive aspirations of businesses. Based on these results the study then concludes that although previous studies have found strong relationships between supply chain integration and agility, the same could not be supported in this study. Supply chain integration exerts a slight but significant influence on supply chain agility's place in SMEs.

7.4.3 Conclusions on the relationship between total quality management and supply chain agility

This study determines that TQM has a moderate, positive and significant relationship with supply chain agility. Its result implies that quality driven decision-making processes and quality-oriented strategies such as training and development contribute adequately to ensure efficient responses to customers' expectations (Misiko 2014:15). Consistent with these results, Harraf, Wanasika, Tate and Talbott (2015:677), conclude that quality practices such as JIT offer businesses with sufficient operational flexibility the opportunity to respond promptly to customers' orders. Zimon (2016:5) further argues that quality management processes play an integral role in increasing quality of goods and services provided, which, according to Calvo-Mora *et al.* (2014:769), facilitates the reduction of potential discrepancies, thereby contributing to improving firms' efficiency. The present study, therefore, acknowledges that TQM is an important supply chain management best practice that positively influences the agility of SMEs.

7.4.4 Conclusions on the relationship between information technology adoption and supply chain agility

Regarding the relationship between IT adoption and supply chain agility, the study found a strong, positive and significant relationship. This result is echoed by Tallon and Pinsonneault (2011:463) who suggest that IT processes are major antecedent factors to agile supply chains. According to Vickery *et al.* (2010:7025), adopting IT practices and processes enables businesses to be more flexible in managing large flows of input data and information, which in return ensures adequate dissemination of quality information relevant for proper decision-making processes. This point is

also supported by Yang (2014:107) who concludes that IT implementation has a positive impact on supply chain agility. This is because it allows for the reduction of lead-time across each component of a supply chain. Hence, the study concludes that IT adoption is an important supply chain management best practice, which has an extensive influence on SMEs firms' abilities to adopt agile principles.

7.4.5 Conclusions on the relationship between supply chain agility and supply chain risk management

This study found that supply chain agility exerts a strong, positive and significant relationship on SCRM in SMEs. This was supported by Thun and Hoenig (2011:242) who state that agility can result in mitigating delivery problems. This fact resonates with a report by Lavastre, Gunasekaran and Spalanzani (2012:831) who suggest that agile supply chains are more equipped to deal with and manage potential risks. It further denotes that agile attributes allow for more flexibility of operational processes, which then enables firms to become more alert and able to deal with unforeseen challenges through the adoption of proactive action plans. This study therefore concludes that supply chain agility improves the ability of SMEs to manage risks occurring within their supply chain networks.

7.4.6 Conclusions pertaining to the relationship between supply chain risk management and supply chain performance

The results of the analysis of this study have revealed that SCRM has a strong, positive and significant relationship with supply chain performance. This fact implies that acceptable management of both internal and external risks enables businesses to optimise their performance objectives meaningfully. This view is supported by Juttner and Maklan (2011:249) who argue that decent management of operational challenges and risks contributes to improving business performance. Proper risk management is crucial in allowing organisations to have precise market and operational visibility, which then contributes to a good allocation of resources and strategies designed at maximising the performance of the value chain (Mohammed & Knapkova 2016:271). Moreover, Pagach and Warr (2011:12) mention that firms which systematically invest in risk management strategies and procedures stand to benefit greatly in terms of improving the performance of their supply chain activities. The study therefore concludes that SCRM is indeed an important antecedent factor to supply chain performance in SMEs.

7.5 RECOMMENDATIONS

This section proposes recommendations based on the results of the empirical objectives in section 7.4. This section is important because it provides practical suggestions to improve the operations of SMEs with respect to the issues considered in this study.

