

SUSTAINABLE PRACTICES IN PAKISTANI MANUFACTURING SUPPLY CHAINS: MOTIVES, SHARING MECHANISM AND PERFORMANCE OUTCOME

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ABSTRACT

This study was initiated to address three main objectives, firstly, identify motives behind the adoption & implementation of green/sustainable practices, secondly, explore the role of inter-firm knowledge sharing in promoting & implementing green/sustainable practices, and thirdly, identify noteworthy gains attained from green/sustainable practices. General survey guided by well structured questionnaire through convenience sampling has been administered across a valuable sample of 187 managers, representing nine major industry of Pakistan i.e. electronic, automotive, chemical, lather, textile/fabrics, fertilizer/pesticide, pharmaceutical, shoes and plastic (items) producers. Findings of this study exposed, environmental pressures, globalization, demand from international players and competitive (industry) pressures are the key motives driving green/sustainable practices in manufacturing industry of Pakistan. Additionally, this study exposed effective engagement of Original Equipment Manufacturers' in knowledge dissemination process within their supplier's network. Finally, scrap reduction, production optimization, reduction in the use of packaging material, visible improvement in 'on-time deliveries', radical structural & procedural changes have been reported as major achievements attained from green/sustainable practices. Study also pinpoints some challenges, particularly, inventory reduction, logistical improvement, customer goodwill and financial improvement. These areas need due attention of policy makers to ripe benefits from green/sustainable practices.

Keywords: *Knowledge Sharing, Sustainable/Green Practices, Manufacturing Supply Chains, Performance, Pakistan.*

1) INTRODUCTION

Since the publication of Brundtland report (1987) titled “Our Common Future”-a report of world commission on environment and development, the focus of researchers shifted towards “sustainability/sustainable development”. Shortly, sustainability-the term stand for smart use of resources, becomes popular among business practitioners due to incredible attention by policy makers. The same is evident from the emerging laws, rules and regulations. In this regard, legislation regarding end-of-life vehicles with focus to minimize the impact of end-of life vehicles on the environment, legislation to reduce waste from electrical and electronic equipment, special legislation to phase out chemicals with Ozone Depleting Potential, recognition & legislation on global warming as societal issue are among the most prominent one (Ball, 2004; Brodin & Anderson, 2008; Cook, 1996). The aim of these legislations is to contribute, protect, preserve and improve the quality of the environment and energy conservation. However, despite of its fame, the term “sustainability” still remained immature and considered as academic curiosity (Linton et al., 2007). Earlier studies on sustainable development both in term of its definition and applicability is still unclear (Hassini et al., 2012; Vachon & Mao, 2008). The same is the case in supply chain context, where literature (theories, models and empirical evidences) on sustainability/green strategies are still inadequate.

In context of supply chain management (SCM), sustainability or sustainable supply chain management (SSCM) stand for smart use of resources form the point-of-origin to the point-of-consumption. Among the resources, knowledge is considered as intangible strategic resource, if properly disseminated by companies within and across their supply networks, it can create value in a unique, inimitable and non-transferable way. In this regard, many researchers have investigated relationship between knowledge management and various supply chain areas. For example, eight core SCM areas namely; outsourcing (Bandyopadhyay & Pathak, 2007; Becker & Zirpoli, 2003; Madsen et al., 2008; Niemi et al., 2010), new product development (Becker & Zirpoli, 2003; Chen et al., 2008; Corso et al., 2001; Croso & Paolucci, 2001), construction (Briscoe et al., 2001; Khalfan et al., 2010; Tah & Carr, 2001), decision support (Koh & Tan, 2006; Pedroso & Nakano, 2009; Raisinghani & Meade, 2005), risk management (Tah & Carr, 2001; Xiwei et al., 2010), build-to-order (Chow

et al., 2007), procurement (Yew, 2008), and organizational performance (Fugate et al., 2009; Wong & Wong, 2011), were repetitively researched in context of knowledge management. Although much attention has focused on understanding relationship between knowledge management (KM) and supply chain management (SCM), still many gray areas need further exploration.

