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Sustainability orientation, supply chain integration, and SMEs performance: a causal analysis

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Abstract

Purpose – The pressure of globalization has raised social concerns related to the protection of the environment, forced companies to use sustainability as a strategic weapon to fulfill the legal obligations and achieve overall competitiveness. It is reported that small- and medium-sized enterprises (SMEs) are globally responsible for approximately 70 percent of the industrial pollution, justifying urgent attention to the operations of these businesses. The purpose of this paper is to analyze the impact of sustainability orientation (SO) and supply chain (SC) integration implemented by SMEs on their sustainable procurement (SP) and design. Moreover, this study examines how SMEs' SP and design affect their environmental and cost performance (CP).

Design/methodology/approach – The authors develop a comprehensive model to test the relationships among SC, SC integration, SP, sustainable design (SD), environmental performance (EP) and CP at the SMEs level. The authors investigate the relationships of the mentoned factors by a data set that is collected from 358 Indian manufacturing SMEs.

Findings – The results indicate that in the SMEs' context: SO positively influences both SP and SD; external integration positively affects SP; internal integration positively affects SD; SP positively influences EP and has not impact on CP; and SD positively influences both EP and CP.

Originality/value – This study provides a broad view of the relation between driving factors that may direct SMEs toward a better sustainability performance and offers practical managerial insights into these important business entities.

Keywords Sustainability, SMEs, Integration, Performance measures, Small- to medium-sized enterprises

Paper type Research paper

1. Introduction

Small- and medium-sized enterprises (SMEs) are the dominant form of business organization which are strategically necessary for the economic growth of both developed and developing countries (Redmond *et al.*, 2016). SMEs are playing a pivotal role in generating employment opportunities, reducing poverty and improving technical manufacturing capabilities. They contribute to higher export rate which is highly important for the economic development. However, considering environmental footprint, SMEs are

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accountable for the significant carbon emissions (Lewis *et al.*, 2014; Redmond *et al.*, 2016). They are responsible for approximately 70 percent of the global industrial pollution, justifying the need for the urgent measures for promising environmental solutions (Reyes-Rodriguez *et al.*, 2016). SMEs should not focus just on operational performance, accordingly, but also on the integration of sustainability practices throughout their supply chain (SC).

Companies around the world have shown interest in environmental-friendly manufacturing initiatives. In the SMEs context, however, the implementation of sustainable practices is not perceived as a promised win-win strategy (Lewis *et al.*, 2014). Several factors have confined SMEs from attaining the desired level of sustainable SC performance, among others the lack of information, awareness and responsiveness to the environmental concerns (Meath *et al.*, 2015), the unavailability of highly skilled labor at affordable costs, the use of obsolete processes and technologies, the use of the low-quality fuels, the utilization of inappropriate transportation infrastructure and the scarcity of the funds and innovation (Deshmukh *et al.*, 2015; Pachouri and Sharma, 2016). Moreover, regardless of the considerable use of energy, many SMEs are exempted from the environmental legislation due to their organizational size (Meath *et al.*, 2015).

The triple bottom line (TBL) concept has gained increasing attention over the last decade from both practitioners and academicians. Early studies on sustainability mainly consider SC of the large companies, indicating a scares literature of the sustainability directions for SMEs. The existing research on the sustainable SMEs' SC is mainly confined to the literature reviews or conceptual-based models, which highlight the associated benefits and barriers for SMEs when moving toward a sustainable SC (Biondi *et al.*, 2002; Walker and Preuss, 2008; Klewitz and Hansen, 2013; Massa *et al.*, 2015; Meath *et al.*, 2015; Redmond *et al.*, 2016; Sarkis *et al.*, 2016). To the best of our knowledge, there is a lack of empirical studies at the SMEs level to simultaneously propose and test the relationship between different SC constructs. We, therefore, develop a theoretical framework in this paper to test, at the SMEs scope, the relationships between different SC constructs such as sustainability orientation (SO), internal integration (IN), external integration (EX), sustainable procurement (SP), sustainable design (SD), environmental performance (EP) and cost performance (CP).

In this paper, we focus on the Indian SMEs because India is the third biggest carbon emitter worldwide (International Energy Agency, 2016) and only over a year its emission has heightened by 5.1 percent (PBL Netherlands Environmental Assessment Agency, 2016); among emerging economies, India has witnessed an increasing economic growth, thereby leading to the high rate of internationalization of the Indian firms (Gaur and Kumar, 2009; Gaur and Delios, 2015; Popli *et al.*, 2017); Indian Government has taken innovation, internationalization and product diversification as the key business expanding strategies (Kumar *et al.*, 2012; Singh and Gaur, 2013; Gaur, Kumar and Singh, 2014; Gaur, Ma and Ding, 2014); exports and foreign direct investments of India have significantly increased in the last few years, implying that India is becoming a manufacturing hub (Gaur, Kumar and Singh, 2014; Gaur, Ma and Ding, 2014); SMEs are the backbone of Indian economy because they contribute to about 45 percent of the entire production, 40 percent of exports and 17 percent of gross domestic production which is expected to reach 22 percent by 2020 (Javalgi *et al.*, 2012; Deshmukh *et al.*, 2015); energy prices, pollution and global warming have significantly increased in India over the last few years, along with the strict implementation of environmental-related rule and regulations (Thanki *et al.*, 2016); and both Make-in-India and National Manufacturing Competitiveness programs are regularly motivating SMEs to become world largest manufacturers (Narasimhan, 2015) implying the possibility of more carbon emission in future. Therefore, it is crucial to find feasible solutions and reliable ways for Indian SMEs to restrict (expand) the negative (positive) impact of their businesses on the environment, society and economy.

The remainder of this paper is organized as follows. Section 2 reviews the major studies reported in the literature on sustainable SC of SMEs. Section 3 presents the conceptual framework and the related research hypotheses. Section 4 describes the research methodology, and Section 5 reports the results of the empirical analysis. Section 6 and 7 present practical implications and concluding remarks, respectively.

2. Literature review

In this section, we review the body of knowledge available in the literature according to the systematic literature review approach proposed by Shashi *et al.* (2018) and Gaur and Kumar (2018) to ascertain the existing gaps between theory and actual practices.

Carter and Rogers (2008) defined the sustainable SC as "a strategic and transparent integration aimed to achieve social, environmental, and economic goals through the systemic coordination of key inter-organizational business processes for improving the long-term economic performance of the individual company and its SC." A vast body of literature reported that the observance of the TBL is nowadays inevitable for the businesses (Aguado *et al.*, 2013; Hsu *et al.*, 2013; Esfahbodi *et al.*, 2016; Mariadoss *et al.*, 2016). In this regard, the customers, stakeholders and regulations have forced firms to investigate and redesign their business processes (Kealy, 2017). Although SMEs are highly responsible for environmental degradation, scholars consider a distinct class for SMEs in the sustainability debate and different from those for large-scale enterprises (Meath *et al.*, 2015). Compared to the large enterprises, the affordability of sustainable practices by SMEs is questionable since they have limited financial resources and less time for dealing with lean and green issues (Crals and Vereeck, 2005; Walker and Preuss, 2008). Therefore, the negligence of sustainable SC practices in SMEs is not surprising, which has made the concept of sustainability problematic for SMEs' management and the adoption of sustainability a cumbersome task for SMEs (Hassini *et al.*, 2012).

The regulation is the most likely driving factor for fostering sustainability (Redmond *et al.*, 2016). According to Hasan (2016), barriers such as corruption, week regulatory environment, lack of sustainability awareness and inefficient external support have caused SMEs fail to keep a full engagement in the sustainable SC. Moreover, the successful adoption of the sustainable SC is highly dependent on the managerial attitude and a long-term strategy in SMEs (Reyes-Rodriguez *et al.*, 2016; Szczepanska-Woszczyna and Kurowska-Pysz, 2016; Jahanshahi and Brem, 2017). In this context, Cassells and Lewis (2011) identified a significant gap between attitude toward environmental initiatives and implementation of sustainability practices among managers. As the technical and managerial knowledge is limited in SMEs, the development of the knowledge bank is, therefore, becoming more of a necessity than an option for SMEs (Heras and Arana, 2010; Klewitz and Hansen, 2013; Meath *et al.*, 2015).

Furthermore, flexibility and responsibility are indeed two primary sources of sustainability improvement (Orzes *et al.*, 2018). The well-designed manufacturing and distribution processes which incorporated eco-friendly technologies may trim down the total operating costs (Bourlakis *et al.*, 2014). Aragon-Correa *et al.* (2008) reported a significant positive relationship between SO strategies and overall firm performance. Literature argued that SO does not directly affect SMEs performance, but it maximizes the positive impact of eco-innovation on firm performance (Zhang and Walton, 2016). Therefore, the foreign direct investment can enable SMEs to be more inventive and focus on eco-innovative business process (Melane-Lavado *et al.*, 2018). Home-country support is also an important factor in accelerating the firm's operation in the international markets (Gaur, Kumar and Singh, 2014; Gaur, Ma and Ding, 2014). The awareness, action, advanced SO and reporting system can motivate practitioners toward the attainment of SC sustainability benefits (Abdul-Rashid *et al.*, 2017; Ceschin and Gaziulusoy, 2016; Ghadge *et al.*, 2017; Jackson *et al.*, 2016;

Kushwaha and Sharma, 2016; Sajan *et al.*, 2017). Meanwhile, SMEs should use their scarce resources effectively and prioritize the factors associated with their performance to become sustainable enterprises (Hsu *et al.*, 2017). Osano and Languitone (2016) highlighted the importance of government's funding program and easily available finance for SMEs to improve EP.

