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RESEARCH PAPER

Investigating Environmental Performance and Competitive Advantage with the perspective of Green Supply Chain Management

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ABSTRACT

Green supply chain management is a modern practice adopted by manufacturing firms having greater influence on environmental sustainability. This study, based on the resource-based view theory, determine the impact of GSCM practices and moderating role of environment management system and firm size on environmental performance by leading towards the competitive advantage. Due to emerging demand of sustainable performance, organizations are struggling to improve their supply chain for getting competitive advantage Therefore, different parameters of supply chain along with implemented management systems is critically important to review. By quantitative cross-sectional approach and using questionnaire as a tool, purposive sample of 209 organizations of Punjab, Pakistan was taken to investigate the impact. It revealed that GSCM dimensions influence directly to the environmental performance and indirectly to the competitive advantage for large sized firms while this response is dull in case of small size firms while effective environment management system accelerates the strength of these relationships. This study contributes theoretically by providing a lens to judge the GSCM and EP relationship in the context of firm size and provide guidelines to industrial practitioners for implementing GSCM strategies in order to get long-term competitive advantage under the umbrella of environmental sustainability.

KEYWORDS Green Supply Chain Management (GSCM), Environmental Performance (EP), Competitive Advantage, Environment Management System, Firm Size

Introduction

Plastic industry is growing day and night due to its eco-friendly nature. In Pakistan, this industry is equipped with all modern manufacturing plants to contribute a major portion in GDP of Pakistan (15%). Its manufacturing sector consist of approximately 11000 small, medium and large processing units (Punjab Board of Investment & Trade, 2020). In Pakistan, the plastic manufacturing sector significantly contributes to environmental challenges due to substantial waste generation and resource consumption. This scenario underscores the imperative for adopting Green Supply Chain Management (GSCM) practices to mitigate environmental impacts and enhance organizational performance (Ahmed, Khan, & Zafar, 2023). The idea of supply chain management was initiated in 1950s and organizations incorporated green concept in their inventory chain in 1990s (Pathan, 2021). The trend of green concept in customer market and regulations of government bodies are compelling the organizations to adopt ecological perspective in their supply chains (Lin and Ho, 2011). So, the green supply chain management (GSCM) is relatively a bright idea in market to avoid violations and degradations (Kirchoff, Tate, Mollenkopf, & Management, 2016). GSCM can be stated as a parameter to improve environmental performance by upgrading its supply chain in terms of its product design, operational activity management and customer relationship by the integration of all organizational processes to ultimately satisfy the consumer (Pourjavad & Shahin, 2018). For instance, a study on Pakistani manufacturing firms found that GSCM practices

positively influence environmental performance, with institutional pressures acting as a significant moderator in this relationship (Nazir, Zhaolei, Mehmood, & Nazir, 2024). Another research indicates that GSCM practices have a positive impact on green innovation, environmental performance, and competitive advantage (Khan, Jabeen, & Ahmed, 2023).

On the other hand, manufacturing firms are the key contributors for emerging environmental issues which are disturbing health and safety measures for the workers and surrounding (Ahmed & Najmi, 2018; Beamon & Mgmt, 1999). So, due to this industrialization, global warming has adverse effect on the environment which is of major concern for the world and nations across the globe are paying attention to reduce this severe impact on environment (Sharma and Gandhi, 2016). Supply chain is also in line with this impact by having resource consumption activities so all regulations and law mainly focus on manufacturing units to accept the agenda of energy saving (Zhu, Qu, Geng and Fujita, 2017). So environmental challenges and worldwide regulations are compelling the manufacturer to shift their activities towards environment friendly ecosystem, called sustainability by adopting green supply chain management activities revealing the modern concept of supply chain which was specifically concerned with reduced cost and improved services instead of considering environmental aspects.

