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The impact of green supply chain management in small to medium enterprises: Cross-sectional evidence

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Background: South Africa has a high rate of small to medium enterprises (SMEs) failure, especially in the manufacturing sector. The operational challenges confronting manufacturing SMEs are acknowledged by the Global Competitiveness Index that ranked South African SMEs as one of the lowest in emerging economies.

Objectives: The aim of this study is to examine the association between green supply chain management (GSCM) practices, environmental collaboration and financial performance in SMEs.

Method: The study is quantitative in nature and involves a convenient sample of 312 SMEs based in Gauteng Province, South Africa. Data analyses follow a two-step process involving a confirmatory factor analysis to test the psychometric properties of the measurement scale and Structural Equation Modelling to test the proposed hypotheses.

Results: The study shows that three GSCM practices, namely, green procurement, green logistics and green manufacturing in SMEs exert a positive effect on environmental collaboration, with green manufacturing exerting a higher effect than the other two constructs. In turn, higher levels of environmental collaboration inspired higher levels of SME financial performance.

Conclusion: The study advances that SMEs can succeed financially through the influence of enhanced environmental collaboration, which emanates, in part, from the adoption and implementation of GSCM practices.

Introduction

Over the years, green supply chain management (GSCM) has attracted extensive research interest as a business practice and strategic option (Chin, Tat & Sulaiman 2015; Lee, Kim & Choi 2012; Zhu, Sarkis & Lai 2012). Although research has examined the effect of greening the supply chain on organisational performance, the majority of such studies have been confined to large corporations with less attention devoted to Small Medium and Micro Enterprises (Ahi & Searcy 2015; Mitra & Datta 2014; Shang, Lu & Li 2010). This is despite the view that, globally, small to medium enterprises (SMEs) contribute immensely to employment creation and economic growth (Cant & Wiid 2013). In South Africa, it is estimated that SMEs contribute up to 57% of the gross domestic product and 60% in terms of employment (Bureau for Economic Research, 2016). However, notwithstanding these contributions, a host of challenges, such as lack of operational skills, access to finance, attracting and retaining skilled personnel, continue to plague the survival of SMEs in South Africa (Pretorius 2009). Hence, growth and development of the SME sector in South Africa remain constrained.

With the ever-growing concern on environmental sustainability, the challenges confronting SMEs in the manufacturing sector are becoming more amplified (Urban & Naidoo 2012). As noted by Rettie, Burchell and Riley (2012) environmentalism continues to influence corporate strategy in the 21st century, and operational skills lacking in SMEs appear to be embedded in the concept of GSCM. Apart from the operational advantages associated with GSCM, greening of the supply chain provides business opportunities in product innovation and eco-preneurship (Kirkwood & Walton 2010; Mohanty & Prakash 2014). Thus, this study aims to contribute to and address the gap in operational skills of manufacturing SMEs by examining the influence of GSCM on environmental collaboration and financial performance.

Problem statement

Although the South African government has made significant strides to promote the sustainability of SMEs, incidences of failure are still high (Fatoki 2014). It is estimated that 71%

of SMEs in South Africa fail to sustain operations beyond one year (Peyper & Liesl 2013). This positions SMEs in South Africa as some of the lowest in terms of survival rate in the world (Cant & Wiid 2013). According to Mohanty and Prakash (2014), managing production costs and improving operational skills are critical for SMEs' sustainability in the manufacturing sector. Similarly, Urban and Naidoo (2012) identified sound operational strategies as a vital cog for the survival of SMEs. The operational challenges bedevilling manufacturing SMEs are acknowledged by the Global Competitiveness Index that ranked South Africa as one of the lowest emerging economies in terms of manufacturing competitiveness (World Economic Forum 2016). This increases the need for both researchers and practitioners to continue to seek ways of mitigating these challenges in order to boost the survival rate of SMEs in South Africa.

Given the background of the increased failure of SMEs, Urban and Naidoo (2012) assert that GSCM is central to business performance enhancement in SMEs. In order to enhance business performance, SMEs in the manufacturing sector across the globe are embracing GSCM principles (Chin et al. 2015; Lee et al. 2012; Zhu et al. 2012). Proponents of GSCM (e.g. Ahi & Searcy 2013; Liu et al. 2011; Rettie et al. 2012) perceive that the adoption and implementation of GSCM strategies results in pertinent paybacks that include operational efficiency, market share growth, financial performance, cost reduction, corporate image and environmental sustainability, among others. However, in order to proffer GSCM as a strategic option in SMEs, the relationship between GSCM and SME performance clusters such as financial performance, competitive advantage, stakeholder satisfaction, resource mobilisation, and overall goal accomplishment needs to be examined. This will provide the springboard for SMEs in South Africa to fully adopt GSCM as a strategic option. This study argues that GSCM is a potential strategic option for SMEs. Previous studies conducted on SMEs in South Africa (e.g. Cant & Wiid 2013; Perks & Smith 2008) focused on the resource perspective with little attention devoted to the operational aspect. To address this gap, this study adopts an operational perspective to examine the potential influence of GSCM practices and environmental collaboration on the financial performance of SMEs in South Africa.