Furthermore, on-time delivery and the reduction of CO_2 emissions are the most significant criteria to be lean and green (Thanki *et al.*, 2016). Aragon-Correa *et al.* (2008) found that companies with most proactive pollution prevention practices have significantly improved their financial performance. However, Cuerva *et al.* (2014) argued that technological capabilities push to conventional innovation but do not lead to green innovation. Sajan *et al.* (2017) reported the influence of SMEs' environmental sustainability on their financial and social performance. Besides, researchers advocate that small-scale firms who have not adopted green practices have better EP than others (Sarkis and Dijkshoorn, 2007). On the other hand, Walker and Preuss (2008) emphasized the crucial role of SMEs as suppliers in the public sector to foster sustainability development.

Lewis *et al.* (2014) studied the collaboration and sustainability relationship in SMEs and emphasized that the collaborative relationship can eradicate for SMEs the complexity of the sustainable SC implementation. SMEs should identify their business inefficiency and, through tight IN and EX, improve the performance (Laurinkeviciute and Stasiskiene, 2011). The exploration of internal capabilities can assist in developing a better understanding of the necessary sustainable efforts among partnering firms (Adams *et al.*, 2016). Meanwhile, the interfirm alliance can strengthen the transformation and upgrading of SMEs toward sustainability (Chen *et al.*, 2017). According to Martin and D'Acunto (2003), proper co-design of manufacturing systems can alleviate the total cost of a business via optimal utilization of materials, energy and workforce. Aguado *et al.* (2013) stated that the benefits of lean manufacturing and agile practices are easily obtainable when SC partners are adequately coordinated. However, in this context, firm's trust in their partners interacts significantly and positively with environmental uncertainty (Mukherjee *et al.*, 2013), and Aboelmaged (2018) reported the strong impact of stakeholders' pressure and employees' engagement on sustainable manufacturing. Likewise, SC collaboration can strengthen knowledge absorption capacity, structuring solution and motivating activity around a commonly defined problems or goal such as cleaner production (Hoof and Thiell, 2014; Cappa *et al.*, 2016).

Moreover, researchers offer deep understanding about the relationship between university-firm interaction, innovation outputs and firm performance in the context of sustainability-oriented innovation. Jones and de Zubielqui (2017) found that human resource transfer has a positive effect on innovativeness, and innovativeness, in turn, is positively related to SMEs performance. Therefore, developing human resource through education and vocational training can enable SMEs to achieve desirable productivity and sale growth in sustainability-oriented innovation. Likewise, literature highlights the need for SMEs to improve their logistics performance through benchmarking (Taschner, 2016). Researchers report the direct impact of e-business on SMEs' financial performance and positive relationship between e-commerce and organizational innovation (Popa *et al.*, 2017). The relation between product diversification and SMEs' performance has also been reported by scholars (Singh *et al.*, 2010). However, the competency of organizational mechanism may bring diversification for the business (Lee and Gaur, 2013).

In addition, the firms should regularly balance their economic performance with social responsibility and environmental protection (Tomsic *et al.*, 2015; Ardito and Dangelico, 2018), meaning that sustainability calls for multi-stakeholder initiatives to support the implementation of cleaner production (Fraccascia *et al.*, 2018; Hoof and Thiell, 2014). The weak EP is triggered by the lack of the following factors: deep managerial understanding about the business processes, relevant knowledge for selecting the appropriate technologies (Albino *et al.*, 2014), the ability of strategic planning to achieve sustainability, integrated managerial approaches and responsibility (Russo and Tencati, 2009; Rizzi *et al.*, 2014). Massa *et al.* (2015) shed light on the development of sustainability report in SMEs. Improved EP not only assists in generating positive interaction with firm's stakeholders but also improves the firm's competitiveness (Lundgren and Zhou, 2017). Therefore, companies need to consider sustainable practices as a long-term strategy (Jorge *et al.*, 2015).

Furthermore, competitive advantages of the SMEs can also moderate the relationship between market orientation and SMEs performance. Besides, the lack of metrics for measuring SC sustainability performance has affected the SMEs' ability in objectively reporting the SC benefits (Ahmad *et al.*, 2016). According to Kealy (2017), the measurement and improvement of sustainable performance are not enough for keeping a business sustainable. A comprehensive performance improvement strategy is required to improve all SCs' functions (Aboelmaged, 2018; Adams *et al.*, 2016).

3. Conceptual framework

By the reviewed literature, we develop a conceptual framework to test the relationship among SO, SC integration, SP, SD, EP and CP at the SMEs level.

According to Banerjee *et al.* (2003), SO is the identification of critical environmental issues faced by the firm. Chan (2010) called it intrinsic values and ethical standards of company commitment toward environmental protection. SO accordingly has an impact on the integration of the new product design and processes into the organizational structure (Klewitz and Hansen, 2013). Moreover, SO positively affects the practices included in firm's sustainability strategies (Kirchoff *et al.*, 2016) and actively influences firm behavior in practice (Johnson, 2015). SO is typically reflected on the redesign of firms' products and production processes according to the environmental and social regulations that ultimately generate competitive advantage (Aikenhead *et al.*, 2015). El-Kassar and Singh (2018) found that product and process innovation reduces pollution and energy consumption and, therefore, firms' performance. A synergistic effect between the SO and SP practices has been reported by Mariadoss *et al.* (2016), implying that SO stimulates firms to continuously purchase sustainable raw material for the production purpose (Allen and Spialek, 2017). Wagner (2005) observed a correlation between company performance and EP, and such relationship is even stronger when company's technology management has an orientation toward environmental protection. These observations lead us to develop the following hypotheses:

H1. SO positively influences SP.

H2. SO positively influences SD.

According to organizational capability theory, integrated capabilities encourage a continuous, precise and on time flow of information, resources and finished products (Huo *et al.*, 2014). Gungor and Gupta (1999) reported that companies with tight integration achieve a higher level of sustainability. Indeed, SC integration provides an opportunity for firms to improve SP, SD and distribution system through collaborative processes, practices, structures, methods and technologies among SC partners (Vijayasarathy, 2010). Li and Lin (2006) argued that both IN and external integration (EX) help firms to overcome their inefficiencies stemmed from resource scarcity and capacity limitation to developing a sustainable SC structure. Likewise, Bai and Sarkis (2010) reported a positive association between suppliers' sustainable performance and firm's sustainable performance. As a result, firms should build sustainability beyond their borders and extend it to upstream and downstream partners. Integration with upstream and downstream partnerships enables the firms to expand new markets and optimize business operations (Zsidisin and Siferd, 2001; Carter, 2004; Limoubpratum *et al.*, 2015). Unclear or unshared sustainability goals, e.g., can decay joint environmental efforts of the firms in the SCs (Hsu *et al.*, 2013). Vachon and Klassen (2008) assessed that synergy with suppliers encourages the introduction and implementation of novel environmental technologies. Consequently, most of the leading manufacturing companies tend to collaborate with business partners who are capable of delivering sustainable material and service (Esfahbodi *et al.*, 2016). Aboelmaged (2018) pointed out that firm's customers, suppliers and media affect the sustainable practices and consequently firm's EP. Moreover, logistics network, government and competitors are the driving factors for EP improvement (Ghadge *et al.*, 2017). Salam (2017) observed the positive impact of collaboration on new product development, customer responsiveness, cost and inventory performance. Srivastava *et al.* (2017) found a positive association between SC integration and financial performance. As a result, effective collaboration assists improving firm's EP (Pakdeechoho and Sukhotu, 2018). Therefore, we hypothesize that:

H3. EI positively influences SP.

H4. EI positively influences SD.

H5. IN positively influences SP.

H6. IN positively influences SD.

The SP function is an influential factor that provides an opportunity to integrate environmental perspectives into the company. It significantly contributes to confining the ecological effect caused by SC processes (Preuss, 2001) that influence all aspects of the SC (Carter, 2004). Zsidisin and Siferd (2001) considered SP as an environmental procedure that guarantees the firm purchases raw material/component according to the desirable ecological attributes (such as reuse, recycle, nontoxic materials and resource reduction) and, therefore, compiles the final disposal of the firm's products. Hence, SP can enable the firm minimizes the material wastage and emission and improves the CP of the manufacturer. Just-in-time purchasing allows the minimization of lot sizes and lead times that in turn lead to the use of quality control measures that significantly decrease logistics costs and the costs of purchased materials (Dong *et al.*, 2001). Mazharul *et al.* (2017) highlighted the need to evaluate the progress of firm's SP practices regularly. Quader *et al.* (2016) pointed out the improvement of EP and CP in the implementation of more sustainable practices by SMEs. Consequently, the improved CP helps the firm to tackle business complexities (Judge *et al.*, 2010; Thanki *et al.*, 2016). SP may also improve the firm's overall performance and mitigate the social and financial risks (Medeiros and Ribeiro, 2017). Esfahbodi *et al.* (2016) also advocated the relationship between SP, EP and CP. With this set of arguments, we hypothesize that:

H7. SP positively influences EP.

H8. SP positively influences CP.