7.5.1 Recommendations on the relationship between buyer-supplier collaboration and supply chain agility

This study determines that buyer-supplier collaboration exerts a moderate influence on supply chain agility. However, it is imperative to explore strategic means to understand how this relationship can be enhanced. This includes, among others:

- Implementation of collaborative planning forecasting and replenishment (CPFR) is an approach based on a mutual engagement among supply chain members to collaboratively share forecast information and data to ensure better visibility of market requirements to cater for customers' expectations through swift responses to market demands. CPFR is suitable for products or goods which have a short lead-time. Its adoption could be useful to SMEs as it could allow for the proper management of operations across the supply chain through collaborative sharing of information, which offers adequate opportunities to properly meet and smoothly respond to sudden changes in orders.
- Another solution could be for supply chain partners to strive continuously towards equipping their workforce with necessary skills and knowledge. This is essential in enhancing the efficiency and technical expertise of staff members so that they can make concise decisions in their collaborative efforts.
- The adoption of a technical system such as electronic resource planning (ERP) could also assist in filtering and managing the continuous or unexpected flow of input data from and to partners. Such a robust network may offer better options to adapt and have more flexibility in firms' operations.

7.5.2 Recommendations on the relationship between supply chain integration and supply chain agility

Supply chain integration was found to have a weak link with supply chain agility. Strategies that could be employed to increase this relationship could comprise the following:

- Foster relationships with partners by adopting alliance approaches across all organisational levels. This serves to strengthen not only mutual relations among associates but optimise their performance objectives through open-exchange of resources and information that enables proper management of operations, which could be crucial in providing accurate responses to discrepancies.
- Good communication between business functions could prove to be essential because it could determine the usefulness and relevance of information that is conveyed from downstream to upstream and *vice versa*. As such, it is supreme for businesses to have systems in place to ensure that there is adequate communication in the supply chain environment. This leads to better action plans and other proactive measures to lessen the adverse effects of poor organisation and swift management of customers' constant order changes.

7.5.3 Recommendations on the relationship between total quality management and supply chain agility

This study found that TQM exerts a moderate and significant influence on supply chain agility. Strategic approaches that can be used to develop this relationship may include:

- The introduction of JIT, which is regarded as an important TQM practice designed at minimising product or process lead-times. Implementing JIT may enable SMEs to enhance the efficiency and quick response level of their operations.
- SMEs could also look at engaging with their customers to have a clear understanding of their expectations, crucial in ensuring that the products supplied or provided to consumers/customers meet their requirements, which is a principal component of quality standards.
- Increasing agility through TQM can only be achieved if there is commitment to invest in acquiring quality processes and systems. These would then facilitate the quick adaptability of operational procedures, to meet demands in volatile market environments.

7.5.4 Recommendations on the relationship between information technology adoption and supply chain agility

The study shows that there is a positive effect between IT adoption and supply chain agility. SMEs can further develop this relationship through the utilisation of the following IT systems:

- Radio frequency identification (RFID): This is aimed at maintaining the visibility of products as they are moved or stored within the supply chain. By so doing, businesses could be able to locate and track items and reduce the lead-time diligently; in the same process accelerate not only the accessibility but also their responsiveness to orders.
- Data warehouse: This allows for smooth communication between different components of a firm's supply chain (manufacturing/order processing etc.). Data warehousing optimises the accessibility of inventory items, which then contributes to robust production activities.
- Integration of IT systems and communication tools can also ensure better flexibility processes across the supply chain, which allows for a continuous flow of information exchanged, which could subsequently enable effective responses to variance in orders.
- External IT integration of communication tools with external shareholders of the business given consumers/customers and other intermediaries could be useful because it may allow for the sharing of market-related information and other customer surveys in which firms can forecast and respond to their requirements adequately.

7.5.5 Recommendations on the relationship between supply chain agility and supply chain risk management

The study confirmed in Section 6.5.3.5, that supply chain agility has a strong positive relationship with SCRM. Despite the positivity of the results obtained, some strategic methods can still be highlighted to solidify this relationship further. These include:

- The agility of a supply chain is to some extent dependant on the ability of firms to minimise potential risks correctly that may hinder their effectiveness. As such, acquiring the right qualified and skilled workforce could be vital in preventing any possible threats from turbulent markets. Investing in training and development of employees could be paramount to businesses to be more flexible in their daily activities. Such a level of agility would allow adequate proactive policies and contingency plans aimed at dealing with the unpredictability of the marketplace.
- Agile organisations exhibit proactive attributes. SMEs should therefore engage more in developing critical strategic planning work processes, which would enable them to be able to put into place measures and proactive plans to minimise the adverse effects of supply chain disruptions.