The remainder of this article is partitioned as follows: the next section outlines the research objectives. This is followed by the review of literature and the development of the hypothetical model as well as the hypotheses. The methodology that guides the study is then discussed. Finally, the results of the study, discussions, conclusions and implications are provided.

Research objectives

The aim of this study is to examine the relationship between GSCM practices, environmental collaboration and financial performance in SMEs. In order to address this aim, the following objectives were formulated:

- to examine the influence of green procurement, green logistics and green manufacturing on environmental collaboration
- to examine the influence of environmental collaboration on financial performance.

Trends from previous literature

Evolution and growth of green supply chain management

GSCM evolved from the concept of green marketing, which is aimed at enhancing environmental sustainability and sustainable development (Seuring & Gold 2013). In its application, GSCM is a multi-faceted concept identified by a repertoire of terms such as sustainable supply chain management, closed-loop supply chains, environmental supply chain management, reverse logistics and green manufacturing (Abbasi & Nilsson 2012; Ahi & Searcy 2015; Carter & Easton 2011; Govindan & Cheng 2011). GSCM builds on the tenets of the traditional value chain by incorporating environmentally conscious processes such as green design and manufacturing, resource conservation, waste management, remanufacturing, product recycling and re-usage (Ahi & Searcy 2015; Golicic & Smith 2013).

According to Ahi and Searcy (2013), GSCM is defined as the inter-organisational coordination of value chain processes that integrates economic, environmental and societal considerations with the aim of fostering organisational performance. GSCM has evolved from a compliance perspective to an integrated inter-organisational concept aimed at enhancing environmental well-being and organisational performance (Zhu, Tian & Sarkis 2012). The benefits of GSCM include operational and relational efficiency, enhanced corporate image, environmental sustainability and financial performance (Lee et al. 2012; Wisner, Tan & Leong 2012; Zacharia et al. 2009). Zhu, Sarkis and Lai (2008) suggest that GSCM enhances operational efficiency through cost reduction, improved product quality and faster production lead times. GSCM enhances supply chain collaboration by increasing trust, open communication and mutual cooperation among value chain members (Zacharia et al. 2009). Chin et al. (2015) add that the overall benefits of GSCM are environmental sustainability and financial performance. Moreover, Urban and Naidoo (2012) opine that the key SMEs benefits that accrue from GSCM implementation include low production costs, shorter order cycles and lead times, market share growth, product quality and good corporate image. Therefore, GSCM has evolved to become a key practice that benefits organisations in numerous ways.

Green supply chain management practices

GSCM practices consist of a set of green value chain addition processes such as green logistics, green manufacturing and green procurement (Chin et al. 2015; Ninlawan et al. 2010). In essence, the adoption of GSCM practices redirects the functional areas of the organisation, as illustrated in Table 1.

Environmental collaboration

Environmental collaboration is a concept that refers to the process in which business partners work together for a common purpose (Huang & Yu 2011). In the context of a supply chain, these partners include all stakeholder groups that include, inter alia, suppliers, manufacturers, wholesalers, retailers, competitors, regulatory authorities and customers (Charvet 2008). The inclusion of competitors should not be surprising because collaborations are grounded on embracing partners that the organisation does not normally work with (Findik & Beyhanb 2015). The rationale behind environmental collaboration is that all stakeholders need each other; therefore, they must work in synergy for mutual benefit and success (Un, Cuervo-Cazurra & Asakawa 2010). In addition, the pursuit of innovative solutions to business challenges, rather than mere compromise is another fundamental premise of collaborations (Dean 2010; Hansen 2009). In other words, the success of a business enterprise in current times depends on how well it is linked to other organisations that influence and are influenced by its activities (Todeva & Knoke 2005). Thus, environmental collaborations have emerged as a critical activity to the long-term prosperity of business enterprises.

TABLE 1: The implications of green supply chain management on business functions.

