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Abstract

This study investigates the relationship between green supply chain management (GSCM) practices and corporate performance (CP) using a sequential mixed methods research design. First, a quantitative survey was conducted with 140 respondents to test a series of hypotheses. When a number of these hypotheses were not supported, a qualitative approach was introduced to uncover the barriers to corporate performance improvements. Our research found that quantitative research alone was not sufficient to uncover the links between GSCM practices and corporate performance which highlights the need to supplement quantitative methods with qualitative research in order to explain the underlying reasons.

Keywords	Green supply chain management; Corporate performance; Mixed method.
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Research Article Re-Submission Letter

[02/09/2018]

Dear Editor - IIMB Management Review,

I/We wish to Re-submit our revised research article entitled “Green Supply Chain Management and Corporate Performance: Developing a Roadmap for Future Research Using a Mixed Method Approach” for consideration for the “IIMB Management Review”.

We confirm that we have carefully addressed all the comments of the reviewers by using track changes.

In this paper, we report on how and why some green supply chain management practices; including eco-design, green purchasing, environmental cooperation and reverse logistics failed to impact some dimensions of corporate performance. A series of recommendations are also provided for firms interested in improving their footprint and their environmental performance while implementing green supply chain practices.

We believe that this manuscript is appropriate for publication by the Journal of “IIMB Management Review” because it relevance and applications. The research contributes to both theoretical and practical significance and hence we think it is imperative for the Journal of “IIMB Management Review” readers.

We have no conflicts of interest to disclose.

Please address all correspondence concerning this manuscript to me at
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Thank you for your consideration of this manuscript.

Sincerely,

Dr.Balan Sundarakani

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Revision # 2: Revisions undertaken by Authors

Editors comments: I went over the paper. The authors have addressed all the issues satisfactorily.
Authors response: Thank you for your comments.

Editors comments: Currently they have 7 pages of references. Ask them to drastically reduce it by keeping only the directly relevant references

Authors response: We have revisited the references carefully and found that some references from the article were cited more than once in the paper and looked at areas where we cite more than one reference in brackets to support a point we make, which we removed as well as one duplicated reference. Thus a total of 31 references as listed below Table were removed this in turn reduced the pages to 5 instead of 7 pages of references.

S.No.	Reference:	Action
1	Al-Tuwaijri....	Removed
2	APO...	Removed
3	Armstrong...	Removed
4	Barney...	Removed
5	Benito	Removed
6	Carter 2011	Removed
7	Carter 1998	Removed
8	Creswell	Removed
9	DeMarrais	Removed
10	Diabat (duplicated)	Removed
11	Eltayeb 2009	Removed
12	Johansson	Removed
13	Key	Removed
14	King, A. and Lenox	Removed
15	Large	Removed
16	Lin 2001	Removed
17	Lin 2010	Removed
18	Linton	Removed
19	Lo..	Removed
20	McGuire	Removed
21	Min	Removed
22	Moneva	Removed
23	Montabon	Removed
24	Naveh	Removed
25	Nunnally	Removed
26	Rao 2002	Removed
27	Rao 2007	Removed
28	Stead	Removed
29	Van	Removed
30	Watson	Removed
31	Zsidisin	Removed

Editors comments:

The Appendix 1 and Appendix 2, Table 1 till Table 7, will be placed in the Online Appendix and Not part of the paper. Only Fig 1 and Fig 2 should appear in the paper

Authors response:

We agree to your comments. Appendix 1 and Appendix 2 were changed into Table 2 and Table 3 in order to justify our arguments in Hypotheses development and construct identification. All remaining Tables are renumbered and cited appropriately.

Green Supply Chain Management and Corporate Performance: Developing a Roadmap for Future Research Using a Mixed Method Approach

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Green Supply Chain Management and Corporate Performance: Developing a Roadmap for Future Research Using a Mixed Method Approach

Abstract

Global warming and the depletion of natural resources have motivated calls for significant changes in the way organizations 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 practices on corporate performance is still inconclusive. This study investigates the relationship between green supply chain management (GSCM) practices and corporate performance (CP) using a sequential mixed methods research design. First, a quantitative survey was conducted with 140 respondents to test a series of hypotheses. When a number of these hypotheses were not supported, a qualitative approach was introduced to uncover the barriers to corporate performance improvements. The qualitative study found some key reasons why green supply chain management practices failed to impact many of the dimensions of corporate performance. The majority related to issues in implementation including eco-design, green purchasing, environmental cooperation and reverse logistics. This information allowed the researchers to develop a series of managerial recommendations for firms interested in improving their performance while implementing green supply chain practices. Our research found that quantitative research alone was not sufficient to uncover the links between GSCM practices and corporate performance which highlights the need to supplement quantitative methods with qualitative research in order to explain the underlying reasons for supporting or not supporting various GSCM practices.

Keywords: Green supply chain management, Corporate performance, Mixed method.