On the other hand, firm size may also play a role, with larger firms possibly having more resources to implement comprehensive GSCM practices, while smaller firms might exhibit greater flexibility and innovation in adopting such practices. A study examining the relationship between GSCM and corporate performance among listed firms in Pakistan highlights the significance of these factors (Hussain, Ahmed, & Tariq, 2022). Thus, in developing countries, concept of GSCM is well understandable and successfully implemented, but in Pakistan, its linkage is at initial level. Collective stress and environmental reserve community is demanding the organizations to implement GSCM practices to make the pollution and global warming controllable. So, due to limited research on GSCM practices and its specific impact on environmental performance in order to get competitive advantage, a small amount of industry is implementing it (Sarwar et al., 2021). Therefore, this research has the objectivity to dig out environmental performance of the industry after implementing green concept of supply chain which will ultimately lead the organization to attain competitive advantage. For this research, plastic manufacturing industries of Pakistan, have been considered to measure the effect of GSCM practices on environmental performance and competitive advantage and since there exist small, medium and large scale industry so this factor will add value in it respectively. Moreover, deep roots of GSCM have been investigated by considering five dimensions of GSCM which are green design, green purchasing, green manufacturing, green distribution and packaging and green marketing, which will have its significant impact on environmental performance leading towards competitive advantage. The above mentioned dimensions were also investigated in literature to establish a strong relationship with environmental performance and competitive advantage (UDDIN, 2021) by highlighting the opportunities to incorporate new directions to make it more established especially within the context of other demographic regions like Pakistan. Furthermore, literature reflects that GSCM has a significant impact on environmental performance in the presence of an important variable firm size which stimulates the relationship positively (Fianko et al., 2021), so there has been found a gap to illustrate resource-based view theory with the perspective of GSCM dimensions having influential effect on competitive advantage within the consideration of firm size, as different sized industries will have a different influence on environmental performance. So, there is a need to relate theoretical foundations to illustrate the impact as mentioned above. Therefore, by implementing GSCM practices, industries depending upon their size, will be able to select suppliers on eco-friendly basis and minimize environmental risk associated with their supply chain activities through enhanced business opportunities and be able to compete in the market.

The outcomes of these objectives will contribute to the existing literature by linking GSCM practices to competitive advantage especially in the context of Pakistan, where plastic sector is divided into small, medium and large size. In addition to it, this study contributes that how GSCM practices improve environmental performance and competitive advantage indirectly and the extent to which environment management system and firm size moderates the relationship strength especially for the case of plastic industry demographically surrounded in the area of Pakistan. Furthermore, contribution of plastic sector industry to implement green concept will be appreciated on the basis of strong findings reflected by this study and thus, the overall image of country will establish an attractive package to minimize its effort to save the atmospheric blessings.

Literature Review

Theoretical Background

Theoretical lens specifically used for this study is resource-based view (RBV) theory, reflecting that there is a great competitive advantage for the organizations having sustainable abilities to adopt greener practices by preventing pollution arising from their processes and by minimizing emissions and wastages (Hart, 1995). This theory also highlights the alliance and incorporation of stakeholders in the process of greening organizational behaviour towards environmental sustainability (Hart and Dowell, 2011) by motivating the employees through combination of competitive and environmental objectives having roots from organizational skills and resources (Barney, 1991). Furthermore, Tariq, Shahzad, and Ali (2023) highlight that plastic manufacturing firms adopting GSCM strategies are better positioned to achieve operational efficiencies and market differentiation.

Green Supply Chain Management

Green Supply Chain Practices: Adoption of green practices is becoming favorable due to market institutional pressure and legislative bodies (Curkovic et al, 2000; Srivastava, 2007; Kumar and Putnam, 2008). According to Uddin, (2021), practices or dimensions for effective green supply chain management are green design, green purchasing, green manufacturing, green distribution & packaging and green marketing. These practices collectively aim to improve both environmental and economic outcomes for organizations (Ahmed, Khan, & Zafar, 2023).

Green Design: Importance of design was highlighted by Buyukozkan and Cifci (2012) when they refer that 80 % of environment related impact may be influenced during the designing of product. Cost reduction opportunities are greater at the beginning of supply chain and organizations must actively seek such opportunities to use recycled components (Min and Galle, 2001). Nazir et al. (2024) identified green purchasing and green manufacturing as the most widely implemented practices in the country's manufacturing sector, driven by regulatory compliance and market demands. So based on this framework, post-consumer waste is one of the sources of recycled material (Field and Sroufe, 2007) and it is possible to sell or reuse product (Zhu et al, 2005).

Green Purchasing: To buy something with green mind set is most common parameter of GSCM practices. The firms who believe in green practice will pay attention to its supplier and firm with small and medium size will ensure these practices with mutual collaboration of suppliers by conducting trainings, environment information sharing and joint venture researches. While large size firms may bound their suppliers to adopt ISO 14001 certification so any other improvement criteria (Lee, 2008).

Green Manufacturing: It is defined as "the ad option and planning of activities that require less energy and resource use in the production process and cause the least

environmental pollution" (Gao et al., 2009). Green manufacturing programs deals with low utilization of energy, contamination and resources with effective cycle courses and incorporation of zero likely security concerns, negligible risk for manufacturers and consumers, lower contamination and garbage removal to the possible extent during its operation (Gao et al., 2009). It may be segregated into two classes with working on scientific instruments and other on models to deliver green products at various levels from less green to more green and then more eco-friendly nature (Deif, 2011). In addition to it, green manufacturing is a step in organizational operations to enhance their productivity and sustainable performance (Akbar, 2021).