It is evident from literature review that little attention has been paid to explore the motives behind the adoption & implementation of sustainable/green practices and the role of inter-firm knowledge dissemination in establishing sustainable supply chains. It reflects the need to explore the impact of knowledge sharing and transferability in promoting & implementing sustainable practices, motives behind the adoption & implementation of sustainable/green practices and its ultimate impact on supply chain performance. Accordingly, this paper provides strong empirical evidences on the role of inter-firm knowledge dissemination in promoting & implementing sustainable practices, as well as, its impact on supply chain performance. The outcome of this paper shed light on effective use of inter-firm knowledge sharing in promoting & implementing sustainable practices and suggests strategies to use knowledge as a weapon to attain sustainability. Observing the rigorousness of the topic, general survey guided by well structured questionnaire through connivance sampling has been administered across a valuable sample of 187 managers, representing nine major manufacturing industry of Pakistan namely; electronic, automotive, chemical, lather, textile/fabrics, fertilizer/pesticide, pharmaceutical, shoes and plastic (items) producers. Managers (supply chain, production, procurement, logistics and operations) were requested to respond in view of their organizational 'knowledge dissemination policy'. Data have been analyzed using SPSS version 16.0, while, findings have been discussed using descriptive statistical mean and standard deviation.

2) LITERATURE REVIEW

2.1) Sustainability

In literature, sustainability or sustainable development is defined as using resources to meet the needs of the present without compromising the ability of future generations to meet their own needs (Daly & Cobb, 1994; WCED - World Commission on Environment and Development, 1987).

There exist diverse debate among the academicians and practitioners regarding the implications of sustainability. Though the concept sustainability can be traced back in economic and philosophical literature (Harding, 1968; Linton et al., 2007), yet it migrated in management literature by the beginning of 1990's (Linton, et al., 2007). Wide range of issues have been highlighted under the umbrella of sustainable development like public policies, political systems, cooperate citizenships, international trade, social equity/justice, economic growth/development, environmental concerns, and social practices (Vachon & Mao, 2008).

In context of SCM, sustainability is majorly viewed from environmental perspectives. Various supply chain perspectives like green purchasing, sustainability in logistics management (Murphy et al., 1994; Quariguasi et al., 2008), reverse logistics/reverse supply chain, product stewardship (Snir, 2001), and green supply chain (Kainumaa & Tawarab, 2006; Zhu et al., 2008) remained in spotlights. Accordingly, wide range of researches were conducted on waste management, from the studies of community participation in composition of waste to the examination of household incentives to recycle (Barr et al., 2001; Huhtala, 1999; Joseph, 2006; Papageorgiou, 2006; Refsgaard & Magnussen, 2008; Tonglet et al., 2004; Zia & Devadas, 2007). In accordance, Handfield et al. (2002) developed a decision model to measure environmental practices of suppliers using multi-attribute utility theory approach. Kainumaa and Tawarab (2006) proposed multiple attribute utility method for assessing re-use and recycling throughout the product life cycle across the supply chain. Linton et al. (2007) proposed product design, manufacturing by-products, by-products produced during product use, product life extension, product end-of-life, and recovery processes at end-of-life as key areas to be addressed in order to attain sustainable supply chains. In a similar tune, Quariguasi et al. (2008) argue that while designing logistics network, cost minimization may not be the only focus of managers rather due consideration must be given to environmental impacts.