SD refers to the integration of a set of intra-organization and inter- organization practices into operational and business activities to alleviate the adverse environmental effect of production processes. SD may conserve energy/resources and promote the well-being and the safety of employees, communities and consumers (Hami *et al.*, 2015). It focuses on the entire products' life-cycle from raw material extraction to final waste disposal (Ceschin and Gaziulusoy, 2016). It includes emission and waste reduction, product stewardship and sustainable development (Jackson *et al.*, 2016) at product, process and system levels (Jayal *et al.*, 2010; Ghadge *et al.*, 2017). Manufacturing processes consume a significant amount of energy and generate a variety of wastes that threaten the ecological systems (Kealy, 2017;

Duflou *et al.*, 2012). Thus, firms who focus on SD perform better as compared to those firms who less focus on SD (Kushwaha and Sharma, 2016). The firms need to design their production processes in a way that wastes and environmental-incompatible materials can be alleviated, eliminated or recycled (Abdul-Rashid *et al.*, 2017; Sajan *et al.*, 2017). The effective energy management during manufacturing may reduce the cost of manufacturing, increase production flexibility and improve quality of the outcomes (Schönsleben, 2007). Rao and Holt (2005) found a significant relationship between SD and EP, and Rusinko (2007) showed that pollution prevention practices lead to a decrease in manufacturing cost that in turn builds competitive advantage. Green *et al.* (2012) stressed that waste minimization not only protects the environment but also reduces the cost of waste treatment. According to the above discussion, we hypothesize that:

H9. SD positively influences EP.

H10. SD positively influences CP.

From the reviewed literature and proposed hypothesizes, we develop a conceptual framework which provides a broad overview of the relationship among factors that may direct SMEs toward a better sustainability performance. Figure 1 depicts the conceptual framework.

4. Research methodology

4.1 Questionnaire development

For this investigation, the research model includes seven constructs (see Figure 1). As for the SO, we adopted the statements that are already tested by Mariadoss *et al.* (2016). They considered the SO as the ethical standards and the internal and external values implemented by the firms for the protection of the environment. As for the EX and IN, we utilized the statements that are proposed by Swink *et al.* (2007) and Danese *et al.* (2013). We use the set of statements that Esfahbodi *et al.* (2016) define for SP, SD, EP and CP. For the responds measurement, we applied a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree).

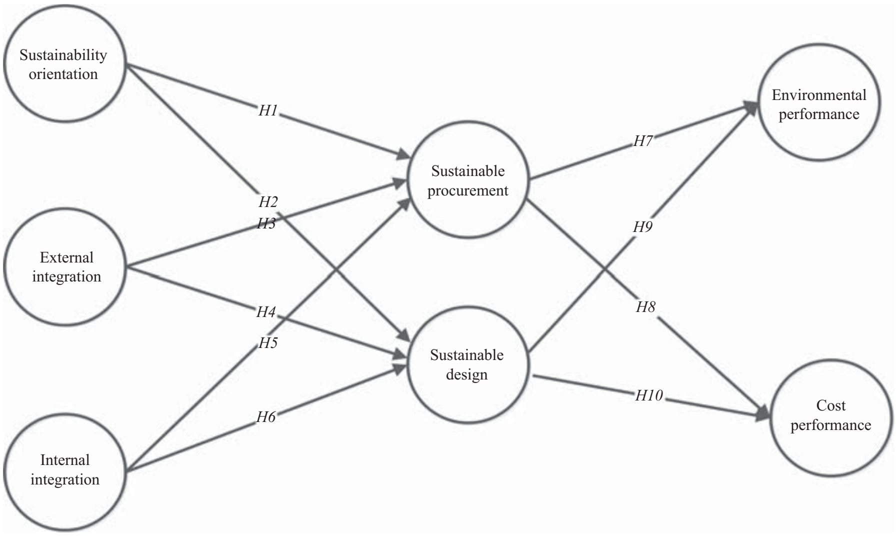

Figure 1.
Conceptual framework

The double translation protocol was adopted to conduct the survey questionnaire (Hsu *et al.*, 2013). It was initially formulated in English language and then transcribed into Hindi with the help of language experts. Reviews of practitioners and academics confirmed the questionnaire's face validity (Cook and Campbell, 1979). Then, the questionnaire was translated back into English and compared with the previous one to ensure their equivalency, and we did not find any significant difference.

4.2 *Data collection procedure*

We empirically investigated the proposed research hypotheses using primary survey-based data that are gathered from managers working in different SC positions in the Indian manufacturing SMEs. In the first step, we made a list of manufacturing SMEs using the Indian SMEs Diary Directory and obtained information such as e-mail and postal addresses and contact numbers of the companies. We initially contacted 800 SMEs and explained to the relevant person the study purpose and to see whether they were interested in participating in the project by filling out the questioner. There were 647 SMEs who showed their interest to take part in the project. Then, we e-mailed the interested SMEs a copy of the questionnaire and a cover letter, which illustrated the aim of the research.

After two weeks, we sent a reminder e-mail to non-respondents. Likewise, after four weeks, a questionnaire was sent another reminder to those who had not replied yet. Finally, as the final reminder, follow-up phone calls made after six weeks. From July to November 2016, 358 valid questionnaires were collected from the surveyed SMEs, which show a response rate of 55.33 percent. According to Tripathy *et al.* (2016), the sample size of our conceptual model is representative of the population and the results assumed to be valid since the number of questionnaires properly filled is higher than 100. The non-response bias is evaluated through considerable differences between the early return and late return survey responses (Prahinski and Benton, 2004). Armstrong and Overton (1977) stated that the late return responses represent the opinion of non-respondents and recommend dividing the returned samples into early and late responses for examining the possible non-response bias. We accordingly used the statistical *t*-test to compare the early and late return responses: the results reported no statistically significant differences. In line with Flynn *et al.* (2010), Gligor *et al.* (2016) and Lii and Kuo (2016), we took Harman's one-factor test (Harman, 1976) to deal with the potential common bias issue. The results of the one-factor analysis revealed seven distinct factors with eigenvalues just above 1.0, explaining 71.307 percent cumulative variance. The first extracted factor explained 34.12 percent of the variance, which was not the majority of the cumulative variance. Therefore, considering discussed outcomes, the issues related to common method bias were insignificant.

4.3 *Sample characteristics*

Table I reports the characteristics of the responding companies including the industry type, size of the firm and respondents' role in the SC. The majority of firms belong to the manufacturing of motor vehicles and transport equipment (27 percent), machinery and equipment (14 percent), and materials and metal production (13 percent). The figures are consistent with those published by the Indian Central Statistics Office, indicating that our sample truly reflects the distribution of firms over sectors in India. Within our sample, 36 percent of the responses came from firms with 10–50 employees, 29 percent of the firms with 51–100, 24 percent of the firms with 101–500 and 11 percent of the firms have less than ten employees.

5. Results

In this section, we use relevant tools and techniques to convert survey data into valuable information. To do so, following Qi *et al.* (2017), we employed a three-step methodology:

	%
Type of industry	
Motor vehicles and transport equipment	27
Machinery and equipment	14
Materials and metal production	13
Rubber and plastic products	11
Food and beverages products	11
Wood and wood products	9
Textiles	8
Chemicals and chemical products	7
Number of employees	
< 10	11
10–0	36
51–100	29
101–500	24
Respondent's position	
General manager/Owner	33
Logistics director	13
Production/Operations manager	11
Purchasing/Procurement	7
Sales/Distribution	22
Supply chain director	6
Other senior manager/Position	8

Table I. Characteristics of firms and respondents

exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and structural equation modeling (SEM). EFA deals with theory building and CFA with theory testing (Gaur and Gaur, 2009), and SEM tests the hypothesized relationships (Hair *et al.*, 2010).

5.1 Exploratory factor analysis

To guarantee the unidimensionality of the scale, we used EFA and, then, adopted Cronbach's α value to verify the reliability. In EFA, principal component analysis with varimax rotation was taken into consideration that excludes items with factor loadings lower than 0.50 and uses eigenvalues higher than 1 as the extraction criterion (Comrey and Lee, 1992). We performed four separated EFAs for subjects SO, SC integration (i.e. EX and IN), sustainable practices (i.e. SP and SD) and sustainable performance (i.e. EP and CP). For the SO, only one factor was extracted since it explains 59.629 percent of the total variance with an eigenvalue equal to 3.579. Since in our model all the factor loadings were greater than 0.5 (see Table II), they are statistically significant (Fornell and Larcker, 1981). For SC integration, two factors were extracted (i.e. IN and EX) with significant factor loadings. The factors cumulatively account for 82.698 percent of the variance. Similarly, EFA extracted two factors for sustainable practices (i.e. SP and SD) with significant relative factor loadings, which explain 70.305 percent of the cumulative variance. For sustainable SC performance (i.e. EP and CP), two factors were extracted with significant factor loadings, which explain 64.561 percent of the cumulative variance. Table III reports the correlations among constructs, means and standard deviations.