1.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 or green initiatives have a positive impact on overall organisational performance. Greening the supply chain has now become a significant issue in supply chain management and this includes managing a series of dimensions including procurement, the management of manufacturing materials, circulation, marketing, and reverse logistics (Younis *et al.*, 2016)

Managing these activities in environmentally friendly ways requires significant resources in an end-to-end supply chain process that includes the procurement of raw materials, environmentally friendly manufacturing, packaging, delivery and product disposal (Hervani, 2005; Kumar & Putnam, 2008; Sarkis, 2003). Thus, the implementation of green practices encapsulates the entire supply chain as a circular economy (Eltayeb *et al.*, 2011; Korhonen *et al.*, 2018) .

Despite the emphasis on environmentally friendly supply chain practices, however, scholarly research has been relatively scant and, in some cases, the results have been inconsistent or inclusive (Golicic and Smith, 2013). This has occurred for a variety of reasons including; access to data, unreliable sample sizes, the level of depth of the research and imprecise results that have not been replicated in subsequent studies. Srivastava's (2007) comprehensive review of the green supply chain management literature had identified this issue, however, research to date has not fully established what the impacts of green supply chain management practices are on corporate performance. This study seeks to address this research gap by conducting a holistic study into the impact of Green Supply Chain Management (GSCM) on organisational performance within the United Arab Emirates (UAE).

Specifically, the study is designed to dig deeply into this phenomenon using a mixed methodology to gain a richer understanding of how the critical dimensions of GSCM impact

overall corporate performance. In doing so, the researchers seek to create a roadmap or framework that can be used in future studies to investigate the impact of green supply chain management practices on corporate performance.

1.1 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) the 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 *et al.* 2016).

The Urban Planning Council in the nation's capital, has also launched a series of green construction regulations, specifically the "Istedama", or "Pearl Rating", which require contractors to adhere to specific codes of practice related to the design, construction and operation of high rise buildings, villas and communities. Other green initiatives include; introducing green service stations, improving in-house recycling and adopting efficient cooling systems.

In keeping with this emphasis, the literature on GSCM within a UAE context is mainly confined to the construction sector where some recent studies have been published. These include Elgayar *et al's* (2016) study of green systems use as well as Balasubramanian's (2012) of GSCM enablers. These studies provide valuable context on GSCM practices within the UAE construction industry, which allowed the researchers to build on this work by investigating whether the implementation of GSCM practices has a positive impact on overall organisational performance. The study is important because organizations frequently balance compliance with

legislation 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 next section presents a review of the relevant literature beginning with empirical works that utilised qualitative research methods and concluding with the identification of the research gap. This is followed by an explanation of the mixed methods research methodology employed in the study. The analyses and results of the quantitative and qualitative data are then presented and discussed and the article concludes with a discussion, a review of the limitations of the study and some implications for further research.

2. Literature Review

As noted earlier, a number of qualitative and quantitative studies found within the literature have informed our understanding of GSCM from a variety of different perspectives. These studies have content analysed secondary data, employed case study methods 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.

[Insert Table 1 Summary of major research articles on GSCM - here]

As can be seen, quantitative methods have been favoured in many of these studies and, for the most part, purposeful sampling has been employed to target specific stakeholders, industry sectors or corporations. For example, Laorsirihongthong (2013) employed a quantitative survey to collect primary data from ISO14001 certified manufacturing companies. That study 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 in order

to gain further 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.

2.1 Qualitative Approach

A comprehensive review of the relevant literature has found that a number of studies employed qualitative methods to examine whether GSCM practices have an impact on organisational performance. Among these is Klassen and McLaughlin's (1996) early study which set out to identify whether the implementation of environmentally sustainable processes within businesses can improve stock market returns. By content analysing archival data of environmental and financial performance, the study found that positive stock market returns were related to environmental performance awards and that negative performance was associated with environmental crises. 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.

Later, Tibben-Lembke's (2002) study focussed on how reverse logistics impacted changes in sales over a product's life cycle. This study identified numerous challenges in managing reverse logistics and highlighted how these occur at different life cycle stages. This included whether a product is wholly new, a new form of an existing product class, or a new model of an existing product. In 2008, Walker *et al.* (2008) conducted an exploratory study in the UK by interviewing stakeholders within seven different private and public sector organizations. 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 as well as a number of industry specific barriers.

Adding to the overall GSCM landscape, Mollenkott *et al.* (2010) embarked on a practical study that extracted a series of important GSM dimensions from the literature. They concluded that there are four significant elements that motivate businesses to adopt green supply chain practices. These are: (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 *et al.* 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 minimization of waste and the reduced use of hazardous materials. Perotti *et al.*, (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. Thus, their results were inconclusive as to whether the adoption of GSCM 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 *et al.*, (2012) found that Waste Electrical and Electronic Equipment (WEEE) and restricting the use of hazardous substances (RoHS) 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, GPs, community pharmacies and customers.

Investigating the issue from a corporate social responsibility perspective (CSR), 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 Klassen and McLaughlin's (1996) earlier study, however, Bose and Pal (2012) further concluded that small businesses are the ones who receive most benefit when GSCM announcements are made. Thus, it would seem that positive publicity can 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 emphasize internal environmental management processes and green design practices, while midstream entities focus more on green manufacturing and logistics. More recently, Genovese *et al.* (2017) investigated green supply chain performance on economic indicators with reference to two case studies in circular production systems with limited findings.