In 2008, the Aberdeen Group has initiated a research to measure the sustainable initiatives surrounding the supply chain of best-in-class companies (Schechterle & Senxian, 2008). Their report suggests (p.05), "desire to be a leader for green/sustainability", "rising cost of energy/fuel", and "competitive advantage/differentiator" are among the leading concerns/pressures driving organization towards green supply chain. Research outcome also suggest that companies that highlight their

environmental friendliness but fail to effectively manage or implement the green initiatives can have negative effect on a company's brand image. Vachon and Mac (2008) have presented country level analysis to link supply chain strength to sustainable development. Their results indicate positive relationship between supply chain strength and three key dimensions of sustainable development i.e. environmental performance, corporate environmental practices and social sustainability.

2.2) Knowledge Dissemination

Organizations use 'knowledge' as power over others to acquire better understanding and to formulate competitive strategies (Ducker, 1994; Nonaka, 1995; Zack, 1999). Knowledge used as tool to get know-how and this know-how helps organizations to boost their performance (Milton, 2002). Knowledge can be classified as explicit and tacit. Ford (2001, p.33) defined explicit knowledge as "knowledge that can be easily coded", while, tacit knowledge as "knowledge that is extremely difficult to code". Tacit knowledge is quite personal in nature, moreover, it cannot be expressed because it's deeply embedded into the persons (Sanchez, 2003). It's normally rooted in actions, experiences and specific working environment (Nonaka, 1995). It is difficult to extract from individuals because it comes over through experience over the period of time.

The process of knowledge dissemination includes, circulating, spreading, sharing, delivering and publicizing relevant & appropriate information. It can be achieved by conducting and concluding research findings, organizing seminars, workshops & symposiums and also by adopting & adapting the outcomes in practice. Explicit knowledge can be disseminated through documents, reports, manuals and practices, while, tacit knowledge can be transferred by transferring individuals or keeping them together under favorable circumstances (Allen, 1977; Berry & Broadbent, 1984, 1987; Starbuck, 1992). Effective knowledge dissemination will have two dimensions; knowledge velocity and knowledge viscosity. Knowledge velocity refers to the speed with which knowledge is transferred from the source to the recipient and knowledge viscosity relates to the richness of the knowledge that is being transferred (Cummings & Teng, 2003). Recipients with an extensive set of routines and learning competencies designed to retain and nurture transferred knowledge - with a learning culture - may achieve greater knowledge transfer success (Cummings & Teng, 2003).

Knowledge transferability considered successful when knowledge (e.g. documents, reports, and practices) transfers in a particular time span being properly received, internalized and retained by the recipient (Hakanson & Nobel, 2001). Here it is worth mentioning that transfer will only be effective when the knowledge is retained and articulated by recipient (Druckman & Bjork, 1992). It is observed that high involvement of the organization to the knowledge transfer process will result in greater internalization and retention of knowledge (Cummings & Teng, 2003). While, knowledge internalization view states that knowledge internalization success depends upon the extent to which recipient's own knowledge, show commitment and express satisfaction with knowledge (Meyer & Rowan, 1977).

In context of SCM, number of authors has suggested 'collaborative or stable relationship' as mechanism to generate new knowledge. Lapre and Wasseenhove (2003) proposed stable relationship with raw material supplier as a source to originate new knowledge. Later, Lin and Wu (2005) suggested collaborative relationships (integration) both with customers and suppliers as key mechanism to facilitate knowledge creation in supply chain. Similarly, Weck (2006) examined collaborative relations in the process of research & development and suggested long-lasting relations as a source to create win-win situation that leads to new knowledge creation. Feller et al. (2006) suggested knowledge transferability among supply chain partners as mechanism to generate learning, which in turn create new knowledge. Wu (2008) by substantiating the findings of others has observed significant affect of organizational conditions, technology adoption, supplier relationship management and customer relationship management on knowledge creation. Hult et al. (2006) suggested organizations to attain strategic fit between supply chain strategy and eight knowledge elements i.e. memory, tacitness of knowledge, accessibility of knowledge, quality of knowledge, knowledge use, knowledge intensity, responsiveness and learning capacity in order to gain superior supply chain performance. Cheng et al. (2008) suggested trust, cooperation and competition as various factors to generate knowledge. Recently, Samuel et al. (2011) in light of Nonaka's four stage spiral model (SECI) proposed conceptual framework which explain the creation of common learning through the process of internalization, socialization, externalization and combination.

