Uncertain Supply Chain Management 7 (2019) 713–726

Contents lists available at GrowingScience

Uncertain Supply Chain Management

homepage: www.GrowingScience.com/uscm

Green supply chain integrations and corporate sustainability

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C H R O N I C L E

Article history:
Received February 1, 2019
Received in revised format March 1, 2019
Accepted March 1 2019
Available online
March 1 2019

Keywords:
Green Supply Chain
CSR
Sustainability
Environmental uncertainties
Oman

A B S T R A C T

The purpose of this paper is to investigate the relationship between green supply chain management (GSCM), sustainability and environmental uncertainties through corporate social responsibility (CSR) perspective. The study also tries to examine the mediating role of environmental uncertainties in the relationship between green supply chain management and sustainable performance. The study is carried out on firms in oil and gas sector of Kingdom of Oman and the results are analyzed using SEM-PLS. The findings reveal the fact that sustainable performance has become the primary objective of the organizations. Achieving sustainable performance is now becoming the main objective for business firms globally. Environmental obligation has caused many business firms to comply with the regulations. The green supply chain management is emerged as a significant determinant of CSR implantation success. According to this study the practice of the GSCM however requires integration among green supply chain partners to achieve sustainable performance. The findings have a number of managerial implications that could contribute to Omani's industries for planning and development a GSCI strategy through the internal, upstream, and downstream of the green supply chain perspective. The managers should develop a comprehensive environmental strategy, which requires the implementation of internal environmental management initiatives and cooperation from both suppliers and customers.

1. Introduction

Supply chain management (SCM) has received increasing attention from industrialists in light of strategic planning in design, maintenance, and operation of supply chain process. Despite the improvements that have been achieved successfully with the help of SCM, some organizations overlooked the environmental issues including global energy, global warming, reverse logistics, and ecological concerns in global competition. With the increasing environmental concerns over the past decades, green supply chain management (GSCM) has recently emerged to comply with regulations for environmental protection (Abdullah et al., 2014). Organizations have been fully aware that in order to satisfy environmental obligations they need to collaborate with the members of supply chain since organizations are considered accountable and are being charged for their suppliers' environmental

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doi: 10.5267/j.uscm.2019.3.001

liabilities (Cote et al., 2008), this creates urgency among companies to incorporate environmental practices not just in their companies, but along the whole supply chain, for achieving sustainable performance (Mahdavinejad et al., 2014; Salvioni & Gennari, 2014; Ahi & Searcy, 2015).

Sustainable business performance of a company is achieved when a company, while satisfying environmental obligations, adds ongoing value to its shareholders and stakeholders (Brent & Labuschagne, 2004; Alkali & Imam, 2016; Rahma, 2017; Chang'ach, 2018). According to Chen et al. (2010), initiating sustainable methods in business is an excellent way of achieving sustainable business performance. Establishing constructive and innovative corporate culture is one of the key constituents in a sustainability transition process. Establishing such cultures result in improved organizational performance, and helps in optimally utilizing the existing set of assets in order to obtain good environmental, economic, and societal outcomes. These outcomes in turn assure shareholders, customer, employee, society, and supplier satisfaction. Abdullah et al. (2014) stated that due to awareness of environmental protection on the global level, supply chain and operational management practitioners and researchers have shown keen interest in GSCM which is now considered as an important management tool in improving sustainable performance particularly among manufacturing firms. GSCM demands that all SCM stages must fulfill environmental protection obligations (Zhu & Sarkis, 2007). It requires manufacturers to incorporate green supply chain integration for employing the environmental management activities with the customers, suppliers and within companies (Mårtensson & Westerberg, 2016). This action will enhance inter-firm cooperation and encourage mutual GSCM as well as influence the firm's sustainable performance (Beleisyte et al., 2014; Aziz et al., 2015; Aziz et al., 2016; Mårtensson & Westerberg, 2016). Husted et al. (2016) mentioned that in terms of environmental problems, different pressures are faced by various countries. Manufacturing firms are the key reason for consuming large amount of resources and for generating waste worldwide. According to the Annual International Energy Report, 36 percent of carbon dioxide is emitted by the global manufacturers. Amrina and Yusof (2011) believed that increased focus on the stakeholders of manufacturing firms, including employees, customers, shareholders, and regulatory makers have increased pressure on the firms to act environmentally responsible during organizational process and production.