2.2 Quantitative Approach

A review of the literature from a quantitative perspective extends the qualitative research presented above. 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 *et al's* (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 and economic performance is positively linked but that economic benefits are moderated by stages of industry growth.

Adding to the body of knowledge Zhu *et al.* (2006) investigated whether GSCM initiatives in China's manufacturing and industrial sectors influenced performance outcomes. The results were inclusive in that there were markedly different performance outcomes based on the levels of implementation of GSCM as well as the sector in which it is implemented. For example, results differed between different environmentally sensitive manufacturing sectors and other industries with similar levels of green implementation. Specifically, the power generating industry and the electrical/electronics industry had similar levels of GSCM, however, the power generating industry attained lower performance outcomes compared to others. Similarly, Simpson *et al's* (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 *et al.* (2008) was also inconclusive. They found that firms that had adopted Environmental Management Systems (EMSs) had also introduced GSCM practices and thus there was a strong relationship between GSCM practices and EMS but this did not necessarily translate into corporate performance. Another study in the USA investigated the impact of customer orientated antecedents of reverse

logistics on cost savings concluding that cost savings can be achieved by increasing reverse logistics capabilities (Jack *et al.* 2010).

In Malaysia, customers were the focus of a survey of ISO certified businesses designed to determine whether an internal proactive environmental strategy, coupled with a number of external institutional drivers could encourage firms to adopt eco-designs that have a positive impact on environmental performance (Zailani *et al.* 2011). While no impact was found on 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). Instead, 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 *et al.* (2012) surveyed different types of manufacturers developing a typology that included early adopters, followers and laggards based on 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 numerous other quantitative studies have been published within the literature, those highlighted above are among the most relevant to this study. Of most importance, however, is Laosirihongthong *et al.*'s (2013) study examining the impact of the environmental, economic and intangible performance of firms based on proactive and reactive practices in the implementation of GSCM in Thailand. Investigating ISO 14001 certified manufacturing companies, they found that legislation and regulations drive environmental, economic and intangible performance and thus a reactive approach dominates GSCM in that country. Laosirihongthong *et al.*, (2013) also identified four practices that have been found to be most

influential in achieving environmental goals, which can be adopted either on the upstream or downstream side of the supply chain. Similarly a recent study by Geng *et al.* (2017) conducted a meta-analysis of GSCM practices within Asian economies that 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 designed to support our study This is presented in section three below.

2.3 Research Gaps

The literature review has shown that many studies have examined the relationship between implementing different sets of green supply chain management practices and different dimensions of corporate performance. Within those studies, a significant amount of research has focused on assessing the green supply chain in terms of economic considerations from the point of view of recycling (Sarkis, 1998; Rao and Holt, 2005). 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 cooperation and reverse logistics) on the four distinctive elements of corporate performance (environmental, economical, operational and social). Finally, earlier studies have not investigated the implementation of these practices on businesses performance in the Middle Eastern region.

This research attempts to fill this gap by providing new insights into how organizations can satisfy the green needs of their stakeholders, as theorized by Freeman (1984), while at the same time improving overall corporate performance. Thus, the general aim of this study is to investigate the impact of implementing green supply chain management practices on corporate performance within a UAE context. More specifically, it explores how the four main green supply chain management practices identified above (eco-design, environmental cooperation

and reverse logistics) impact corporate performance from environmental, operational, economic and social points of view.

3. Theoretical Model

Based on the preceding 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 *et al.* (2012) argue may create a barrier for organizations planning to adopt GSCM practices. This research addresses this gap by investigating the impact of the implementation of the four dimensions of GSCM on four elements of corporate performance. Figure 1 presents the theoretical model underpinning the study.

[Insert Figure 1: Theoretical Model – here]

The left side of the model shows the four independent variables which are; 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 may affect the dependent variable are; environment management system (EMS) certification, firm size and age are displayed in the upper middle of the model. The model assumes a relationship between each of the four green supply chain management practices which are; eco-design, green purchasing, environmental cooperation and economic performance from one side, and each corporate performance dimension from the other side. These are; are environmental performance, operational performance, economic performance and social performance. Three control variables are also presented.

Environmental performance in this research refers to the ability of the organization to reduce air emissions, effluent wastes and solid wastes, while decreasing the consumption of hazardous and toxic materials Zhu *et al.*(2008).

Operational performance refers to the organizations's capabilities to more efficiently produce and deliver products to customers with improved quality and reduced lead times and, therefore, improve its position within the marketplace (Melnik *et al.*, 2013)

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

Finally, this research adopts Wood's (1991) definition for social performance, which is: "[...] 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" pp.693.