As for Cronbach's α to assess the stability and consistency of test results, the recommended threshold is 0.50 (Hair *et al.*, 2010). Table IV indicates that Cronbach's α values of all extracted factors were greater than 0.80 and exceeded the rule of thumb of 0.7 suggested by Nunnally (1978). Also, Table IV reports the results of the corrected item–total correlation (CITC) reliability test. Accordingly, CITCs exceeded the threshold

(1)	Statement	Sustainable orientation	
SO5	Our top management team believes they are adopting environmental actions	*0.821*	
SO1	For our firm, it is important to allocate sufficient funds in the annual budget for environmental improvement	*0.801*	
SO4	For our firm, it is important to adopt environment protection criteria for the supplier selection process	*0.782*	
SO3	Our firm believes in employees training on environmental-related issues	*0.757*	
SO6	Our firm supports research and development of environmental technologies	*0.746*	
SO2	Top management believes in having systems for measuring and assessing environmental performance	*0.723*	
Eigenvalue		3.579	
Total variance explained		59.65%	
(2)	Statement	Internal integration	External integration
IN3	The marketing and finance functions know a great deal about manufacturing	*0.912*	0.218
IN4	Our plant's departments coordinate their activities	*0.898*	0.215
IN2	The departments in our plant cooperate to solve conflicts between them when they arise	*0.894*	0.193
IN1	The departments in our plant work well together	*0.876*	0.16
IN5	Our plant's departments work interactively with each other	*0.874*	0.257
EX4	We share our production planning and demand forecasted information with keys partners	0.194	*0.905*
EX3	We emphasize openness of communications in collaborating with our partners	0.209	*0.897*
EX2	We establish quick ordering system with our suppliers	0.199	*0.88*
EX5	We share inventory level information with customers	0.202	*0.862*
EX1	We plan supply chain activities collaboratively	0.218	*0.854*
Eigenvalue		5.964	2.305
Total variance explained			82.70%
(3)	Statement	Sustainable procurement	Sustainable design
SP2	Cooperation with suppliers for environmental objectives	*0.845*	0.231
SP4	Suppliers' certification	*0.842*	0.176
SP1	Eco labeling packaging	*0.839*	0.15
SP3	Environmental audit for suppliers' internal management	*0.836*	0.174
SD3	Design of products for reuse, recycle and recover of material, and component parts	0.252	*0.803*
SD2	Design of products to reduce energy consumption	0.169	*0.799*
SD1	Design of products to reduce material consumption	0.154	*0.789*
SD4	Design of products to avoid or reduce the adoption of hazardous material in manufacturing processes	0.184	*0.783*
Eigenvalue		3.998	1.626
Total variance explained			70.31%
(4)	Statement	Environmental performance	Cost performance
EP3	Significant reduction in solid wastes	*0.837*	0.178
EP5	Significant decrease of consumption for hazardous/harmful/toxic materials	*0.814*	0.211
EP6	Significant decrease of frequency for environment accidents	*0.811*	0.165
EP1	Significant reduction of air emission	*0.793*	0.145
EP4	Significant reduction of effluent wastes	*0.783*	0.263
EP2	Significant reduction of waste emission	*0.757*	0.104
CP5	Significant reduction of fine for environmental accidents	0.159	*0.803*
CP3	Significant reduction of fee for waste treatment	0.137	*0.787*
CP2	Significant reduction of cost for energy consumption	0.224	*0.759*
CP1	Significant reduction of cost for purchased material	0.206	*0.754*
CP4	Significant reduction of fee for waste discharge	0.131	*0.711*
Eigenvalue		5.104	2.014
Total variance explained			64.56%

Table II. EFAs for (1) sustainable orientation, (2) SC internal and external integration, (3) sustainable procurement and sustainable design and (4) SC environmental and cost performance

No.	SO	EX	IN	SP	SD	EP	CP
SO	1						
EX	0.386**	1					
IN	0.371**	0.442**	1				
SP	0.509**	0.470**	0.265**	1			
SD	0.342**	0.182**	0.358**	0.419**	1		
EP	0.530**	0.309**	0.268**	0.608**	0.554**	1	
CP	0.517**	0.218**	0.309**	0.325**	0.578**	0.419**	1
Mean	5.18	5.28	5.42	4.96	5.09	5.76	5.39
SD	0.860	1.212	1.082	1.010	1.226	1.170	0.912

Note: **Significant at the 0.01 level (two-tailed)

Table III. Correlations, means, and standard deviations

Construct	Number of questions	Cronbach's α	CITC
SO	6	0.863	0.600–0.718
IN	5	0.951	0.827–0.898
EX	5	0.943	0.820–0.878
SP	4	0.884	0.735–0.773
SD	4	0.829	0.616–0.701
EP	6	0.901	0.657–0.780
CP	5	0.839	0.571–0.690

Note: CITC, corrected item–total correlation

Table IV. Reliability tests

value of 0.30 (Kerlinger, 1986). Therefore, based on the Cronbach's α and CITC values, the results of our test were internally reliable.

5.2 Confirmatory factor analysis

We carried out a CFA to test convergent validity. We also wanted to estimate the covariance of each item that was connected to its corresponding construct. For the convergent validity, the factor loadings should be higher than 0.5, the composite reliabilities (CR) should exceed 0.8 and the average variance extracted (AVE) for each construct should exceed the measurement error variance (Fornell and Larcker, 1981).

Model fit indicates how well proposed model estimates the correlations between variables in the data set (Hair *et al.*, 2010). The results of the CFA model (χ^2/degree of freedom (df) (CMIN/df) = 1.511, goodness-of-fit index (GFI) = 0.889, incremental fit index (IFI) = 0.968, Tucker–Lewis index (TLI) = 0.964, comparative fit index (CFI) = 0.967 and root-mean-square errors of approximation (RMSEA) = 0.038) indicate the acceptability of the model's fit (Hair *et al.*, 2010). Factors' indicator loadings, which are reported by Table V, are significant because they are greater than 0.50 and range from 0.64 to 0.91. Moreover, the CR values range between 0.82 and 0.95 (see Table VI). All AVE measures for each construct are higher than 0.50, meaning that all the study items are important for the concept of constructs. Therefore, the convergent validity is ensured in the study.

According to Hair *et al.* (2010), two conditions should be satisfied for ensuring discriminant validity: maximum shared variance should be lower than AVE, and squared root of AVE should exceed the inter-construct correlations. These two requirements are indeed satisfied (see Table VI), indicating the ensured discriminant validity.

Construct and relative items	Standardized factor loading
Sustainability orientation	
SO1	0.76
SO2	0.68
SO3	0.69
SO4	0.72
SO5	0.78
SO6	0.69
External integration	
EX1	0.85
EX2	0.87
EX3	0.90
EX4	0.91
EX5	0.83
Internal integration	
IN1	0.84
IN2	0.89
IN3	0.93
IN4	0.91
IN5	0.88
Sustainable procurement	
SP1	0.81
SP2	0.86
SP3	0.78
SP4	0.80
Sustainable design	
SD1	0.69
SD2	0.86
SD3	0.81
SD4	0.71
Environmental performance	
EP1	0.77
EP2	0.70
EP3	0.82
EP4	0.78
EP5	0.81
EP6	0.79
Cost performance	
CP1	0.76
CP2	0.73
CP3	0.71
CP4	0.64
CP5	0.75

Table V.
CFA results

5.3 Structural equation model and hypotheses testing

To test the associations among the constructs (see Figure 2), we used SEM with the maximum likelihood estimation approach. We also estimated GFI by the χ^2 test. The measurement model resulted by dividing the χ^2 by the degrees of freedom (CMIN/df) was 1.932, which is lower than the suggested maximum value of 5.0 (Bagozzi *et al.*, 1991). Further indices were calculated and fell within recommended values from the literature (GFI = 0.860, IFI = 0.940, TLI, 0.935, CFI = 0.940, RMSEA = 0.048). These fit indices guarantee an acceptable fit between the model and the observed data and that the model is suitable for hypothesis testing (Kline, 2011). We then examined the structural model. Table VII reports the values for the standardized path coefficients (β) between the constructs.

H1, SO positively influences SP, is supported ($\beta = 0.50$, CR = 8.49 and $p = 0.000$). *H2*, SO positively influences SD, is supported ($\beta = 0.41$, CR = 6.49 and $p = 0.000$). *H3*, EX positively influences SP, is supported ($\beta = 0.37$, CR = 7.21 and $p = 0.000$). *H4*, EX positively influences SD, is not supported ($\beta = -0.05$, CR = −0.88 and $p = 0.378$). Similarly, *H5*, IN positively influences SP, is not supported ($\beta = -0.03$, CR = −0.72 and $p = 0.471$). *H6*, IN positively influences SD, is supported ($\beta = 0.30$, CR = 5.41 and $p = 0.000$).

No.	CR	AVE	MSV	EP	SO	EX	IN	SP	SD	CP
EP	0.902	0.607	0.468	*0.779*						
SO	0.865	0.517	0.358	0.587	*0.719*					
EX	0.944	0.771	0.268	0.339	0.425	*0.878*				
IN	0.951	0.797	0.215	0.290	0.397	0.464	*0.893*			
SP	0.884	0.656	0.468	0.684	0.577	0.518	0.287	*0.810*		
SD	0.829	0.550	0.489	0.642	0.460	0.221	0.405	0.499	*0.741*	
CP	0.841	0.515	0.489	0.487	0.598	0.241	0.349	0.377	0.699	*0.718*

Notes: CR, composite reliability; AVE, average variance extracted; MSV, maximum shared variance