Green Distribution and Packaging: Green distribution reduces carbon dioxide and results in better living of future generations by changing the way to deal with vehicles and whole distribution channel by taking it serious (Chin et al, 2015). The storage facility is also essential to be considered in it (Mwaura, 2016) by considering other essential as green labeling of products, environmental awareness in packaging with the alternative of green transportation (Masoumik et al, 2015). On the other hand, organization and their stakeholders should assure green packaging for their products (Zhu et al, 2005).. Green packaging promotes the concept of packaging to be light weight, reusable, recyclable and to prevent the use of hazardous substance (Zhang and Zhao, 2012).

Green Marketing: It is a paradigm dealing with organizations and its marketing strategies to boost the wish of customers to buy environment friendly products, ultimately leading to the profitability of that organization. Therefore, usage and modification of raw materials, natural resources and production processes is aligned with the core purpose of green marketing (Al-Hersh and Aburoub, 2015). Moreover, the organizations complying with green marketing produces quality assured products, honest advertisements, safe environment and social laws that are cause of goodwill for the organization and results in increase of sales and marketing value of the shares (Miles and Covin, 2000).

Environmental Performance

Organizational strategic plans to mitigate the effect of pollution on natural eco-system are associated with environmental performance (Walls et al, 2012). Nazir et al. (2024) highlighted that firms prioritizing green logistics and packaging have achieved substantial reductions in carbon emissions. Enhanced environmental performance not only fulfills regulatory requirements but also aligns with global sustainability goals (Khan, Jabeen, & Ahmed, 2023).

Competitive Advantage

Competitiveness relates organizational ability to outperform its competitors for supplying goods and services according to the need of market, in effective and efficient way (Tan et al, 2019). If company's practices improve in terms of waste minimization, brand image, reduction of cost and energy utilization, then not only financial performance may enhance, but competitive advantage may also be gained (Ali et al, 2019). In addition to it, three key indicators which are quality, cost & measure and price or delivery are brand ambassadors for competitive advantage and all studies related to green practices literature support it (Rao and Holt, 2005). Hussain et al. (2022) reported that green marketing strategies, such as promoting eco-friendly packaging, have enhanced brand reputation and customer loyalty among Pakistani firms. Moreover, Khan et al. (2023) noted that cost efficiencies achieved through sustainable production practices provide firms with a significant edge in competitive markets, particularly in export-oriented industries.

Moderating Role of Environmental Management Systems (EMS)

Environmental Management Systems (EMS), such as ISO 14001, provide organizations with a structured framework to manage environmental impacts effectively. EMS adoption has been shown to enhance the implementation and outcomes of GSCM practices (Tariq et al., 2023).

In Pakistan, firms with certified EMS demonstrate higher levels of compliance with environmental regulations and greater success in integrating sustainability into their supply chain activities. Nazir et al. (2024) observed that EMS acts as a catalyst for green innovation, particularly in industries like plastic manufacturing where environmental impacts are significant. Additionally, Hussain et al. (2022) highlighted that firms with EMS certifications are better equipped to address stakeholder concerns and align with global environmental standards, thereby enhancing their competitive positioning.

Moderating Role of Firm Size

Firm size plays a critical role in determining the adoption and effectiveness of GSCM practices. Larger firms often have greater financial and technological resources to implement comprehensive sustainability initiatives, whereas smaller firms may face resource constraints but are often more agile in adapting to new practices (Khan et al., 2023).

In the Pakistani context, Ahmed et al. (2023) found that larger firms in the manufacturing sector are more likely to adopt green purchasing and manufacturing practices due to their ability to invest in advanced technologies and training. However, smaller firms have demonstrated innovation in adopting cost-effective solutions, such as using locally sourced recyclable materials and optimizing supply chain processes (Nazir et al., 2024). The findings suggest that firm size is a critical factor in shaping the outcomes of GSCM adoption.

Hypothesis Development

Green design and environmental performance: It concerns with proactive steps taken for environment by considering cross functional coordination among different departments of the firm and outside the firm among all stakeholders (Kumar and Chandarkar, 2012). Green effectiveness and market demand is justified by incorporating environmental concerns into the designing and production process (Liu et al, 2018). Environmental performance and functionality of products is associated with green design by minimizing the effects of product life cycle (Jabbour et al, 2015). Green design also enables the products to be easily recyclable by consuming less amount of raw material and other hazardous ingredients (Sarkis et al, 2016). A significant impact of green design on environmental performance has been reported (Jawaad and Zafar, 2019) so, this study is going to propose following hypothesis:

H1- Green designing has significant impact on environmental performance.