Green Supply Chain Management Practice	Impact
Green manufacturing or operations function	Focus on profitability by using environmentally friendly operations.
	Produce durable products from design to disposal by decreasing ecological damage.
	Consider input costs in terms of regulations, energy use and disposal.
	Use eco-friendly materials, procedures and processes and minimise emissions.
	Use lean manufacturing to incorporate green goals into productive outcomes.
	Production methods, tools and techniques must satisfy environmental requirements and market needs.
	Research and development should explore new sustainable ways of extracting raw materials and new methods to minimise energy generation.
Green marketing or sales function	Enhance consumer awareness of green products.
	Satisfy consumer needs for green products in a green manner to ensure business credibility.
	Create a balance between profitability and environmental concern.
	Having good environmental credentials provides a competitive advantage.
	Portray an environmentally friendly business image through green marketing communications.
Green procurement	Seek suppliers with green production processes to offset environmental risk.
	Choose suppliers with good waste management systems.
	Select suppliers committed to sound environmental performance.
Green logistics	Limit carbon emissions linked to the transportation of goods.
	Use biofuels as fuel alternatives and greener technologies.
General management or Human resources function	Communicate green business strategies to staff for effective goal attainment.
	Use green workplace, corporate culture and reward systems to encourage green activities.
	Employ experts in environmental development to implement environmentally friendly systems.
	Design business strategies to address environmental issues that satisfy stakeholder expectations.
	Foster a green organisational culture through employee training and development.
Finance or information technology function	Emphasise sustainability reporting in line with the triple-bottom-line concept and auditing systems.
	Institute green accounting policies and use an integrated eco-information system.
	Use advanced cutting-edge technology to move to a paperless administrative environment.
	Get up-to-date information about new environmentally friendly technology.

Sources: Garen (2009); Silins (2009); Smith and Perks (2010)

In the context of supply chain management, the long-term benefits of GSCM depend on the commitment and cooperation of supply chain members such as suppliers, manufacturers, wholesalers, retailers and customers (Sarkis, Zhu & Lai 2011). Collaboration is pivotal to GSCM because of the level of interdependence between supply chain members whereby the output of one partner is a key input of another (Shang et al. 2010). Supply chain collaboration encompasses operational processes such as new product design, product innovation, procurement joint planning, distribution rationalisation, providing suppliers with product specification, sharing best practices, environmental sustainability, cost reduction and exchanging input in strategic planning (Gunasekaran, Subramanian & Rahman 2015; Li 2011; Paulraj, Lado & Chen 2008). For this reason, seamless integration of supply chain processes is considered the hallmark of GSCM implementation (Zhu, Geng & Lai 2010). According to Sarkis et al. (2011), the successful implementation of GSCM depends on the quality of collaborative effort, loyalty, fairness in negotiation and the collective trust of supply chain partners. The seamless flow of information within a green supply chain builds operational capabilities and relationships that limit the perception of risk and uncertainties in the operating environment (Cao & Zhang 2010; Carter & Rogers 2008; Ruan et al. 2012).

Financial performance

There is growing evidence in extant literature that environmental collaboration enhances the bottom line of the organisation (Zhu et al. 2012). Through environmental collaboration in the supply chain, financial performance is enhanced by symbiotic relationships that engender trust, cooperation and commitment and reduce operating risks (Lai 2009). However, it is worth noting that, as suggested by Zhu et al. (2012), financial performance improvements are more noticeable in the long term than in the short term when operational synergies among supply chain members are more integrated.

Challenges in fostering green supply chain management in small to medium enterprises

In order to successfully implement GSCM, SMEs need to grapple with a host of challenges. This explains the reason why some SMEs, especially in developing economies, tend to be ambivalent towards GSCM (Preuss 2011). The challenges confronting SMEs include lack of financial and human resources, limited innovation capability and limited operational knowhow (Abbasi & Nilsson 2012). As observed by Chin et al. (2012), the majority of SMEs are financially constrained to implement GSCM initiatives and

lack formalised organisational structures required to implement GSCM action programmes. For instance, Preuss (2011) noted that some SMEs are of the view that a formalised organisational structure limits flexibility in decision making. In addition, implementing GSCM requires innovative technological capabilities in the realms of green design, managerial competencies in supplier evaluation and negotiation skills, which are inherently scarce in most SMEs (Mohanty & Prakash 2014). Besides, there is need for employee training and development in order to inculcate a green corporate culture needed to roll out and sustain GSCM practices (Diabat & Govindan 2011). Although these challenges may prove insurmountable, GSCM remains a viable strategy in the long-term through cost savings and product differentiation (Mohanty & Prakash 2014).

Hypothetical model and hypotheses development

Figure 1 provides the hypothetical model utilised in this study to understand GSCM from the perspective of SMEs.

