



Investigating the relationship between green supply chain management and corporate performance using a mixed method approach: Developing a roadmap for future research

Hassan Younis^a, Balan Sundarakani^{b,*}, Barry O'Mahony^c

^a German Jordanian University, Jordan

^b Faculty of Business, University of Wollongong in Dubai, United Arab Emirates

^c Ecole hôtelière de Lausanne HES-SO // University of Applied Sciences Western Switzerland, Switzerland

Received 5 September 2017; revised form 26 September 2018; accepted 17 October 2019; Available online 24 October 2019

KEYWORDS

Mixed method;
Green supply chain
management;
Corporate performance

Abstract Global warming and the depletion of natural resources have motivated calls for significant changes in the way organisations produce and deliver products and services. In many countries, mandatory measures, such as carbon taxation, have been introduced to stimulate the greening of supply chains. However, research on the impact of the implementation of green supply chain management (GSCM) practices on corporate performance (CP) is still inconclusive. This study investigates the relationship between (GSCM) practices and (CP) using a sequential mixed methods research design. The study found some key reasons for why GSCM practices failed to impact many of the dimensions of (CP). The majority of them related to issues in implementation of these (GSCM) practices.

© 2020 Published by Elsevier Ltd on behalf of Indian Institute of Management Bangalore. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction

While climate change is of global concern, it is only relatively recently that researchers have sought to determine whether the implementation of climate change initiatives, also known as green initiatives, has a positive impact on overall organisational performance (Gonzalez, Sarkis, and Díaz, 2008). Greening the supply chain has now become a significant issue in

supply chain management, and this includes managing several dimensions including procurement, the management of manufacturing materials, circulation, marketing, and reverse logistics (Younis, Sundarakani, & Vel, 2016).

Managing these activities in environment-friendly ways requires significant resources in an end-to-end supply chain process that includes the procurement of raw materials, environment-friendly manufacturing, packaging, delivery, and product disposal (Hervani, Helms, & Sarkis, 2005; Kumar & Putnam, 2008; Sarkis, 2003). Thus, the implementation of green practices encapsulates the entire supply chain as a circular

*Corresponding author.

E-mail address: balansundarakani@uowdubai.ac.ae (B. Sundarakani).

<https://doi.org/10.1016/j.iimb.2019.10.011>

0970-3896 © 2020 Published by Elsevier Ltd on behalf of Indian Institute of Management Bangalore. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

economy (Eltayeb, Zailani, & Ramayah, 2011; Korhonen, Honkasalo, & Seppälä, 2018).

Despite the emphasis on environment-friendly supply chain practices, scholarly research has been relatively scant and, in some cases, the results have been inconsistent or inconclusive (Golčić & Smith, 2013). This could be due to a variety of reasons including limited access to data, unreliable sample sizes, the depth of the research, and imprecise results that have not been replicated in subsequent studies. Srivastava's (2007) comprehensive review of the literature on green supply chain management (GSCM) identified this issue. However, subsequent research has not fully established what the impacts of GSCM practices are on corporate performance (Lin and Sheu, 2012). This study seeks to address this research gap by holistically studying the impact of GSCM on organisational performance in the United Arab Emirates (UAE).

Specifically, this study is designed to comprehensively examine the impact of GSCM practices using mixed methodology to gain a richer understanding of how the critical dimensions of GSCM impact overall corporate performance. In doing so, we seek to create a roadmap or framework that can be used in future studies to investigate the impact of GSCM practices on corporate performance.

The research context: GSCM in the United Arab Emirates

While GSCM in the UAE is at an early stage, the Ministry of Environment and Water advocates a long-term approach to sustainable improvements (UAE State of Green Economy Report, 2014). The country's strategy is supported by four main pillars: (i) green technology and market development; (ii) integrated social and spatial development; (iii) clean energy; and (iv) sustainable use of resources. The UAE government has also supported the implementation of a number of green initiatives in various sectors including MASDAR, a government-owned entity that focusses on clean energy research and development (Balasubramanian, 2012; Elgayar, Beheiry, Jabbar, & Al Ansari, 2016).

The Urban Planning Council in the nation's capital launched a series of green construction regulations, specifically the Estidama or Pearl Rating System, which requires contractors to adhere to specific codes of practice related to the design, construction, and operation of high-rise buildings, villas, and communities (Al-Tuwaijri, Christensen, and Hughes, 2004). Other green initiatives include the introduction of green service stations, improved in-house recycling, and the adoption of efficient cooling systems.

In keeping with this emphasis, the extant research on GSCM in the context of UAE is mainly confined to the construction sector. These include Elgayar et al. (2016) study of the use of green systems and Balasubramanian's (2012) study of GSCM enablers. These studies provide valuable context for the GSCM practices within the UAE construction industry. We built on this prior work by investigating whether the implementation of GSCM practices has a positive impact on overall organisational performance. This study is important because organisations frequently balance legislative compliance with shareholders' performance expectations. Thus, understanding whether businesses can achieve this balance is of significant value (Ayuso et al., 2014; Freeman, 2002; Russo & Fouts, 1997).

The rest of this article is structured as follows. The second section presents a review of the relevant literature, including empirical works that have utilised qualitative research methods, and then proceed to identify the research gap. This is followed by an explanation of the mixed methods research methodology that we use in this study. The analyses and results of the quantitative and qualitative data are then presented and discussed. We conclude with a discussion of the findings, a review of the limitations of the study, and some implications for further research.

Literature review

Several extant qualitative and quantitative studies from the literature have informed our understanding of GSCM from a variety of perspectives. These studies have analysed secondary data, used case studies, and conducted surveys with individual stakeholders or corporate entities. Table 1 contains a sample of these studies, presenting a snapshot of the methods, sample sizes, dimensions, and findings.

Many of these studies favoured quantitative methods and, for the most part, purposeful sampling was used to target specific stakeholders, industry sectors, or corporations. For example, Laosirihongthong, Adebajo, and Tan (2013) used a quantitative survey to collect primary data from ISO14001 certified manufacturing companies. They found that performance within these organisations was principally motivated by legislation and regulations, which would seem logical given the emphasis of ISO14001. In the literature review that follows, we examine previous qualitative and quantitative studies to gain insights into the overall research landscape. By dividing the review into qualitative and quantitative sections, we seek to uncover whether there is still a role for qualitative, exploratory research as a method to gain a deeper understanding of the impact of GSCM on overall corporate performance.

Qualitative approach

A comprehensive review of the relevant literature showed that several studies employed qualitative methods to examine whether GSCM practices have an impact on organisational performance. Among these is an early Klassen and McLaughlin's (1996) study, which set out to identify whether the implementation of environmentally sustainable processes within businesses can improve stock market returns. Through content analysis of the archival data of environmental and financial performance, they found that positive stock market returns were related to environmental performance awards, and that negative performance was associated with environmental crises (Minichiello, Aroni, Timewell, and Alexander, 1995). That is, the publicity associated with awards and crises played a major role in stock market performance, suggesting that management of the media is an important dimension in achieving GSCM-related organisational performance.

Tibben-Lembke's (2002) study focussed on how reverse logistics impacted changes in sales over a product's life cycle (Tibben-Lembke, 2002). This study identified numerous challenges in managing reverse logistics, and highlighted how these occur at different stages of a product's life cycle.

Table 1 Summary of major research articles on GSCM.

Title	Author/s and publication date	Research methodology	Variables	Measures/dimensions	Statistical tool	Findings	No. of Citations
Corporate social and financial performance: a meta-analysis	Orlitzky <i>et al.</i> (2003)	Meta analysis of 52 quantitative studies	DV: Corporate Financial Performance IV: Corporate Social Performance	CFP: market based measures, accounting based measures and perceptual based measures CSP: disclosure, reputation indexes, social audits and corporation social responsibility values and attitudes	File drawer analysis	(1) across studies, CSP is positively correlated with CFP, (2) the relationship tends to be bidirectional and simultaneous, (3) reputation appears to be an important mediator of the relationship	1651
A resource-based perspective on corporate environmental performance and profitability	Russo and Fouts (1997)	243 sample firms from Franklin Research and Development Corporation (FRDC)	DV: Economic performance Moderator: Industry growth IV: Environmental performance Control variables: industry concentration, firm growth rate, firm size, advertising intensity, capital intensity and industry growth	EP: FRDC Rating EcP: ROA	Regression Analysis	Environmental performance and economic performance are positively linked moderated by industry growth	1406
The impact of environmental management on firm performance	Klassen and McLaughlin (1996)	Event study methodology for 22 firms	Environmental management and firm performance	Environmental management: product and operations technologies designed to minimise their environmental impact and strong EMS Firm performance: financial performance and market valuation of the firm	* ANCOVA * ANOVA * Regression analysis	* Significant positive stock returns following positive environmental event performance. * Larger market valuation with winning of an award. * Significant negative returns for environmental crises	821
Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises	Zhu and Sarkis (2004)	Survey questionnaire to 186 manufacturing firms in China	IV: GSCM Practices Moderators: quality management and just-in-time DV: Organisational performance	GSCM: Internal environmental management, external GSCM, investment recovery and eco design Organisational performance: environmental performance, positive economic performance and negative economic performance	Factor analysis for variables internal consistency and validity Multivariate regression analysis to test the relationship	* Firms with higher levels of GSCM adoption have better environmental and positive economic performance	638
The relations among environmental disclosure, environmental performance and economic performance: a simultaneous equations approach	Al-Tuwaijiri <i>et al.</i> (2004)	Analysis of cross-sectional sample of 198 US firms from Standard & Poors	DVs: Economic performance, environmental performance and environmental disclosure IVs: Unexpected earnings, growth opportunities, environmental exposure, environmental concern. Control variables: public visibility and firm size	Environmental concern is measured by: having environmental committee, number and frequency of environmental reports published and number of programs the firm participates in	Three-stage least squares regression	* There is positive relation between economic performance and environmental performance. * Environmental performance is positively related to environmental disclosure.	349

(continued)

Table 1 (Continued)