- Agility calls for more flexibility of resources and operational practices to respond quickly to marketplace changes. Through such flexibility, SMEs can gain by conducting risk assessment practices consistently to provide a thorough and in-depth overview of potential risks and sudden alterations that may occur.

7.5.6 Recommendations on the relationship between supply chain risk management and supply chain performance

This study revealed in Section 6.5.3.6 that SCRM exerts a strong positive influence on supply chain performance. This provides a foundation to build on when assessing determinant factors to supply chain performance and possible ways to strengthen this relationship. One such method, as suggested by Pagach and Warr (2011:14), could be for SMEs to be more integrative in their risk management approach by expanding risk management processes to all components and functions within the sphere of the organisation. This would undoubtedly provide a better chance of improving the firms' performance as there would be cohesive visibility of actual and potential risks within the firm's operations. Other strategies could include:

- The provision of a risk management framework in which SMEs can categorise and rank risks according to their degree of severity could be an ideal tool to manage their occurrence and effects.
- The advancement of soft skills (effective communication between partners; sharing of quality and proprietary information) is imperative in identifying and managing critical risk factors. These allow firms to be better equipped to handle disruptions and increase performance objectives.

7.6 LIMITATIONS OF THE STUDY

The present study has offered in-depth results regarding the hypothesised relationships proposed. However, despite the relevance of the results obtained, it is important to note that the investigation has several limitations. There were a few factors which may have, to some extent, negatively impacted on the results obtained. One of those is related to the scope of the study. In fact, the limited scope of the study to one province, Gauteng in this case, could be viewed as a drawback given that assessing the performance of a supply chain calls for a more extensive and broader geographic scope. A substantial expansion of the scope to at least two provinces such as the Free State, given its proximity to Gauteng, could have yielded a more informative reading of results as

the Gauteng province is essentially the smallest of the nine provinces in South Africa. In addition, the lack of monitoring during the completion process of the questionnaires could also be seen as a potential limitation. It would have been more appropriate if the researcher was able to guide the respondents through the essence of the questions posed or presented to them to ascertain a holistic understanding of the sentences and obtained honest feedback from participants. One possible alternative could be to adopt a mixed-method approach whereby respondents could be interviewed, which might be time-consuming, and still produce more reliable results than responding to a lengthy questionnaire. Besides, the selection of only four supply chain management best practices could be questionable since the practice itself comprises a broad array of factors, which in some cases, might not have been in use by the participating SMEs. Therefore, the lack of incorporation of a large number of best practices in the study might have resulted in limited results.

7.7 IMPLICATIONS FOR FURTHER RESEARCH

The results of this study appear to be valuable for not only the SME sector but also larger corporations. This is because of the outcome the use of supply chain management best practices could have on their performance objectives. As alluded to in the previous section, one of the main unexplored terrains for future studies would be to conduct a much more elaborative exploration of supply chain best practices, as indicated in Table 2.1. Such an investigation could prove to be important in the sense that it could provide insights into the strategic role and importance that these practices have on the performance of an organisation's supply chain, given the fact that this study investigated the indirect influence that supply chain management best practices exert on supply chain performance. Additionally, as highlighted in section 7.6, an expansion of the scope of the study to different provinces of the country could enlighten both academics and business practitioners of the value of supply chain best practices.

7.8 THEORETICAL AND MANAGERIAL IMPLICATIONS OF THE STUDY

There is a lack of research that focuses on the role of supply chain management best practices and their influence on supply chain agility, risk management and performance in South African SMEs. This makes this study a significant source of literature on the interplay between these constructs from the context of SMEs in developing countries. It provides an in-depth examination of some supply chain management best practices (buyer-supplier collaboration, supply chain integration, IT adoption and TQM), supply chain agility and supply chain risks management and supply chain

performance, and therefore identifies the driving factors to supply chain agility, SCRM and supply chain performance within SMEs. This adds to the existing body of literature on these issues within the area of supply chain management, and future researchers may use the present study as a leading source of secondary data.