Table VI. Validating the measurement CFA model

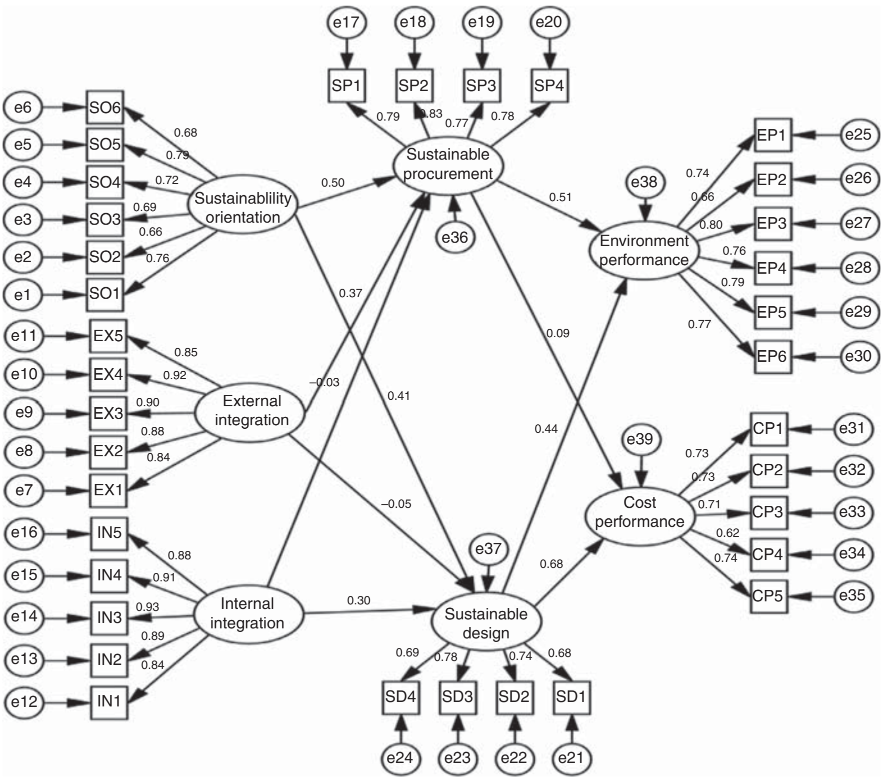

Figure 2. Structure equation model

Table VII.
Hypotheses testing results

No.	Hypothesis	Standardized coefficient (β)	CR	p-Value	Remark
H1	SO positively influences SP	0.50	8.49	***	Supported
H2	SO positively influences SD	0.41	6.49	***	Supported
H3	EI positively influences SP	0.37	7.21	***	Supported
H4	EI positively influences SD	−0.05	−0.88	0.378	Unsupported
H5	IN positively influences SP	−0.03	−0.72	0.471	Unsupported
H6	IN positively influences SD	0.30	5.41	***	Supported
H7	SP positively influences EP	0.51	9.07	***	Supported
H8	SP positively influences CP	0.09	1.75	0.079	Unsupported
H9	SD positively influences EP	0.44	7.64	***	Supported
H10	SD positively influences CP	0.68	9.16	***	Supported

Notes: ***p-value = 0.000

H7, SP positively influences EP, is strongly supported ($\beta = 0.51$, CR = 9.07 and $p = 0.000$), whereas *H8* which states SP positively influences CP is not supported ($\beta = 0.09$, CR = 1.75, $p = 0.079$). *H9*, SD positively influences EP, is supported ($\beta = 0.44$, CR = 7.64 and $p = 0.000$). Finally, *H10*, which states SD positively influences CP, is supported ($\beta = 0.68$, CR = 9.16 and $p = 0.000$).

6. Discussion and managerial implications

In this paper, we developed a framework to test the effects of SC, SC internal and external integration, SP and SD on the SMEs' environmental and CP. This is the first systematic attempt to reveal hidden facts to improve the sustainability of the SMEs.

The results of this study, which is validated by a data set of 358 Indian SMEs, explain that SO is the key strategy to attain SC sustainability through SP and SD. In line with Sharma and Vredenburg (1998), our findings indicate that SO may lead to the competitive advantages. Therefore, Indian manufacturing SMEs should strategically support SO and its implementation.

Furthermore, we found that EX and IN in SMEs SC are strongly associated with SP and SD, respectively. These results fall in with the findings of Reyes-Rodriguez *et al.* (2016) in that the SC integration may foster SMEs' sustainability efforts and create an additional competitive advantage. More in details, better coordination among firm's departments and across SC players can lead to highly sustainability-oriented process and products.

Our findings confirmed the strong relation between SP and EP, meaning that SMEs with SP can mitigate the negative impact of their business processes on the environment. This study found no significant correlation between SP and CP. One possible reason for the lack of such a relationship might be the high cost of the sustainability-oriented materials. We observed that SD has a substantial impact on both EP and CP. The association of SD and CP was higher than that of SD and EP, which may be explained by the significant savings in the firm's cost via a reduction in material waste, use of reusable material and cutbacks in energy consumption (Jorge *et al.*, 2015).

From an industry perspective, Indian SMEs are continuously striving to attain competitiveness both in the manufacturing capacity and profitability. SMEs are the main players of the different industries in India which have the support of the top management: budget allocation for environmental protection, training and courses on sustainability for employees, and periodic EP assessment. The findings of this paper indicate that the adoption of SO practices improves the SP and SD, thereby leading to a better EP and CP. SMEs may accordingly keep the top management supports and achieve environmental objectives through the design of reusable and recyclable products, the reduction of energy and material consumption, and the use non-hazardous materials in the production processes.

However, the employees of Indian SMEs mainly lack the latest knowledge of emission and waste reduction. Nevertheless, according to our observations, environmental education and training programs may support Indian SMEs in improving both EP and CP. Similarly, the supportive organizational culture can direct Indian SMEs toward skill and knowledge development. Therefore, Indian SMEs should allocate sufficient annual budget for research and development to gain knowledge and green technologies to protect the environment better.

The findings of this paper reveal that sustainability issues are of primary interest not only from a social and environmental point of view, but also for SMEs to invest in greening their business processes, improving economic performance and gaining competitive advantages. Also, the need for the identification of environmental approaches influences the SMEs' performance and their specific impact. Findings also confirm the positive effect of collaboration between the actors throughout the SC. Another important aspect that emerges from the study is the positive effect of collaboration between the actors throughout the SC. The exchange of information with customers and suppliers leads to better understanding of the customers and suppliers needs.

Regarding practical and policy implications, the findings reveal that the improvements in adopting the sustainability practices can be attained by both large enterprises and SMEs. SMEs are perfectly capable of finding ways to utilize the green opportunities for strategic purposes. Therefore, the governments should provide incentives for SMEs because it would allow the local development of both India and other countries, where SMEs are the engine of the economy. Moreover, the integration of SMEs in the SC may provide new opportunities for expanding the market through innovative products and services. For the SC management performance improvement, more efforts are required to implement the information sharing practices along SC effectively. Nowadays, the growing number of information and communication technologies available in the market helps SMEs to bridge physical distances and improve the exchange of information with their partners. Finally, the collaboration between SMEs from different business areas is essential to keep the operations productive.

Our findings show that SMEs should formulate their sustainability efforts in an investment network. Additionally, SMEs need to optimize their resources utilization and reduce wastes at the same time. That is, practitioners should simultaneously improve the environmental and economic performance.

For Indian manufacturing SMEs, the implementation of the routine sustainable performance measurement is of great importance. They need a deep insight of the performance management system, and they should analyze the right metrics to track and trace the efficacy of their business. Besides, given that partners' performance, directly and indirectly, affects the overall firm's performance, SMEs need to understand the nature of their partners' business, guide and motivate them to build the habit of their routine performance measurement, encourage them to define their sustainability objectives and fix their annual sustainability goals.

7. Limitations and future research directions

This research contributes to the literature and practices related to the operations of the SMEs. However, it has some limitations based which we can highlight several areas for future research. First, we used in this paper only primary data that had explicitly been collected for the aim of this study. Therefore, future research could test the validity of the proposed framework when primary data are analyzed together with secondary data (reported by government publications, websites, books, journal articles, internal records, etc.). Second, we collected survey responses from SMEs who active in six different industries, thus the further research can test our framework by considering only a single sector to understand the sustainability exposure in that particular industry. Third, this study proposed a conceptual model based on seven sustainability constructs for SMEs. The constructs, however, are not limited to SMEs, meaning that they may also be relevant for large companies. Scholars may repeat the research by considering large-scale companies and compare the results with findings of this study to offer more insights about the relationship between SO, IN, EX, SP, SD, EP and CP. Fourth, including additional constructs into the proposed conceptual model, e.g., cooperating product and process innovation may produce further insight into the performance of the SMEs. Fifth, to carry out this research, we targeted a single respondent in each firm. Targeting more respondents from each of the SMEs could extend the understanding of the results and make the study finding stronger. Finally, the field analysis has been conducted in India which is one of the most promising developing countries. For the generality purposes, similar studies could be done in other countries.

References

Abdul-Rashid, S.H., Sakundarini, N., Ghazilla, R.A.R. and Thurasamy, R. (2017), "The impact of sustainable manufacturing practices on sustainability performance: empirical evidence from Malaysia", *International Journal of Operations & Production Management*, Vol. 37 No. 2, pp. 185-204.

Aboelmaged, M. (2018), "The drivers of sustainable manufacturing practices in Egyptian SMEs and their impact on competitive capabilities: a PLS-SEM model", *Journal of Cleaner Production*, Vol. 175, pp. 207-221.

Adams, R., Jeanrenaud, S., Bessant, J., Denyer, D. and Overy, P. (2016), "Sustainability-oriented innovation: a systematic review", *International Journal of Management Reviews*, Vol. 18 No. 2, pp. 180-205.

Aguado, S., Alvarez, R. and Domingo, R. (2013), "Model of efficient and sustainable improvements in a lean production system through processes of environmental innovation", *Journal of Cleaner Production*, Vol. 47, pp. 141-148.