Title	Author/s and publication date	Research methodology	Variables	Measures/dimensions	Statistical tool	Findings	No. of Citations
Does it really pay to be green	King and Lenox (2001)	Analysis of 652 US manufacturing firms during 1987-1996	IV: Environmental performance DV: Financial performance Control variables: Company size, capital intensity, the annual growth, leverage, R&D intensity and stringency	IV: Relative emissions and industry emissions DV: Tobin's q	Least-squares regression analysis	* Environmental performance is associated with financial performance * Firms with lower emissions in their industries have higher financial performance	296
Greening the supply chain: new initiative in south east Asia	Rao (2002)	Survey questionnaire to 52 manufacturing firms in Philippines, Malaysia, Indonesia, Thailand and Singapore	Environmental initiatives and Performance	IV: Environment initiatives and green supply chain environmental management DV: Environmental performance, economic performance and competitiveness	Confirmatory and exploratory factor analysis to validate the constructs and structural equation modelling to validate the model proposed	* There is significant link between environmental initiatives and environmental performance * There is important link between environmental performance and competitiveness * There is important link between competitiveness and economic performance	277
The moderating effects of institutional pressures on emergent green supply chain practices and performance	Zhu and Sarkis (2007)	Survey questionnaire to 341 manufacturing facilities in China	IVs: Green supply chain practices DV: Performance Improvements Control variables: Institutional pressures	GSCMPs: Internal environmental management, green purchasing, Eco-design, cooperation with customers and investment recovery Performance improvements: environmental, positive economic and negative economic Institutional pressure: Market, regulatory and competition	Exploratory factor analysis for data reduction and hierarchical regression analysis to test the relationships	* Market and regulatory pressures will influence organisations to have better environmental performance * Manufacturers facing regulatory pressures tend to implement green purchasing and investment recovery practices, GP leads to improved environmental performance but IR leads to worse economic performance.	222
An examination of corporate reporting, environmental management practices and firm performance	Montabon et al. (2007)	Content analysis of 45 corporate reports	Environment management practices and firm performance	EMPs: Recycling, proactive waste reduction, remanufacturing, environmental design, specific design targets and surveillance of market Firm performance: Product innovation, process innovation, ROI and sales growth	Canonical correlation	* All EMPs except specific design targets are positively associated with product and process innovation * EMPs had relatively weak relationship with sales growth and negative relationship with ROI * Overall the results are consistent with Porter and van der Linde argument for Innovation offsets	193

(continued)

Table 1 (Continued)

Title	Author/s and publication date	Research methodology	Variables	Measures/dimensions	Statistical tool	Findings	No. of Citations
An analysis of the drivers affecting the implementation of green supply chain management	Diabat and Govindan (2011)	Case study of Indian company that produces aluminium products	Drivers of green supply chain management	Drivers: certification of suppliers' environmental management system, environmental collaboration between product designers and suppliers, government regulations and legislation, green design, ISO 14001 certification, collaboration with customers and reverse logistics	Interpretive structural modelling (ISM)	* Certification of suppliers' EMS, environmental collaboration with suppliers, green design, ISO 14001 certification, integrating quality environmental management into planning and operation process, reusing and recycling materials and packaging, and environmental collaboration with customers found to have strong driving power and strong dependence power	171

This included whether a product is wholly new, a new form of an existing product class, or a new model of an existing product. Walker, Di Sisto, and McBain (2008) conducted an exploratory study in the UK by interviewing stakeholders from seven private and public sector organisations. They sought to identify the drivers and barriers that influence organisations to implement GSCM initiatives within the public and private sectors. By examining a series of specific organisational factors, including regulation, customers, competitors, and society, they found that the main internal barrier was cost. External barriers included lack of commitment by suppliers and several industry-specific barriers.

Adding to the overall GSCM landscape, Mollenkott, Stolze, Tate, and Ueltschy (2010) conducted a practical study that extracted a series of important green supply chain (GSC) dimensions from the literature. They concluded that four significant elements motivate businesses to adopt green supply chain practices: (i) a reduction in overall costs; (ii) satisfying customers' demands; (iii) improved management of risks; and (iv) ISO14001 certification, which focuses on the systems and standards required to achieve environmental goals.

ISO14001 certification also featured in an exploratory study of the automotive industry in Portugal that examined the relationship between GSCM and overall supply chain performance (Azevedo, Carvalho, & Machado, 2011). A grounded theory approach was adopted to study five ISO14001 certified firms. The researchers concluded that in order to consider a supply chain to be green, ISO14001 procedures need to be in place, and these need to be supported by reverse logistics, the minimisation of waste, and the reduced use of hazardous materials. Perotti, Zorzini, Cagno, and Micheli (2012) also employed qualitative techniques to collect data from 15 Italian corporations on the adoption of GSCM practices by third-party logistics (3PLs) firms. They found that only some of the 15 firms had gained benefits from the introduction of GSCM practices. Thus, their results were inconclusive on whether the adoption of GSCM practices can improve overall financial or operational performance.

Qualitative methods were also used to model the antecedents that lead to the adoption of environmental initiatives related to greening the supply chain in the IT sector in Taiwan. Koh, Gunasekaran, and Tseng (2012) found that the Waste Electrical and Electronic Equipment (WEEE) Directive and the Restriction of Hazardous Substances (RoHS) Directive had indirect but positive effects on forward and reverse supply chains.

Reducing or preventing waste was also a feature of Xie and Breen's (2012) study of the pharmaceutical sector. They employed secondary sources as well as a comprehensive review of the relevant literature to gain a deeper understanding of the issues and stakeholders that influenced waste management within that industry. Their study highlighted the need for the involvement of all supply chain members including manufacturers, wholesalers, logistics providers, community pharmacies, and customers.

Investigating the issue from a corporate social responsibility (CSR), perspective Bose and Pal (2012) employed qualitative techniques to assess whether media announcements of GSCM initiatives might improve share prices. They found that the announcement of GSCM initiatives can have a positive impact on shareholder value. While confirming the

findings reported in Klassen and McLaughlin's (1996) earlier study, Bose and Pal (2012) further concluded that small businesses are the ones that receive the maximum benefit when GSCM announcements are made. Thus, positive publicity seemed to provide benefits for both large and small organisations.

Qualitative research has also been used to explore the attitude of corporate entities towards green strategies. Lo's (2014) study in Taiwan, for example, examined 12 corporations engaged in the high-tech sector using a case study approach. This yielded a useful typology related to whether a corporation is located upstream or downstream in the supply chain. Downstream entities were found to emphasise internal environmental management processes and green design practices, while midstream entities focus more on green manufacturing and logistics. More recently, Genovese, Acquaye, Figueroa, and Koh (2017) investigated green supply chain performance based on economic indicators with reference to two case studies in circular production systems with limited findings.

Quantitative approach

A review of the quantitative research in the literature extends the qualitative research presented in the previous section. It specifically highlights a number of studies designed to understand the relationship between the implementation of GSCM practices and elements of corporate performance. For example, Russo and Fouts' (1997) survey of 243 firms from the Franklin Research and Development Corporation (FRDC) sought to identify a relationship between environmental performance and the economic performance of the corporation. They concluded that environmental performance and economic performance are positively linked, but that economic benefits are moderated by the different stages of industry growth.

Adding to the body of knowledge, Zhu and Sarkis (2006) investigated whether GSCM initiatives in China's manufacturing and industrial sectors influenced performance outcomes. They reported markedly different performance outcomes based on the levels of implementation of GSCM and the sector in which it was implemented. For example, the results differed between environmentally sensitive manufacturing sectors and other industries with similar levels of green implementation. Specifically, although the power-generating industry and the electrical/electronics industry had similar levels of GSCM, the power-generating industry attained lower performance outcomes compared to other industries. Similarly, Simpson, Power, and Samson (2007) survey of automotive suppliers within the automotive industry in Australia was unable to find any significant relationship between environmental commitment and environmental performance.

A survey of managers in US manufacturing firms by Darnall, Jolley, and Handfield (2008) was also inconclusive in its findings. They found that firms that had adopted environmental management systems (EMS) had also introduced GSCM practices. Thus, there was a strong relationship between GSCM practices and EMS. However, this did not necessarily translate into corporate performance. Another study in the US investigated the impact of customer-orientated antecedents of

reverse logistics on cost savings, and concluded that cost savings can be achieved by increasing reverse logistics capabilities (Jack, Powers, & Skinner, 2010).

In Malaysia, customers were the focus of a survey of ISO-certified businesses. The survey was designed to determine whether an internal proactive environmental strategy, coupled with several external institutional drivers, could encourage firms to adopt eco-designs that have a positive impact on environmental performance (Zailani, Eltayeb, Hsu, & Tan, 2012). While no impact was found on the firms' economic performance, customer pressure had a positive impact on the use of eco-design, suggesting that external drivers can influence the adoption of GSCM practices.

However, this was not confirmed in another Malaysian study that focussed on whether green supply chain practices had a positive environmental, economic, or intangible outcome for manufacturing firms (Eltayeb et al., 2011). In this study, externally oriented green supply chain initiatives, such as green purchasing and reverse logistics, were found to have little effect on the internal performance of a firm.

In China, Zhu, Sarkis and Lai (2012) surveyed different types of manufacturers developing a typology that included early adopters, followers, and laggards based on the levels of GSCM adoption. They found that the early adopters outperformed the followers and laggards in terms of achieving a return on GSCM investment.

While there are numerous other quantitative studies in this field, the studies reviewed so far are among the most relevant to the present study. Of the most important is Laosirihongthong et al.'s (2013) study examining the impact on the environmental, economic, and intangible performance of firms based on proactive and reactive practices in the implementation of GSCM in Thailand. Investigating ISO14001-certified manufacturing companies, they found that legislation and regulations drive environmental, economic, and intangible performance. Thus, a reactive approach dominates GSCM in Thailand. Laosirihongthong et al. (2013) also identified four practices that were found to be most influential in achieving environmental goals, which can be adopted either on the upstream or downstream side of the supply chain. Geng, Mansouri, and Aktas (2017) conducted a meta-analysis of GSCM practices within Asian economies, and found a positive relationship between GSCM and performance. Our review concludes that eco-design, green purchasing, environmental co-operation, and reverse logistics form the basis for the development of the theoretical model for this study.