4 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 inconclusive in relation to a number of our hypotheses. As a result, a qualitative phase was developed 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). Indeed, 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 and followed by quantitative research or vice versa (Cresswell & Clark, 2011; Tashikkori and Teddlie, 2010). In our study, because some of the findings of the quantitative study were found to be inconsistent with earlier studies, it was felt that by collecting further data using in-depth, semi structured interviews with environment management representatives (EMRs) within a selected sample from the population targeted in the quantitative phase of the study, the research findings could be more meaningfully explained. 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, results from qualitative research can help explain incomprehensible statistical results (Kelle, 2006).

5. The Quantitative and Qualitative Phase

5.1 The quantitative phase

Based on the review of literature, previous studies relevant to this research were used to frame the research hypotheses. For example, Perotti *et al.*, (2012) found that environmental performance among 15 firms in Italy was improved following the implementation of green supply chain management practices. Additionally, Green *et al.*, (2012) surveyed 159 firms in the US and found that green supply chain management practices, including eco design and environmental cooperation, were positively linked to environmental performance. Therefore, within the UAE context, we posited that:

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

Many studies have also attempted to investigate the relationship between green supply chain practices and corporate operational performance with different outcomes and within different contexts. These include Lee *et al.*, (2012) who found an indirect positive relationship between green supply chain practices and operational performance within Korean firms. Moreover, Melnyk *et al.*,(2003) found a positive relationship between the presence of formal EMS and improved performance such as; reduced costs, improved quality, the reduction of waste in the design and equipment selection process, and reduction of lead times. Accordingly, and within a UAE context, we posited that:

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

In order to examine the relationship between GSCM practice 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 leads to improved economic performance. Consequently, in this study we posited that:

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

Finally, 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). As a result, we posited the hypothesis below to see if the same holds true within a UAE context:

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

[Insert Table 2 and Table 3 here]

Based on the model presented in Figure 1, this research expands these hypotheses to be tested in the model framed as a total of 16 hypotheses, which are represented in Figure 1 and presented in Table 2. 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 in an online survey accessed through Survey Monkey and targeted at environmental management representative (EMR) firms within the UAE. Panel data provided by Dunn and Bradstreet was used to send the survey details and access link to respondents. The questionnaire was sent in two waves with a two-week gap between each wave and closed 42 days (6 weeks) from the date of commencement.

5.2 Analysis of Quantitative Data

Responses were categorized as responding to the first call or to the follow up call. Of the responses 33 were categorized as early responses (28%) and 84 responses were categorized as late responses (72%).

Content validity is a tool usually employed to ensure that the measures used are appropriate for the concepts being tested (Sekaran, 2003). To ensure content validity, the survey was shared with individual industry experts to get their feedback and revise any issues arising. In order to measure the reliability of the measurements and to verify the internal consistency of the constructs, Cronbach's alpha testing was conducted. The results indicate that

all the values are above 0.7 and this 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 were found to be above 0.7 which ensures the internal consistency and validity of the constructs employed.

A comparison of the means of some demographic and independent variables for the two groups was conducted using one-way ANOVA (Rogelberg and Stanton, 2007). **Table 4** below shows no statistically significant difference between early and late wave groups and therefore non-response bias was not seen as an issue.

[Insert **Table 4**: Analysis of Variance (ANOVA) test among the IVs and Demographic variable - here]

With respect to practices, the eco design construct is considered 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 practices are identified as green purchasing (Mean=2.7, SD=1.38). The suggestion therefore is that UAE manufacturers pay more attention to the eco design of their products as well as to reverse logistics and product take back, which is 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 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 entering the control variables as independent variables at block one and entering the independent variables in block two.

We assessed the contribution of each independent variable to the model in the coefficients Table below (Table 5). As can be seen only GP and EC contribute significantly to the model when the effects of other variables have been 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.

[Insert Table 5: Operational Performance (OP) Coefficients - here]

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 they help in predicting the dependent variable. The t-statistic value for ED and RL is greater than 0.05, therefore non-significant and, in turn, can not help in predicting the dependent variable. The impact of each of the three control variables on each performance dimension is summarized in Table 6. This shows that firm size in the UAE is a dominating factor that impacts environmental, economic and operational performance, whereas the firm size impact on operational performance seems to be insignificant with $\beta < 0.1$. When it comes to the age of UAE firms, the majority of the firms (82%), that responded have been based in the UAE for more than 5 years and age does not have an impact on any of the corporate dimensions as mentioned in Table 6.

[Insert Table 6: Control variables performance impact here]

Figure 2 summarizes the significant relationships between GSCM practices and the four performance dimensions.

[Insert Figure 2: GSCM practices and corporate dimension results – here]

The summarized 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 reverse logistics impacts social performance. However, none of these practices impact any other dimensions. 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 somewhat confounding. In fact, 75% of the hypotheses in the study were unsupported. The qualitative phase of the study was introduced to try to understand the reasons for this lack of clarity. The researchers employed semi structured interviews with a sample selected from the original quantitative research population to gain a deeper understanding as to why some green supply chain management practices failed to impact certain corporate performance dimensions.