Ahmad, W.N.K.W., Brito, M.P.D. and Tavasszy, L.A. (2016), "Sustainable supply chain management in the oil and gas industry: a review of corporate sustainability reporting practices", *Benchmarking: An International Journal*, Vol. 23 No. 6, pp. 1423-1444.

Aikenhead, G., Farahbakhsh, K., Halbe, J. and Adamowski, J. (2015), "Application of process mapping and causal loop diagramming to enhance engagement in pollution prevention in small to medium size enterprises: case study of a dairy processing facility", *Journal of Cleaner Production*, Vol. 102, pp. 275-284.

Albino, V., Ardito, L., Dangelico, R.M. and Messeni Petruzzelli, A. (2014), "Understanding the development trends of low-carbon energy technologies: a patent analysis", *Applied Energy*, Vol. 135, pp. 836-854.

Allen, M.W. and Spialek, M.L. (2017), "Young millennials, environmental orientation, food company sustainability, and green word-of-mouth recommendations", *Journal of Food Products Marketing*, pp. 1-27.

Aragon-Correa, J.A., Hurtado-Torres, N., Sharma, S. and Garcia-Morales, V.J. (2008), "Environmental strategy and performance in small firms: a resource-based perspective", *Journal of Environmental Management.*, Vol. 86 No. 1, pp. 88-103.

Ardito, L. and Dangelico, R.M. (2018), "Firm environmental performance under scrutiny: the role of strategic and organizational orientations", *Corporate Social Responsibility and Environmental Management*, Vol. 25 No. 4, pp. 426-440.

Armstrong, J.S. and Overton, T.S. (1977), "Estimating non-response bias in mail surveys", *Journal of Marketing Research*, Vol. 4, pp. 396-402.

Bagozzi, R.P., Yi, Y. and Phillips, L.W. (1991), "Assessing construct validity in organizational research", *Administrative Science Quarterly*, Vol. 36 No. 3, pp. 421-458.

Bai, C. and Sarkis, J. (2010), "Integrating sustainability into supplier selection with grey system and rough set methodologies", *International Journal of Production Economics*, Vol. 124 No. 1, pp. 252-264.

Banerjee, S.B., Iyer, E.S. and Kashyap, R.K. (2003), "Corporate environmentalism: antecedents and influence of industry type", *Journal of Marketing*, Vol. 67 No. 2, pp. 106-122.

Biondi, V., Iraldo, F. and Meredith, S. (2002), "Achieving sustainability through environmental innovation: the role of SMEs", *International Journal of Technology Management*, Vol. 24 Nos 5/6, pp. 612-626.

Bourlakis, M., Maglaras, G., Aktas, E. and Gallear, D. (2014), "Firm size and sustainable performance in food supply chains: insights from Greek SMEs", *International Journal of Production Economics*, Vol. 152, pp. 112-130.

Cappa, F., Del Sette, F., Hayes, D. and Rosso, F. (2016), "How to deliver open sustainable innovation: an integrated approach for a sustainable marketable product", *Sustainability (Switzerland)*, Vol. 8 No. 12.

Carter, C.R. (2004), "Purchasing and social responsibility: a replication and extension", *Journal of Supply Chain Management*, Vol. 40 No. 3, pp. 4-16.

Carter, C.R. and Rogers, D.S. (2008), "A framework of sustainable supply chain management: moving toward new theory", *International Journal of Physical Distribution & Logistics Management*, Vol. 38 No. 5, pp. 360-387.

Cassells, S. and Lewis, K. (2011), "SMEs and environmental responsibility: do actions reflect attitudes?", *Corporate Social Responsibility and Environmental Management*, Vol. 18 No. 3, pp. 186-199.

Ceschin, F. and Gaziulusoy, I. (2016), "Evolution of design for sustainability: from product design to design for system innovations and transitions", *Design Studies*, Vol. 47, pp. 118-163.

Chan, R.Y. (2010), "Corporate environmentalism pursuit by foreign firms competing in China", *Journal of World Business*, Vol. 45 No. 1, pp. 80-92.

Chen, L., Xu, J. and Zhou, Y. (2017), "Regulating the environmental behavior of manufacturing MEs: interfirm alliance as a facilitator", *Journal of Cleaner Production*, Vol. 165, pp. 393-404.

Comrey, A.L. and Lee, H.B. (1992), "A first course in factor analysis", Erlbaum, Hillsdale, NJ.

Cook, T. and Campbell, D. (1979), *Quasi-Experimentation: Design and Analysis Issues*, Rand McNally, Chicago, IL.

Crals, E. and Vereeck, L. (2005), "The affordability of sustainable entrepreneurship certification for SMEs", *International Journal of Sustainable Development & World Ecology*, Vol. 12 No. 2, pp. 173-183.

Cuerva, M.C., Triguero-Cano, A. and Corcoles, D. (2014), "Drivers of green and non-green innovation: empirical evidence in Low-Tech SMEs", *Journal of Cleaner Production*, Vol. 68, pp. 104-113.

Danese, P., Romano, P. and Formentini, M. (2013), "The impact of supply chain integration on responsiveness: the moderating effect of using an international supplier network", *Transportation Research Part E Logistics and Transportation Review*, Vol. 49 No. 1, pp. 125-140.

Deshmukh, P.D., Thampi, G.T. and Kalamkar, V.R. (2015), "Investigation of quality benefits of ERP implementation in Indian SMEs", *Procedia Computer Science*, Vol. 49, pp. 220-228.

Dong, Y., Carter, C.R. and Dresner, M.E. (2001), "JIT purchasing and performance: an exploratory analysis of buyer and supplier perspectives", *Journal of Operations Management*, Vol. 19 No. 4, pp. 471-483.

Duflou, J.R., Sutherland, J.W., Dornfeld, D., Herrmann, C., Jeswiet, J., Kara, S., Hauschild, M. and Kellens, K. (2012), "Towards energy and resource efficient manufacturing: a processes and systems approach", *CIRP Annals-Manufacturing Technology*, Vol. 61 No. 2, pp. 587-609.

El-Kassar, A.-N. and Singh, K.S. (2018), "Green innovation and organizational performance: the influence of big data and the moderating role of management commitment and HR practices", *Technological Forecasting and Social Change* (in press).

Esfahbodi, A., Zhang, Y. and Watson, G. (2016), "Sustainable supply chain management in emerging economies: trade-offs between environmental and cost performance", *International Journal of Production Economics*, Vol. 181, Part B, pp. 350-366.

Flynn, B.B., Huo, B. and Zhao, X. (2010), "The impact of supply chain integration on performance: a contingency and configuration approach", *Journal of Operations Management*, Vol. 28 No. 1, pp. 58-71.

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *International Journal of Research*, Vol. 18 No. 1, pp. 29-50.

Fraccascia, L., Giannoccaro, I. and Albino, V. (2018), "Green product development: what does the country product space imply?", *Journal of Cleaner Production*, Vol. 170, pp. 1076-1088.

Gaur, A.S. and Delios, A. (2015), "International diversification of emerging market firms: the role of ownership structure and group affiliation", *Management International Review*, Vol. 55 No. 2, pp. 235-253.

Gaur, A.S. and Gaur, S.S. (2009), *Statistical Methods for Practice and Research: A Guide to Data Analysis using SPSS*, 2nd ed., Sage, New Delhi.

Gaur, A.S. and Kumar, M. (2018), "A systematic approach to conducting review studies: an assessment of content analysis in 25 years of IB research", *Journal of World Business*, Vol. 53 No. 2, pp. 280-289.

Gaur, A.S. and Kumar, V. (2009), "International diversification, firm performance and business group affiliation: empirical evidence from India", *British Journal of Management*, Vol. 20 No. 2, pp. 172-186.

Gaur, A.S., Kumar, V. and Singh, D.A. (2014), "Resources, institutions and internationalization process of emerging economy firms", *Journal of World Business*, Vol. 49, pp. 12-20.

Gaur, A.S., Ma, X. and Ding, Z. (2014), "Perceived home country supportiveness/unfavorableness and outward foreign direct investment from China", *Journal of International Business Studies*, Vol. 49 No. 3, pp. 324-345.

Ghadge, A., Kaklamanou, M., Choudhary, S. and Bourlakis, M. (2017), "Implementing environmental practices within the Greek dairy supply chain: drivers and barriers for SMEs", *Industrial Management & Data Systems*, Vol. 117 No. 9, pp. 1995-2014.

Gligor, D.M., Holcomb, M.C. and Feizabadi, J. (2016), "An exploration of the strategic antecedents of firm supply chain agility: the role of a firm's orientations", *International Journal of Production Economics*, Vol. 179, pp. 24-34.

Green, K.W., Zelbst, P.J., Meacham, J. and Bhadauria, V.S. (2012), "Green supply chain management practices: impact on performance", *Supply Chain Management: An International Journal*, Vol. 17 No. 3, pp. 290-305.

Gungor, A. and Gupta, S. (1999), "Issues in environmentally conscious manufacturing and product recovery: a survey", *Computers & Industrial Engineering*, Vol. 36 No. 44, pp. 811-853.

Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2010), *Multivariate Data Analysis*, 7th ed., Prentice Hall, Upper Saddle River, NJ.

Hami, N., Muhamad, M.R. and Ebrahim, Z. (2015), "The impact of sustainable manufacturing practices and innovation performance on economic sustainability", *Procedia CIRP*, Vol. 26, pp. 190-195.

Harman, H.H. (1976), *Modern Factor Analysis*, 3rd ed., The University of Chicago Press, Chicago, IL.