Research gaps

Our review of the extant literature showed that many studies have examined the relationship between implementing different sets of GSCM practices and various dimensions of corporate performance. Among those studies, a significant amount of research has focused on assessing the green supply chain in terms of economic considerations from the perspective of recycling (Rao & Holt, 2005; Sarkis, 1998). However, an overall perspective of the implementation of green supply chain practices with respect to corporate performance is lacking within both the theoretical and practical literature. Moreover, no study has specifically considered

the impact of implementing the four main GSCM practices (eco-design, green purchasing, environmental co-operation, and reverse logistics) on four distinct elements of corporate performance (environmental, economic, operational, and social). Prior studies did not investigate the implementation of these practices on businesses performance in the Middle Eastern region.

This study addresses this research gap by providing new insights into how organisations can satisfy the green needs of their stakeholders, as theorised by Freeman (1984), while improving overall corporate performance. We investigate the impact of implementing GSCM practices on corporate performance in the context of the UAE. Specifically, we explore how the four main GSCM practices (eco-design, green purchasing, environmental co-operation, and reverse logistics) impact corporate performance from environmental, operational, economic, and social perspectives.

Theoretical model

Based on the review of the extant literature, it can be argued that there is a lack of consensus on the impact of GSCM on corporate performance (Laosirihongthong et al., 2013) with some conflicting results, which Zhu, Sarkis, and Lai (2012) argue might create a barrier for organisations planning to adopt GSCM practices. This study addresses this gap by investigating the impact of the implementation of the four dimensions of GSCM on four elements of corporate performance. Fig. 1 presents the theoretical model underpinning the study.

The left side of the model shows the four independent variables: eco-design, green purchasing, environmental

cooperation, and reverse logistics. The dependent variable of corporate performance is shown with its four dimensions on the right side of the model. The three control variables that could affect the dependent variable are: environment management system (EMS) certification, firm size, and age. These control variables are displayed on the right of the model. The model assumes a relationship between each of the four GSCM practices (eco-design, green purchasing, environmental cooperation, and reverse logistics) and each corporate performance dimension (environmental performance, operational performance, economic performance, and social performance). Three control variables are also presented.

Environmental performance in this study refers to the ability of an organisation to reduce air emissions, effluent wastes, and solid wastes while decreasing the consumption of hazardous and toxic materials (Zhu, Sarkis, & Lai, 2008).

Operational performance refers to an organisation's capabilities to produce and deliver products more efficiently to customers, with improved quality and reduced lead times, and therefore, to improve its position in the marketplace (Melnik, Sroufe, & Calantone, 2003).

Economic performance is defined as the financial and marketing performance improvements resulting from implementing GSCM practices that enhance a firm's position when compared to the industry average (Green & Inman, 2005). Financial improvement encompasses increased costs for material purchasing, decreased costs for energy consumption, decreased costs for waste discharge, and decreased costs for environmental accidents (Sundarakani, Souza, Goh, Wagner, & Manikandan, 2010).

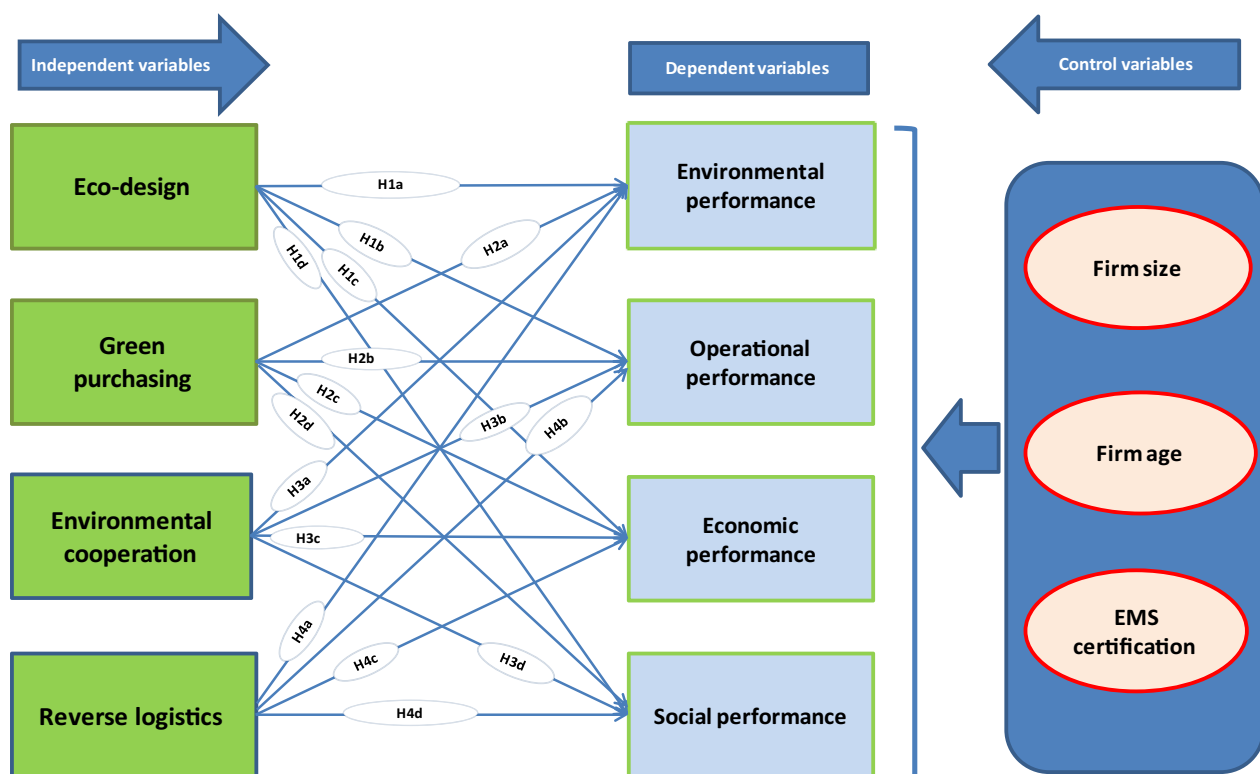


Figure 1 Theoretical model.

This study adopts Wood's (1991) definition of social performance as "a business organization's configuration of principles of social responsibility, processes of social responsiveness, and policies, programs and observable outcomes as they relate to the firm's societal relationships" (Wood, 1991, p. 693).

Research methodology: Mixed methods

Initially, the research was designed as a quantitative study, where a questionnaire was developed and presented to a targeted sample extracted from panel data. However, as will be shown in the quantitative data analysis below, the results were found to be inconclusive in relation to several of our hypotheses. Consequently, we developed a qualitative phase to triangulate the results of the quantitative phase by seeking the views of key stakeholders from the original sample.

Broadly, qualitative research assists researchers to understand "how" and "why" people, and in this case firms, behave in certain ways (Crotty, 1998; Myers, 2011). While this information can be solicited in a variety of ways, one meaningful way to gain these insights is to engage directly with key stakeholders or their representatives using in-depth interviews (Cresswell & Clark, 2011; Michello et al., 1995). Myers (2011) asserts that interviews are a common technique to understand the broader context of a phenomenon and to determine the motivations and actions that lead stakeholders to behave in certain ways.

The most common mixed methods research approach is a sequential design, where qualitative research is conducted first, followed by quantitative research, or vice versa (Cresswell & Clark, 2011; Tashakkori & Teddlie, 2010). In this study, because we found some of the findings of the quantitative study to be inconsistent with the findings reported in prior studies, we felt that the research findings could be more meaningfully explained by collecting further data using in-depth, semi-structured interviews with environment management representatives (EMRs) from a selected sample of the population that was targeted in the quantitative phase of the study. This is in keeping with Kelle's (2006, p. 309) observation that "adopting mixed method design can help identify unobserved heterogeneity in quantitative data as well as previously unknown explanatory variables and mis-specified models". In other words, the results from qualitative research can help explain incomprehensible statistical results (Kelle, 2006).

The quantitative and qualitative phases

The quantitative phase

Based on the review of the extant literature, prior studies relevant to this study were used to frame the research hypotheses. For example, Perotti et al. (2012) found that the environmental performance of 15 firms in Italy improved following the implementation of GSCM practices. Green, Zelbst, Meacham, and Bhadauria (2012) surveyed 159 firms in the US and found that GSCM practices—including eco-design and environmental cooperation—were positively

linked to environmental performance. Therefore, within the UAE context, we posit that:

H₁: There is a positive relationship between the implementation of green supply chain practices and corporate environmental performance.

Many prior studies investigated the relationship between green supply chain practices and corporate operational performance, and reported different outcomes and within different contexts. These include Lee, Kim, and Choi (2012), who found an indirect positive relationship between green supply chain practices and operational performance among Korean firms. Melnyk et al. (2003) found a positive relationship between the presence of formal EMS and improved performance such as reduced costs, improved quality, reduction of waste in the design and equipment selection process, and reduction of lead times. Accordingly, in the UAE context, we posit that:

H₂: There is a positive relationship between the implementation of green supply chain practices and corporate operational performance.

To examine the relationship between GSCM practices and economic performance in Chinese manufacturing enterprises, Zhu and Sarkis (2004) surveyed 185 manufacturing firms and found a positive relationship between the implementation of green supply chain practices and corporate economic performance. Similarly, Al-Tuwaijiri et al. (2004) found that among 198 firms in the US, improved environmental performance led to improved economic performance. Therefore, we posit that:

H₃: There is a positive relationship between the implementation of green supply chain practices and corporate economic performance.

Wahba (2008) conducted an analysis of 156 ISO14001-certified firms in Egypt across 19 industries over a three-year period, and found that corporate environmental responsibility has a significant positive impact on corporate market value and social performance (measured by Tobin's q). We posited the following hypothesis to explore whether this finding holds true in the UAE context:

H₄: There is a positive relationship between the implementation of green supply chain practices and corporate social performance.

