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Enhancing SME performance through supply chain integration, collaborative planning, and supply chain capabilities

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Abstract

The past decade has seen a growing interest in the strategic importance of integrating suppliers, manufacturers and customers. For this reason, supply chain integration has attracted the attention of both the researchers and practitioners alike. Whilst there have been studies conducted to provide more insight into this area, there remains a need for more understanding of the notion and practice of supply chain integration especially as increasing competition puts pressure on firms. Yet, so far, the empirical investigation of the impact of these antecedents on small and medium enterprise (SME) performance has received little attention.

The main objective of this study is to fill this void by investigating the influence of supply chain integration, collaborative planning, and supply chain capabilities on SME competitiveness and firm performance in the Sedibeng municipal district area. The study employs a quantitative method. Sample data from 300 SMEs collected for the final data analysis by means of confirmatory factor analysis (CFA) and structural equation modelling (SEM) using AMOS 22.0 statistical software package.

The principal finding of this study reveals that supply chain integration, collaborative planning and supply chain capabilities have an impact on SME performance. These findings lend credence to the notion that by investing on supply integration tools, by planning collaboratively and by developing supply chain capabilities, SMEs can improve their own performance.

Key phrases

collaborative planning; supply chain capabilities (SCC); supply chain integration (CSI); SME performance

1. INTRODUCTION

For many countries, improving the competitiveness and performance of their economies involves creating conducive environments in which small and medium enterprises (SMEs) thrive and flourish. Such countries view SMEs as the most important driver of the economy (Ahmad & Alaskari 2014:477) and this is reflected in the kind of policy instruments meant to promote and support SMEs.

While many studies have attempted to provide insight into understanding SME performance, thereby contributing to the body of knowledge in this area (e.g. Gronum 2015:1-221; Pett & Wolff 2007:1-16; Sidik 2012:373-383), our understanding remains far from complete. Granted, SME performance has been investigated from a kaleidoscope of perspectives. The present study will investigate SME performance from three perspectives namely, supply chain integration, supply chain capability, and collaborative planning.

The past decade has seen a growing interest in the strategic importance of integrating suppliers, manufacturers and customers. For this reason, supply chain integration has attracted the attention of both researchers and practitioners alike. Whilst there have been studies conducted to provide more insight into the notion and practice of supply chain integration, increasing competitive pressures on firms have revealed the need for a more refined understanding in this regard (Georgise, Thoben & Seifert 2014:1; Katunzi 2011:105; Prajogo & Olhager 2011:514). This is especially so as greater levels of integration are associated with better firm performance (Beheshti, Oghazi, Mostaghel & Hultman 2014:28; Cannon, Doney, Mullen & Petersen 2010:509; Gimenez, Van der Vaart & Van Donk 2012:603).

Over a decade ago, a study by Welker, Van der Vaart and Van Donk (2008:711) showed the importance of supply chain integration for competitive capabilities in the case of world-class manufacturers. Wong and Boon-Itt (2008:400) determined that many supply chain related problems facing SMEs can be traced to the lack of effective supply chain integration. These problems include inventory shortages, logistics, delivery and quality problems, as well as escalation of costs.

According to Panahifar, Heavey, Byrne and Fazlollahtabar (2015a:842), collaborative planning (CP) is a fundamental part of supply chain management, which as the first step of

collaborative planning, forecasting and replenishment (CPFR) is critical as partners develop collaboration initiatives and terms. Successful collaboration practices are likely to result in the selection of the most suitable partners (Panahifar, Heavey, Byrne 2015b:1302).

Without collaboration, supply chain partners will only remain partners by name and thus supply chain capabilities will hardly be developed (Cao & Zhang 2011:6613). The importance of supply chain capabilities in enhancing collaboration was established empirically in a more recent study by Mandal, Sarathy, Korasiga, Bhattacharya and Dastidar (2016:549).

Yet most of the studies, including those mentioned, were conducted in developed countries such as United States, The Netherlands and Spain, to mention just a few. Given the differences in the definitions of SMEs and the socio-economic dynamics within which SMEs operate in a developing country such as South Africa, it would be naïve to conclude that the findings from such studies can be generalised to the local context. The need for more similar studies to be conducted in emerging countries was underscored by Lee, Kim and Su- Lee (2016:12) who argue that the pressures on supply chains between emerging and developed countries are likely to be different.

While there remains a paucity of empirical studies in the areas of supply chain integration, supply chain capabilities, and collaborative planning in South Africa, it is encouraging to see the emergence of such studies more recently (e.g. Amadi-Echendu & Krüger 2016:1-13; Bautista-Santos, Martinez-Flores, Bernabé-Loranca, Sanchez-Partida & Sanchez-Galvan 2016:234-250; Mosoma 2004:132-144; Ziaullah, Feng & Akhter 2015:519-533), albeit mainly in contexts other than SMEs.