5.3 Sample Selection for Qualitative Interviews

The researchers adopted a nonprobability sampling technique because the objective was to ‘... select a sample from which the most can be learned’ (Merriam and Merriam, 2009, p. 77). Consequently, the researchers selected a convenience sample from those that responded to the initial quantitative survey because they could provide answers that could help to explain why some hypotheses were not supported. Of the 140 respondents that 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 and 19 were either on leave, had left their organizations or declined to be interviewed citing time constraints. Eleven senior staff from eight companies, eventually committed to be interviewed. Based on their industry expertise, all were in a position to provide specific insights into the current state

of play within their organisations and were deemed appropriate 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.

[Insert **Table 7**: Characteristics of firms and interviewees - here]

Among the eight case organisations selected, only case number 6 (company F), representing the large scale furniture manufacturing industry, was a noncertified company. The remaining organisations were certified with ISO14001 certification as part of their business activities. The interviewees were from managerial and senior managerial positions within the organisation and had worked within the industry for a minimum of 5 years. As a result, they had a complete understanding of the company 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 were found to be confounding. A series of interview questions and probes was developed to assist this process and these are summarized in **Table 8**.

[Insert **Table 8**: Summary of the interview questions - here]

5.4 Qualitative Data Analysis and findings

Interviews varied in length but on average were just over thirty minutes. In total eleven respondents took part in the interviews, however, in some cases two informants from the same organization participated in the interview discussion. The interviews were transcribed, coded and categorized allowing for themes to emerge systemically (Schram, 2006).

[Insert **Table 9**: Summary of firms answers to the 12 interview questions - here]

Table 9, shows respondents' initial explanations of the reasons for the lack of a relationship between some green supply chain management 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 next section elaborates further on the details provided by respondents, along with some key quotes that capture their perceptions.

Process related issues

There was general agreement among respondents that implementing green supply chain management practices needs to be properly performed by organizations to ensure 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 specializes in the manufacture of building materials such as bricks, was asked why green supply chain management 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 relationship between green supply chain management 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 green processes, sometimes recycling in itself generates emissions. An example was damaged concrete that is sometimes ground and reused in the concrete mix for bricks. This grinding process generates CO₂ emissions and this, in turn impacts, corporate environmental performance. Similarly, the production manager of company B asserted that the quality of a recycled product is usually lower than a product made from raw materials, which may explain why green supply chain practices sometimes fail to improve corporate operational performance.

Another significant factor to enable some green supply chain practices to improve corporate environmental performance is coupling individual practice with other green practices. In other words, 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).

Environment Management System (EMS) Related Issues

Respondents felt that having a dedicated resource within the organization to ensure adherence to environment management system 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 practices can lead to green practices not improving corporate performance. The informant 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 health, safety and environmental (HSE) policy within the organization may also obstruct corporate social improvement. The purchasing manager of company D asserted, for example, that for green supply chain management practices to improve employee health and safety within the pharmaceutical industry, there must be a HSE policy in place.

Cost related issues

Adopting GSCM practices may improve corporate economic performance such as reducing product cost, improving sales and enhancing return on investment. However, some respondents claimed that this might be true in the long term but not in the short term which was reported earlier by Porter (1991). The HSE manager of company H advised for example 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 specializes 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 organization.

Marketing related issues

Marketing 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 will lead to losing the management support required to successfully implement green supply chain practices and consequently reap the benefits. Firms need to advertise any green related efforts to the wider community to be rewarded. Thus, it was felt that many respondents linked the failure of green practices to improving 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” working with the Abu Dhabi Municipality to plant trees around their three square kilometre manufacturing facility. This was designed to offset the carbon dioxide emitted during production, however, despite planting 1,500 trees, neither the Municipality nor his organization had announced this initiative to the public and, therefore, no change in his firm’s corporate image has taken place.

Time related issues

There was general agreement among respondents that benefits of implementing green supply chain practices may not materialize in the short term but may be accomplished in the long term. Representatives of four firms asserted that corporate performance will not improve

overnight as a result of green practice implementation because it requires some time to achieve payback.

6. Discussion

6.1 Triangulation of results

Four dimensions of corporate performance that were found to be highly associated with green supply chain implementation and were previously assessed by several researchers in the field (although not collectively) were adopted for this research. These were: environmental performance, operational performance, economic performance and social performance. By employing institutional and stakeholder theories as reference points, the study found that although half of the companies surveyed are 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 also 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), the reduction of waste in the design and equipment selection process (EP), and a reduction of lead times (OP). Additionally, Gonzalez *et al.* (2008) found that there is a significant relationship between the possession of certified EMS and demand on suppliers to implement environmental practices. As noted by Dun and Bradstreet UAE (2017), more than 4,000 firms are ISO14001 certified in the UAE and more are in the certification stage. This in turn, indicates that UAE firms have begun to realize the importance of being green conscious

Discussing the main hypotheses of the research, however, it is important to note that 75% of these hypotheses were not supported within the quantitative study, which means that

the GSCM practices within UAE organizations appear to have 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 (see 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), the study 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 may be that these firms adopted compliance-based strategies within these GSCM practices and not proactive strategies, which may have improved environmental performance.