Based on the model presented in Fig. 1, this study expands these hypotheses into 16 hypotheses, which are represented in Fig. 1 and presented in Table 2. The definitions of the various constructs, their measurement items, and the sources of the constructs are shown in Table 3. The proposed hypotheses were tested in the quantitative phase using an online survey accessed through Survey Monkey and targeted at EMR firms within the UAE. Panel data provided by Dunn and Bradstreet was used to send the survey details and access link to the respondents (Dun and Bradstreet, 2017). The questionnaire was sent in two waves, with a two-

Table 2 Hypotheses development of GSCM practices and performance measures.

Hypothesis 1a: There is a positive relationship between the implementation of eco-design practices and corporate environmental performance.
Hypothesis 1b: There is a positive relationship between the implementation of green purchasing practices and corporate environmental performance.
Hypothesis 1c: There is a positive relationship between the implementation of environmental cooperation practices and corporate environmental performance.
Hypothesis 1d: There is a positive relationship between the implementation of reverse logistics practices and corporate environmental performance.
Hypothesis 2a: There is a positive relationship between the implementation of eco-design practices and corporate operational performance.
Hypothesis 2b: There is a positive relationship between the implementation of green purchasing practices and corporate operational performance.
Hypothesis 2c: There is a positive relationship between the implementation of environmental cooperation practices and corporate operational performance.
Hypothesis 2d: There is a positive relationship between the implementation of reverse logistics practices and corporate operational performance.
Hypothesis 3a: There is a positive relationship between the implementation of eco-design practices and corporate economic performance.
Hypothesis 3b: There is a positive relationship between the implementation of green purchasing practices and corporate economic performance.
Hypothesis 3c: There is a positive relationship between the implementation of environmental cooperation practices and corporate economic performance.
Hypothesis 3d: There is a positive relationship between the implementation of reverse logistics practices and corporate economic performance.
Hypothesis 4a: There is a positive relationship between the implementation of eco-design practices and corporate social performance.
Hypothesis 4b: There is a positive relationship between the implementation of green purchasing practices and corporate social performance.
Hypothesis 4c: There is a positive relationship between the implementation of environmental cooperation practices and corporate social performance.
Hypothesis 4d: There is a positive relationship between the implementation of reverse logistics practices and corporate social performance.

week gap between each wave. We ended the survey 42 days (6 weeks) from the date of commencement.

Analysis of quantitative data

The responses were categorised as responses to the first call (early responses) or to the follow-up call (late responses). Of the responses, 33 were categorised as early responses (28%), and 84 responses were categorised as late responses (72%).

Content validity is a tool commonly employed to ensure that the measures used are appropriate for the concepts that are being tested (Sekaran, 2003). To ensure content validity, the survey was shared with individual industry experts to get their feedback and to revise the survey questions based on any issues that they reported. To measure the reliability of the measurements and to verify the internal consistency of the constructs, we conducted Cronbach's alpha testing. The results showed that all the values are above 0.7, which confirms that the constructs are acceptable (Cronbach, 1951). In addition, Cronbach's α was measured for the whole questionnaire, for all 44 measurement items. These values were found to be above 0.7, which confirms the internal consistency and validity of the constructs that we employed.

A comparison of the means of some of the demographic and independent variables for the two groups was conducted using one-way ANOVA (Rogelberg & Stanton, 2007). Table 4 shows that there is no statistically significant difference between the early wave and late wave groups. Therefore, non-response bias was not considered to be an issue.

With respect to practices, the eco-design construct is identified as the strongest practice (Mean = 3.76, SD = 1.34), followed by reverse logistics (Mean = 2.81, SD = 1.47), followed by the environmental cooperation construct (Mean = 2.77, SD = 1.31). The weakest practice is identified as green purchasing (Mean = 2.7, SD = 1.38). The explanation here is that within UAE, the eco-design of manufacturers' products and reverse logistics and product take-back practices, are driven primarily by close cooperation between supply chain members. Less attention is paid to green purchasing, indicating that auditing suppliers for environmental commitment and selecting them based on environmental criteria are not considered a priority in the UAE when compared to other practices.

To test the impact of the independent variables (*ED*, *GP*, *EC*, *RL*) on each dependent variable (*EP*, *OP*, *EcP*, *SP*) while controlling for the three control variables (*firm size*, *firm age*, and *EMS certification*), hierarchical multiple regression was adopted: we entered the control variables as

Table 3 Conceptual definitions of constructs.

Construct	Definition	Source
Eco Design	The actions taken the during product development stage targeted towards minimizing a product's environmental impact during its whole life cycle starting from acquiring raw material to manufacturing, use and finally to its final disposal without compromising other essential product criteria such as performance and cost.	Johansson (2002)
Green Purchasing	An environmental purchasing initiative that aims to ensure purchased products and material meet with environmental objectives set by the purchasing firm such as reducing sources of waste, encouraging recycling, reuse and substitution of materials.	Carter et al. (1998); Min and Galle, (2001); Zsidisin and Siferd, (2001)
Environmental Cooperation	The activities that take place between the supply chain members for eco-design, cleaner production, green packaging, use of less energy during transportation of materials and goods, and working together on mutual environmental responsibilities and objectives.	Green et al. (2012); Zhu et al. (2006) and Azevedo et al. (2011)
Reverse Logistics	The return or take back of products and materials from the point of consumption to the forward supply chain for the purpose of recycling, reuse, remanufacture, repair, refurbishing or safe disposal of products and materials.	Carter and Ellram (1998)
Environmental Performance	The ability of the organization to reduce air emissions, effluent waste, and solid wastes and the ability to decrease consumption of hazardous and toxic material and decreased frequency for environmental accidents.	Zhu et al. (2008)
Operational Performance	The organization's capabilities to more efficiently produce and deliver products to customers with improved quality and reduced lead times which ultimately lead to improving its position in the market place and increasing its chances of selling its products into international markets.	Melnyk et al. (2003) and Zhu et al. (2008)
Economic Performance	The financial and marketing performance improvements resulting from implementing green supply chain management practices that enhance the firm's position compared to the industry average.	Green and Inman (2005) and Zhu et al. (2005)
Social Performance	A business organization's configuration of principles of social responsibility, processes of social responsiveness, and policies, programs and observable outcomes as they relate to the firm's societal relationships.	Wood (1991)

independent variables in block one, and entered the independent variables in block two.

We assessed the contribution of each independent variable to the model in the coefficients Table (Table 5). Only *GP* and *EC* contribute significantly to the model when the effects of the other variables are removed. When we observe model performance after controlling for the effect of the three control variables, the model explains an additional 18.8% of the variability in environmental performance (see Table 5). The Sig F change is less than 0.05; and therefore, the addition of the four independent variables (*ED*, *GP*, *EC*, *RL*) has a statistically significant contribution to predicting the dependent variable, i.e., *OP*.

Table 5 shows that the *t*-statistic value for only two independent variables (*GP* and *EC*) is more than 0.05, and is therefore significant as highlighted, which in turn means that these variables help in predicting the dependent variable. The *t*-statistic value for *ED* and *RL* is greater than 0.05,

and therefore, is non-significant. Thus, it cannot help in predicting the dependent variable.

The impact of each of the three control variables on each performance dimension is summarised in Table 6. This shows that firm size in the UAE is a dominating factor that impacts environmental, economic, and operational performance, whereas the impact of firm size on operational performance seems to be insignificant ($\beta < 0.1$). When it comes to the age of UAE firms, the majority of the firms (82%) that responded had been based in the UAE for more than five years. Age does not have an impact on any of the corporate dimensions, as shown in Table 6.

Fig. 2 summarises the significant relationships between GSCM practices and the four performance dimensions.

The summarised results show that both environmental cooperation and reverse logistics impact one dimension each, based on the value of beta and R^2 . Explicitly, environmental cooperation impacts operational performance and

Table 4 Analysis of variance (ANOVA) test among the IVs and demographic variable.

		ANOVA				
		Sum of squares	df	Mean square	F	Sig.
(EMS)	Between groups	2.043	1	2.043	8.663	.004
	Within groups	26.880	114	.236		
	Total	28.922	115			
Size	Between groups	6.154	1	6.154	4.591	.034
	Within groups	154.154	115	1.340		
	Total	160.308	116			
ED2	Between groups	9.744	1	9.744	4.472	.037
	Within groups	250.581	115	2.179		
	Total	260.325	116			
ED3	Between groups	8.376	1	8.376	3.930	.050
	Within groups	245.077	115	2.131		
	Total	253.453	116			
RL3	Between groups	17.082	1	17.082	7.447	.007
	Within groups	261.495	114	2.294		
	Total	278.578	115			

Table 5 Operational performance (OP) coefficients.

Coefficients								
Model		Unstandardised coefficients		Standardised coefficients	t	Sig.	Collinearity statistics	
		B	Std. error				Beta	Tolerance
1	(Constant)	−0.553	.351		−1.577	.118		
	FirmSize	.129	.082	.152	1.581	.117	.870	1.149
	FirmAge	.017	.106	.015	.164	.870	.915	1.093
	EMSC	.435	.185	.218	2.352	.020	.937	1.067
2	(Constant)	−0.529	.320		−1.652	.101		
	FirmSize	.078	.076	.092	1.031	.305	.837	1.195
	FirmAge	.084	.098	.074	.849	.398	.870	1.150
	EMSC	.174	.183	.087	.950	.344	.786	1.273
	FED	−0.110	.100	−0.110	−1.108	.270	.669	1.494
	FGP	.219	.130	.219**	1.682	.095	.390	2.563
	FEC	.270	.141	.27**	1.923	.057	.335	2.983
	FRL	.078	.109	.078	.716	.475	.558	1.791

Significant at * $\alpha = 0.05$ and ** $\alpha = 0.10$.**Table 6** Performance impact of control variables.