Hence, the present study aims to contribute to the understanding of the role of supply chain integration, supply chain capabilities, and collaborative planning on SME performance. The remainder of this article is organised as follows: The next section will provide an overview of the literature review followed by the conceptualised research model and hypotheses development. Next, the research methodology section, which include data collection procedure, construct operationalisation and measurement follow. Finally, the article concludes by presenting the data analysis and recommendations.

2. LITERATURE REVIEW

2.1 Small and medium enterprises

According to Ayyagari, Demirguc-Kunt and Maksimovic (2011:6), the term SME encompasses a diversity of definitions and measures that vary across countries and sources reporting SME statistics. In South Africa, the National Small Business Amendment Act (29 of 2004) defines an SME as any business with fewer than 200 employees, where one with fewer than 50 employees is deemed small, and between 50 and 200, medium sized. In addition, by definition, SMEs annual turnover may not exceed R5 million, and that the SME owners are involved directly in the day-to-day management of their businesses. SMEs are further classified by the sector or sub-sector to which they belong.

Time and again, studies have shown the pivotal role played by SMEs in the creation of employment and wealth, innovation, and in the reduction of poverty (Aremu & Adeyemi 2011:201; Memba, Gakure & Karanja 2012:30; Prajogo 2007:69). Furthermore, SMEs have been described as essential for economic growth and development in most economies due to their ability to respond and adjust to environmental changes and technological orientation (Adams, Khoja & Kauffman 2012:21). A vibrant and flourishing SME sector is an important sign of a growing economy (Chinomona & Pooe 2013:3).

Sadly, GEM (2012:26) reports a consistent finding that the rate of establishing businesses South Africa of 2.3% remains the second lowest in the world in comparison with the 8% rate in other comparable countries. It is also estimated that the SME contribution to gross domestic product (GDP) in South Africa stands at 45%, is one of the lowest in the world. The failure of SMEs to flourish in South Africa may be attributed to a number of factors, such as limited market access and limited integration with other businesses (UNDP 2014:5). Thus, it was found necessary to investigate the influence of supply chain integration, firm collaborative planning, and supply chain capabilities on SME performance.

2.2 Supply chain integration

According to O'Leary-Kelly and Flores (2002:22) integration refers to the extent to which separate entities work together cooperatively to arrive at mutually acceptable outcomes.

Stevens and Johnson (2016:22) define supply chain integration (SCI) as 'the alignment, linkage and coordination of people, processes, information, knowledge, and strategies across the supply chain with a view to facilitate the efficient and effective flows of material, money, information, and knowledge in response to customer needs'. SCI involves both information and material, and cannot be limited to only one (Prajogo & Olhager 2011:415). SCI entails collaboration and coordination either within the enterprise between different departments or functions or across the supply chain network between the various supply chain partners (Flynn, Huo & Zhao 2010:58).

Huang, Yen and Liu (2014:67) posit that for supply chain coordination to be effective and efficient, it requires the integration of all product flow processes. A well-integrated supply chain is characterised by the support suppliers give to each other and commitment to optimise their relationship (Lazzarini, Claro & Mesquita 2008:565). Tsinopoulos and Mena (2015:1453) stress that effective supply chain relationships depend on the ability of the supply chain members to design and shape their integration systems and processes. Yet Stevens and Johnson (2016:25) argue that SCI is not just about technology but includes governance, organisation structure, systems, relationship management, business strategy, process design, and performance management.

2.3 Collaborative planning

According to Ramanathan and Gunasekaran (2012:218), for supply chains to be effective, planning, decision making and execution need to become essential elements of collaboration. Li, Kumar and Lim (2002:551) define collaborative planning (CP) as a process of joint decision making for supporting plans of individual supply chain partners with a view to attaining some coordination among the partners through which existing interdependencies can be identified.

Coordination differs from integration in that coordination indicates an interactive, joint decision making process, where separate supply chain members influence each other's decisions more directly in order to improve overall performance whereas integration refers mainly to a seamless material and information flow of all members within a supply chain with the objective to maximize competitive advantage. (Moharana, Murty, Senapati & Khuntia

2012:50). A well-coordinated and integrated supply chain will to a large extent serve as a counter-measure for the bullwhip effect, which are distortions in the supply chain caused mainly by order fluctuations.

However, due to high product variety, increased competition and unstable consumer demand creating perfect plans to meet the demand and their goals can be a challenging task, especially for SMEs. (Rickard & Ritsert 2011:931). Creating a responsive supply chain ideally requires dependable forecasts (Kaipia, Dukovska-Popovska & Loikkanen 2013:270). However, sharing information based on resources and forecasts would enable supply chain members plan their operations better and more strategically (Jonsson & Mattsson 2013:2).