Oman is one of the rapidly growing Arab economies and her economic activities are largely based on the oil export and production. The industry is under increasing pressure from the world environmental bodies. The concept of green, although has been lauded by many countries, is quite new to the Sultanate of Oman (Powmya & Abidin 2014). Meanwhile environmental vulnerabilities such as macro and micro forces are playing a key role in determining the impact of green initiatives on firm performance in general and sustainable performance in particular as such, it is wise to push the green concept as quickly as possible into the oil and gas industry to optimize the opportunity of gaining sustainability and overcome environmental. Actually, the abundant availability of crude oil and fossil fuel has accelerated the economic growth of these countries and has increased the standards of living. However, the oil and gas production has significant impact on the society (Krane, 2015). According to stakeholder's theory, the cost and benefits of any activity can be accessed and improved by the successful integration of all the stakeholders. As the oil and gas industry contributes economic growth but at the same time, they are responsible for environmental related issues which are increasing the social cost in Oman. Hence, corporate social responsibility (CSR) functions are used as a way to reduce the effects of corporate activities, to increase the long-term performance and society trust in Oman (Krane, 2015). The current study is planned to answer the following questions.

How does green supply chain integration affect the sustainability performance in Oman?

How do CSR related sustainability measures affect the sustainability performance in Oman?

How do the environmental uncertainties affect the link between green supply chain integration and sustainable performance in Oman?

2. Hypothesis Development

2.1. Sustainable Performance

Sustainable business performance of a company is achieved when a company while satisfying environmental obligations, also adds ongoing value to its shareholders and stakeholders (Brent & Labuschagne, 2004). A few important aspects of organizations' sustainable value include keeping shareholders and customers happy, and contributing well towards society and environment. Sustainability involves activities which increase the ability to renew and maintain viability of all living species and biosphere, enhance the life of a firm, improve society's ability to resolve major issues, maintain itself, as well as to preserve decent participation, personal freedom, and welfare for present as well as for the future generations. Companies with practices to achieve sustainable performance are able to improve economic performance in terms of income, profit, tax, as well as taking care of employee's welfare financially (Zhu et al., 2012). The importance of economic sustainability performance has also been highlighted by Chien and Shih (2007) where they discovered that integrated GSCM is beneficial in reducing costs, promoting market shares, and increasing enterprises profits. Chan et al. (2012) through their study on environmental and corporate performance have also proved significant relationship between GSCM and firms' earning growth, market share, sales growth, and tax returns on investment.

According to Chen et al. (2010) initiating sustainable methods in business is an excellent way of achieving sustainable business performance. Establishing constructive and innovative corporate culture is one of the key constituents in sustainability transition process. Establishing such cultures result in the improvement of organizational performance and helps in optimally utilizing the existing set of assets in order to obtain good environmental, economic, and societal outcomes. Three important aspects of sustainable performance include social sustainable performance, environmentally sustainable performance, and economic sustainable performance (Chen et al., 2010). Pei et al. (2010) mentioned that, by focusing on the environmental protection, economic growth, and social cohesion, a sustainable development strategy was established by European Commission in 2001. Sustainable supply chain management is referred as a pattern of modern management that focuses on the integration of society, environment, and economy using all operations i.e. production, procurement, packaging, storage, transportation, disposal of by product, and consumption, that are promoted by the SCM technology. Thus, its ultimate goal is the achievement of sustainable societal, environmental, and economic performance (Guan et al., 2010). Three dimensions of sustainability, namely social sustainability, environmental sustainability, and economic sustainability are employed in order to examine the sustainability performance of an organization (Brent & Labuschagne, 2004). Eweje (2011) suggested that these pillars play an essential role in adopting the sustainability framework for smooth running of business operations, now and in future.

Economic sustainability is continuing to be one of major goals for business firms. According to Green et al. (2012), "economic sustainable performance is the evaluation of organizational cost reduction, promotes market shares, return on assets, improve income, and profits regarding the economic goals of performance". The implementation of GSCM practices among manufacturing firms has resulted better economic performance (Green et al., 2012). The positive result from economic aspect can be achieved through multiple direct pathways of sustainable supply chain management. Previous research from Eltayeb et al. (2011) investigated on green supply chain initiatives among Malaysian certified companies and the result has confirmed the positive relationship between economic performance and green supply chain initiatives. Consumers are the main driver of green practices implementation and playing huge role by demonstrating their influence and environmental conscious in choosing companies, increasing competitiveness, and economic performance (Andic et al., 2012).