Green purchasing and environmental performance: As far as environmental awareness is increasing, the demand for green product is also increasing which may enhance the initial cost as green materials are relatively expensive and may lead the firm to discourage (Nguyen et al, 2017). While other studies lead the impact of positivity of green purchasing on environmental performance (Jawaad and Zafar, 2019) along with other studies (Chan et al, 2012; Rao and Holt, 2005), so, following hypothesis may be postulate:

H2- Green purchasing has significant impact on environmental performance.

Green manufacturing and environmental performance: Manufacturing with green strategy has significant influence on environmental performance of the firm by facilitating kaizen approach in design and production in order to limit the water, air and soil pollution. Many researches support the claim that environment friendly production process consumes fewer materials, water and produces less wastage (Lee, 2009) and add a significant role in environment sustainability (Azevedo et al, 2011). Moreover, Yildiz et al (2018) also revealed positive impact of green manufacturing on environmental performance in Turkish firms along with the supporting arguments of related researches (Famiyeh et al., 2018; Kung et al., 2012). So, this study is interested to form the following hypothesis:

H3- Green manufacturing has significant impact on environmental performance.

Green distribution and packaging and environmental performance: Green distribution and packaging not only impart the GSCM but also the environment by considering fuel consumption of the vehicles, transportation incidents, simple packaging and reduction of unnecessary packaging and easy recyclability (Kung et al, 2012). It also has all those practices which minimize environmental harms and waste disposal during transportation and packaging (Geo et al, 2009). Green packaging deals with the amendment of product's packaging in order to reduce its harm which may interplay after the use of product (Chuang, 2014). So, lot of literature supports the argument of strong link between green distribution and packaging and environmental performance. However, Kumar et al. (2015) showed that green distribution and packaging develop environmental performance by fuel efficiency, optimization of transportation routes and assuring full load ability. So, below mentioned hypothesis may be assumed:

H4- Green distribution & packaging has significant impact on environmental performance.

Green marketing and environmental performance: Green marketing comprises those activities like designing, promotion, pricing, advertising and distribution, which are not harmful to the safety of the environment (Pride and Ferrell, 1993). Many previous studies highlighted the influence of green marketing on the environmental performance of the firms like s study conducted for Turkish firms showed a positive relationship of green marketing with environmental performance (Yildiz et al, 2018) and a study conducted at Taiwanese hotel exhibit a strong link between green marketing and safety of the eco system (Chung, 2019). In addition to it, green marketing is a dominant determinant for objective strategies to achieve safe environment by aiming to fulfil the interest of stakeholders and sustainable environment. As per Papadas et al, (2017), ecological balance is achieved through the implementation of green marketing by meeting the criteria of business strategy development. So, it may be hypothesized that:

H5- Green marketing has significant impact on environmental performance.

Moderation of environment management system: Resource based view described that conformance of environment management system along with the practices of GSCM has advantageous impact on environmental performance (Han and Huo, 2020). Some other studies (Kalpande and Toke, 2020), also argue that GSCM is integrated with its environmental management system by influencing green behavior. While, if environment management system is weak so it will lead to demonstrate less effect on GSCM practices on environmental performance (Han and Hou, 2020). Thus, environmental performance of any organization is improved with the help of environmental activities which results in competitive advantage when they follow the path of strong environment management system by hypothesizing the following arguments:

H6- Environment management system has significant impact on environmental performance.

H7- Environment management system as a moderator has significant impact between green design and environmental performance.

H8- Environment management system as a moderator has significant impact between green purchasing and environmental performance.

H9- Environment management system as a moderator has significant impact between green manufacturing and environmental performance.

H10- Environment management system as a moderator has significant impact between green distribution & packaging and environmental performance.

H11- Environment management system as a moderator has significant impact between green marketing and environmental performance.

Moderation of firm size: Firm size is an important variable to affect the environmental performance as firms with larger size have more resources and bear more preserve from local authorities to fulfill environmental compliance requirement as compared to small size firms (Creswell, 2007; Krejcie and Morgen, 1970). In 2018, Wang investigated the impact of GSCM practices on sustainable performance of Chinese firms under the moderating role of firm size and found that firm size and GSCM practices have significant relationship with social and environmental performance while economic performance and GSCM practices relationship is moderated by firm size. In addition to it, internal practices of GSCM had large influence on economic performance of large firms as compared to small and medium firms.

H12- Firm size has significant impact on environmental performance.

H13- Firm size as a moderator has significant impact between green design and environmental performance.

H14- Firm size as a moderator has significant impact between green purchasing and environmental performance.

H15- Firm size as a moderator has significant impact between green manufacturing and environmental performance.

H16- Firm size as a moderator has significant impact between green distribution & packaging and environmental performance.

H17- Firm size as a moderator has significant impact between green marketing and environmental performance.