Hasan, M.N. (2016), "Measuring and understanding the engagement of Bangladeshi SMEs with sustainable and socially responsible business practices: an ISO 26000 perspective", *Social Responsibility Journal*, Vol. 12 No. 3, pp. 584-610.

Hassini, E., Surti, C. and Searcy, C. (2012), "A literature review and a case study of sustainable supply chains with a focus on metrics", *International Journal of Production Economics*, Vol. 140 No. 1, pp. 69-82.

Heras, I. and Arana, G. (2010), "Alternative models for environmental management in SMEs: the case of Ekoscan vs ISO 14001", *Journal of Cleaner Production*, Vol. 18 No. 8, pp. 726-735.

Hoof, B.V. and Thiell, M. (2014), "Collaboration capacity for sustainable supply chain management: small and medium-sized enterprises in Mexico", *Journal of Cleaner Production*, Vol. 67, pp. 239-248.

Hsu, C., Chang, A. and Luo, E. (2017), "Identifying key performance factors for sustainability development of SMEs – integrating QFD and fuzzy MADM methods", *Journal of Cleaner Production*, Vol. 161, pp. 629-645.

Hsu, C.C., Tan, K.C., Zailani, S.H.M. and Jayaraman, V. (2013), "Supply chain drivers that foster the development of green initiatives in an emerging economy", *International Journal of Operations & Production Management*, Vol. 33 No. 6, pp. 656-688.

Huo, B., Qi, Y., Wang, Z. and Zhao, X. (2014), "The impact of supply chain integration on firm performance: the moderating role of competitive strategy", *Supply Chain Management: An International Journal*, Vol. 19 No. 4, pp. 369-384.

International Energy Agency (2016), "Co_2 emission from fuel combustion", available at: www.iea.org/publications/freepublications/publication/CO2EmissionsfromFuelCombustion_Highlights_2016.pdf

Jackson, S.A., Gopalakrishna-Remani, V., Mishra, R. and Napier, R. (2016), "Examining the impact of design for environment and the mediating effect of quality management innovation on firm performance", *International Journal of Production Economics*, Vol. 173, pp. 142-152.

Jahanshahi, A.A. and Brem, A. (2017), "Sustainability in SMEs: top management teams behavioral integration as source of innovativeness", *Sustain*, Vol. 9 No. 10, pp. 2-16.

Javalgi, R.G., Todd, P.R., Johnston, W.J. and Granot, E. (2012), "Entrepreneurial orientation, management commitment, and human capital: the internationalization of SMEs in India", *Journal of Business Research*, Vol. 64 No. 9, pp. 1004-1010.

Jayal, A.D., Badurdeenm, F., Dillon, O.W. Jr and Jawahir, I.S. (2010), "Sustainable manufacturing: modeling and optimization challenges at the product, process and system levels", *CIRP Journal of Manufacturing Science and Technology*, Vol. 2 No. 3, pp. 144-152.

Johnson, M.P. (2015), "Sustainability management and small and medium-sized enterprises: managers' awareness and implementation of innovative tools", *Corporate Social Responsibility and Environmental Management*, Vol. 22 No. 5, pp. 271-285.

Jones, J. and de Zubielqui, G.C. (2017), "Doing well by doing good: a study of university-industry interactions, innovationess and firm performance in sustainability-oriented Australian SMEs", *Technological Forecasting and Social Change*, Vol. 123, pp. 262-270.

Jorge, M.L., Madueno, J.H. and Martinez-Martinez, D. (2015), "Competitiveness and environmental performance in Spanish small and medium enterprises: is there a direct link?", *Journal of Cleaner Production*, Vol. 101, pp. 26-37.

Judge, W.Q., Gaur, A.S. and Muller, M.K. (2010), "Antecedents of shareholder activism: evidence from a multi-country study", *Corporate Governance: An International Review*, Vol. 18 No. 4, pp. 258-273.

Kealy, T. (2017), "Stakeholder outcomes in a wind turbine investment: is the Irish energy policy effective in reducing GHG emissions by promoting small-scale embedded turbines in SME's?", *Renewable Energy*, Vol. 101, pp. 1157-1168.

Kerlinger, F.N. (1986), *Foundations of Behavioral Research*, 3rd ed., Holt, Rinehart and Winston, New York, NY.

Kirchoff, J.F., Tate, W.L. and Mollenkopf, D.A. (2016), "The impact of strategic organizational orientations on green supply chain management and firm performance", *International Journal of Physical Distribution & Logistics Management*, Vol. 46 No. 3, pp. 269-292.

Klewitz, J. and Hansen, E.G. (2013), "Sustainability-oriented innovation of SMEs: a systematic review", *Journal of Cleaner Production*, Vol. 65, pp. 57-75.

Kline, R.B. (2011), *Principles and Practice of Structural Equation Modeling*, The Guilford Press, New York, NY.

Kumar, V., Gaur, A.S. and Pattnaik, C. (2012), "Product diversification and international expansion of business groups: evidence from India", *Management International Review*, Vol. 52 No. 2, pp. 175-192.

Kushwaha, G.S. and Sharma, N.K. (2016), "Green initiatives: a step towards sustainable development and firm's performance in the automobile industry", *Journal of Cleaner Production*, Vol. 121, pp. 116-129.

Laurinkeviciute, A. and Stasiskiene, Z. (2011), "SMS for decision making of SMEs", *Clean Technologies and Environmental Policy*, Vol. 13 No. 6, pp. 797-807.

Lee, J.-H. and Gaur, A.S. (2013), "Managing multi-business firms: a comparison between Korean Chaebols importance of external environment for sustainability", *Journal of World Business*, Vol. 48 No. 4, pp. 443-454.

Lewis, K.V., Cassells, S. and Roxas, H. (2014), "SMEs and the potential for a collaborative path to environmental responsibility", *Business Strategy and the Environment*, Vol. 24 No. 8, pp. 750-764.

Li, S. and Lin, B. (2006), "Accessing information sharing and information quality in supply chain management", *Decision Support Systems*, Vol. 42 No. 3, pp. 1641-1656.

Lii, P. and Kuo, F.-I. (2016), "Innovation-oriented supply chain integration for combined competitiveness and firm performance", *International Journal of Production Economics*, Vol. 174, pp. 142-155.

Limoubpratum, C., Shee, H. and Ahsan, K. (2015), "Sustainable distribution through competition strategy", *The International Journal of Logistics Management*, Vol. 18 No. 5, pp. 424-441.

Lundgren, T. and Zhou, W. (2017), "Firm performance and the role of environmental management", *Journal of Environmental Management*, Vol. 203 No. 1, pp. 330-341.

Mariadoss, B.J., Chi, T., Tansuhaj, P. and Pomirleanu, N. (2016), "Influences of firm orientations on sustainable supply chain management", *Journal of Business Research*, Vol. 69 No. 9, pp. 3406-3414.

Martin, P. and D'Acunto, A. (2003), "Design of a production system: an application of integration product-process", *International Journal of Computer Integrated Manufacturing*, Vol. 16 Nos 7-8, pp. 509-516.

Massa, L., Farneti, F. and Scappini, B. (2015), "Developing a sustainability report in a small to medium enterprise: process and consequences", *Meditari Accountancy Research*, Vol. 23 No. 1, pp. 62-91.

Mazharul, M.M., Murad, M.M., McMurray, A.J. and Abalala, T.S. (2017), "Aspects of sustainable procurement practices by public and private organisations in Saudi Arabia: an empirical study", *International Journal of Sustainable Development & World Ecology*, Vol. 24 No. 4, pp. 289-303.

Meath, C., Linnenluecke, M. and Griffiths, A. (2015), "Barriers and motivators to the adoption of energy savings measures for small- and medium-sized enterprises (SMEs): the case of the ClimateSmart Business Cluster program", *Journal of Cleaner Production*, Vol. 112 No. 5, pp. 3597-3604.

Medeiros, J.F.D. and Ribeiro, J.L.D. (2017), "Environmentally sustainable innovation: expected attributes in the purchase of green products", *Journal of Cleaner Production*, Vol. 142 No. 1, pp. 240-248.

Melane-Lavado, A., Alvares-Herranz, A. and Gonzalez-Gonzales, I. (2018), "Foreign direct investment as a way to guide the innovative process towards sustainability", *Journal of Cleaner Production*, Vol. 172, pp. 3578-3590.

Mukherjee, D., Gaur, A.S., Gaur, S.S. and Schmid, F. (2013), "External and internal influences on R&D alliance formation: evidence from German SMEs", *Journal of Business Research*, Vol. 66 No. 11, pp. 2178-2185.

Narasimhan, T.E. (2015), "Make in India' to transform MSMEs' fortunes: minister", *Business Standards*, January 12, available at: www.business-standard.com/article/sme/make-in-india-to-transform-msmes-fortunes-minister-115011100792_1.html

Nunnally, J. (1978), *Psychometric Methods*, McGraw-Hill, New York, NY.

Orzes, G., Moretto, A.M., Ebrahimpour, M., Sartor, M., Moro, M. and Rossi, M. (2018), "United Nations global compact: literature review and theory-based research agenda", *Journal of Cleaner Production*, Vol. 177, pp. 633-654.

Osano, H.M. and Languitone, H. (2016), "Factors influencing access to finance by SMEs in Mozambique: case of SMEs in Maputo central business district", *Journal of Innovation and Entrepreneurship*, Vol. 5 No. 13, pp. 1-16.