By providing standardised information and establishing objective plans, collaborative planning is considered value-creating for the customer, which improves overall supply chain performance (Hollmann, Scavarda & Thomé 2015:981). Previous studies have shown that enterprises collaborate to share resources and expertise, for example, to design products, provide customer support or share computer programmes across the supply chain (Vereecke & Muylle 2006:1176-98). In this regard, Pooe and Mathu (2011:326) posit that collaborative planning in supply chains should take place continuously.

2.4 Supply chain capabilities

Supply chain capabilities (SCC) are defined as the identification, use, and adjustment of both internal and external resources and information by organisations to facilitate the entire activities of the supply chain (Wu, Yeniyurt, Kim & Cavusgil 2006:493). Liu, Srai and Evans (2016:3) define SCC as bundles of SCM skills, knowledge, routines and competencies that are developed over a period of time through complex interactions, both within a firm and with its network partners with which the firm can coordinate SCM. Such skills and competencies include, among others, production planning, managing supply chain functions such as transportation, procurement, warehousing, inventory management, and logistics (APICS 2015:1-20).

Supply chain capabilities can be categorised into efficiency and efficacy-related capabilities (Chen, Daugherty & Roath 2009:63). These capabilities contribute towards firms achieving good logistics performance at lower cost (Wu, Mahajan & Balasubramanian 2003:425),

while allowing for relationships with supply chain partners to be maintained as firms respond to customer requirements (Kim, Cavusgil & Calantone 2006:40). This means that when SMEs or firms develop a strong relationship with their suppliers they may share not only some risks associated with the supply chain but may also improve their performance.

The literature also distinguishes between dynamic capability and operational capability. On the one hand, operational capability refers to a firm's ability to perform, execute and coordinate the various tasks such as distribution, logistics and marketing campaigns (Liu, Ke, We & Hua 2013:1455). Thus this partly reflects the firm's ability to respond to market changes (Inan & Bititci 2015). To enhance and improve their performance SMEs need to consider the reliable capabilities by either integrating, collaborating or sharing their plans with their suppliers (Liu *et al*. 2013:1458). Krishnapriya and Baral (2014:51) opine that firms need to develop inter-organisational capabilities that integrate a firm with its supply chain partners to create and deliver value for the firm. In view of this, supply chain information capabilities have been suggested as a source of competitive advantage (Park, Fujimoto & Hong 2012:1).

2.5 SME performance

In this study, SME performance is the outcome variable and reflects multiple self-reported measures of firm performance (Richard, Devinney, Yip & Johnson 2009:718-804). The performance of SMEs has generated a great deal of attention from scholars and other decision makers (Alpkan, Yilmaz & Kaya 2007:152-172; Sandada, Pooe & Dhurup 2014:659-670). Due to increasing competition, pressure to reduce lead times, and the risks associated with a less loyal customers, SME owners and managers are increasingly concerned by their performance and how it is managed (Bahri, St-Pierre & Sakka 2010:606).

The major concern is that although in theory, many performance measurement tools are valid, they hardly take into account the fundamental differences between SMEs and larger firms, thereby resulting in the poor adoption of performance measurement practices in SMEs (Ahmad & Alaskari 2013:488). Considering the difficulty in collecting valid performance data from SMEs and the reluctance of SME owners to share actual performance data (Gronum 2015:36), non-financial performance measures were used in the study. The use of self-

reported non-financial measures were also justified in other studies (Chow & Van der Stede 2006:5; Tapinos, Dyson & Meadows 2005:378).

2.6 Theoretical underpinning

This study draws from a resource-based view (RBV) of the firm. According to the RBV, organisational resources are developed into capabilities that help an enterprise to manage its environment and enhance performance (Kozlenkova, Samaha & Palmatier 2013:3). Resources can be assets, processes, information and knowledge, while technology, customers and capabilities include organisational processes and routines rooted in knowledge (Aminu & Mahmood 2015:443).

According to the present study, these resources are developed through a routine of collaborative planning and supply chain integration. The RBV theory postulates that enterprises share their resources by integrating their functions and plans to create inimitable capabilities that will improve their competiveness and performance by either sharing their resources, raw material and ideas through integration and collaborative planning to maintain a strong competitive advantage (Garg & De 2014:312).

Hence, this study asserts that an enterprise's resources are developed through supply chain integration and that collaborative planning generates superior rents and provide competitive capabilities, which improve the performance of an enterprise.

3. CONCEPTUAL MODEL AND HYPOTHESES DEVELOPMENT

Drawing from the preceding literature review a research model is conceptualised in Figure 1.