The business firms have a huge *responsibility socially* where they need to take care of their employees and societies. Teraji (2009) defined social sustainable performance as an evaluation of a firm in terms

of participation & social commitment, healthy work environment, human resource development, and education and training. As the consumers became well aware about corporate social performance, management seeks to consider the responsibility towards improving social welfare by adopting ethical programs in the organizations. There are several domains namely human resources, corporate governance, human rights, and environment that should be properly assessed (Bessire & Onnee, 2010). Brent and Labuschagne (2004) referred social sustainable performance as "achievements in creating social welfare (for various stakeholders including supplier, employee, customer and society) resulting from the undertaken operational efforts. In detail, the management have full responsibility in the implementation of social commitment and participation, social administrative policies, human resource management, and healthy working environment". Apart from that, United Microelectronics Corporation quoted that the responsibility also includes employee benefits, staff relations, talent development, working conditions, public welfare support, social concerns, and response. Exposure on social sustainable performance would ensure organization in achieving its mission and vision as well as to stay competitive in the market.

Environmental concerns and conscious are driving business firms to look into their operational impacts. Based on Junquera et al. (2012), environmentally sustainable performance is defined as "a firms' evaluation of the efficient use of energy resources, decline in emissions, and slower down the consumption of harmful or hazardous materials". However, Brent and Labuschagne (2004) described environmentally sustainable performance as the successful reduction in emissions, waste generated, and reducing the use of resources that occur as a result of certain efforts. Environmentally sustainable performance is also strongly associated with environmental goals of organization including the decrease of frequency for environmental accidents and solutions to improve an enterprise's environmental situation (Chien & Shih, 2007). The environmental performance can also be a useful indicator in decreasing environmental risks, as well as supporting external communication and policy-making for both public and private sectors (Mazzi et al., 2012).

2.2 Green Supply Chain Management (GSCM) and Green Supply Chain Integration (GSCI)

Zhu et al. (2012) defined GSCM as the provision of goods and services from manufacturers and suppliers to the end users using cash flows, information flows, and material flows, with reference to the environment. GSCM is the integration of environmental view and SCM, involving material selection and sourcing, product design, manufacturing operations, provision of final good to the end users, and disposal of product after its expiration (Srivastava, 2007). Because of customer pressures and regulatory obligations, the extent of GSCM starts from the monitoring and evaluation of environmental management and ends at the implementation of proactive practices using several reverse operations, for instance refurbish, recycle, rework, reuse, and remanufacture (Ali & Haseeb, 2019; Haseeb et al., 2018; Suryanto et al., 2018).

Several supply chain and operational management practitioners and researchers have shown increased interest in the GSCM practices. The increasing significance of GSCM is mainly steered by growing environmental deterioration, such as decline in the resources of raw materials, overflowing of waste sites, and increased population (Wilkerson, 2005). However, GSCM does not solely provide eco-friendly production, but it also targets higher returns and better business sense. Therefore, in reality, GSCM aims to enhance business value performance of an organization. Since organizations are considered accountable and are being charged for their suppliers' environmental liabilities this creates urgency among companies to incorporate environmental practices, not just within the companies but along the whole supply chain for achieving sustainable performance.

The need for the integration of green supply chain partners has risen to green supply chain integration, which is an approach to integrate GSCM practices in business operations. Economic and Social Resource Council has defined GSCI as the strategic integration of associated firms within a supply chain, in order to deal with the environmental and operational effects of SC operations, through the coordination of inter as well as intra organizational operations. GSCI illustrates why and how the

integration of green manufacturing processes results in improved performance, as well as it identifies what and who needs to be collaborated (Wong et al., 2013).

Coordination of environmental management among supply chain partners is also called as environmental collaboration. This collaboration within supply chain partners can be impaired by the lack of supply chain integration. The integration within a supply chain can be expected to positively influence cooperative activities related to environmental (Canning & Hanmer-Lloyd, 2001). Therefore, the GSCI can be considered as "a novel concept when firms develop an approach to strategically integrate with suppliers, customers, internal, logistic, and technology to reduce environmental impacts" (Zhu et al., 2012). Successful GSCI practices would contribute to reduction of environmental impacts of the supply chain (Zhu et al., 2012).