Control variable	Performance dimension	β	Significance
Firm size	Environmental performance	0.231*	Significant
	Operational performance	0.092	Nonsignificant
	Economic performance	0.162**	Significant
	Social performance	0.26**	Significant
Firm age	Environmental performance	−0.023	Nonsignificant
	Operational performance	0.074	Nonsignificant
	Economic performance	−0.039	Nonsignificant
	Social performance	−0.058	Nonsignificant
EMSC	Environmental performance	0.265*	Significant
	Operational performance	0.087*	Significant
	Economic performance	0.257*	Significant
	Social performance	0.29*	Significant

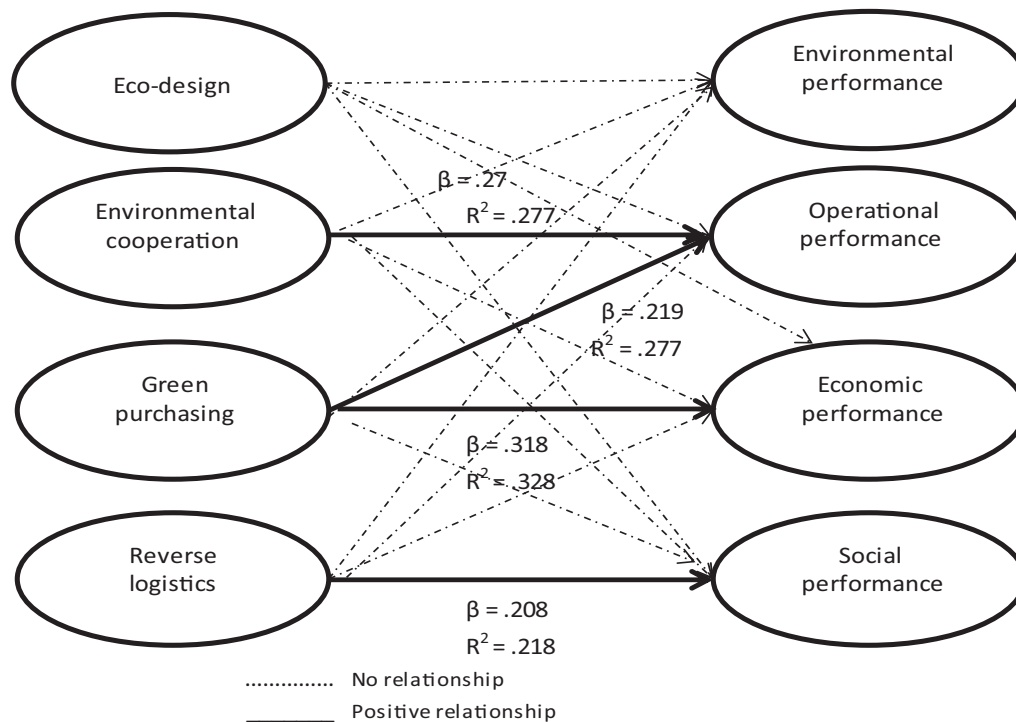


Figure 2 GSCM practices and corporate dimension results.

reverse logistics impacts social performance. However, neither of these practices impacts any other dimension. The research did find, however, that green purchasing impacts both operational and economic performance, but does not impact either environmental or social performance. The results also show that eco-design failed to impact any corporate performance dimension, which is rather confounding. In fact, 75% of our hypotheses were unsupported by the results. We then introduced the qualitative phase of the study to understand the reasons for this lack of clarity. We used semi-structured interviews with a sample selected from the original quantitative research population to gain a deeper understanding as to why some GSCM practices failed to impact certain corporate performance dimensions.

Sample selection for qualitative interviews

We adopted a nonprobability sampling technique because the objective was to "... select a sample from which the most can be learned" (Merriam & Merriam, 2009, p. 77). Consequently, we selected a convenience sample from the respondents who had responded to the initial quantitative survey because they could provide answers that could help explain why some hypotheses were not supported. Of the 140 respondents who had completed the quantitative survey in the first phase of the research, only 32 had indicated that they were prepared to be contacted again. All 32 were contacted to take part in an interview; 19 were on leave, had left their organisations, or declined to be interviewed, citing time constraints. Eleven senior staff from eight companies eventually agreed to be interviewed. Based on their industry expertise, all these respondents were in a position to provide specific insights into the current state of play within their organisations, and were deemed suitable to enhance

and validate the findings of the quantitative survey. Table 7 highlights some characteristics of the firms and the participants targeted for the interview.

Among the eight case organisations selected, only case number 6 (company F), which represented the large-scale furniture manufacturing industry, was a non-certified company. The remaining organisations were ISO14001-certified as part of their business activities. The interviewees were from managerial and senior managerial positions within the organisation, and had worked in the industry for a minimum of five years. As a result, they had a complete understanding of the company's vision, mission, and strategies. The objective of the interviews was to present the findings of the quantitative study to these environmental management representatives, and to gain their views on the results that we found confounding. A series of interview questions and probes were developed to assist this process, which are summarised in Table 8.

Qualitative data: Analysis and findings

The interviews varied in length, but on average, they were just over 30 min. In total, 11 respondents took part in the interviews. In some cases, two informants from the same organisation participated in the interview discussions. The interviews were transcribed, coded, and categorised, allowing for themes to emerge systemically (Schram, 2006).

Table 9 shows the respondents' initial explanations for the lack of relationships between some GSCM practices and some dimensions of corporate performance. These revolve around five main themes: (i) process-related issues, (ii) EMS-related issues, (iii) cost-related issues, (iv) marketing-related issues, and (v) time-related issues. The following

Table 7 Characteristics of firms and interviewees.

S.No.	Country	City	Company	Activity	ISO 14001 Certified	Interviewee designation
1	UAE	Abu Dhabi	A	Glass reinforced plastic pipes and fittings	Yes	Production Engineer, Technical Manager
2	UAE	Abu Dhabi	B	Tiles manufactory	Yes	Production Manager
3	UAE	Abu Dhabi	C	Manufactory of thermally preinsulated piping systems	Yes	Production Incharge, Q&A Manager
4	UAE	Abu Dhabi	D	Pharmaceutical manufacturing	Yes	Purchasing Manager
5	UAE	Abu Dhabi	E	Manufacturer of building materials for the construction field	Yes	General Manager
6	UAE	Abu Dhabi	F	Furniture manufactory	No	Procurement Manager
7	UAE	Abu Dhabi	G	Manufactory of pipes	Yes	Production Manager
8	UAE	Abu Dhabi	H	Production and supply of ready mix concrete	Yes	Operations Manager, HSE Manager

sections present the details provided by the respondents, along with some key quotes that capture their perceptions.

Process-related issues

There was general agreement among the respondents that GSCM practices need to be properly implemented by organisations to ensure that they achieve the projected results. Improper implementation might lead to inefficiencies that hamper improvements in corporate performance. For example, when the general manager of company E, which specialises in the manufacture of building materials such as bricks, was asked why GSCM practices sometimes fail to improve corporate environmental performance, he stated that:

“... firms need to have knowhow in using the recycled product in manufacturing again. For example, we have made a system to reduce emissions because we have kept a blower sucking the dust and pumping inside the wall, running down the sediment. We are collecting 90% of the dust generated and entering it again into production, which not all firms in this industry are good at...” (General Manager, company E).

Other respondents felt that issues in measurement might be the reason for the lack of a relationship between GSCM practices and corporate performance. This claim was supported by many respondents, including the quality and assurance (Q&A) manager of company C, who noted that:

“... There are no agreed upon measures to gauge how well your corporate performance has improved after implementing green supply chain management practices as all existing measures are subjective ...” (Q&A Manager, company C).

Some informants also claimed that although recycling is implemented to reduce resource depletion and to green processes, sometimes recycling itself generates emissions. An example was damaged concrete that is sometimes ground up and reused in the concrete mix for bricks. This grinding process generates CO₂ emissions, which impacts corporate environmental performance. The production manager of company B stated that the quality of a recycled product is usually lower than that of a product made from raw materials, which might explain why green supply chain practices sometimes fail to improve corporate operational performance.

Another significant factor that could enable some GSCM practices to improve corporate environmental performance is to couple an individual practice with other green practices. That is, some green supply chain practices need to be implemented together with other green supply chain practices. As one production manager explained:

In some cases, green purchasing alone may not impact your corporate environmental performance unless it is coupled with other green supply chain practices such as eco-design, for example ... (Production Manager, company B).

Table 8 Summary of the interview questions.

S. No.	Question
1	Why you think eco-design practices such as design of products for reduced consumption, design of products for reuse, recycle, and design of products to reduce use of hazardous material didn't impact corporate environmental performance i.e., help in reducing air emissions, waste water, solid wastes, consumption of hazardous materials, frequency of environmental accidents; and improve the company's overall situation?
2	Why you think eco-design practices such as design of products for reduced consumption, design of products for reuse, recycle, and design of products to reduce use of hazardous material didn't impact corporate economic performance i.e., decrease cost for materials, energy consumption, water discharge and treatment; and improve return on sales, average profit and average market share?
3	Why you think eco-design practices such as design of products for reduced consumption, design of products for reuse, recycle, and design of products to reduce use of hazardous material didn't impact corporate operational performance i.e., reduce lead times, improve product quality, help design better products, sell in international market, and improve market position?
4	Why you think eco-design practices such as design of products for reduced consumption, design of products for reuse, recycle, and design of products to reduce use of hazardous material didn't impact corporate social performance i.e., improve corporate image, social commitment; and enhance employee job satisfaction and health and safety?
5	Why you think environmental cooperation practices such as cooperation with suppliers and customers for eco-design products, cleaner production and working together to reduce environmental impact of activities didn't impact corporate environmental performance i.e., help in reducing air emissions, waste water, solid wastes, consumption of hazardous materials, frequency of environmental accidents; and improve the company's overall situation?
6	Why you think environmental cooperation practices such as cooperation with suppliers and customers for eco-design products, cleaner production and working together to reduce environmental impact of activities didn't impact corporate economic performance i.e., decrease cost for materials, energy consumption, water discharge and treatment; and improve return on sales, average profit and average market share?
7	Why you think environmental cooperation practices such as cooperation with suppliers and customers for eco-design products, cleaner production and working together to reduce environmental impact of activities didn't impact corporate social performance i.e., improve corporate image, social commitment; and enhance employee job satisfaction and health and safety?
8	Why you think green purchasing practices such as environmental audit for suppliers, second-tier supplier environmentally friendly practice evaluation, selecting suppliers using environmental criteria and require suppliers to use environmental packaging didn't impact corporate environmental performance i.e., help in reducing air emissions, waste water, solid wastes, consumption of hazardous materials, frequency of environmental accidents; and improve the company's overall situation?
9	Why you think green purchasing practices such as environmental audit for suppliers, second-tier supplier environmentally friendly practice evaluation, selecting suppliers using environmental criteria and require suppliers to use environmental packaging didn't impact corporate social performance i.e., improve corporate image, social commitment; and enhance employee job satisfaction and health and safety?
10	Why do you think reverse logistics practices such as use of remanufacturing, recovery of the company's end-of-life products and taking back packaging didn't impact corporate environmental performance i.e., help in reducing air emissions, waste water, solid wastes, consumption of hazardous materials, frequency of environmental accidents; and improve the company's overall situation?
11	Why do you think reverse logistics practices such as use of remanufacturing, recovery of the company's end-of-life products and taking back packaging didn't impact corporate operational performance i.e., reduce lead times, improve product quality, help design better products, sell in international markets, and improve market position?
12	Why do you think reverse logistics practices such as use of remanufacturing, recovery of the company's end-of-life products and taking back packaging didn't impact corporate social performance i.e., improve corporate image, social commitment; and enhance employee job satisfaction and health and safety?