The study's conceptual model is depicted in Figure 1. The model is derived from the hypothesised relationships between research constructs. These relationships are examined and developed later. In the conceptualised research model, supply chain integration, collaborative planning, supply chain capabilities are the predictor variables while firm performance is posited to be the outcome variable

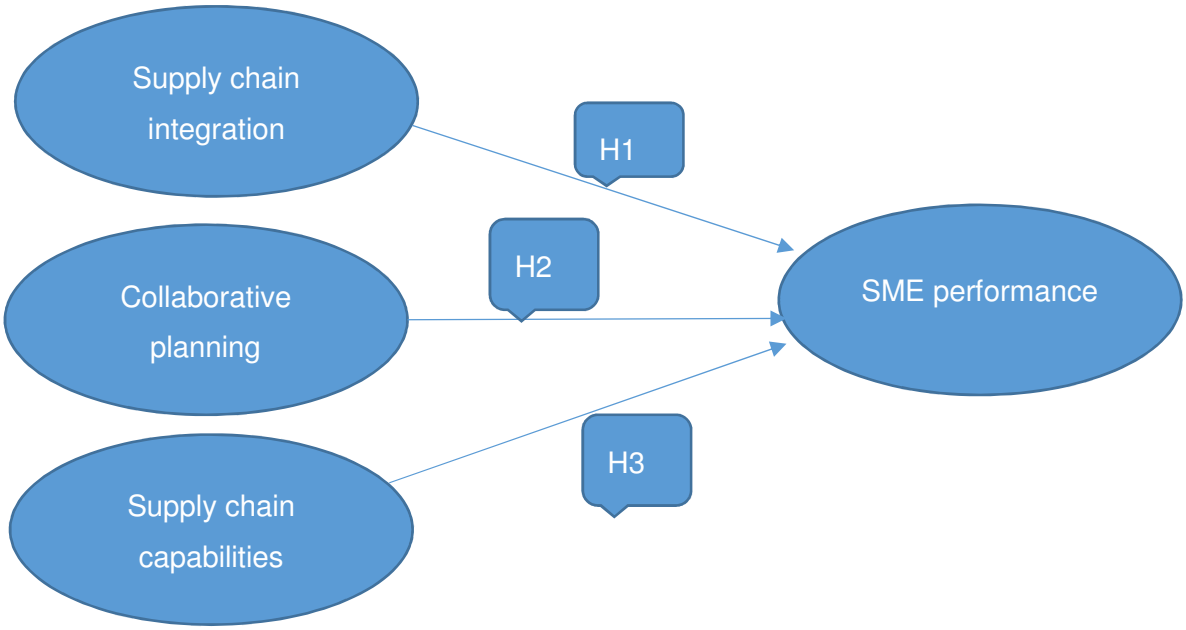

FIGURE 1: Conceptual research model

Source: Own compilation

3.1 Supply chain integration and firm performance

The relationships between supply chain integration and firm performance has been a subject of interest by several researchers. The reason for this is the increasing requirement for firms to integrate with numerous commercial partners, internal corporate sections, business processes and various customers across the supply chain (Kotcharin, Eldridge & Freeman 2012:1). Cannon et al., (2010:509) note that the higher the integration level the better the better the firm performance will be, and the better firms will respond to their business challenges strategically, operationally, and technologically.

Being innovative and embracing new opportunities will also lead to improved firm performance (Van der Vaart & Van Donk 2008:111). In this regard, Huang et al. (2014:74) found in their study that there was a positive and significant relationship between SCI and supplier performance, and that uncertainty in demand may moderately weaken the relationship.

In their study of manufactures in The Netherlands and Spain, Gimenez et al. (2012:603) found that supply chain integration improves performance provided supply complexity is high, while a very limited or no influence of supply chain integration can be detected in cases of low supply complexity. Beheshti et al. (2014:28) also found that enterprise supply chain integration resulted in a better level of financial performance for enterprises. Other studies have also found a similar significant and positive relationship between SCI and business performance (e.g. Huo, Han, Zhao, Zhou, Wood & Zhai 2013:82-94; Swink, Narasimhan & Wang 2007:148-164; Xu, Huo & Sun 2014:1186-1206; Yu, Jacobs, Salisbury & Enns 2013:346-358). In view of the foregoing, the following hypothesis is formulated:

H1: There is a positive and significant relationship between supply chain integration and firm performance

3.2 Collaborative planning and firm performance

Previous studies indicated that supplier collaboration helps firms reduce transaction cost and procurement hazards so they can achieve their competitive positions (Kohli & Jensen 2010: 1-16; Sheu, Yen & Chae 2006 24-49). In their study of the role of partnership in supply chain performance, Ryu, So and Koo (2009:509) found a positive relationship between collaboration and performance.