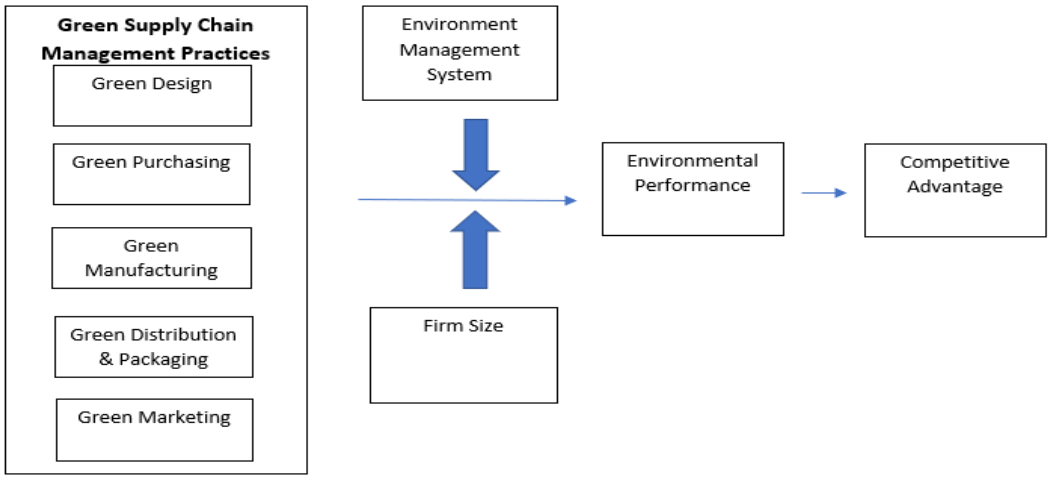
Environmental performance & competitive advantage: It can be observed from previous studies that GSCM practices such as internal environment management, green design, green purchasing, green manufacturing and green marketing has essential and outstanding impact on environmental performance (Han and Huo, 2019; Jawaad and Zafar, 2019) and ultimately results in competitive advantage (Hou et al, 2019). On the other hand, low level environmental performance is linked with reduced goodwill, optimum rate of return and lower competitive advantage as environmental performance actually reduces the cost, limits input usage, increase social reputation and differentiations, relatively suitable pricing of products and therefore increased profitability and competitiveness (Chen et al, 2018).

Ecofriendly nature, green purchasing and raw material are the characteristics of GSCM which are in practice by the firms. Smart manufacturing operations and their

designing results in reduced breakdown timings and human and machine cost as well as improved production flexibility by reduction of cycle time and quick delivery. Thus, all the firms comprising to make a close lope of supply chain may share their resources, by creating value, and enabling the individual firm to exceed its abilities and produce the items with smart inner supply chain to its customers and boost the average profitability in other supply chains (Guide, 2000). Therefore, competitive advantage is the tangible form of firm performance which can be enhance as far as environmental performance enhances by leading to the following hypothesis:

H18- Environmental performance has significant impact on competitive advantage.

Theoretical Framework



(Research Framework)

Material and Methods

Sample and data collection procedure

Since plastic manufacturing industry is growing day by day and it has major contribution in GDP of Pakistan so study was sector specific to plastic manufacturing plants where extrusion-based production activities take place. Since environment management system is our core concern so list of certification bodies which are eligible to certify a company as per requirements of ISO 14001 was taken from accreditation body of Pakistan which is PNAC (Pakistan National Accreditation Council). There was total 9 certification bodies, eligible to make any company certified on environment management system (EMS). Researcher sent a request to those certification bodies for sharing a list of extrusion-based plastic manufacturing organizations of Punjab, Pakistan. Out of nine, only five certification bodies shared their list while other four bodies refused. So, after compiling the list of those five certification bodies, 303 plastic manufacturing units were named out so population was those 303 companies which were EMS certified. Point of contact was established by taking the concern of environment management system and supply chain as a base for which some people respond and some referred to concern person in that organizations. After contacting relevant persons and inquiring either they were following green practices and strictly ensuring the rules and regulations of environment department, 267 organizations were sort out to be the sample size of this study using purposive sampling technique which were insured that those are willing to take part in this study and their responses will be kept confidential and will only be used for study purpose. Participant who will fill the questionnaire must have knowledge of their

supply chain, EMS, and be designated as general manager, manager, officer or any other management post. Mode of communication used for questionnaire-based survey was telephone, email, postal and face to face interview and 219 organizations responded from which ten questionnaire was discarded due to incomplete filling while 209 were taken into account with a response rate of 82.02 %.