In the qualitative phase of this study, for instance, when firms' Environment Management Representatives (EMRs) were asked why green supply chain management practices appeared not to improve corporate environmental performance, the answers varied. For example, the production managers in both 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 underscore management support and commitment which can lead to real performance improvements. Finally, the procurement manager of company F, which specializes in furniture manufacturing, opined that eco-design practices are long-term initiatives and therefore the benefits require some time to be realised. This, reinforced the earlier finding that it can take some time for investments in GSCM to show a return.

When interviewees were asked why environmental cooperation didn't 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 Environment

Management System requirements might be a reason for this lack of relationship, while the Q and 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 versus short term returns. One surprising reason for a lack of relationship between environmental cooperation and environmental performance presented by the general manager of company E, whose firm is in the building materials manufacture business, was that recycling can generate emissions and this might hamper environmental performance improvements.

The reasons for the absence of a relationship between green purchasing and environmental performance were similar to those of environmental cooperation. That is, the technical manager of company A as well as the procurement manager of company F, confirmed that the absence of a dedicated person monitoring the implementation of green purchasing practices and rectifying any issues 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 ($\beta=0.219$, respectively). These results are consistent with the resource based view by Eisenhardt, (1989) and Gavronski et al. (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 *et al.* (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 “Istedama”, “Pearl Rating” and “Green Building” initiatives launched by the UAE government aimed at motivating supply chain members to work more closely to deliver more sustainable products and projects.

Neither eco-design or reverse logistics were 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. It is possible that this is because the level of implementation was not sufficient to lead to better outcomes as found by Zhu *et al.* (2006). Similar findings were also reported by Deutz *et al.* (2013) where firms were not effectively implementing eco-design. Interviewees in our study were of the same opinion. For example, the production manager of company B stated that, if eco-design practices were not properly implemented, it may not lead to any operational benefits to the firm. Additionally, the quality control and assurance manager of company C claimed that eco-design practices require a dedicated environmental management resource within the organization to monitor and manage its implementation which is not the case currently with most companies in the UAE.

With regards to reverse logistics, Richey *et al.* (2005) reported similar results. That is, the authors found that the implementation of reverse logistics procedures did not improve corporate operational performance. The operation manager of company B, for example, stated that products from recycled materials are usually lower in quality than those from raw materials and this 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 may be connected with 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. In other words, green purchasing is the lowest GSCM practice in terms of implementation, and economic performance is the lowest in terms 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 realize short term economic benefits. This is in keeping with Green *et al.* (2012), who found that green purchasing is positively linked to economic performance. Mitra and Datta (2014) and Yadlapalli et al. (2018) reported similar results. They found that supplier collaboration is positively related to sustainable product design, which in turn, positively impacts economic performance. Indeed, it could be argued that only green purchasing has an impact on economic performance as none of the four green supply chain practices were found to impact environmental performance in this study.

However, these results do present a challenge to the researcher, particularly since the research is set within the context of the UAE. Within this context, it is possible that other practices within 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 realized.

UAE regulations are also relatively recent and thus their impact may take some time to yield results. This is consistent with the institutional theory perspective by Zhu and Sarkis, (2007) and Cai et al. (2008). The study did find that 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 not linked with legislation or regulations, which were the major external drivers found in most previous studies. Instead, the main drivers of social performance 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 green supply chain management practices such as eco-design, environmental cooperation 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, as well as the procurement manager of company D, both asserted 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 organization and the community become aware of the organization'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. Finally, the Q and A manager in company C pointed out that there are no accurate measures to measure the impact of eco-design practices on corporate social performance.

6.2 Limitations, Further Research and Managerial Recommendations

6.2.1 Limitations

One limitation in this study was the concentration on firms in the manufacturing sector, however, this sector was specifically selected because the manufacturing industry accounts for a large proportion environmental impact and manufacturing is also responsible for the depletion of natural resources. The study was also limited to manufacturing industries in the UAE because the research purposefully intended to gain an understanding of green supply chain management practices among the UAE businesses and sought to discover how these practices relate to different aspects of corporate performance. This was seen as significant in a rapidly growing economy and particularly because the UAE is considered to be a role model for other gulf cooperation council (GCC) countries seeking to diversify their economies. The sample size was also lower than expected due to a low response rate; however, these data were enhanced by the addition of the qualitative research phase.

Further research may provide additional insights into how the different dimensions of corporate performance impact over time and how the outcomes of implementing green practices are realized.

6.2.2 Further research

Extending this study to other industrial sectors in the UAE may allow researchers to understand how the performance of other firms is impacted by the implementation of green supply chain management practices and how they cope with mounting environmental issues. For example, in transportation or other environmentally sensitive sectors.

This study also lays the foundation for future research in other sectors as well as other Gulf Cooperation Council (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 studies might 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 as well as any links between GSCM practices.