As illustrated in Figure 1, GSCM is the antecedent variable, which is multidimensional in nature and is represented in this case by three elements, namely, green procurement, green logistics and green manufacturing. Environmental collaboration is the mediator variable between GSCM and financial performance, the latter being the outcome variable. The GSCM phenomenon is of significant interest to SMEs' survival, especially in the operational domain. This is so because lack of top-notch operational stills has been cited as the major impediment of SME sustainability in South Africa (Blackburn, Hart & Wainwright 2013; Mbonyane & Ladzani 2011). An operational skill refers to a set of competencies related to production efficiency and meeting customer requirements (Luthra, Gary & Harleem 2014). GSCM acknowledges green procurement, green manufacturing, green distribution and green logistics as operational dimensions required by SMEs to enhance competitiveness (Lee et al. 2012; Thoo et al. 2014; Wisner et al. 2012).

Green procurement represents a set of best practices employed by the firm to evaluate and select suppliers on the basis of environmental performance and compliance with environmental regulation (Paulraj 2011). The key benefits of green procurement to SMEs include cost reduction, waste reduction and enhanced corporate image (Chien 2014). However, Chin et al. (2015) noted that the benefits accruing from green procurement are contingent on the support of suppliers. Thus, it is hypothesised that:

- **Null hypothesis 1 (Ho_1):** There is no association between green procurement and environmental collaboration in SMEs.
- **Hypothesis 1 (H_1):** There is a positive relationship between green procurement and environmental collaboration in SMEs.

The green logistics value chain is defined as a sequence of interrelated activities involving the retrieval of used products from the consumer through recycling, remanufacturing or reusing (Genchev et al. 2010; Mangan et al. 2012). It can be deduced from the green logistics definition that customers, suppliers and manufacturers play a central role in green logistics implementation. Accordingly, it is hypothesised that:

- **Null hypothesis 2 (Ho_2):** There is no association between green logistics and environmental collaboration in SMEs.
- **Hypothesis 2 (H_2):** There is a positive relationship between green logistics and environmental collaboration in SMEs.

Green manufacturing is also a key component of GSCM. To SMEs, green manufacturing accords benefits such as new product development innovation, lean production and remanufacturing options (Chien 2014). In addition, GSCM reduces production costs and environmental non-compliance risks and improves corporate image and environmental performance (Lee et al. 2015). To sustain green manufacturing operations, Chin et al. (2015) as well as Elrod, Murray and Bande (2013) emphasised the importance of long-term collaborative relationships with suppliers. Thus, it is hypothesised that:

- **Null hypothesis 3 (Ho_3):** There is no association between green manufacturing and environmental collaboration in SMEs.
- **Hypothesis 3 (H_3):** There is a positive relationship between green manufacturing and environmental collaboration in SMEs.

Collaboration among supply chain members is the most critical success factor of GSCM (Azevedo, Carvalho & Machado 2011; Dangelico, Pontrandolfo & Pujari 2013; De Giovanni & Vinzi 2012). Green supply chain collaboration refers to the extent to which supply chain partners seamlessly integrate and mutually cooperate in performing value chain addition activities, such as procurement, transportation, warehousing, distribution, manufacturing and reverse logistics, in a manner that fosters organisational performance (Yang et al. 2013). The core benefits of green supply chain collaboration include synergies in procurement, cost reduction and operational leverage that translate into improved financial performance (Chen & Hung 2014; Zhu et al. 2010). The effective implementation of GSC collaboration results in

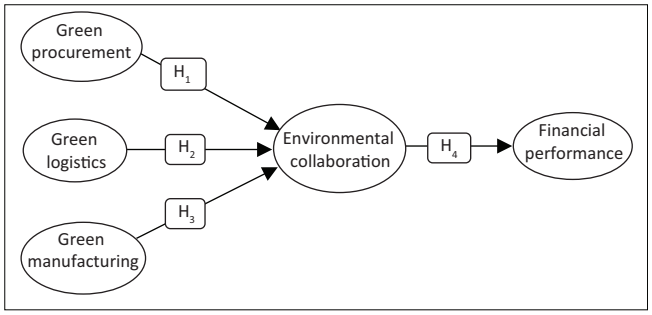

FIGURE 1: Hypothetical model of the association between green supply chain management, environmental collaboration and financial performance.

a reciprocal benefit among supply chain members that ultimately offers customer value and competitive advantage (Ramanathan, Gunasekaran & Subramanian 2011; Yang et al. 2013). As collaboration offers insightful market intelligence, operational synergies and relational efficiency (Lee et al. 2015; Zacharia et al. 2009), it is hypothesised that:

- **Null hypothesis 4 (Ho_4):** There is no association between environmental collaboration and financial performance in SMEs.
- **Hypothesis 4 (H_4):** There is a positive relationship between environmental collaboration and financial performance.