3) METHODOLOGY

General survey guided by well structured questionnaire through convenience sampling has been administered across a valuable sample representing manufacturing industry of Pakistan. Structured questionnaire was developed to accomplish the objectives of this study, which are;

- 1) Identify motives behind the adoption & implementation of green/sustainable practices.
- 2) Explore the role of inter-firm knowledge sharing in promoting & implementing green/sustainable practices, and
- 3) Identify noteworthy gains attained from green/sustainable practices.

The content of the questionnaire is based on variables mostly grounded in supply chain literature (Kumar et al., 2012; Qinghua et al., 2008); however, modifications were made to attain the objectives and to precisely measure the construct of this study. To increase the clarity, face validity, and readability of the scales, three professors with relevant expertise were requested to critically examine the questionnaire. Based on their suggestions, changes were introduced in the questionnaire. Furthermore, to ensure the content validity, thirteen supply chain and operation managers were requested to fill the questionnaire. Their responses were checked, evaluated and changes were incorporated in final questionnaire.

Final questionnaire contain three sections. Section-1 includes seven independent variables, which are; environmental rules & regulations, suppliers, employees, customers, globalization & international pressures and self interest. These variables were included in the questionnaire to identify major motives behind the adoption & implementation of green/sustainable practices. Section-2 consists of variables aiming to observe knowledge sharing mechanism between original equipment manufacturers and their supply chain partners. It is argued that by identifying effective sharing mechanism, supply chain managers can effectively promote and implement green/sustainable practices within and across their supply networks. Parameters included in Section-2 are; seminars, training sessions, and/or workshops, exclusive documents, reports, manuals and environmental certifications. Section-2 also includes parameters aiming to measure efforts of original equipment manufacturer in promoting & implementing sustainable practices within and across

their supply chain networks. Lastly, eleven parameters i.e. reduction in the inventory level, reduction or elimination of scrap, production optimization, quality of suppliers' production process, reduction in the use of packaging material, improvement in inbound logistics systems, improvement in outbound logistics systems, percentage improvement in 'on time deliveries', attaining customer goodwill, financial performance, radical improvement in the organizational structure and procedures, were included in Section-3 to identify possible gains (achievements) attained from green/sustainable practices.

Sustainable practices are mostly observed in manufacturing organizations (Hassini, Surti, & Searcy, 2012). Hence, major manufacturing/assembling industries namely; electronic, automotive, chemical, leather, textile/fabrics, fertilizer/pesticide, pharmaceutical, shoes and plastic (items) producers were selected for data collection. Structured questionnaire were sent to 129 different organizations on their postal addresses available on their official websites. Organizational officials (usually admin officers) were requested to ensure that questionnaire must filled by supply chain, operations, procurement, logistics and/or production managers. Furthermore, each respondent were requested to mark his/her opinion on four point Likert scale, where, 4-stand for strongly agree to 1-strongly disagree. Respondents were requested to answer each statement in light of their organizations' 'knowledge dissemination policy'. To enhance response rate, backup emails (twice a week) were sent. Finally, 211 questionnaires received from 129 organizations via surface mail between October, 2011 to February, 2012. Out of 211, one hundred eighty seven (88.62%) were selected for final analysis, while, remaining 24 (11.37%) were discarded because of incomplete information. Table-1 indicates industry/sector wise response rate.