Managerial implications provide a practical overview of the possible strategic routes that managers/owners of the SMEs may explore in their analysis of supply chain related issues. One of the main practical implications of this study lies in the tested conceptual model. In fact, the model provides the basis for analysis when SMEs are engaged in assessing the readiness or effectiveness of their input practices when evaluating their supply chain-related problems. The model suggests that specific attention should be directed to all of the four practices (buyer-supplier collaboration, supply chain integration, IT adoption and TQM) as a possible avenue to address operational impediments. Further suggestions include incorporating more mechanisms that can assist in managing their risks correctly. Since the adoption of IT exerted the most significant influence on supply chain agility when compared to the other supply chain management practices, more considerable attention should be applied towards it than other practices. IT adoption could even be included as part of the strategic objectives of SMEs as it leads to higher gains.

7.9 CONCLUSION

Supply chain management best practices have been identified as important drivers to supply chain performance in South African SMEs. This is because of the indirect influence and role they play in influencing agility and the ability of firms to manage supply chain risks. This study further found that supply chain agility exerts a considerable influence on SMEs' ability to control their potential risks and further acts as a predicting construct to supply chain performance achievement. SCRM was confirmed to be an antecedent factor in supply chain performance for SMEs. The results of this investigation provide a reasonable basis for the importance of the adoption of supply chain management best practices and their role in enabling the agility of firms, which has a domino effect on influencing the performance of the whole supply chain. The relevance of this investigation is worth noting in that it contributes to the body of supply chain literature and can be used by business owners as well as executives as a diagnostic tool for policy-making.

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APPENDIX 1

RESEARCH QUESTIONNAIRE



Vaal University of Technology

THE INFLUENCE OF SUPPLY CHAIN MANAGEMENT BEST PRACTICES ON SUPPLY CHAIN AGILITY, SUPPLY CHAIN RISK MANAGEMENT AND SUPPLY CHAIN PERFORMANCE IN SOUTH AFRICAN SMES

Research conducted by

Mr Loury-Okoumba

Cell: 078 993 0820

Email: lvandrys@yahoo.com

Dear Respondent,

You are requested to participate in an academic research study conducted by Loury-Okoumba, a Doctoral student from the Department of Logistics Management at the Vaal University of Technology. The purpose of the study is to gather information on the perceptions of SME owners and managers on the influence of supply chain best practices on supply chain agility, risk management and performance. The completion of this questionnaire may enable researchers and both supply chain organisations and practitioners to understand the importance that supply chain management best practices have in contributing to the overall performance objectives of firms.

You have been chosen to participate in the study based on your experience of working in the logistics industry. I, therefore, believe that you will provide relevant information.

Please note the following:

1. This study takes the form of an anonymous survey. Your name will not appear on the questionnaire, and the answers you give will be treated as strictly confidential. You cannot be identified in person based on the answers you give.
2. Your participation in this study is very important to us. You may, however, choose not to participate and you may also stop participating at any time without any negative consequences.
3. Please answer the questions in the attached questionnaire as completely and honestly as possible. This should not take more than 20 minutes of your time.
4. The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.
5. Please contact my promoter, Dr C. Mafini chengedzaim@vut.ac.za, if you have any questions or comments regarding the study.

Please sign this letter to indicate that:

- You have read and understood the information provided above.
- You give your consent to participate in the study on a voluntary basis.

Respondent's signature

Date

SECTION A: GENERAL INFORMATION

In this section, we would like to find out information regarding the overall profile of your company. Please place a cross (x) in the appropriate block.