Research method

Research design

This study is quantitative in nature and based on a cross-sectional survey of manufacturing SMEs in South Africa. The selection of the research approach is premised on the hypothetical model illustrated in Figure 1. As suggested by Schmidt and Kohlmann (2008), cross-sectional surveys are usually relational because they are designed to scientifically investigate associations between two or more research constructs. In view of this, the survey method was deemed appropriate for this study because the interplay between several constructs (green procurement, green logistics, green manufacturing, environmental collaboration and financial performance) was under spotlight.

Research sample

The sampling region selected for this study is the Gauteng Province of South Africa. The Gauteng Province was selected as it is the heartland of entrepreneurship, accounting for approximately 38% of all SMEs in South Africa (Urban & Naidoo 2012). Although the precise number of SMEs in Gauteng Province is unclear, it is estimated that there are at least 1.1 million small businesses, which buttresses the notion that it is the province with the highest number of SMEs in South Africa (SME South Africa 2015). However, there apparently exists no known single reliable sample frame for SMEs in Gauteng Province, which made it difficult to employ probability sampling approaches in selecting participating SMEs. Accordingly, a non-probability convenience (or availability) sampling approach was employed to select sampling elements in this study. A convenience sampling approach is one in which the elements chosen for inclusion in the sample are those that are available to the investigators, such that all population elements do not have an equal chance of being selected (Ozdemir, Louis & Topbas 2011). Application of convenience sampling in this study made the data collection process easier and simpler and facilitated savings in terms of time and the costs of conducting the study.

Measurement scales

The questionnaire includes measures for green procurement, green logistics, green manufacturing, environmental collaboration and financial performance. The measures for green procurement are adapted from Zhu et al. (2008), while those for green logistics are adapted from Zhang et al. (2014). The measures of green manufacturing are adapted from Govindan, Diabat and Shankar (2015). The measures of environmental collaboration are adapted from Zhu, Sarkis and Lai (2007) and designed to measure both collaboration with suppliers as well as customers. Measures of financial performance are adapted from Walker, Di Sisto and McBain (2008). The response format was a seven-point Likert scale anchored by 1 representing 'strongly disagree' and 7 representing 'strongly agree'. Words rather than numerical figures are preferred when labelling each point on the Likert scale as this assists in avoiding ambiguity and increasing the accuracy of each response Grekova et al. (2016). Appendix 1 outlines statements used to measure each construct in the study.

Research results

Sample demographic characteristics

In the present study, questionnaires were distributed to individual SME owners and managers in Gauteng Province, South Africa in March 2015. This was accomplished through the use of the drop-and-collect survey technique, which involves delivering self-administered questionnaires to be personally recovered later (Walker 1976). Initially, 500 questionnaires were distributed in the month of May 2015. Of this number, 347 questionnaires were returned, but after the screening, a total of 312 questionnaires were found to be usable, giving an acceptable response rate of 62%. Descriptive statistics in Table 2 indicate the educational level of each respondent, number of employees in each SME, age group of respondent, gender of respondent and the industry in which the SME operates and years of existence of the SME.

Table 2 shows that most of the respondents were holders of either a matric certificate (37.3%; n = 117) or a diploma (32.8%; n = 102). In terms of the number of employees in each SME, the majority of participating entities (51.2%; n = 160) employed less than 50 people. The most active ages sampled in this study were either in the 18–35 (45.1%; n = 141) or in 36–50 (43.4%; n = 135) age groups. The profile further indicates that a majority of the employees (74.7%; n = 233) were men while 25.3% (n = 79) were women. The study also reveals that most of the SMEs participating in the study (51%; n = 163) belonged to the agro processing industry. SMEs that had been in existence for less than 5 years were the majority (53.1%; n = 166). These statistics show that sample representativeness in terms of the demographic factors analysed in this study was adequate. Therefore, the results of this study are credible because the sample used is representative of the current demographic patterns within SMEs in South Africa as provided by Small Enterprise Development Agency (2016).

Measurement scale reliability and validity

Because this study is intended to test associations between various constructs, the two-step formula recommended by

TABLE 2: Demographic profile of respondents.