Table 1: Industry/Sector Wise Response Rate

Sr. No.	Industry/Sector	Total Response	Percentage
1.	Plastic (items) Producers	22	11.76%
2.	Automotive	21	11.22%
3.	Chemical	26	13.90%
4.	Lather	25	13.36%
5.	Textile/Fabric	18	9.62%
6.	Fertilizer/Pesticide	14	7.48%
7.	Pharmaceutical	31	16.57%
8.	Shoes	10	5.34%
9.	Electronics	20	10.69%
	Total	187	100%

4) FINDINGS & DISCUSSION

Green or sustainable practices are still new and immature in Pakistani business environment. Till 2000, it was hard to find bunch of organizations with green or sustainable practices, however, at present, due to recently introduced environmental laws by Ministry of Environmental Affairs and Ministry of Production Government of Pakistan, both national and multinational companies are compelled to adopt green/sustainable practices. In addition to local legislations, international pressures have also forced organizations to adopt green/sustainable practices. Hence, this study was initiated with the aim to identify motives behind the adoption & implementation of green/sustainable practices.

It is argued that knowing the motives behind the adoption & implementation of green/sustainable practices will help supply chain managers to collect, organize and promote relevant knowledge with their channel partners. For example, if the real driver is 'environmental laws' that have been asserted by the government agencies and/or by social organization like, NGO's, than it will be worthwhile to share information regarding environmental rules & regulations with channel partners. Moreover, it is argued that such sharing will facilitate channel members to adopt & implement green/sustainable practices. To attain the objective, six different motives were probed on 4-point Likert scales, where 4 stand for strongly agree and 1 stand for strongly disagree. Averages and

standard deviations (represented by “m” & “sd” respectively) describe the motives of the various organizations behind the adoption & implementation of the green/sustainable practices.

Table 2: Motives behind Green/Sustainable Practices (OEM's Response)

Sr. No.	VARIABLES	Mean Score	Standard Deviation
1.	We have adopted green/sustainable practices because of environmental rules & regulations.	3.73	0.32
2.	We have adopted green/sustainable practices because our suppliers' insist us to adopt environmental practices.	2.56	1.14
3.	We have adopted green/sustainable practices because our employees consistently insist us to adopt environmental practices.	2.05	0.39
4.	We have adopted green/sustainable practices because our customers' insist us to adopt environmental practices.	2.18	0.21
5.	We have adopted green/sustainable practices because of globalization & international pressures.	3.45	0.36
6.	We have adopted green/sustainable practices because our major competitors have already adopted these practices.	3.31	0.66
7.	We have adopted green/sustainable practices by our own choice (i.e. desire to be leader for green/sustainability).	1.71	0.74

Result in Table-2 indicates that environmental rules & regulations (m=3.73) considered being the most significant driver behind the adoption & implementation of green/sustainable practices, followed by globalization & international pressures (m=3.45). Findings of this study also portrait that organizations in Pakistan are not adapting green/sustainable practices by choice (m=1.71) rather they are forced to adopt & implement green/sustainable practices in compliance of recently introduced environmental laws. Likewise, results suggest, adoption of green/sustainable practices is due to rising pressures for sustainable practices from international players. Interestingly, industry trend also considered being a strong driver for the adoption & implementation of green practices (m=3.31). For example, in the chemical industry, since the adoption of green/sustainable practices by the first firm in 2004, within no time, the rest of the firms (due to stiff competition) in the industry have adopted green/sustainable practices. These findings are in line with the outcome of Aberdeen Group (2008), where they suggest, “competitive

advantage/differentiator” is among the leading concerns/pressures driving organization towards green supply chain. However, contradiction can also be observed in case, where, Aberdeen Group (2008, p.05) suggest “desire to be leader for green/sustainability” is among the leading driving force for the adoption of green/sustainable practice, while, the same has been denied by the respondent in this study.