Questionnaire and pre-test

Questionnaire was adapted from different studies like six-items for green purchasing (GRP) variable were adapted from Zhu et al. (2013), six-items for green design (GRD) construct from Zhu et al. (2010), five-items of environment management system (EMS) construct from Zhu et al. (2013), six-items green marketing (GRMT) scale from by Shang et al. (2010), green distribution and packaging (GRDP) construct from Perotti et al. (2012), five-items environmental performance (EP) scale from Chien (2014) and five-items competitive advantage (CA) measurement were adapted from López-Gamero and Molina-Azorín (2016). 5-point Likert scale was used as a response evaluator, representing value 5 for low perceptional response (strongly disagree) and value of 1 for high perceptional response (strongly agree).

Content validity was assured by sharing the designed instrument with 3 managers of supply chain and environment within the industry and 2 assistant professors having specialized education in supply chain and business specialization. In addition to make it clearer, pilot testing was conducted by sending questionnaire to 30 respondents in order to seek their feedback and after their response it was observed that no amendment was required so it was finally implemented by sharing with relevant respondents comprising of 50 questions having section I with 7 questions for demographic and organizational information and section II with 43 questions related to scope of study.

Demographic findings showed that out of 209 participants, 83.3% (174) were male and 16.7% (35) were female. The majority of the employees were fall in two categories with 43.5% within 31 to 40 years and 28.7% within 41 to 50 years while remaining percentage of 15.3% falls within the age of 21 to 30 years and 12.4% with the age more than 50 years. In terms of qualification, 14.8% (31) of participants were matric pass, followed by 58.4% (122) with degree of graduation, 22.5% (47) had masters or post graduate diploma and the remaining 3.3% (7) were uneducated.

Meanwhile, 32 (15.3%) respondents were general managers by designation, 126 respondents were positioned as manager with the majority percentage of 60.3%, 38 (18.2%) were of officer rank and rest of them 13 (6.2%) were designated on other positions. As far as personal certification is concern, 55 (26.3%) respondents had EMS related certification in their past, 38 (18.2%) had QMS related certification, 50 (23.9%) had any other kind of personal certification while 66 (31.6%) had none of the personal certification. The results relating to their length of service, found that 11.5% (24) had one to three years job experience, 25.8% (54) of participants had 4–6 years of experience, while 34% (71) had 7–10 years of experience and remaining 28.7% (60) had 10+ years of job experience in their respective firms.at the last, firm size as an important moderator exhibit that 50 (23.9%) respondents were working in small industry having employees in between 6 to 29, 75 (35.9%) were working in medium sized industry having employees in between 30 to 99 while remaining 84 respondents (40.2%) were going to work in large sized industry with employees more than 100 in their respective industries.

Results and Discussion

Initially data was summarized on Microsoft excel and demographic information was analyzed using SPSS. PLS-SEM was used for testing of hypothesis and other validity measurements because it is widely used software now a days in all business perspectives.

The study was conducted to investigate all constructs regarding the perspective of resource-based view by using PLS-SEM being assumed as flexible technique for model assessment (Ringle, Wende, and Will, 2005) and being able to proceed at less sample size as compared to other softwares like AMOS (Hair et al, 2016). Moreover, two techniques of PLS which are algorithm and bootstrapping are used to determine the outer (factor) loadings along with the testing of construct validity and consistency reliability (Rasoolimanesh et al, 2018) and path coefficients. So, firstly measurement calculations were performed and then structural model assessment was performed to reach out at final results.

Common Method Biasness

Common method biasness (CMB) is a common error which can be produced in our data due to the reason that data was collected cross-sectionally and from management level employees. Past studies reflect that full collinearity test could be used to determine the extent to which data may be affected from this error while using structural equation modeling in PLS (Kock, 2015) so, variance inflation factors (VIF) were computed through full collinearity test. The cut-off value for VIF is 3.3 and if the values of our results lie above to 3.3 then there exist an error of CMB but in our case, all the values of VIF lie below the cut-off value, so it is assured that our data is not contaminated with the error of common method biasness. Therefore, we can claim that CMB is not an issue with our study and we may proceed for further empirical analysis.

Measurement Model Assessment

In order to determine measurement model assessment, convergent validity was determined through the factors of outer loadings, average variance extract and competitive reliability. Table 1 shows that except few of the factor loading values, all other values are more than recommended value of 0.50 which is acceptable. Moreover, the factor having value below 0.5 are also deleted but that are not more than 20 % of the whole construct items. In case of composite reliability, the recommended value is 0.7 and it can be observed that all the values are exceeding from it. As far as average variance extract is concern, all the values are more than the recommended value of 0.5 (Hair et al, 2016). On the other hand, discriminant validity was measured through Hetrotrait-Monotrait Ratio (HTMT) which can be seen that all the values are less than 0.85 which is a cut-off value (Kline, 2011) which confirms that discriminant validity is not the harm to our study.