Pachouri, A. and Sharma, S. (2016), *Barriers to Innovation in Indian Small and Medium-Sized Enterprises*, Asian Development Bank Institute, available at: www.adb.org/sites/default/files/publication/189392/adbi-wp588.pdf

Pakdeechoho, N. and Sukhotu, V. (2018), "Sustainable supply chain collaboration: incentives in emerging economies", *Journal of Manufacturing Technology Management*, Vol. 29 No. 2, pp. 273-294.

PBL Netherlands Environmental Assessment Agency (2016), "Trends in global CO_2 emission", available at: http://edgar.jrc.ec.europa.eu/news_docs/jrc-2016-trends-in-global-co2-emissions-2016-report-103425.pdf

Popa, S., Soto-Acosta, P. and Perez-Gonzalez, D. (2017), "An investigation of the effect of electronic business on financial performance of Spanish manufacturing SMEs", *Technological Forecasting and Social Change*, Vol. 136, pp. 355-362.

Popli, M., Ladkani, R.M. and Gaur, A.S. (2017), "Business group affiliation and post-acquisition performance: an extended resource-based view", *Journal of Business Research*, Vol. 81, pp. 21-30.

Prahinski, C. and Benton, W. (2004), "Supplier evaluations: communication strategies to improve supplier performance", *Journal of Operations Management*, Vol. 22 No. 1, pp. 39-62.

Preuss, L. (2001), "In dirty chains? Purchasing and greener manufacturing", *Journal of Business Ethics*, Vol. 34 No. 3, pp. 345-359.

Qi, Y., Huo, B., Wang, Z. and Yeung, H.Y.J. (2017), "The impact of operations and supply chain strategies on integration and performance", *International Journal of Production Economics*, Vol. 186, pp. 167-174.

Quader, M.S., Kamal, M.M. and Hassan, A.B.M.E. (2016), "Sustainability of positive relationship between environmental performance and profitability of SMEs: a case study in the UK", *Journal of Enterprising Communities: People and Places in the Global Economy*, Vol. 10 No. 2, pp. 138-163.

Rao, P. and Holt, D. (2005), "Do green supply chains lead to competitiveness and economic performance?", *International Journal of Operations & Production Management*, Vol. 25 Nos 9-10, pp. 898-916.

Redmond, J., Cox, J.W., Curtis, J., Kirk-Brown, A. and Walker, B. (2016), "Beyond business as usual: how (and why) the habit discontinuity hypothesis can inform SME engagement in environmental sustainability practices", *Australasian Journal of Environmental Management*, Vol. 23 No. 4, pp. 426-442.

Reyes-Rodriguez, J.F., Ulhoi, J.P. and Madsen, H. (2016), "Corporate environmental sustainability in Danish SMEs: a longitudinal study of motivators, initiatives, and strategic effects", *Corporate Social Responsibility and Environmental Management*, Vol. 23 No. 4, pp. 193-212.

Rizzi, F., Frey, M., Testa, F. and Appolloni, A. (2014), "Environmental value chain in green SME networks: the threat of the Abilene paradox", *Journal of Cleaner Production*, Vol. 85, pp. 265-275.

Rusinko, C.A. (2007), "Green manufacturing: an evaluation of environmentally sustainable manufacturing practices and their impact on competitive outcomes", *IEEE Transactions on Engineering Management*, Vol. 54 No. 3, pp. 445-454.

Russo, A. and Tencati, A. (2009), "Formal vs. informal CSR strategies: evidence from Italian micro, small, medium-sized, and large firms", *Journal of Business Ethics*, Vol. 85, pp. 339-353.

Sajan, M.P., Shalij, P.R., Ramesh, A. and Biju, A.P. (2017), "Lean manufacturing practices in Indian manufacturing SMEs and their effect on sustainability performance", *Journal of Manufacturing Technology Management*, Vol. 28 No. 6, pp. 772-793.

Salam, M.A. (2017), "The mediating role of supply chain collaboration on the relationship between technology, trust and operational performance: an empirical investigation", *Benchmarking: An International Journal*, Vol. 24 No. 2, pp. 298-317.

Sarkis, J. and Dijkshoorn, J. (2007), "Relationships between solid waste management performance and environmental practice adoption in Welsh small and medium-sized enterprises (SMEs)", *International Journal of Production Research*, Vol. 45 No. 21, pp. 4989-5015.

Sarkis, J., Bai, C., de Sousa Jabbour, A.B.L., Jabbour, C.J.C. and Sobreiro, V.A. (2016), "Connecting the pieces of the puzzle toward sustainable organizations: a framework integrating OM principles with GSCM", *Benchmarking: An International Journal*, Vol. 23 No. 6, pp. 1605-1623.

Schönsleben, P. (2007), *Integral Logistics Management: Operations and Supply Chain Management in Comprehensive Value-added Networks*, CRC Press, available at: www.adb.org/sites/default/files/publication/189392/adbi-wp588.pdf

Sharma, S. and Vredenburg, H. (1998), "Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities", *Strategic Management Journal*, Vol. 19 No. 8, pp. 729-753.

Shashi, K., Cerchione, R., Singh, R., Centobelli, P. and Shabani, A. (2018), "Food cold chain management: from a structured literature review to a conceptual framework and research agenda", *International Journal of Logistics Management*, Vol. 29 No. 3, pp. 792-821.

Singh, D. and Gaur, A.S. (2013), "Governance structure, innovation and internationalization: evidence from India", *Journal of International Management*, Vol. 19 No. 3, pp. 300-309.

Singh, D.A., Gaur, A.S. and Schmid, F. (2010), "Corporate diversification, TMT experience and performance: evidence from German SMEs", *Management International Review*, Vol. 50 No. 1, pp. 35-56.

Srivastava, P., Iyer, K.N.S. and Rawwas, M.Y.A. (2017), "Performance impact of supply chain partnership strategy-environment co-alignment", *International Journal of Operations & Production Management*, Vol. 37 No. 7, pp. 927-949.

Swink, M., Narasimhan, R. and Wang, C. (2007), "Managing beyond the factory walls: effects of four types of strategic integration on manufacturing plant performance", *Journal of Operations Management*, Vol. 25 No. 1, pp. 148-164.

Szczepanska-Woszczyna, K. and Kurowska-Pysz, J. (2016), "Sustainable business development through leadership in SMEs", *Engineering Management in Production and Services*, Vol. 8 No. 3, pp. 57-69.

Taschner, A. (2016), "Improving SME logistics performance through benchmarking", *Benchmarking: An International Journal*, Vol. 23 No. 7, pp. 1780-1797.

Thanki, S., Govindan, K. and Thakkar, J. (2016), "An investigation on lean-green implementation practices in Indian SMEs using analytical hierarchy process (AHP) approach", *Journal of Cleaner Production*, Vol. 135 No. 1, pp. 284-298.

Tomsic, N., Bojnec, S. and Simcic, B. (2015), "Corporate sustainability and economic performance in small and medium sized enterprises", *Journal of Cleaner Production*, Vol. 108, Part A, pp. 603-612.

Tripathy, S., Aich, S., Chakraborty, A. and Lee, G.M. (2016), "Information technology is an enabling factor affecting supply chain performance in Indian SMEs: a structural equation modelling approach", *Journal of Modelling in Management*, Vol. 11 No. 1, pp. 269-287.

Vachon, S. and Klassen, R.D. (2008), "Environmental management and manufacturing performance: the role of collaboration in the supply chain", *International Journal of Production Economics*, Vol. 111 No. 2, pp. 299-315.

Vijayasarathy, L.R. (2010), "Supply integration: an investigation of its multi-dimensionality and relational antecedents", *International Journal of Production Economics*, Vol. 124 No. 2, pp. 489-505.

Wagner, M. (2005), "How to reconcile environmental and economic performance to improve corporate sustainability: corporate environmental strategies in the European paper industry", *Journal of Environmental Management*, Vol. 76 No. 2, pp. 105-118.

Walker, H. and Preuss, L. (2008), "Fostering sustainability through sourcing from small businesses: public sector perspectives", *Journal of Cleaner Production*, Vol. 16 No. 5, pp. 1600-1609.

Zhang, J.A. and Walton, S. (2016), "Eco-innovation and business performance: the moderating effects of environmental orientation and resource commitment in green-oriented SMEs", *R&D Management*, Vol. 47 No. 5, pp. 26-39.

Zsidisin, G.A. and Siferd, S.P. (2001), "Environmental purchasing: a framework for theory development", *European Journal of Purchasing & Supply Management*, Vol. 7 No. 1, pp. 61-73.

Further reading

Gaur, S.S., Vasudevan, H. and Gaur, A.S. (2011), "Effect of market orientation on manufacturing performance: moderating role of firm resources and environmental factors", *European Journal of Marketing*, Vol. 45 Nos 7/8, pp. 1172-1193.

Sambataro, J.P. III and Hughey, K.F.D. (2006), "The awareness, action and advancement (AAA) environmental management and reporting system: moving from the household to small and medium-size enterprises", *Journal of Cleaner Production*, Vol. 14 Nos 9-11, pp. 1017-1027.

Stewart, H. and Gapp, R. (2012), "Achieving effective sustainable management: a small-medium enterprise case study", *Corporate Social Responsibility and Environmental Management*, Vol. 21 No. 1, pp. 52-64.

Thakkar, J., Kanda, A. and Deshmukh, S.G. (2009), "Supply chain performance measurement framework for small and medium scale enterprises", *Benchmarking: An International Journal*, Vol. 16 No. 5, pp. 702-723.

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