EMS-related issues

The respondents felt that having a dedicated resource within the organisation to ensure adherence to EMS rules and regulations, and to oversee the implementation of green supply chain practices is crucial for the success of any green initiative. The absence of this resource was presented as a key reason for why green supply chain practices fail to improve corporate performance. As the procurement manager for one firm stated:

“... Companies should appoint a manager of green-related matters who should train all others in the company on how green practices must be deployed and only then things can improve...” (Procurement Manager, company F).

One respondent pointed out that non-adherence to EMS requirements while implementing green supply chain

Table 9 Summary of firms' answers to the 12 interview questions.

Firm	Activity	ISO 14,001 Certified	Interviewee designation	ED > EP	ED > OP	ED > EcP	ED > SP	
A	Glass Reinforced Plastic Pipes and Fittings	Yes	Production Engineer, Technical Manager	Does not apply as their product is not recoverable	Does not apply as their product is not recoverable	Extra cost incurred	Disagree	
B	Tiles Manufactory	Yes	Production Manager	Issues in implementation	Issues in measurement	Mismatch between customers wants and green products	No advertising of green initiatives	
C	Manufactory of Thermally Preinsulated Piping Systems	Yes	Production In charge, Q&A Manager	Indirect impact	No EMRs to look after green initiatives	Extra cost incurred	Issues in measurement	
D	Pharmaceutical Manufacturing	Yes	Purchasing Manager	Lack of management support	It takes time	It takes time	No advertising of green initiatives	
E	Manufacturer of Building Materials for the Construction Field	Yes	General Manager	Does not apply to them	Does not apply to them	Does not apply to them	Does not apply to them	
F	Furniture Manufactory	No	Procurement Manager	It takes time	It takes time	Extra cost incurred	Disagree	
G	Manufactory of Pipes	Yes	Production Manager	Issues in implementation	Disagree	Product cost increased	Lack of awareness	
H	Production and Supply of Ready Mix Concrete	Yes	Sales Manager, HSE Manager	Disagree	Disagree	Product cost increased	Disagree	
Firm	EC > EP	EC > EcP	EC > SP	GP > EP	GP > SP	RL > EP	RL > OP	RL > EcP
A	No idea	Difficult to compete as green product is costly	Issues in measurement	No EMRs to look after green initiatives	Lack of awareness	Does not apply as their product is not recoverable	Does not apply as their product is not recoverable	Does not apply as their product is not recoverable
B	Not correctly adhering to EMS requirements	It takes time	No advertising of green initiatives	GP needs to be coupled with other green initiatives	No advertising of green initiatives	Indirect impact	Recycled are lower quality	Additional costs incurred
C	No EMRs to look after green initiatives	Product cost increased	Lack of awareness	No idea	No idea	Disagree	Issues in measurement	Extra cost incurred
D	No idea	No idea	No idea	No idea	Lack of HSE policy	Issues in implementation	It takes time	It takes time
E	Recycling generates emissions	Extra cost incurred	Lack of awareness	Disagree	Lack of awareness	Issues in implementation	Issues in implementation	Issues in implementation
F	It takes time	Extra cost incurred	No advertising of green initiatives	No EMRs to look after green initiatives	Issues in implementation	Issues in implementation	No Idea	Extra cost incurred
G	No idea	No idea	Lack of awareness	Issues in implementation	Lack of awareness	Disagree	No Idea	Extra cost incurred
H	Takes time	Extra cost incurred	Takes time	Does not apply as there in monopoly in the supply	Indirect effect	Does not apply as their product is not recoverable	Does not apply as their product is not recoverable	Does not apply as their product is not recoverable

practices could be why green practices did not improve corporate performance. The respondent specifically noted that:

“...Some companies take EMS certifications for the sake of certification and really don't want to make EMS practical. If you are not following your set goal, you won't achieve it. Every year, we have some EMS targets. These targets are written on paper, and then executed by the team ...” (Production Manager, company B).

The absence of a robust health, safety and environmental (HSE) policy in the organisation could also obstruct corporate social improvement. For example, the purchasing manager of company D asserted that for GSCM practices to improve employee health and safety within the pharmaceutical industry, there must be an HSE policy in place.

Cost-related issues

Adopting GSCM practices may improve corporate economic performance by reducing product cost, improving sales, and enhancing returns on investment, for instance. However, some respondents claimed that this might be true in the long term but not in the short term, which was previously reported by Porter (1991). The HSE manager of company H stated that:

“... Adding microsilica to normal concrete to make it green concrete increases its cost as well as the controlling costs since it is a harmful material and needs to be dealt with carefully. Microsilica fumes are one of the finest dust materials, and if it gets into the lungs it's over...” (HSE Manager, company H).

Additionally, the purchasing manager of company H, which specialises in pharmaceutical products, confirmed that their costs increased when they implemented reverse logistics practices. In particular, they had to involve a third party to properly dispose of their medical waste, which increased costs for their organisation.

Marketing-related issues

The marketing of green initiatives internally within the firm and externally to the public is crucial to boost corporate social performance. For example, the purchasing manager for company D stated that failure to market green initiatives within the firm would lead to the loss of the management's support, which is required to successfully implement green supply chain practices and to consequently reap the benefits of these practices. Firms need to advertise any green-related efforts to the wider community to be rewarded. We noted that many respondents linked the failure of green practices to improve corporate performance with a lack of awareness. For example, the production manager of company B stated that:

“You have to be publicizing yourself, what you are doing in favour of society. If this message did not go to society, how will people know what you are doing for the environment ...?” (Production Manager, company B).

He added that his company had implemented an environmental cooperation initiative called “green boundary”, where they worked with the Abu Dhabi Municipality to plant trees around their three square kilo-meter manufacturing facility. This was designed to offset the carbon dioxide emitted during production. However, despite planting 1500 trees, neither the municipality nor the organisation had announced this initiative to the public, and therefore, there was no perceived change in the firm's corporate image.

Time-related issues

There was general agreement among the respondents that the benefits of implementing green supply chain practices may not materialise in the short term, but could be accomplished in the long term. The representatives of four firms stated that corporate performance would not improve overnight as a result of implementing green practices because it requires some time to achieve payback.

Discussion

Triangulation of results

Four dimensions of corporate performance that were found to be highly associated with GSCM implementation and were previously assessed by several researchers in the field (although not collectively) were adopted for this research: environmental performance, operational performance, economic performance, and social performance. By employing institutional and stakeholder theories as reference points, we found that although half of the companies surveyed were EMS-certified, these companies were motivated by different institutional drivers in their attempt to satisfy various stakeholders. Overall, however, there is evidence that firms in the UAE are going in the right direction because EMS implementation and certification form the basis for any green initiative to drive corporate performance. These findings were echoed by Melnyk et al. (2003), who found a positive relationship between the presence of formal certified EMS and improved performance, such as reduced costs (*EcP*), improved quality (*OP*), reduction of waste in the design and equipment selection process (*EP*), and reduction of lead times (*OP*). Additionally, Gonzalez (2008) found that there is a significant relationship between the possession of EMS certification and the demand on suppliers to implement environmental practices. As noted by Dun and Bradstreet UAE (2017), more than 4000 firms are ISO14001-certified in the UAE, and more firms are in the certification stage. This, in turn, indicates that UAE firms have begun to realise the importance of being green-conscious.

Discussing the main hypotheses of this study, it is, however, important to note that 75% of our hypotheses were not supported by the results of the quantitative study, which means that GSCM practices within UAE organisations appear to have only a minor impact on their performance outcomes. One reason for this might be a lack of legislation and regulation, which were found to be the main drivers for tangible and intangible outcomes in other studies (for example, Laosirihongthong et al., 2013).

Although environmental performance showed high levels of attainment, as discussed in the descriptive statistics, and ranked second after social performance (Mean=3.75, SD=1.04), we found that none of the independent variables had any significant impact on environmental performance. From a resource-based view, and as claimed by Hart (1995), it could be that these firms adopted compliance-based strategies within these GSCM practices and not proactive strategies that might have improved environmental performance.

In the qualitative phase of this study, for instance, when the firms' environment management representatives (EMRs) were asked why GSCM practices appeared not to improve corporate environmental performance, the answers varied. For example, the production managers in companies B and G, which manufacture tiles and pipes, respectively, stated that eco-design practices might not impact corporate environmental performance if the practices were not properly implemented. On the other hand, the purchasing manager of company D, which manufactures pharmaceuticals, advised that eco-design practices require management support and commitment, which can lead to real performance improvements. Finally, the procurement manager of company F, which specialises in furniture manufacturing, opined that eco-design practices are long-term initiatives; therefore, the benefits require some time to be realised. This reinforced the earlier finding that it could take some time for investments in GSCM to show a return.