Table 1
Convergent Validity

Construct	Items	Loadings	Cronbach's Alpha	CR	AVE
Competitive Advantage	CA1	0.743	0.804	0.746	0.732
	CA2	0.662			
	CA3	0.699			
	CA4	0.751			
	CA5	0.837			
EMS	EMS1	0.818	0.883	0.875	0.791
	EMS2	0.926			
	EMS3	0.738			
	EMS4	0.849			
	EMS5	0.765			
Environmental Performance	EP1	0.841	0.902	0.884	0.687
	EP2	0.875			
	EP3	0.826			
	EP4	0.748			
	EP5	0.783			
Firm Size	FS1	0.782	0.792	0.901	0.698
	FS2	0.685			

	FS3	0.798			
Green Design	GRD1	0.738	0.862	0.913	0.735
	GRD4	0.749			
	GRD5	0.785			
	GRD6	0.839			
Green Distribution and Packaging	GRDP1	0.807	0.879	0.873	0.576
	GRDP2	0.867			
	GRDP4	0.877			
	GRDP5	0.768			
	GRDP6	0.726			
Green Manufacturing	GRMF1	0.682	0.911	0.764	0.627
	GRMF2	0.839			
	GRMF3	0.848			
	GRMF4	0.795			
	GRMF5	0.868			
Green Marketing	GRMT1	0.786	0.828	0.902	0.72
	GRMT2	0.718			
	GRMT3	0.83			
	GRMT4	0.792			
	GRMT5	0.892			
	GRMT6	0.832			
Green Purchasing	GRP1	0.787	0.883	0.847	0.672
	GRP2	0.723			
	GRP3	0.831			
	GRP4	0.795			
	GRP5	0.843			
Green Design * EMS		0.674			
Green Design * FS_		0.536			
Green Distribution & Packaging * EMS		0.753			
Green Distribution & Packaging * FS_		1.011			
Green Manufacturing * EMS		0.603			
Green Manufacturing * FS_		0.942			
Green Marketing * EMS		0.918			
Green Marketing * FS		0.95			
Green Purchasing * EMS		1.088			
Green Purchasing * FS_		0.964			

Note: CR Competitive Reliability= and AVE=Average Variance Extract

Table 2

Discriminant Validity (HTMT Ratio)

	CA	EMS	EP	FS_	GRDEM	GRDFSE	GRDPEM	GRDPFS	GRMFEM	GRMFFS	GRMTEM	GRMTFS	GRPEM	GRPFSE	GRD	GRDP	GRMF	GRMT	GRP
CA																			
EMS	0.845																		
EP	0.824	0.838																	
FS_	0.194	0.159	0.146																
GRDEM	0.489	0.454	0.532	0.048															
GRDFSE	0.052	0.062	0.081	0.079	0.034														
GRDPEM	0.469	0.438	0.507	0.066	0.792	0.056													
GRDPFS	0.066	0.068	0.101	0.072	0.059	0.743	0.066												
GRMFEM	0.387	0.369	0.304	0.036	0.719	0.046	0.768	0.022											
GRMFFS	0.058	0.043	0.05	0.021	0.007	0.678	0.014	0.029	0.475										
GRMTEM	0.462	0.455	0.436	0.069	0.842	0.002	0.784	0.029	0.743	0.024									
GRMTFS	0.074	0.088	0.092	0.048	0.023	0.836	0.05	0.814	0.009	0.84	0.036								
GRPEMS	0.457	0.424	0.412	0.048	0.765	0.035	0.793	0.004	0.753	0.023	0.744	0.02							
GRPFSE	0.066	0.065	0.065	0.071	0.006	0.81	0.035	0.838	0.027	0.719	0.038	0.85	0.029						
GRD	0.813	0.814	0.758	0.139	0.587	0.063	0.552	0.072	0.325	0.031	0.435	0.055	0.428	0.043					
GRDP	0.795	0.807	0.793	0.155	0.513	0.075	0.505	0.074	0.324	0.058	0.408	0.099	0.397	0.067	0.784				
GRMF	0.833	0.795	0.631	0.175	0.197	0.039	0.21	0.042	0.315	0.067	0.303	0.102	0.288	0.093	0.804	0.745			
GRMT	0.807	0.831	0.825	0.163	0.366	0.077	0.369	0.091	0.368	0.095	0.406	0.126	0.388	0.095	0.842	0.821	0.795		
GRP	0.821	0.827	0.82	0.186	0.375	0.046	0.369	0.062	0.335	0.077	0.386	0.092	0.383	0.074	0.845	0.801	0.799	0.792	