Cao and Zhang (2011:174) found that efficient and effective collaborative practices is a fundamental determinant of performance enhancement from suppliers. Similarly, in their study of the German automotive industry, Wiengarten, Humphreys, Cao, Fynes and McKittrick (2010:468) found a positive and significant relationship between collaborative practices and firm performance. In view of the above, the following hypothesis is posited:

H2: Collaborative planning has a positive influence on firm performance

3.3 Supply chain capabilities and firm performance

Supply chain capabilities (SCC) include adopting long-term relationship; fostering collaborative communication; designing and using cross-functional teams; and involving supply-chain partners to create and deliver strategic value to customers and other stakeholders (Lado, Paulraj & Chen 2011:205).

Empirical studies on SCC have generally investigated the association of firms' capabilities with their competitive advantages and/or performance (Armstrong & Shimizu 2007:959-986; Newbert 2007:121-46; Ray, Barney & Muhanna 2004:23-37). In their study on dynamic capabilities in supply chains, Cheng, Chen and Huang (2014:173-186) found that dynamic capabilities have a positive impact on inter-organsational innovation performance. According to Lintukangas, Hallikas, Koivisto-Pitkänen and Kähkönen (2016:2112), SCC are organisational-level assets that may have an impact on competitiveness and performance. Accordingly, it is hypothesised that:

H3: Supply chain capabilities have a positive influence on SME performance.

4 RESEARCH METHODOLOGY

4.1 Research design

Quantitative research involves the collection of raw data from a large sample size with a view to generalise results to a greater population (Moutinho & Hutcheson 2011:236). Further, quantitative studies allow for statistical tests and estimates about relationships between research constructs as well as generalising inferences about the defined target population (SMEs). Thus, the survey method was considered appropriate for the present study since data was collected by means of a questionnaire from a relatively large sample (Malhotra 2010:312).

4.2 Sample and data collection

To validate the conceptual model empirically, a survey was conducted on SMEs in the Vaal Triangle region (Vanderbijlpark, Vereeniging, and Sasolburg) on a sample size of 300 SMEs. Due to the non-availability of a single reliable database that could be used as a sampling frame, the study applied non-probability, purposive sampling. A self-administered survey was used and 300 questionnaires were distributed to respective SMEs after making appointments with managers and/or owners. Data were collected over a period of four months from February until May 2015 from managers and/or owners of the participating SMEs.

To ensure a speedy and effective process, questionnaires were distributed in person by one of the researchers who was assisted by a trained fieldworker in the distribution process. As a result, 211 of the 238 collected questionnaires were usable for data analysis, representing a response rate of 70%, which is considered good by many standards (Nulty 2008:303).

Three reviewers, all academics, were asked to test the face validity and clarity of the questionnaire measures, with some consequential minor wording changes. There were no material errors or changes proposed during the pre-testing as the reviewers were largely satisfied with the clarity of the questions.

4.3 Measurement instrument and design

The measures used in this study were adapted from several previous studies. Relevant adjustments were made to suit the current research context and purpose. The measurement items were measured using a 5-point Likert scale with the following representative values: 1-strongly disagree to 5-strongly agree. The scale is based upon the assumption that each statement item on the scale has equal attitudinal value, importance or weight in terms of reflecting attitudes towards the issued questions (Kumar 2014:145). Supply chain integration items were adapted from Prajogo and Olhager (2011:514), collaborative planning items were adapted from Kim (2009:328) while supply chain capabilities items were adapted from Morash and Lynch (2002:51) and SME performance items were adapted form (Li, Yang, Sun & Sohal 2009:546).

4.4 Data analysis

The analysis of the collected data was done using three statistical tools, namely, Microsoft Excel, Statistical Package for Social Sciences (SPSS) version 22.0, and AMOS version 22.0. Data were coded on an Excel spreadsheet, followed by importing the data into the (SPSS) format. After formatting the data into SPSS, descriptive statistics were used to analyse data pertaining to the demographic profiles of the SMEs. Subsequently, the final stages of the data analysis were conducted, which included the confirmatory factor analysis (CFA) and path modelling using AMOS 22.0 statistical software.

5. RESEARCH RESULTS

The results section is divided into three sub-sections; namely, the sample description of respondents, confirmatory factor analysis, and path modelling results.

5.1 Sample description of participating SMEs

The profile of SMEs that participated in the study is reported in Table 1.

TABLE 1: Respondents' profile

		Frequency	Percentage (%)
Type of ownership	Co-operatives	23	10.90
	Sole proprietor	40	18.96
	Close corporation	53	25.12
	Private enterprises	46	21.80
	Partnerships	49	23.22
	Total	**211**	**100.00**
Nature of the business	Mining	6	2.84
	Manufacturing	22	10.42
	Retail	40	18.96
	Construction	27	12.80
	Transport and logistics	52	24.64
	Tourism	27	12.80
	Finance/Insurance	25	11.85
	Community	12	5.69
	Total	**211**	**100.00**

		Frequency	Percentage (%)
Number of employees	21-50	48	22.75
	51-100	55	26.07
	101-200	108	51.18
	Total	**211**	**100.00**

Source: Own compilation

Table 1 shows that the majority of respondents operate in the transport and logistics industry (24%), followed by retail (19%), then construction (13%) and tourism (13%). Further, of the majority, (51%) employ between 101 and 200, indicating that they are medium-sized.