2.2.1 Green Supplier Integration and Sustainable Performance

Previous studies have proven that supplier integration is positively associated with organizational sustainable performance (Vachon & Klasson, 2006; Zhu et al., 2012). Vachon and Klassen (2006) found that collaboration with suppliers could improve sustainable performance of one organization economically and environmentally. Developing collaborative relationship with suppliers is also favorable for an effective adoption, development, and implementation of the GSCM toward social contributions (Vachon & Klasson, 2006). Zhu et al. (2010) emphasized the significance of supplier integration and sustainable performance by stating that the lack of supplier collaboration would weaken sustainable performance improvements among manufacturing firms. Based on the literature reviews, these hypotheses have been proposed:

H_1: Supplier integration has significant impact on sustainable performance

2.2.2 Sustainable Performance and Green Customer Integration

Customers from the UK, the USA, and Australia are ready to collaborate with manufacturing companies for the purpose of fulfilling environmental requirements, as customers are more inclined towards using environmentally friendly products (Chen et al., 2012). The study also exhibited a positive association among sustainable performance and customer integration. Interestingly, customers closely analyze the green features of a specific product or service they purchase. It highly affects the social, environmental, and economic sustainable performance of an organization. Andic et al. (2012) found that competitive advantage and the economic performance of a firm were determined by their customer collaboration. Significant positive association was also found among environmentally sustainable performance and customer integration (Eltayeb et al., 2011). Customer involvement plays a key role while introducing a new product into the market, as the manufacturer is expected to clearly define, present, and highlight the green features of the newly introduced product (Chan et al., 2012). Customers and manufacturers' integration can greatly enhance the sustainable performance of an organization (Yeung et al., 2008; Ellram et al., 2008). Similarly, the literature shows a significant impact of customer collaboration on the firms' social and environmentally sustainable performance (Simpson et al., 2007). Thus, hypotheses were formulated as:

H_2: Customer integration has significant impact on sustainable performance

2.2.3 Green Internal Integration and Sustainable Performance

Internal integration is referred to "environmental management practices conducted within a company" (Dubey et al., 2017). Wu (2013) classified internal integration as "level of integration in combining and improving information and internal resources in the company to generate knowledge sharing beyond the boundaries of individual functions or departments in reducing and preventing pollutions". Communication and cooperation are crucial to successful environmental practices as GSCM involves all departmental boundaries between and within organizations. Zhu et al. (2010) also stressed about the influence of coordination across the functional department within the entire supply chain to improve

environmental management. Most of the time the implementation and adoption towards environmental practices internally seem to be the main issue (Zhu et al., 2012). However, the GSCM practices like minimizing wastes and attracting customer cooperation for eco-design of product for instance, would require internal coordination mechanisms (Zhu et al., 2012). There are many firms going towards the environmental direction these days with their environmental management systems, environmental auditing of departments, internal evaluation of environmental reports, and certification of ISO 14001 (Zhu et al., 2012). Therefore, cooperation within the organization is essential to ensure sustainable performance, economically and socially as well as achieving environmental objectives.

Past study by Green et al. (2012) investigating GSCM among firms has shown that collaboration and cooperation from organization internally leads to a better overall sustainable performance. Eltayeb et al. (2011) added that the economic aspect could be gradually increased through efficient internal integration from the adoption of GSCM. Many companies which integrate with the GSCM are able to create competitive market shares and increase the profits. According to Zhu et al. (2012), lack of internal resource and managerial support lead to economic failure. Eltayeb et al. (2011) have also found positive relationship between internal integration and environmentally sustainable performance. Previously, Sroufe (2003) found that an environmental management system (EMS) adopted in organization positively affects operational performance measure such as production waste reduction. The integration within manufacturer via sustainable design practice also improves income, employee's welfare, and profit (Zhu et al., 2012). The internal coordination mechanisms like exposure of cross-functional cooperation and having specialized staff on environmental issues are correlated to social sustainable performance, including safer working environment, increased happiness, motivation, involvement, social commitment, and high participation among the staffs (Zhu et al., 2012). Referring to previous studies, these hypotheses were proposed:

H_3: Internal integration has significant impact on sustainable performance

2.3 Environmental Uncertainty, Supply Chain and Suitability

Environmental turbulence is referred not as an antecedent of co-evolving and knowledge assessing, rather it acts to moderate the effect of strategic orientations on dynamic SC capabilities (Defee & Fugate, 2010). A highly unstable environment cannot solely cause members of SC to enhance their mutual understanding regarding consistency and encouraging the development of eco-evolving capabilities. The rearrangement of inter-organizational routine occurs as a result of multiple partners from SC, which are likely to learn and collaborate within organizations. Under turbulent environments, the SC and its learning-oriented members are likely to acknowledge the need for co-evolving dynamic capabilities and acquiring knowledge by supply chain (Defee & Fugate, 2010). When the members of supply chain share similar strategic orientation, for the purpose of co-evolving and acquiring knowledge, it enhances their desire for developing and driving these underlying dynamic abilities, particularly under unstable environments.