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

Finally, it is worth noting that many insights discovered in this study would not have been found without supporting the quantitative methods with a qualitative research phase. As a result, it is suggested that quantitative research, supported by exploratory research techniques such as in-depth interviewing, are still 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 has allowed the researchers to develop a roadmap for future research in the sustainable supply chain management area and has identified the important themes required to understand corporate performance in emerging economies.

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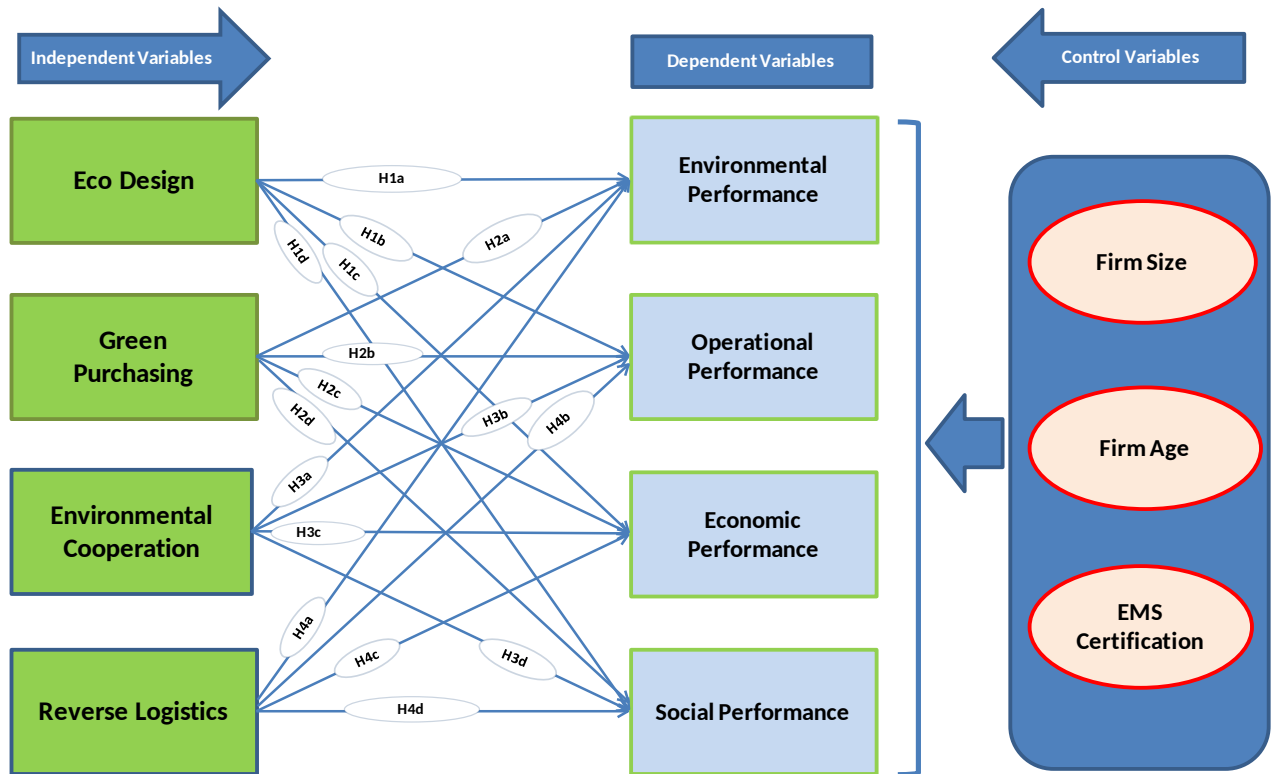