A1	Type of business	Cooperative	Sole proprietor	Close corporation	Private business	Partnership
	(x)					

A2	Nature of your business	Mining	Manufacturing	Retail	Transport	Tourism	Finance/insurance	Agriculture
	(x)							
Other (please indicate)								

A3	Number of people employed	1-9	10-19	20-49	50-100	101-200
	(x)					

A4	Number of years in operation	Less than 2 years	2 to 5 years	5 to 10 years	More than 10 years
	(x)				

SECTION B: DEMOGRAPHIC PROFILE OF RESPONDENTS

B1	Gender	Male	Female
	(x)		

B2	Race	African	White	Indian/Asian	Coloured
	(x)				
Other (please indicate)					

B3	Age group	18-25	26-35	36-45	46-55	56+
	(x)					

B4	Highest academic qualification	Matric	Diploma	Degree	Postgraduate	Other
	(x)					

SECTION C: BUYER-SUPPLIER COLLABORATION

We would like to find out a little more about your views towards buyer supplier collaboration. Please indicate the extent to which you agree or disagree by ticking the corresponding number between 1 (Strongly disagree) and 5 (Strongly agree). With 2 (Disagree), 3 (Neutral/No opinion) and 4 (Agree).

BSC ₁	Our business collaborates with its major suppliers in terms of solving logistics and product quality problems.	Strongly disagree	1	2	3	4	5	Strongly agree
BSC ₂	Our business collaborates with its partners in terms of sharing business information.	Strongly disagree	1	2	3	4	5	Strongly agree
BSC ₃	Our business collaborates with its suppliers in planning logistics and production schedules.	Strongly disagree	1	2	3	4	5	Strongly agree
BSC ₄	Our company collaborates with its major supply chain partners in setting operation strategies and objectives.	Strongly disagree	1	2	3	4	5	Strongly agree
BSC ₅	Our business collaborates with its suppliers in terms of sharing operational and industry knowledge.	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION D: SUPPLY CHAIN INTEGRATION

We would like to find out a little more about your views towards supply chain integration. Please indicate the extent to which you agree or disagree by ticking the corresponding number between 1 (Strongly disagree) and 5 (Strongly agree). With 2 (Disagree), 3 (Neutral/No opinion) and 4 (Agree).

SCI ₁	Our business has an integrated communication network with all its business functions to enable an effective sharing and flow of information across all departments.	Strongly disagree	1	2	3	4	5	Strongly agree
SCI ₂	Our business shares production plans and schedules with its suppliers.	Strongly disagree	1	2	3	4	5	Strongly agree
SCI ₄	Our business shares forecasting activities with its major suppliers to ensure adequate inventory management.	Strongly disagree	1	2	3	4	5	Strongly agree
SCI ₅	Our business shares market-related information with its major suppliers and customers.	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION E: TOTAL QUALITY MANAGEMENT (TQM)

We would like to find out a little more about your views towards total quality management (TQM). Please indicate the extent to which you agree or disagree by ticking the corresponding number between 1 (Strongly disagree) and 5 (Strongly agree). With 2 (Disagree), 3 (Neutral/No opinion) and 4 (Agree).

TQM ₁	Our business continuously reviews the quality standard of its production and operations processes on a regular basis.	Strongly disagree	1	2	3	4	5	Strongly agree
TQM ₂	Our production equipment is thoroughly checked in order to improve its overall productiveness.	Strongly disagree	1	2	3	4	5	Strongly agree
TQM ₃	Our business takes into consideration customers' complaints as input to improve the quality of our products and services.	Strongly disagree	1	2	3	4	5	Strongly agree
TQM ₄	Our production times are maintained through just-in-time strategy to facilitate quick response to customers' inquiries.	Strongly disagree	1	2	3	4	5	Strongly agree
TQM ₅	Our business is actively engaged in providing quality training courses to its employees.	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION F: INFORMATION TECHNOLOGY (IT) ADOPTION

We would like to find out a little more about your views towards information technology adoption. Please indicate the extent to which you agree or disagree by ticking the corresponding number between 1 (Strongly disagree) and 5 (Strongly agree). With 2 (Disagree), 3 (Neutral/No opinion) and 4 (Agree).

ITA ₁	Our business has invested adequately in obtaining new technology systems to facilitate the production process.	Strongly disagree	1	2	3	4	5	Strongly agree
ITA ₂	Our business intends to acquire new IT systems to share information amongst different departments.	Strongly disagree	1	2	3	4	5	Strongly agree
ITA ₃	Our business emphasises the adoption of technologically related processes amongst staff.	Strongly disagree	1	2	3	4	5	Strongly agree
ITA ₄	Our business makes use of sophisticated technology to conduct its operations.	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION G: SUPPLY CHAIN AGILITY

We would like to find out a little more about your views towards supply chain agility. Please indicate the extent to which you agree or disagree by ticking the corresponding number between 1 (Strongly disagree) and 5 (Strongly agree). With 2 (Disagree), 3 (Neutral/No opinion) and 4 (Agree).