Environmental uncertainty can arise in the form of technological turbulence and market turbulence which are most likely to affect organizational behaviors, which further relates to IT collaborative behaviors and bring successful organizational outcomes (Iyer, 2011). The two dimensions of uncertainty can have varying effects on the relationship between collaboration and IT analytic capability. With the increased customer awareness regarding the implementation of dynamism in certain supply chain processes e.g. technological turbulence, organizations seek to become more responsive towards such indications as well as to incorporate certain IT analytic capabilities for any unforeseen situation. Technological turbulence refers to the greater changes that occur in production, service, and process technologies (Iyer, 2011). Thus, it poses an undesirable influence on organizations' processes such as increased fluctuations in delivery efficiency or schedules, or increased unpredictability in processes, resulting in poor customer services.

Firms seek to develop IT analytic capabilities in their processes to neutralize the adverse effect of organizational performance (Melville et al., 2004). These capabilities help firms in improving the combine efforts among the downstream partners, for smooth functioning of operations as well for optimal utilization of pooled resources, which collectively would result in the reduction of variations. Higher levels of technological turbulence impel firms to incorporate more IT-facilitated collaborative attempts, for the purpose of improving the internal predictability of supply chain operations. Resultantly, technological turbulence can facilitate in improving the direct relationship between demand chain/customer collaboration and IT analytic capability. The dynamic large-scale decision issues may involve the reconstruction of existing SC through removing or adding of some products, planning to implement changes in SC operation in order to satisfy changing market requirements, shutting down or extending certain production facilities, and redesigning of new SC. With reference to its application in chemical industry, three dimensional issues can arise as a result of technical challenges, namely, degree of uncertainty, temporal, and physical scale.

High levels of uncertainty occur as all the factors include some stochastic elements. These factors include market parameters for the availability of feed stock, demand of products, and prices; facility parameters, i.e. availability or reliability, and technical parameters including product qualities, processing rates and time, and product yield (Applequist et al., 2000). While the temporal scale occurs as a result of various dynamic operations and entities, for instance logistics and distribution may take weeks to complete, equipment residence times take hours, while individual steps in operational processing can take minutes. Furthermore, the wider physical scales arise because of the necessity for assessing the system at various levels of physical aggregation including equipment items, production lines along the manufacturing units, and globally dispersed organizations.

This study is based on the coordination-theoretic approach in SCM. Malone and Crowston (1994) proposed the coordination theory, which explains the mutual dependencies between the coordination mechanism and tasks, where different members of the group perform various tasks and bring together their work through alternative mechanism. Based on the works by Lai Wong and Cheng (2010), this theory has already been employed by many researchers in order to assess the impact of alternative mechanism in SC operations and inter-organizational dependencies.

H_4: Environmental sustainability (Hamzah) has significant impact on sustainability performance (SP).

H_5: Environmental sustainability (Hamzah) mediates the relationship between supplier integration (SI) and sustainable performance (SP).

H_6: Environmental sustainability (Hamzah) mediates the relationship between customer integration (SI) and sustainable performance (SP.

H_7: Environmental sustainability (ES) mediates the relationship between internal integration (II) and sustainable performance (SP).

3. Methodology

The sampling technique engaged in the study was a cluster sampling. The sample size is determined according to the five technique suggested by Gay and Diehl (1992). First is to identify the population, or the total number of the firms. Then, the number of the population sample size is determined based on Krejcie and Morgan (1970) table for determining a sample size (in this case the appropriate number according to the table is 310). SEM is one of the most powerful statistical tools in the area of social science that has the ability to test several relationships simultaneously (Hair et al., 2016). Even though, covariance-based approach (CB-SEM) such as AMOS have been a focused by previous researches (Hair et al., 2016), a variance-based approach or PLS-SEM with a distinctive methodological feature makes it a possible alternative to the more popular CB-SEM approach. The measurement of sustainable performance has been adopted from the study of Brent and Labuschagne (2004), the green supply chain

integration has been adopted form Wu (2013) and of environmental uncertainties measures are adopted from the work by Naman and Slevin (1993). A total of 600 questionnaires forms had been send via electronic e-mail and parcels to the operational and production managers of manufacturing firms operating in Oman. In specific, the study focused on the personnel who were in-charge or responsible of environmental management system or ISO documentations in the organization. Out of 600 questionnaire forms distributed by mail and online, the authors received back a total of 319 questionnaires from respondents equaling to 63.0% response rate.