When the interviewees were asked why environmental cooperation did not impact corporate environmental performance, they presented four main reasons. For example, the production manager of company B (which manufactures tiles) asserted that non-adherence to EMS requirements might be a reason for this lack of impact, while the Q & A manager in company C (which manufactures pre-insulated pipes) felt that the cause was a lack of assignment of a dedicated staff member to manage environmental issues within the firm. Additionally, both, the procurement manager in company F and the HSE manager in company H (which produces ready-mix concrete) claimed that environmental cooperation practices take time to improve environmental performance, which reinforces the emphasis on long-term versus short-term returns. One surprising reason for the lack of a relationship between environmental cooperation and environmental performance that was presented by the general manager of company E (whose firm is in the building materials manufacture business) was that recycling can generate emissions which might hamper improvements in environmental performance.

The reasons for the absence of a relationship between green purchasing and environmental performance were similar to those listed for environmental cooperation. That is, according to technical manager of company A and the procurement manager of company F, the absence of a dedicated person to monitor the implementation of green purchasing practices and to rectify any issues that occur during implementation is the main reason for the lack of impact on corporate performance. Similarly, the production manager of company B pointed out that green purchasing practices need to be coupled with other green practices in order to improve corporate performance.

The study also found that green purchasing and environmental cooperation are positively related to operational

performance ($\beta = 0.219, 0.27$ respectively). These results are consistent with the resource-based view (Eisenhardt, 1989; Gavronski, Klassen, Vachon, & do Nascimento, 2011). In other words, these firms tend to acquire and deploy innovative resources that proactively address environmental issues while working closely with their supply chain partners to prevent environmental accidents and improve product quality. These results are in keeping with those recently reported by Diabat, Khodaverdi, and Olfat (2013), who found that environmental cooperation is one of the most important GSCM practices that can lead to better operational performance outcomes. These findings might be influenced by some recent regulations such as Estidama, the Pearl Rating System, and the green building initiatives launched by the UAE government to motivate supply chain members to work more closely to deliver more sustainable products and projects.

Neither eco-design nor reverse logistics was found to have any impact on operational performance. This is curious because both practices were found to be the most highly adopted GSCM practices in the UAE. This could be because the level of implementation was not sufficient to lead to better outcomes, as reported by Zhu and Sarkis (2006). Similar findings were also reported by Deutz, McGuire, and Neighbour (2013), who found that firms did not effectively implement eco-design. The interviewees in this study were of the same opinion. For example, the production manager of company B stated that if eco-design practices were not properly implemented, they might not lead to any operational benefits for the firm. Additionally, the Q&A manager of company C claimed that eco-design practices require a dedicated environmental management resource within the organisation to monitor and manage the implementation of such practices, which is not the case currently with most companies in the UAE.

With regards to reverse logistics, Richey, Chen, Genchev, and Daughert (2005) reported similar results, that the implementation of reverse logistics procedures did not improve corporate operational performance. The operation manager of company B, for example, stated that products produced using recycled materials are usually lower in quality than those produced from raw materials, which might account for the lack of improvement in corporate operational performance. When the general manager of company E was asked why reverse logistics failed to have an impact on operational performance, he stated that it could be connected to issues in implementation. He also provided an example of building bricks, where the dust generated is collected and recycled back into the production process. However, this process requires complex control and implementation which not all firms are good at.

In terms of economic performance, of the four GSCM practices, only green purchasing was found to have a significant impact on economic performance ($\beta = 0.318$). Surprisingly, both variables have the lowest levels of adoption and attainment. That is, green purchasing is the GSCM practice with the lowest level of implementation, and economic performance has the lowest level of attainment. One plausible explanation is that the improvement in the economic performance of UAE firms in the green context is mainly due to green purchasing practices. Green purchasing practices are, therefore, important for firms that have limited resources and want to realise

short-term economic benefits. This is in keeping with Green et al.'s (2012) research, who found that green purchasing is positively linked to economic performance. Mitra and Datta (2014) and Yadlapalli, Rahman, and Gunasekaran (2018) reported similar results. They found that supplier collaboration is positively related to sustainable product design, which in turn, positively impacts economic performance. It could be argued that only green purchasing has an impact on economic performance because none of the other green supply chain practices were found to impact environmental performance in this study (Xie and Breen, 2012).

However, these results do present a challenge, particularly since the research is set within the context of the UAE. Within this context, it is possible that other practices of UAE firms might be long-term oriented because they entail substantial initial investments. Examples include pollution prevention systems, and research and development in eco-design products, where it can take time for returns to be realised.

UAE regulations are also relatively recent, and thus their impact could take some time to yield results. This is consistent with the institutional theory perspective proposed by Zhu and Sarkis (2007) and Cai et al. (2008). We found that reverse logistics had a significant impact on corporate social performance ($\beta = 0.208$). Reverse logistics was also found to be the second most implemented green supply chain practice in the UAE, after eco-design. Social performance also had the highest attainment level. This relationship is not unique in that similar results were found by Mitra and Datta (2014). In their study, the recovery of packaging and products improved corporate image. Drawing on institutional theory, therefore, it is possible to claim that the reported improvement in social performance was partially due to external drivers such as image, but was not linked to legislation or regulations, which were the major external drivers found in most prior studies. Instead, the main drivers of social performance that we found in this study were internal reverse logistics pressures, which echoes Lin and Sheu's (2012) conclusion that internally driven GSCM practices lead to performance improvements.

Our study did not find any impact of other GSCM practices such as eco-design, environmental co-operation, and green purchasing on corporate social performance. However, the interviews revealed some interesting explanations for these results. For example, the production manager of company B and the procurement manager of company D stated that for eco-design to impact corporate social performance, the firm needs to promote these initiatives internally within the firm and externally to the community, so that the employees feel more satisfied working for an environmentally conscious organisation and the community becomes aware of the organisation's green efforts. Indeed, the production manager of company G confirmed that lack of awareness was the main reason for the failure of eco-design to impact corporate social performance. And also, as pointed out by the Q&A manager in company C there were no accurate measures to measure the impact of eco-design practices on corporate social performance.

Limitations of the study

One limitation of this study was the focus on firms in the manufacturing sector. We specifically selected this sector

because the manufacturing industry accounts for a large proportion of environmental impact. Furthermore, manufacturing is also responsible for the depletion of natural resources. This study was also limited to manufacturing industries in the UAE because we intended to gain an understanding of GSCM practices among the UAE businesses and sought to discover how these practices relate to different aspects of corporate performance. This is significant in a rapidly growing economy, particularly because the UAE is considered a role model for other Gulf Cooperation Council (GCC) countries that seek to diversify their economies. The sample size was also lower than expected due to a low response rate; however, the data was enhanced by the addition of the qualitative research phase.

Further research could provide additional insights into how the different dimensions of corporate performance are impacted over time, and how the outcomes of implementing green practices are realised.

Further research

Extending this study to other industrial sectors in the UAE could allow researchers to understand how the performance of other firms is impacted by the implementation of GSCM practices, and how they cope with mounting environmental issues. For example, this research could be extended to the transportation industry or other environmentally sensitive sectors.

This study also lays the foundation for future research in other sectors and in other GCC countries such as Saudi Arabia, where manufacturing is growing significantly. Qatar has also witnessed unprecedented economic vitality in almost all sectors, including construction and aviation. Further research could also investigate the impact of EMS certifications such as ISO14001 on different corporate performance dimensions, to assess whether such certification plays a role in improving their environmental performance and to identify any links between GSCM practices.

Managerial recommendations

Based on the results of this study, the following recommendations are presented for firms interested in improving environmental performance while implementing green supply chain practices:

1. Ensure that the senior management supports the initiative through a strategic mission.
2. Ensure that the agreed-upon practices are properly implemented, measured, and monitored.
3. Ensure that EMS rules are followed and adhered to.
4. Employ a dedicated project manager to manage the implementation process.
5. Ensure that objective measures are in place to measure the outcomes.
6. Ensure that all green initiatives are advertised to the public through planned marketing initiatives.

Finally, it is worth noting that many insights discovered in this study would not have been found if the quantitative methods were not supported with a qualitative research phase. Therefore, we suggest that quantitative research techniques supported by exploratory research techniques such as in-depth interviewing are important when