Demographic factor	*N*	%
Educational level		
Matric	117	37.3
Diploma or professional	102	32.8
Degree	67	21.5
Postgraduate	26	8.4
Total	**312**	**100**
Age group		
18–35 years	141	45.1
36–50 years	135	43.4
≥ 51 years	36	11.5
Total	**312**	**100**
Industry		
Agro processing	163	52.1
Chemical	35	11.3
Textile, clothing and footwear	46	14.6
Other	68	22.0
Total	**312**	**100**
Number of employees in SME		
≤ 50	160	51.2
51–100	104	33.3
101–200	48	15.5
Total	**312**	**100**
Gender		
Male	233	74.7
Female	79	25.3
Total	**312**	**100**
Years of existence of SME		
≤ 5	166	53.1
6–10	117	37.6
≥ 11	29	9.3
Total	**312**	**100**

SME, small to medium enterprise.

Anderson and Gerbing (1988) was embraced. The formula involves conducting a confirmatory factor analysis (CFA) first followed by using the testing of the proposed hypotheses. In this study, CFA is conducted to test the psychometric properties (reliability, validity and model fit specifications) of the measurement scale (Kline 2010). Only measurement scales that are consistent with the recommended thresholds should be used in a research study. The results are reported in Table 3.

In this study, reliability was measured using three indicators, namely, the Cronbach's alpha coefficient, composite reliability and average variance extracted (AVE) values. According to a suggestion by Mitchell and Jolley (1996), Cronbach's alpha values greater than 0.70 are considered to be acceptable because they demonstrate that the scale is internally consistent (reliable). As reported in Table 3, Cronbach's alpha values for all the scales ranged between 0.701 and 0.860, indicating that the scale was internally consistent. With respect to composite reliabilities, Fornell and Lacker (1981) recommend that a minimum threshold of 0.7 be applied in order to accept the reliability of the scale. In this study, composite reliability values for the measurement scales ranged between 0.711 and 0.856, which meets the minimum requirements. With reference to AVE values, Fraering and Minor (2006) suggest that values greater than 0.5 are indicative of acceptable reliability within a measurement scale. Again, this recommendation was satisfied in this study, where AVE values ranged between 0.593 and 0.853. Thus, all measurement scales used are considered to be reliable or internally consistent.

The study also tested for validity, apart from determining the reliability. Face validity was ascertained through a review of the questionnaire items by a panel of academics who are experts in supply chain management. To ensure content validity, a pilot study involving 50 conveniently selected SMEs was conducted. These SMEs were excluded from the main survey. Feedback from the panel of experts as well as the pilot survey was used to modify the questionnaire through improvements in structure, length and wording as well as technical formatting. Convergent validity was ascertained through checking if the item loadings were greater than 0.5, as recommended by Karatepe (2006). Table 2 reveals that all item loadings ranged between 0.516 and 0.902, which is beyond the recommended minimum values, thereby confirming the adequacy of convergent validity in this study. Discriminant validity was ascertained by checking if the AVE value was greater than the recommended minimum value of 0.5 and higher than the highest shared variance (SV) value (Fornell & Larcker 1981). Additionally, inter-construct correlations less than the marginally acceptable value of 0.85 (Hulland 1999) were also used as evidence of acceptable discriminant validity. These correlations are shown in Table 4.

Table 4 reveals that correlations between the constructs ranged between 0.511 and 0.734, which attests that discriminant validity was acceptable in this study. Furthermore, AVE values for all constructs are greater than the 0.5 threshold and higher than the values for the highest SV. This serves as further evidence that discriminant validity was acceptable in this study.

The following acceptable CFA model fit indices were used to ascertain how well the factor structure accounts for the correlations between variables in the data set (Westland 2015): the Chi-square/degree of freedom [$\chi^2/(df)$] value ≤ 3.0, the Comparative Fit Index (CFI) value ≥ 0.9, the Tucker and Lewis Index (TLI) value ≥ 0.9, the Incremental Index of Fit (IFI) value ≥ 0.9 and the Root Mean Square Error of Approximation (RMSEA) value ≤ 0.08. The results obtained in this study are as follows; $\chi^2/(df) = 2.31$, CFI = 0.953, TLI = 0.927, IFI = 0.962 and RMSEA = 0.06. These results show that an acceptable CFA measurement model was obtained, which enabled the study to proceed to the next phase of assessing the structural model fit and testing the hypotheses.

Research model assessment and hypothesis testing

In this study, hypotheses were tested using the Structural Equation Modelling (SEM) method. According to Bagozzi and Yi (2012), SEM is a statistical procedure for estimating the relationship between the constructs in a proposed model (in this case Figure 1). However, it is necessary to perform

TABLE 3: Accuracy analysis statistics.