SCA ₁	Our organisation is well-equipped to respond to possible changes in its customers/consumers' demands.	Strongly disagree	1	2	3	4	5	Strongly agree
SCA ₂	The production process of our company is flexible enough to forecast potential threats from the market.	Strongly disagree	1	2	3	4	5	Strongly agree
SCA ₃	Our business strives to ensure timely introduction of new products to meet market requirements and expectations.	Strongly disagree	1	2	3	4	5	Strongly agree
SCA ₄	Our business has the necessary technological and technical capabilities to incorporate additional changes to meet customers' expectations.	Strongly disagree	1	2	3	4	5	Strongly agree
SCA ₅	Our business has the capability to meet customers' expectations in a timely manner in terms of on-time delivery.	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION H: SUPPLY CHAIN RISK MANAGEMENT

We would like to find out a little more about your views towards supply chain risk management. Please indicate the extent to which you agree or disagree by ticking the corresponding number between 1 (Strongly disagree) and 5 (Strongly agree). With 2 (Disagree), 3 (Neutral/No opinion) and 4 (Agree).

SCRM ₁	Our business strives to reduce or minimise potential internal or external operational problems that can negatively affect its operations.	Strongly disagree	1	2	3	4	5	Strongly agree
SCRM ₂	Our business openly shares information with its suppliers and customers to find mutual strategies to deal with possible operational deficiencies.	Strongly disagree	1	2	3	4	5	Strongly agree
SCRM ₃	Our business consistently monitors the operations of our suppliers to	Strongly disagree	1	2	3	4	5	Strongly agree

	minimise potential distortions in supplies/deliveries.							
SCRM ₄	Our business has proper contingency plans to mitigate/handle sudden market changes.	Strongly disagree	1	2	3	4	5	Strongly agree
SCRM ₅	Our business minimises risks related to customers' demands by adopting the late product differentiation approach.	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION I: SUPPLY CHAIN PERFORMANCE

We would like to find out a little more about your views towards supply chain performance. Please indicate the extent to which you agree or disagree by ticking the corresponding number between 1 (Strongly disagree) and 5 (Strongly agree). With 2 (Disagree), 3 (Neutral/No opinion) and 4 (Agree).

SCP ₁	Our supply chain enables us to react and meet our customers' requirements effectively.	Strongly disagree	1	2	3	4	5	Strongly agree
SCP ₂	Our supply chain enables us to consistently respond adequately to changes in our customers/consumer's orders.	Strongly disagree	1	2	3	4	5	Strongly agree
SCP ₃	Our supply chain enables us to adapt and produce new products.	Strongly disagree	1	2	3	4	5	Strongly agree
SCP ₄	Our supply chain helps us to improve the performance of our products.	Strongly disagree	1	2	3	4	5	Strongly agree
SCP ₅	Our supply chain enables us to improve customer service related to product complaints.	Strongly disagree	1	2	3	4	5	Strongly agree

Thank you for your time and your cooperation.

Your views are much appreciated.

APPENDIX 2
DECLARATION FOR LANGUAGE EDITING

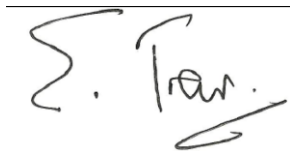
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Faculty of Management Sciences
Logistics Dept
Vaal University of Technology
Vanderbijlpark.

12 April 2018.

LANGUAGE EDITING

This is to certify that I language-edited, with formatting, the dissertation, “Supply chain management best practices, agility, risk management and performance in small and medium enterprises”, by Loury Van Okoumba for his D. Tech degree in Business in the Faculty of Management Sciences.

A handwritten signature in black ink, appearing to read 'E. Trew', is positioned below a horizontal line.

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