4. Regression analysis

PLS-SEM has become popular for a number of reasons. Urbach and Ahleman (2010) reported several arguments on why PLS has been used by most researchers. PLS is especially useful when the main objectives of applying the structural modeling are prediction and explanation of a construct (Hair et al., 2016). For the purpose of this study, researchers decided to use PLS-SEM on the conditions that PLS-SEM is more flexible; it makes minimal demands on the sample size and able to cater to complex structural model. In addition, the model of this study consists of reflective and formative construct. Furthermore, the objectives of this study are to make prediction among the constructs. The justification for using Partial Least Square (PLS) for the data analysis was further supported by Hair et al. (2016). SEM-PLS is a two-step process which starts from the assessment of the measurement of model and ends at the assessment of structural model.

In measurement of model, all items in the measurement model are changed too. Therefore, all indicators are highly correlated which means that all indicators together form the construct. This study performed Confirmatory Factor analysis (CFA) to validate the measurement model (outer model) by examining the relationship between items/indicators and their respective underlying construct. In CFA, the both constructs, the first order construct and second order construct are accessed. In evaluating the measurement model, elements of the model are individually evaluated based on certain quality criteria such as reflective measurement models, formative measurement models and structural model. Measurement of model for the current study is shown in Fig. 1

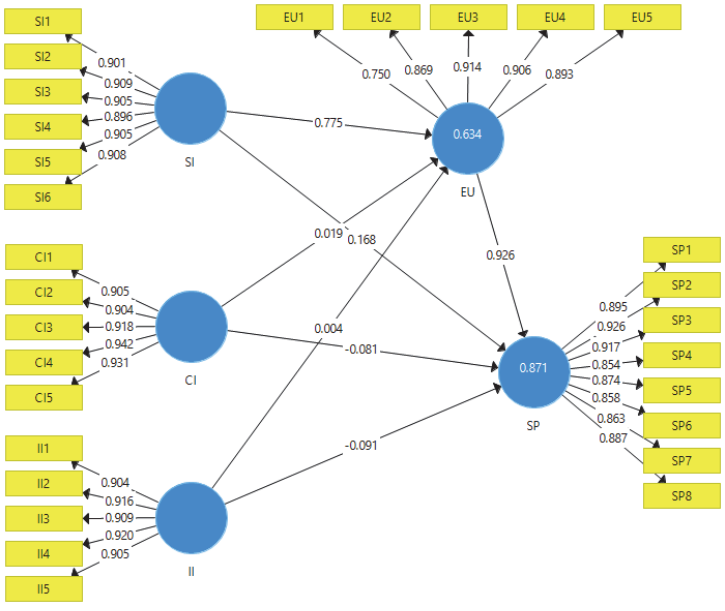

Fig. 1. Measurement of model

A factor is said to be significant and valid if the value of factor loading comes more than 0.5. This study thus analyses the outcomes of a loading factor using the Smart-PLS technique. Reliability and validity of data were considered before testing the proposed hypothesis. The values of both Average Variance Extracted and factor loadings were above 0.5, while the value for composite reliability turned out to be

higher than 0.7. Therefore, present study achieved the level of convergent validity. Content validity measure is referred as the degree to which the measurement of the manufactured products is adequately assessed and measured. However, all the developed items for measuring the latent variables must have greater factor loadings as compared with other constructs that can be ascertained through extensive investigation of the literature review. Reviewing literature will result in selection of factors based on their validity, in the available literature. Based on the outcomes of factor analysis, it confirms that all items are loaded accurately to their respective variables. Convergent validity is examined using reliability analysis, composite reliability, and factor loadings. Moreover, average variance extracted (AVE) is also used in understanding validity. Convergent validity depicts that within parent factor, variables either dependent or mediating, can correlate with each other.

Table 1
CFA

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
CI	0.955	0.955	0.965	0.847
EU	0.917	0.919	0.939	0.754
II	0.949	0.95	0.961	0.83
SI	0.955	0.956	0.964	0.817
SP	0.96	0.961	0.966	0.782

The measure of discriminate validity measures the interrelationship among reflective variables, along with its indicators. Principally, it exhibits or estimates operationalization of the set of variables that are somehow linked or not linked with the case study. A powerful and widely employed measure that was introduced by Fornell-Larcker is the discriminate validity measure. Therefore, the present study utilizes this as a basis for the evaluation of discriminate validity. Value of reliability index must be higher than 0.70. Therefore, the cross-loading values were the same as the outer loadings. Although cross loadings compare the existence of correlation between the constructs. Hence, the present study assessed the discriminate validity following shown in Table 2.