researching GSCM practices despite the fact that there are many existing and validated measures available to conduct quantitative studies in this area. In this study, the mixed method technique allowed us to develop a roadmap for future research in the sustainable supply chain management area, and identified the important themes required to understand corporate performance in emerging economies.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Al-Tuwaijri, S., Christensen, T., & Hughes, K. (2004). The relations among environmental disclosures environmental performance, and economic performance: A simultaneous equations approach. *Accounting Organizations and Society* 29 (5), 447-471.
- Azevedo, S., Carvalho, H., & Machado, V. (2011). The influence of green practices on supply chain performance: A case study approach. *Transportation Research Part E-Logistics and Transportation Review* 47 (6), 850-871.
- Balasubramanian, S. (2012). A hierarchical framework of barriers to green supply chain management in the construction sector. *Journal of Sustainable Development* 5 (10), 15-27.
- Bose, I., & Pal, R. (2012). Do green supply chain management initiatives impact stock prices of firms? *Decision Support Systems* 52, 624-634.
- Cai, S., Robert, D., Goh, S.M.K.H., Li, W., Lu, Q., & Sundarakani, B. (2008). The adoption of green supply chain strategy: An institutional perspective, IEEE international conference on management of innovation and technology, 21-24 Sep 2008, century park hotel, Bangkok, Thailandpp. 1044-1055.
- Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika* 16, 297-334.
- Crotty, M. (1998). The foundations of social research: Meaning and perspective in the research process. Sage, Thousand Oaks, CA.
- Darnall, N., Jolley, J., & Handfield, R. (2008). Environmental management systems and green supply chain management: Components for sustainability? *Business Strategy and the Environment* 17 (1), 30-45.
- Deutz, P., McGuire, M., & Neighbour, G. (2013). Eco-design practice in the context of a structured design process: An interdisciplinary empirical study of UK manufacturers. *Journal of Cleaner Production* 39, 117-128.
- Diabat, A., Khodaverdi, R., & Olfat, L. (2013). An exploration of green supply chain practices and performance in an automotive industry. *International Journal of Advanced Manufacturing Technology* 68, 949-961.
- Dun and Bradstreet, company profile available from: <http://www.dnbsame.com/company/in-the-region> (5 May (2017)).
- Eisenhardt, M.K. (1989). Agency theory: An assessment and review. *Academy of Management Review* 14 (1), 57-74.
- Elgayar, A., Beheiry, S., Jabbar, A., & Al Ansari, H. (2016). A benchmarking approach to the progress of green materials and systems' use in the UAE construction industry. *World Journal of Science, Technology & Sustainable Development* 13 (4), 315.
- Eltayeb, T., Zailani, S., & Ramayah, T. (2011). Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes. *Resources Conservation and Recycling* 55 (5), 495-506.
- Freeman, R.E. (1984). Strategic management: A stakeholder approach, Pittman, Marshfield, MA.
- Freeman, R.E. (2002). Stakeholder theory of the modern corporation. In: Donaldson, T., Werhane, P. (Eds.), *Ethical issues in business: A philosophical approach*. 7th ed. Prentice Hall, Englewood Cliffs, NJ, pp. 38-48.
- Gavronski, I., Klassen, R.D., Vachon, S., & do Nascimento, L.F.M. (2011). A resource-based view of green supply management. *Transportation Research: Part E Logistics and Transportation Review* 47 (6), 872-885.
- Geng, R., Mansouri, S.A., & Aktas, E. (2017). The relationship between green supply chain management and performance: A meta-analysis of empirical evidences in Asian emerging economies. *International Journal of Production Economics* 183, 245-258.
- Genovese, A., Acquaye, A.A., Figueroa, A., & Koh, S.L. (2017). Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications. *Omega* 66, 344-357.
- Golicic, S.L., & Smith, C.D. (2013). A meta-analysis of environmentally sustainable supply chain management practices and firm performance. *Journal of supply chain management* 49 (2), 78-95.
- Gonzalez, J. (2008). The effect of manufacturing proactivity on environmental management: An exploratory analysis. *International Journal of Production Research* 46 (24), 7010-7038.
- Gonzalez, P., Sarkis, J., & Díaz, B. (2008). Environmental management system certification and its influence on corporate practices Evidence from the automotive industry. *International Journal of Operations and Production Management* 28 (11), 1021-1041.
- Green, K., & Inman, R. (2005). Using a just-in-time selling strategy to strengthen supply chain linkages. *International Journal of Production Research* 43 (16), 3437-3453.
- Green, K., Zelbst, P., Meacham, J., & Bhaduria, V. (2012). Green supply chain management practices: Impact on performance. *Supply Chain Management: An International Journal* 17 (3), 290-305.
- Hart, S. (1995). A natural resource-based view of the firm. *Academy of Management Review*.
- Hervani, A., Helms, M., & Sarkis, J. (2005). "Performance measurement for green supply chain management. *Benchmarking: An International Journal* 12 (4), 330-353.
- Jack, E., Powers, T., & Skinner, L. (2010). Reverse logistics capabilities: Antecedents and cost savings. *International Journal of Physical Distribution and Logistics Management* 40 (3), 228-246.
- Kelle, U. (2006). "Combining qualitative and quantitative methods in research practice: Purposes and advantage. *Qualitative Research in Psychology* 3 (4), 293-311.
- Klassen, R., & McLaughlin, C. (1996). The impact of environmental management on firm performance. *Management Science* 42 (8), 1199-1214.
- Koh, S., Gunasekaran, A., & Tseng, C. (2012). Cross-tier ripple and indirect effects of directives WEEE and RoHS on greening a supply chain. *International Journal of Production Economics* 140, 305-317.
- Korhonen, J., Honkasalo, A., & Seppälä, J. (2018). Circular economy: The concept and its limitations. *Ecological economics* 143, 37-46.
- Kumar, S., & Putnam, V. (2008). Cradle to cradle: Reverse logistics strategies and opportunities across three industries. *International Journal of Production Economics* 15 (2), 305-315.
- Laosirihongthong, T., Adebajo, D., & Tan, K. (2013). "Green supply chain management practices and performance. *Industrial Management and Data Systems* 113 (8), 1088-1109.
- Lee, S., Kim, S., & Choi, D. (2012). Green supply chain management and organizational performance. *Industrial Management and Data Systems* 112 (8), 1148-1180.
- Lin, R., & Sheu, C. (2012). Why do firms adopt/implement green practices? An institutional theory perspective. *Procedia - Social And Behavioral Sciences* (57), 533-540.

- Lo, S. (2014). Effects of supply chain position on the motivation and practices of firms going green. *International Journal of Operations & Production Management* 34 (1), 93-114.
- Melnyk, S., Sroufe, R., & Calantone, R. (2003). Assessing the impact of environmental management systems on corporate and environmental performance. *Journal of Operations Management* 21 (3), 329-351.
- Merriam, S., & Merriam, S. (2009)., *Qualitative Research: A Guide To Design And Implementation*, n.p.: San Francisco: Jossey-Bass, c2009., UOW Catalogue, EBSCOhost, viewed 6 May 2016
- Minichiello, V., Aroni, R., Timewell, E., & Alexander, L. (1995). *In-depth interviewing: Principles, techniques, analysis*, 2nd ed. Longman, Melbourne.
- Mitra, S., & Datta, P. (2014). Adoption of green supply chain management practices and their impact on performance: An exploratory study of Indian manufacturing firms. *International Journal of Production Research* 52 (7), 2085-2107.
- Mollenkopf, D., Stolze, H., Tate, W., & Ueltschy, M. (2010). Green, lean, and global supply chains. *International Journal of Physical Distribution and Logistics Management* 40 (1), 14-41.
- Myers, M. (2011). *Qualitative research in business and management*. SAGE, New Delhi.
- Perotti, S., Zorzini, M., Cagno, E., & Micheli, G. (2012). Green supply chain practices and company performance: The case of 3PLs in Italy. *International Journal of Physical Distribution and Logistics Management* 42 (7), 640-672.
- Porter, M. (1991). America Green Strategy. *Scientific American* 264, 168-168.
- Rao, P., & Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance? *International Journal of Operations and Production Management* 25 (9), 898-916.
- Richey, R., Chen, H., Genchev, S., & Daughert, P. (2005). Developing effective reverse logistics programs. *Industrial Marketing Management* 34 (8), 830-840.
- Rogelberg, S., & Stanton, J. (2007). Introduction: Understanding and dealing with organizational survey nonresponse. *Organizational Research Methods* 10 (2), 195-209.
- Russo, M., & Fouts, P. (1997). A resource-based perspective on corporate environmental performance and profitability. *Academy of Management Journal* 40 (3), 534-559.
- Sarkis, J. (1998). Evaluating environmentally conscious business practices. *European Journal of Operational Research* 107 (1), 159-174.
- Sarkis, J. (2003). A strategic decision framework for green supply chain management. *Journal of Cleaner Production* 11 (4), 397-409.
- Schram, T. (2006). *Conceptualizing and proposing qualitative research*. Pearson Merrill Prentice Hall, Upper Saddle River, N.J. n.p.c2006., UOW Catalogue, EBSCOhost, viewed 6 May 2016.
- Sekaran, U. (2003). *Research methods for business: A skill building approach*. Wiley, Singapore.
- Simpson, D., Power, D., & Samson, D. (2007). Greening the automotive supply chain: A relationship perspective. *International Journal of Operations and Production Management* 27 (1), 28-48.
- Srivastava, S. (2007). Green supply-chain management: A state-of-the-art literature review. *International Journal of Management Reviews* 9 (1), 53-80.
- Sundarakani, B., Souza, R., Goh, M., Wagner, S., & Manikandan, S. (2010). Modeling carbon footprints across the supply chain. *International Journal of Production Economics* 128 (1), 43-50.
- Tashakkori, A., & Teddlie, C. (2010). *Sage handbook of mixed methods in social and behavioural research*. Sage, Thousand Oaks, CA.
- Tibben-Lembke, R.S. (2002). Life after death: Reverse logistics and the product life cycle. *International Journal of Physical Distribution & Logistics Management* 32 (3), 223-244.
- United Arab Emirates Ministry of Environment and Water, (2014). UAE state of green economy. Available from <http://www.moew.gov.ae> [27 February August 03, 2016]
- Wahba, H. (2008). Does the market value corporate environmental responsibility? An empirical examination. *Corporate Social Responsibility and Environmental Management* 15 (2), 89-99.
- Walker, H., Di Sisto, L., & McBain, D. (2008). Drivers and barriers to environmental supply chain management practices: Lessons from the public and private sectors. *Journal of Purchasing and Supply Management* 14, 69-85.
- Wood, D. (1991). Corporate social performance revisited. *Academy of Management Review* 16, 691-718.
- Xie, Y., & Breen, L. (2012). Greening community pharmaceutical supply chain in UK: A cross boundary approach. *Supply Chain Management: An International Journal* 17 (1), 40-53.
- Yadlapalli, A., Rahman, S., & Gunasekaran, A. (2018). Socially responsible governance mechanisms for manufacturing firms in apparel supply chains. *International Journal of Production Economics* 196, 135-149.
- Younis, H., Sundarakani, B., & Vel, P. (2016). The impact of implementing green supply chain management practices on corporate performance. *Competitiveness Review: An International Business Journal* 26 (3), 216-245.
- Zailani, S., Eltayeb, T., Hsu, C., & Tan, K. (2012). The impact of external institutional drivers and internal strategy on environmental performance. *International Journal of Operations and Production Management* 32 (6), 721-745.
- Zhu, Q., & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management* 22 (3), 265-289.
- Zhu, Q., & Sarkis, J. (2006). An inter-sectoral comparison of green supply chain management in China: Drivers and practices. *Journal of Cleaner Production* 14 (5), 472-486.
- Zhu, Q., & Sarkis, J. (2007). The moderating effects of institutional pressures on emergent green supply chain practices and performance. *International Journal of Production Research* 45 (18), 4333-4355.
- Zhu, Q., Sarkis, J., & Lai, K. (2008). Confirmation of a measurement model for green supply chain management practices implementation. *International Journal of Production Economics* 111 (2), 261-273.
- Zhu, Q., Sarkis, J., & Lai, K. (2012). Green supply chain management innovation diffusion and its relationship to organizational improvement: An ecological modernization perspective. *Journal of Engineering and Technology Management* 29 (1), 168-185.