5.2 Reliability and validity

Reliability refers to the similarity of results provided by the independent but comparable measures of the same object or construct, or an index of consistence (Iacobucci & Churchill 2010:258). In this study, the researcher employed item-total correlation values, Cronbach's coefficient alpha (α), composite reliability (CR) and average variance extracted (AVE) to check the measurement reliability.

The researcher tested the internal reliability of each construct using the standardised Cronbach's coefficient alpha, where a higher level of Cronbach's coefficient alpha showed higher reliability of the measurement scale. Higher item-total correlations were employed in complement of the Cronbach's coefficient alpha, which revealed statistical agreement among the measured items. The results of scale reliability tests are shown in Table 2.

5.3 Ethical considerations

Respondents were advised that their participation in the study was on a voluntary basis and that if they so wish, they could withdraw from the process at any point. Their anonymity was assured and so was the confidentiality of the information provided.

TABLE 2: Composite reliability

Composite reliability research construct	Composite reliability
Supply chain integration) (SCI1,2,3,4,5,6)	0.86
Collaborative planning (CP1,2,3,4,5)	0.77
Supply chain capabilities (SCC1,2,3,4)	0.85
Firm performance (FP1,2,3,4)	0.68

Source: Own compilation

Validity is concerned with whether an instrument or test actually measures the attributes it is meant to measure. It can be defined as the extent to which differences in observed scale scores reflect true differences between objects on the characteristics being measured, rather than systematic or random errors (Kimberlin & Winterstein 2008:2280). As for validity, both convergent and discriminant validity were checked. Convergent validity was checked using item total correlation, item loading and AVE values whereas discriminant validity was assessed using AVE values, compared to shared variance and the inter construct correlation matrix. (Jayasinghe-Mudalige, Udugama & Ikram 2012:31).

The results are shown in Table 3.

Table 3 shows the factor loadings, which ranged from 0.662 to 0.789. Therefore, all the items finally used had a loading of more than the recommended threshold of 0.5, indicating acceptable individual item convergent validity, as more than 50 percent of each item's variance was shared with its respective construct (Anderson & Gerbing 1988:415). This evidence supported the convergent validity of all scale items.

Furthermore, the composite reliability was above the recommended threshold of 0.6 and, therefore, further validates the existence of convergent validity. Convergent validity complements discriminant validity (Hair, Anderson, Tatham & Black 2006:115).

TABLE 3: Accuracy analysis statistics: factor loadings

Construct	Factor loadings	Reliability
Supply chain integration		
SCI6	0.411	
SCI5	0.932	
SCI4	0.534	0.789
SCI3	0.770	
SCI2	0,000	
SCI1	0.007	
Collaborative planning		
CP1	0.735	
CP2	0.753	0.662
CP3	0.760	
CP4	0.537	
CP1	0.457	
Supply chain capabilities		
SCC1	0.528	
SCC2	0.771	0.663
SCC3	0.722	
SCC4	0.828	
Firm performance		
FP1	0.711	
FP2	0.813	0.669
FP3	0.713	
FP4	0.762	

Source: Own compilation

The correlation matrix and the Chi-square CFA test methods were used to check the discriminant validity of the research constructs. When research concepts are different their correlation value should be less than one (1.0). Yet a correlation value between constructs, of less than 0.7 confirms the existence of discriminant validity (Hair, Babin, Anderson & Tatha 2010:762).

Otherwise, discriminant validity related to the correlation matrix can be tested by checking whether the Average Variance Extracted (AVE) for two constructs is greater than the square of the correlation between the constructs (Hair *et al*. 2006:778). Discriminant validity in this study was checked by evaluating whether the correlations among the latent constructs were less than 1.0. Table 5.4 below, provides examples of assessing discriminant validity.

TABLE 4: Correlations between constructs

	SCI	CP	SCC	FP
SCI	1.00			
CP	0.787**	1.00		
SCC	0.609	0.775**	1.00	
FP	0.715	0.456	0.720	1.00

Source: Own compilation

Note: SCI=supply chain integration, CP= collaborative planning, SCC= supply chain capabilities, FP= firm performance

5.4 Research model fit assessment

A confirmatory factor analysis was employed to establish whether or not the model was fit for the conceptualised research model. Model fit indicators such as Chi-square degrees of freedom, Goodness of Fit Index (GFI), Augmented Goodness of Fit Index (AGFI), Normed Fit Index (NFI), Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), Composite Fit Index

(CFI) and RMSEA were used to assess the model fit. The CFA results are as illustrated in Table 5.