Table 2
Discriminant validity

	CI	**EU**	**II**	**SI**	**SP**
CI	**0.92**				
EU	0.75	**0.869**			
II	0.845	0.741	**0.911**		
SI	0.838	0.796	0.728	**0.904**	
SP	0.685	0.732	0.674	0.745	**0.885**

As explained earlier, after analyzing reliability as well as validity of instruments, assessing the structured relationships among the variables would be the next step. The usefulness of SEM-PLS as compared with other techniques is the fact that, it analyzes all assembled relations simultaneously, but others compute it indecently. Hence, in structural equation model, direct as well as indirect effects were inspected. The structural model of the current study is shown in Fig. 2. While mediation level is checked for inspecting its indirect effect. Bootstrapping process is employed at 1000 observations, for the purpose of specifying the importance of the proposed relationship. P-value is considered in this process. The threshold level of 0.05 is set for the p-value, in order to check the significance of hypotheses. Direct results showed that all hypotheses except H_2 have p-values below 0.05. Thus H_1, H_3, H_4 are accepted while H_2 is rejected. The results are shown in Table 3.

Table 3
Direct results

	Original Sample (O)	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**T Statistics (|O/STDEV|)**	**P Values**
CI → SP	-0.081	-0.09	0.113	0.72	0.472
EU → SP	0.926	0.925	0.035	26.517	0.000
II → SP	0.091	0.081	0.023	3.973	0.000
SI → SP	0.168	0.169	0.079	2.124	0.034

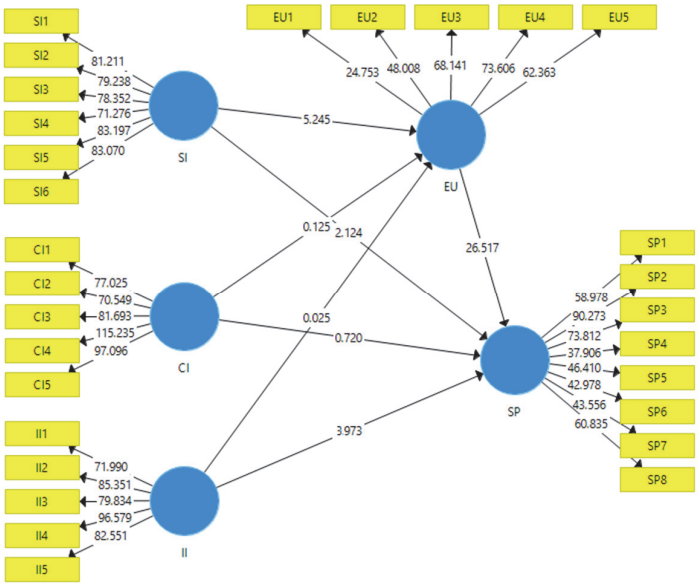

Fig. 2. Structural model

Moreover, Table 4 highlights the mediating effect of customer response in the relationship between the agile supply chain and external supply chain performance. These results of moderation show that for both moderation hypothesis, the t-value is above 1.96 and p-value is below 0.05 which accept H_5, H_6, and H_7.

Table 4
In-Direct Effect through Mediation

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
CI → EU → SP	0.018	0.024	0.04	2.00	0.042
II → EU → SP	0.004	0.007	0.002	1.989	0.046
SI → EU → SP	0.717	0.723	0.142	5.06	0.000

In case of structural model, its predictive power can be analyzed using R-Square (R^2) value of endogenous variables. Path coefficients close to 0 are usually nonsignificant, Coefficient of determination or level of R^2 values (R^2 value ranges from 0 – 1 with higher levels indicating higher level of predictive accuracy). R^2 values of 0.75, 0.50, or 0.25 can be described as substantial, moderate, or weak, respectively. For the current study, the value of R^2 is 0.640, which indicates 64 percent variation in SP is explained by green supply chain integration and environmental uncertainties.