Structural Model Assessment

As per measurement evaluation, model is reliable and valid, structural modeling is performed to testify the hypothesis which had been supposed in this study by measuring path coefficients, t-value and standard errors in order to determine whether model and relationships are significant with collected data or not. By using smart PLS, bootstrapping

technique was adopted to evaluate the main and moderating effects (Ringle et al, 2005). After applying bootstrapping, it was clear that all dimensions of green supply chain management including green design, green purchasing, green manufacturing, green distribution and packaging and green marketing, all have significant relation with environmental performance which ultimately supports H1, H2, H3, H4 and H5 respectively. Additionally, results revealed that environment management system which is acting as a mediator has also positive contact with environmental performance by supporting H6. Moreover, when impact of environment management system as a moderator was determined with green design, green purchasing, green manufacturing, green distribution and packaging and green marketing along with environmental performance, it was reflected that all p-values were less than 0.5 by supporting H7, H8, H9, H10, H11. As, we have two mediators, so, impact of firm size was also test with environmental performance which showed that firm size has valuable effect on environmental performance which strengthen the H12 and when this mediator was checked with all dimensions of green supply chain coving green design, green purchasing, green manufacturing, green distribution and packaging and green marketing, results of t-value and p-value confirm the positivity of moderator in between environmental performance and green supply chain dimensions by validating H13, H14, H15, H16 and H17. At the end, impact of environmental performance was judged with competitive advantage and all values support the claim of H18. So, in general, it was concluded that, all 18 hypotheses were tested and results revealed that there exists a significant relationship between all the model drawn connections. Table 3 shows all those values which have been claimed in above paragraph.

Table 3
Hypothesis Testing

	Relationships	Beta-Value	STDEV	T-Value	P-Values	Decision
H1	Green Design -> Environmental Performance	0.284	0.032	4.954	0.043	Supported
H2	Green Purchasing -> Environmental Performance	0.404	0.045	8.984	0.021	Supported
H3	Green Manufacturing -> Environmental Performance	0.387	0.039	14.028	0.011	Supported
H4	Green Distribution & Packaging -> Environmental Performance	0.284	0.050	5.339	0.034	Supported
H5	Green Marketing -> Environmental Performance	0.217	0.035	6.228	0.076	Supported
H6	EMS -> Environmental Performance	0.226	0.030	7.441	0.073	Supported
H7	GRDEMSEP -> Environmental Performance	0.255	0.042	7.772	0.071	Supported
H8	GRPEMSEP -> Environmental Performance	0.315	0.051	8.017	0.025	Supported
H9	GRMFEMSEP -> Environmental Performance	0.393	0.039	8.492	0.024	Supported
H10	GRDPEMSEP -> Environmental Performance	0.267	0.041	5.227	0.070	Supported
H11	GRMTEMSEP -> Environmental Performance	0.214	0.049	6.063	0.069	Supported
H12	FS_ -> Environmental Performance	0.492	0.038	9.784	0.032	Supported
H13	GRDFSEP -> Environmental Performance	0.325	0.034	8.342	0.024	Supported
H14	GRPFSEP -> Environmental Performance	0.287	0.038	5.512	0.048	Supported
H15	GRMFFSEP -> Environmental Performance	0.294	0.059	5.597	0.061	Supported
H16	GRDPFSEP -> Environmental Performance	0.198	0.074	4.976	0.091	Supported

H17	GRMTFSEP -> Environmental Performance	0.238	0.068	7.315	0.075	Supported
H18	Environmental Performance -> Competitive Advantage	0.378	0.05	8.419	0.047	Supported

Conclusions

This study explores the moderating role of environment management system and firm size in improving the environmental performance through the adoption of green supply chain practices which in results enhances the competitive advantage of the manufacturing firms. This study explored that firms with large size have more resources and they adopt the green practices more efficiently as compared to small organizations and when environment management system is implemented properly, it will enhances the chances of green supply chain practices to be more reliable and will achieve greater results in terms of ecological sustainability and the firms which are considering environmental performance in their day to day activities, they are getting competitive advantage in the market and their reputation and brand image is getting fame in the market.

Recommendations

Although this study provides absolute results but there exist some limitations that may be use as future directions. Firstly, data was collected from plastic manufacturing organizations and from one province of Pakistan only, which may limit the generalizability of our findings to consider the concept of environmental performance and competitive advantage potentially in other sectors like textile, hospitality, banking etc. and in other demographic locations of the country. Secondly, data was collected cross-sectionally from single resources, that may resist the drawing of conclusions on broader scope. Additionally, our research reports no errors for CMB and validity and reliability were ensured by the use of statistical tools but future studies may consider mixed method approach to overcome the limitations of quantitative approach.

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