TABLE 5: CFA results

Fit index	Results
Chi-Square/ d.f.	2.173
CFI (Comparative Fit Index)	0.975
RMSEA (Root Mean Square Error of Approximation)	0.063
NFI (Normal Fit Index)	0.895
TLI (Tucker Lewis Index)	0.949
IFI (Incremental Fit Index)	0.878

Source: Own compilation

From Table 5, the ratio of chi-square over degree-of-freedom was 2.173. This value is less than the recommended threshold of less than 3.0 and, therefore, confirms the model fit. Additionally, CFI, NFI, TLI, and IFI values were above the recommended threshold of 0.8 whereas the RMSEA values less than 0.08, suggesting that the proposed conceptual model converged well and could be a plausible representation of the underlying empirical data structure collected (Hair *et al*. 2006:35-37).

Since the model fit was acceptable, the study proceeded to test the research hypotheses, which are both linear and nonlinear as shown in the conceptual model in the next section. After obtaining an acceptable CFA measurement, the study then proceeded to the hypothesis testing stage by using SEM. Table 6 presents the results of SEM.

From Table 6, the ratio of chi-square over degree-of-freedom was 1.899. This value is less than the recommended threshold of less than 3.0 and, therefore, confirms the model fit. Additionally, GFI, NFI, RMR, IFI, CFI, TLI, and RMSEA values were 0.874, 0.944, 0.078, 0.973, 0.972, 0.962 and 0.065.

TABLE 6: SEM Model Fit Results

Fit index	Results
Chi-Square/ d. f.	1.899
CFI (The comparative fit index)	0.874
RMR (Root Mean Square Residual)	0.078
CFI (Comparative Fit Index)	0.972
RMSEA (Root Mean Square Error of Approximation)	0.065
NFI (Normal Fit Index)	0.944
TLI (Tucker Lewis Index)	0.962
IFI (Incremental Fit index)	0.973

Source: Own compilation

All these model fit measures were above the recommended marginally accepted threshold of greater than 0.8 for GFI, NFI, RFI, IFI, CFI, TLI and less than 0.08 for RMSEA, which suggests that the proposed conceptual model converged well and could be a plausible representation of the underlying empirical data structure collected. Since the model fit was acceptable, the study proceeded to test the research hypotheses, which are both linear and nonlinear as shown in the conceptual model in the next section.

5.5 The hypotheses testing stage and results

The three tested hypotheses are stated, and addressed their validation or non-validation based on the SEM results tabulated in Table 7. After the modification of the full conceptual model, and results were obtained from it, the rest of the hypotheses were supported. The results are presented in Table 7.

TABLE 7: Results of the hypothesis testing

Path coefficients	Hypothesis	Factor loading	Significance
H1: Supply chain integration and firm performance	FP <--- SCI	0.779 (significant)	***
H2: Collaborative planning and firm performance	FP <--- CP	0.248 (supported)	0.050
H3: Supply chain capabilities and firm performance	FP <--- SCC	0.673 (significant)	***

Source: Own compilation

Structural model fits: $\chi 2/df=1.899$; GFI=0.874; NFI=0.944; RFI=0.923; IFI=0.973; TLI=0.962; CFI= 0.972; RMSEA=0.065. Note: c significance level - ***p-value<0.001, b significance level- **p-value<0.05, a significance level- *p-value<0.1, ns significant level- insignificant (p-value>0.1).

Table 7 shows the three hypothesised linear relationships, discussed below:

6. DISCUSSION

6.1 Supply chain integration and SME performance

A positive relationship was hypothesised between supply chain integration and SME performance. This hypothesis aimed to investigate the impact of supply chain integration on firm performance. The positive factor loading (0.779) confirms the existence of a positive linear relationship between supply chain integration and performance. Such results are consistent with the findings of Rosenzweig, Roth and Dean Jr. (2003:45), which proposes that highly integrated organisations are posited to obtain a competitive advantage relative to more independent firms in two main ways.

Firstly, that in the face of the ever-changing environment in such areas as competition, technology, and regulation, information visibility and operational knowledge enable supply chain partners to become more responsive.

Secondly, firms operating within highly integrated supply chains are more likely to have reduced net costs of conducting business and the total delivered costs to customers.

However, the existence of a negative factor loading accompanied by a p-value more than 0.5 resulted in the validation of H1, **therefore, H1 was supported and valid.**

6.2 Collaborative planning and SME performance

H2 depicted that collaborative planning has a positive impact on SME performances and the researcher accordingly hypothesised a linear relationship between collaborative planning and SME performance. Based on the positive factor loadings (above 0.5) and their significance level of p-values less than 0.001, this relationship (H2) was validated.