Table 5
Expected Variance

	R^2
CP	64.0%

4. Conclusion

The study has contributed to the GSCI knowledge in several ways. In response to previous where the findings found that there are possibilities of other variables in representing the GSCI theoretically, this study clarifies the relationship between multiple GSCI dimensions and sustainable performance dimensions to extend the understanding of GSCM research. Furthermore, there is a lack of theory in explaining how and why green-integration leads to better performance, and what and who are supposed to be integrated. The previous studies have also separately investigated internal and external 80 characteristics when investigating the supply chain and inter-organizational performance. Therefore,

the first contribution of this study is to provide and test an integrated framework, which incorporates various GSCI dimensions simultaneously with addition of logistic and technology integration. Second, choosing the most appropriate performance measures is difficult due to complexity and interdependence of green supply chains. This can be seen through common selection of organizational performance, a measurement using composite of several performance dimensions, which suggests a bias towards the universal applicability of manufacturing practices. Apart from that, many studies examining the effect of GSCI on organizational performance have pulled different dimensions of sustainable performance altogether within one construct, which can lead to a shortcoming in the findings. This study contributes theoretically via the measurement of sustainable performance which includes dimensions of economic, environmental, and social. The use of sustainable performance measurement fits with the GSCM study as environmental becomes the main objective and the fact that it covers the perspective of organization's economy, environmental protection through organization's green practices, and protection on social's welfare, health, and safety. Hence, as sustainable performance is multi-dimensional in nature, it must be analyzed as such. The results enrich the knowledge on the relationship of GSCI and sustainable performance. This study provides comprehensive explanation of the GSCI with a combination of both internal integration and external integration (supplier and customer) to suggest that a relationship between the GSCI and sustainable performance might be miscast if either internal integration or external integration is overlooked. This study also includes logistic integration and technology integration in exploring the relationship between supply chain integration and sustainable performance, in which the technology integration turned out to be the strongest predictor of sustainable performance. Nevertheless, further theoretical investigation of the GSCI would be encouraged as there are more possible factors of integrated green supply chain that may strengthen the sustainable performance.

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Appendix A

Measure items for Green Supply Chain Integration Environmental uncertainties and Sustainable Performance

The Authors have used the following Measure items for Green Supply Chain Integration Environmental uncertainties and Sustainable Performance in survey-based instrument for the collection of data. The five-point Likert scale is used to gauge the response.

Variables	Items		Source
Supplier Integration	1.	Collaborating with suppliers to set up environmental goals. 2. Implementing environmental audit for suppliers' internal management.	Canning and Hanmer-Lloyd (2001)
	2.	Providing suppliers with environmental design requirements related to design specifications and cleaner production technology.	
	3.	Requiring suppliers to implement environmental management or obtain third-party certification of environmental management system (e.g., ISO 14001).	
	4.	Selecting suppliers according to environmental criteria.	
	5.	Provides information to help supplier to improve logistic management.	
	6.	Exchange operational and logistical information with supplier.	
Customer Integration	1.	Achieving environmental goals through joint planning with customers.	Wu (2013)
	2.	Cooperating with customers to reduce environmental impact of the products.	
	3.	Cooperating with customers for cleaner production, green packaging, or other environmental activities.	
	4.	Sharing organizational know-how and experience with customers for environmental management and find solutions to environmental challenges.	
	5.	Customer provides information that help company's operations.	
	6.	Customer discusses the issues related to major design changes in existing packaging (colours, size).	
	7.	Customer share information informally without specific agreement.	
Internal Integration	1.	Senior and middle managers are committed to GSCM practices.	Wu (2013)
	2.	Cross-functional cooperation for environmental improvements.	
	3.	Environmental issues are well communicated among departments.	
	4.	Environmental compliance and auditing programs are implemented.	
	5.	Environmental knowledge is accumulated and shared across departments.	
	6.	An environmental management system exists.	
Sustainable Performance	1.	Reduction of the negative impact of products and processes on the local community..	Brent' and Labuschagne' (2004);
	2.	Improvement of community health and safety resulting from green practices.	
	3.	Decrease in cost for materials purchasing.	
	4.	Decrease in consumption for hazardous/ harmful/ toxic materials.	
	5.	Decrease in frequency for environmental accidents of the firm	
	6.	. Reduction in air emission caused by firm's manufacturing activities.	
	7.	Reduction in waste water caused by firm's manufacturing activities.	
	8.	Reduction in solid wastes caused by firm's manufacturing activities.	
	9.	Improvement of employees' health and safety resulting from green practices.	
Environmental Uncertainty	1.	The external environment our firm operates in has a high level of risk and uncertainty	Naman and Slevin (1993).
	2.	The external environment poses serious threats to our firm's survival and well-being	
	3.	Our firm must deal with a wide range of external environment influences	
	4.	Declining markets for products are a major challenge in our industry	
	5.	Tough price competition is a major challenge in our industry.	
	6.	Government interference is a major challenge in our industry.