Research construct	Item code	Factor loading	Cronbach's test		Mean value	C.R. value	AVE value	Highest shared variance
			Item total	α value				
Green procurement	GP1	0.902	0.738	0.701	5.473	0.711	0.654	0.58
	GP2	0.738	0.706					
	GP3	0.815	0.721					
	GP4	0.855	0.733					
	GP5	0.708	0.751					
Green logistics	GL1	0.707	0.725	0.827	5.717	0.826	0.609	0.59
	GL2	0.787	0.784					
	GL3	0.800	0.793					
	GL4	0.776	0.616					
	GL5	0.774	0.657					
Green manufacturing	GM1	0.736	0.672	0.860	5.916	0.856	0.593	0.53
	GM2	0.814	0.724					
	GM3	0.708	0.705					
	GM4	0.781	0.725					
	GM5	0.763	0.799					
Environmental collaboration	EC1	0.8.25	0.747	0.823	5.704	0.833	0.829	0.51
	EC2	0.843	0.766					
	EC3	0.896	0.789					
	EC4	0.777	0.763					
	EC5	0.753	0.753					
	EC6	0.783	0.744					
Financial performance	FP1	0.561	0.634	0.767	5.662	0.794	0.753	0.58
	FP2	0.587	0.683					
	FP3	0.544	0.655					
	FP4	0.516	0.612					

Scores: 1, strongly disagree; 4, neutral; 7, strongly agree.
C.R., composite reliability; AVE, average variance extracted.

TABLE 4: Correlations between constructs.

Research constructs	GP	GL	GM	EC	FP
Green procurement	1.000	-	-	-	-
Green logistics	0.725	1.000	-	-	-
Green manufacturing	0.661	0.534	1.000	-	-
Environmental collaboration	0.538	0.603	0.734	1.000	-
Financial performance	0.511	0.676	0.589	0.444	1.000

GP, green procurement; GL, green logistics; GM, green manufacturing; EC, environmental collaboration; FP, financial performance.

another model fit analysis prior to testing the relationship, in order to verify whether the collected data fit the proposed model (Westland 2015). Upon testing the structural model, it was observed that all model fit statistics were within acceptable thresholds, that is, $\chi^2/(df)$ = 2.762, CFI = 0.948, TLI = 0.909, IFI = 0.935 and RMSEA = 0.049. The individual hypothesis testing results are reported in Table 5.

The path coefficients for the proposed alternative hypotheses H_1, H_2, H_3 and H_4 were 0.524, 0.632, 0.785 and 0.418, respectively. All hypothesis coefficients were significant at a 10% confidence level (p value) of 0.001. Therefore, these results provide support for all the proposed four alternative hypotheses.

Discussions and conclusion

The aim of the present study is to examine the relationship between GSCM practices, environmental collaboration and financial performance in SMEs. The study is anchored on the increasing importance of sustainability-based practices such as GSCM in most industrial sectors of economies the world over. To test the proposed hypotheses, data were collected from 312 SMEs in Gauteng Province, South Africa. Four hypotheses are put forward, which are supported significantly by the empirical results of the study. Consistent with hypothesis H_1, the results of the study reveal that the embracing of green procurement has a positive stimulus effect of the level of collaboration between SMEs and the strategic constituencies within their external environment. Also, in parallel with hypothesis H_2, the study discloses that implementation of green logistics practices within SMEs leads to better environmental collaboration. Still, in line with hypothesis H_3, the study reveals that the application of green manufacturing practices boosts environmental collaboration. Finally, in resonance with hypothesis H_4, the study advances that higher environmental collaboration by SMEs leads to improved financial performance.

Interesting to note from the results of this study is the fact that among the three GSCM practices considered, green manufacturing (β = 0.785) has a stronger effect on environmental collaboration than both green procurement (β = 524) and green logistics (β = 0.632). This implies that green manufacturing within SMEs influences environmental collaboration to a greater extent than green procurement and green logistics. Perhaps this outcome can be attributed to the fact that manufacturing is the nucleus of the activities of most business enterprises. Although the procurement and logistics functions are important to any enterprise, they remain a support service to the operations (manufacturing) function of the business. Manufacturing remains the primary function of the business;

TABLE 5: Structural equation modelling results.

Proposed relationship	Null hypothesis (Ho)	Alternative hypothesis (H)	Path coefficient	Decision
GP→EC	Ho_1	H_1	0.524*	Reject null hypothesis
GL→EC	Ho_2	H_2	0.632*	Reject null hypothesis
GM→EC	Ho_4	H_3	0.785*	Reject null hypothesis
EC→FP	Ho_5	H_4	0.418*	Reject null hypothesis

Structural model fits: $\chi^2/(df) = 2.762$; Comparative Fit Index = 0.948; Tucker and Lewis Index = 0.909; Incremental Index of Fit = 0.935 and Root Mean Square Error of Approximation = 0.049.
GP, green procurement; EL, environmental collaboration; GL, green logistics; GM, green manufacturing; FP, financial performance.
*, Significance level, $p = 0.001$

hence, collaboration with suppliers, customers and other stakeholders is bound to improve to a greater extent through improvements in the production function (Baines et al. 2012). It is logical then to expect that the implementation of green manufacturing practices exerts a greater influence on the degree of collaboration between SMEs and their environmental partners. Overall, it can be concluded that financial success within an SME can be achieved to the degree that environmental collaboration between SMEs and their partners has been enhanced through the adoption of GSCM practices by SMEs.