Figure 1: Theoretical Model

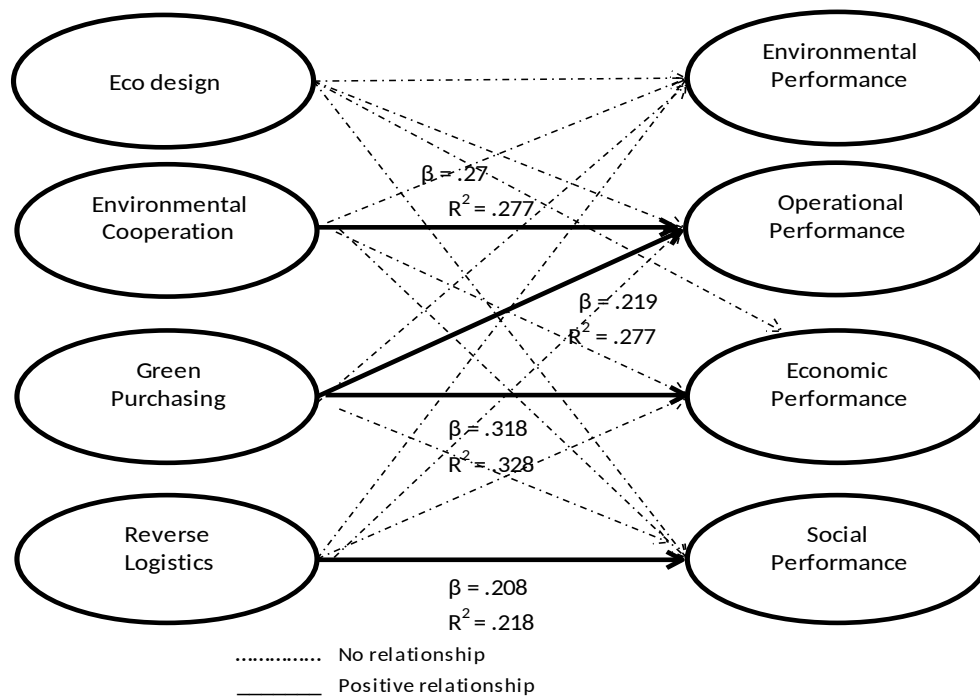


Figure 2: GSCM practices and corporate dimension results

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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 Ec P: 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 minimize 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: Organizational performance	GSCM: Internal environmental management, external GSCM, investment recovery and eco design Organizational 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-Tuwaijri <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 participate 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
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 Philippine, 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 DVs: 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 organizations 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 <i>et al.</i> (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
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 with suppliers, 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

Table 2: Hypotheses development of GSCM practices and performance measures

Hypothesis 1a: There is a positive relationship between 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

Table 3: Conceptual definitions of Construct

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 <i>et al.</i> (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 <i>et al.</i> (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 <i>et al.</i> (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 <i>et al.</i> (2003) and Zhu <i>et al.</i> (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 <i>et al.</i> (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)

Table 4: Analysis of Variance (ANOVA) test among the IVs and Demographic variable

		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

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.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)	-.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	-.110	.100	-.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:** Control variables performance impact

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

Table 7: Characteristics of firms and interviewees

S.No.	Company	Activity	ISO 14001 Certified	Interviewee designation
1	A	Glass Reinforced Plastic Pipes and Fittings	Yes	Production Engineer, Technical Manager
2	B	Tiles Manufactory	Yes	Production Manager
3	C	Manufactory of Thermally Preinsulated Piping Systems	Yes	Production Incharge, Q&A Manager
4	D	Pharmaceutical Manufacturing	Yes	Purchasing Manager
5	E	Manufacturer of Building Materials for the Construction Field	Yes	General Manager
6	F	Furniture Manufactory	No	Procurement Manager
7	G	Manufactory of Pipes	Yes	Production Manager
8	H	Production and Supply of Ready Mix Concrete	Yes	Operations Manager, HSE Manager

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. helped in reducing air emissions, waste water, solid wastes, consumption of hazardous materials, frequency of environmental accidents and improves 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. decreased cost for materials, energy consumption, water discharge and treatment, improves 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. reduced lead times, improved product quality, helped design better product, sell in international market, 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, 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. helped in reducing air emissions, waste water, solid wastes, consumption of hazardous materials, frequency of environmental accidents and improves 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. decreased cost for materials, energy consumption, water discharge and treatment, improves 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, 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. helped in reducing air emissions, waste water, solid wastes, consumption of hazardous materials, frequency of environmental accidents and improves 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 Improve corporate image, social commitment, 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. helped in reducing air emissions, waste water, solid wastes, consumption of hazardous materials, frequency of environmental accidents and improves 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. reduced lead times, improved product quality, helped design better product, sell in international market, 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, enhance employee job satisfaction and health and safety?

Table 9: Summary of firms answers to the 12 interview questions

Firm	ED > EP	ED > OP	ED > EcP	ED > SP	EC > EP	EC > EcP	EC > SP	GP > EP	GP > SP	RL > EP	RL > OP	RL > EcP
A	Don't apply as their product is not recoverable	Don't apply as their product is not recoverable	Extra cost incurred	Disagree	No idea	Difficult to compete as green product is costly	Issues in measurement	No EMRs to look after green initiatives	Lack of awareness	Don't apply as their product is not recoverable	Don't apply as their product is not recoverable	Don't apply as their product is not recoverable
B	Issues in implementation	Issues in measurement	Mismatch between customers wants and green products	No advertising of green initiatives	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	Indirect impact	No EMRs to look after green initiatives	Extra cost incurred	Issues in measurement	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	Lack of management support	It takes time	It takes time	No advertising of green initiatives	No idea	No idea	No idea	No idea	Lack of HSE policy	Issues in implementation	It takes time	It takes time
E	Don't apply on them	Don't apply on them	Don't apply on them	Don't apply on them	Recycling generate emissions	Extra cost incurred	Lack of awareness	Disagree	Lack of awareness	Issues in implementation	Issues in implementation	Issues in implementation
F	It takes time	It takes time	Extra cost incurred	Disagree	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	Issues in implementation	Disagree	Product cost increased	Lack of awareness	No idea	No idea	Lack of awareness	Issues in implementation	Lack of awareness	Disagree	No idea	Extra cost incurred
H	Disagree	Disagree	Product cost increased	Disagree	Takes time	Extra cost incurred	Takes time	Don't apply as there in monopoly in the supply	Indirect effect	Don't apply as their product is not recoverable	Don't apply as their product is not recoverable	Don't apply as their product is not recoverable