Further evidence shows that collaborative relationships enable firms to manage risk by sharing and providing access to complementary resources, thereby enhancing profitability and performance (Davis & Spekman 2003:54). This result corroborates a study by Vachon and Klassen (2006:795–821) who found that for collaboration to result in improved performance, there needs to be direct interaction between the supply chain partners, which involves knowledge and experience sharing. The results on the support of H2 are shown in Table 7. **Therefore, this study validates and supports the hypothesis** that collaborative planning has a positive influence on SME performance**.**

6.3 Supply chain capabilities and SME performance

Supply chain capabilities and firm performance was validated because it had a positive factor loading of 0.673, which is greater than the recommended value of 0.05 (Hair et al. 2010:115). H3 was also supported because it was significant, with a positive significance level of closer to 0.001 (c significance level with 3 stars ***).

These results are consistent with previous studies, which found a positive relationship between the supply chain capabilities and firm performance (Wu *et al*. 2006:493–504). These capabilities are utilised both individually and in bundles to improve firm performances.

Therefore, this study validates and supports the hypothesis that supply chain capabilities have a positive influence on the firm' performance.

7. LIMITATIONS AND FUTURE RESEARCH

Notwithstanding the model fit determined by the study and its contribution to both academia and practice, it was limited in some ways, and therefore some future research directions are suggested.

Firstly, while using convenience rather than simple random sampling was deemed most expedient for this study, it is acknowledged that it is not ideal for the accuracy of the results. *Secondly*, the results of this study are based on a cross-sectional nature of the study, which by its nature, does not allow for the firm causality among latent variables.

In the light of these limitations, the following directions for future research are suggested. Similar studies could be conducted in the future, using bigger sample sizes and a wider geographic area. In addition, the study could yield more insightful results if it is conducted in industry-specific SME categories such as manufacturing, construction, retail and mining. It might also be more interesting to expand the study to include larger businesses. A longitudinal study investigating the causal effects might be more instructive. Since this study employed self-reported and non-financial measures for performance, future research could use financial measures.

8. CONCLUSION

The purpose of this study was to examine the relationship between supply chain integration, supply chain capabilities, collaborative planning, and SME performance. To this end, three hypotheses were postulated. To test the proposed hypotheses, data were collected from SMEs businesses in Vaal Triangle, South Arica.

The empirical results supported all three proposed research hypotheses in a significant way. The findings of this empirical study are expected to provide helpful guidance to practitioners and academics. Academically, this study makes a significant contribution to the SMEs performance and supply chain literature by determining the relationship between supply

chain integration, collaborative planning, supply chain capabilities and SME performance in the context of South African SMEs.

On the practitioners' side, the current study's findings lend credence to the notion that by investing on supply integration tools, by planning collaboratively and by developing supply chain capabilities, SMEs can improve their own performance. As the findings indicate, supply chain integration has a strong influence on SME performance, possibly due to effective configuration of the integration mechanisms in the areas of technology, systems, relationship management, business strategy, product development, and process design, among other things. Thus, SMEs need to adopt integrated systems and supply chain processes with their suppliers, customers, logistics service and banks. This will require SMEs to be willing to share information regarding demand plans and forecasts, production schedules, and distribution channels with their suppliers and customers. To this end, the internet and appropriate technologies can be useful communication tools for improving the quality and accuracy of the relevant information. It is time that SMEs begin to place technology at the very heart of their strategies. While SMEs may find this investment costly, it may be worthwhile as the results of the present study have shown that supply chain integration leads to improved performance.

Whilst the role played by SMEs in economies was highlighted at the outset, this study points to the fact that supply chain integration, collaborative planning, and supply chain capabilities will likely result in improved SME performance. Collaborative planning will enable SMEs to pull their resources together, which may help them improve their capabilities, reduce time to market, and gain access to new markets. This will likely lead to gaining competitive advantage. To achieve these benefits would require SMEs to consciously develop supply chain capabilities such as sourcing, supplier performance management, managing logistics service providers, and the use of technology in supply chains, among others.

This study therefore submits that to enhance their business performance, SMEs should integrate their supply chain activities, improve their collaborative planning and ensure that they hone their supply chain capabilities. The implication is that when SMEs share resources and knowledge in the areas of product design, information and communication technology,

and distribution channels across the supply chain, they are likely to reduce unnecessary risks and costs in the process, resulting in improved business performance.

To that end, SMEs need to develop inter-organisational and information capabilities that integrate a firm with its supply chain partners to create and deliver value for the firm. This calls for ensuring an effective interface of information and communication technologies between SMES and buying firms in the supply chain.

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