Implications

The present study has both academic and practical implications. On the academic front, the study contributes to an emergent research area of sustainability or GSCM literature in the context of SMEs in developing countries such as South Africa. Accordingly, the study is expected to enlarge further the horizons associated with the understanding of recent developments in the field of supply chain management in Southern Africa.

Some strategic implications may be put forward as a practical contribution of the present study. In light of the importance of GSCM practices in stimulating environmental collaboration, it is necessary for SMEs to bolster the adoption and implementation of green procurement, green logistics and green manufacturing practices. Perhaps measures to achieve this may include aligning green supply chain goals with business goals, prescribing basic environmental requirements across the supply chain, integrating operational efficiency and waste reduction with supply chain objectives, use of environmentally friendly technology and innovation, development of recycling systems and the use of performance standards (Yan & Xia 2011). In implementing these measures, more emphasis should be directed towards increasing green manufacturing as it has a greater effect on environmental collaboration than both green procurement and green logistics. Because environmental collaboration has a positive effect on financial performance, it is important for SMEs to enhance their environmental collaboration activities. This can be achieved through, among other things, the adoption of technology (e.g. inter-organisational systems), joining or establishing communities of practice, employing dedicated staff and commitment to organisational flexibility (Chin et al. 2015). Implementation of these activities is likely to lead to improved financial performance within SMEs.

Strengths and limitations

The strength of the study is found in its novelty. The research is arguably the first to test the hypothetical model for GSCM, environmental collaboration and financial performance within the context of SMEs in South Africa. However, despite its contributions, this study has some limitations, which raises the need for further research in the future. Firstly, the results of the study are based on SMEs from a single location (Gauteng Province), which makes it difficult to generalise results to other environments. This invokes the need to extend the results of the study by increasing the scope to include other regions that are excluded in this study. Secondly, only three GSCM issues (procurement, logistics and manufacturing) were included in the study, which makes it necessary to conduct other studies that cover GSCM activities holistically. Future studies can also be sector specific when considering manufacturing SMEs because there are various industries (e.g. agro processing, chemical, metals, textile), which may be subjected to empirical studies. Given the contribution of GSCM practices as shown by this study, it may be necessary to test the hypothetical model proposed in this study in bigger companies. This may provide room for comparative studies by industry size.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

A.M. was responsible for formulating the problem statement, conducting the literature review and the development of hypotheses. C.M. composed the research methodology, conducted the analysis of data and wrote the results section.

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Appendix starts on the next page →

Appendix 1: Measurement scales used in the study

Configuration for all measurement scales

1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = undecided; 5 = somewhat agree; 6 = agree; 7 = strongly agree.

Green procurement

GP1: Selection of suppliers with ISO 14001 certification.

GP2: Cooperation with suppliers to achieve green goals.

GP3: Available green guidelines to suppliers.

GP4: Assessment of green issues of second-tier suppliers.

GP5: Conducting green audits within the suppliers.

Green logistics

GL1: Establishing alternative energy plans of company.

GL2: Monitoring pollutants emitted from vehicles.

GL3: Using recyclable packaging materials and logistics containers.

GL4: Monitoring recycling of transportation waste.

GL5: Environmental management certification, such as the ISO14000 series.

Green manufacturing

GM1: Adequate technology competence.

GM2: Compliance with regulations.

GM3: Environmental conservation.

GM4: Sustainable production processes.

GM5: Innovation.

Environmental collaboration

EC1: Being informed about suppliers' activities done to reduce environmental impact.

EC2: Provision of suppliers with environmental requirements for purchased inputs.

EC3: Working together with suppliers on solutions to reduce environmental impact.

EC4: Collaboration with customers to reduce or reuse or recycle the packaging.

EC5: Collaboration with customers to reduce the energy use during the transportation.

EC6: Working together with customers on solutions to reduce environmental impact.

Financial performance

FP1: High investments and less return-on investments.

FP2: Cost of environment-friendly packaging.

FP3: Availability of bank loans to encourage green processes.

FP4: Risk in hazardous material inventory and high cost of hazardous waste disposal.