On the other hand, mean score depicts that employees ($m=2.05$) seem least interested in green/sustainable practices, hence, employees (as initiators) never insist (motivate) their employers to adopt green/sustainable practices. Unfortunately, general customers ($m=2.18$) observed somewhat indifferent towards green practices that may adversely affect the adoption & implementation of green/sustainable practices. It is generally believed that if customers will overlook the benefits of green/sustainable products in their purchase behavior, it may create hurdle in promoting green/sustainable practices. Amazingly, the role of suppliers in promoting green/sustainable practices also seem suspicious ($m=2.56$), that means, suppliers in Pakistan need strong enforcement from their buyers (OEM's) to adopt green/sustainable practices. Such interesting outcomes itself justify the need to explore the role of inter-firm knowledge dissemination in promoting green/sustainable practices i.e. the second objective of this study.

To accomplish the second objective of this study, managers were requested to mark their opinion on 4-point Likert scales, where 4 stand for strongly agree and 1 stand for strongly disagree. Mean score & standard deviation in Table-3 depicts that except few areas, most of the manufacturing organizations (OEM's) in Pakistan through knowledge dissemination are struggling hard to promote green/sustainable practices within their suppliers' network.

For the first variable i.e. we organize seminars, training sessions and/or workshops etc for our suppliers to disseminate knowledge regarding sustainable/green practices, mean score ($m=3.53$) depicts that OEM's (in Pakistan) are actively engaged in knowledge dissemination process. Result also pretends that OEM's organize regular seminars, training sessions and/or workshops to educate and assist their suppliers. In addition to many other core business areas, these dedicated efforts are directed purposefully to promote green/sustainable practices within their supply chain network. Second variable probed were; “we share exclusive

documents, reports, manuals etc. with our suppliers to disseminate knowledge regarding sustainable/green practices". Mean score ($m=3.44$) substantiate the efforts of OEM's in prompting green/sustainable practices through knowledge dissemination. Next, "we consider environmental measures or certificate like ISO 14000 and/or ISO 26000 etc. as key selection parameters for new vendors". Finding i.e. ($m=3.30$), disclose that OEM's give valuable consideration to environmental measures or certificate/s like ISO 14000 and/or ISO 26000 etc. in the selection of their new vendors. Above stated results exhibit active & encouraging efforts of OEM's in promoting green/sustainable practices within their suppliers' network.

Furthermore, to probe the efforts of OEM's in disseminating knowledge regarding various green/sustainable practices, some more variable were asked, for example, "we conduct seminars, training sessions and/or workshops etc. to share techniques with our suppliers to minimize the use of packaging material". Mean score (i.e. $m=3.34$) reflect noteworthy efforts of various organizations in disseminating knowledge regarding techniques to minimize the use of packaging material. Outcome regarding performance achievement in minimizing the use of packaging material ($m=3.12$) substantiate the efforts of OEM's in promoting & disseminating knowledge in the said area. Another variable asked was; "we assist our suppliers to introduce design & material that can be reused, recycled, recovered and/or remanufactured". Mean score and standard deviation ($m=1.67$ & $sd=1.26$) disclose that some firms are facing difficulties, while, others' seem actively engaged with their suppliers in introducing design & material that can be reused, recycled, recovered and/or remanufactured. There are number of reasons for lack of sharing, first, many organizations (OEM's) themselves are struggling hard to attain required knowledge regarding waste management before disseminating to other, second, the concept of recycling and re-manufacturing are still in infancy in Pakistan.

In response to next variable i.e. we educate our suppliers to use eco-logistics system for the movement of products/parts, outcome indicates ($m=1.54$) disagreement of the managers. Low score depicts lack of knowledge sharing in context of eco-logistics system. Performance indicators in Table-4 regarding inbound logistics system ($m=1.39$) and outbound logistics system ($m=2.03$) also validate the findings. Low sharing is because of the fact that till today, logistics organizations

(transportation firms & warehouses in Pakistan) are still wondering to update their vehicles and warehouses as per new environmental requirements. Resultantly, low knowledge sharing has been reported. Seventh variable i.e. “we provide design specification to our suppliers that include environmental requirements for purchased items” were included in the questionnaire to explore possible sharing regarding environmental requirements for purchased items between OEM’s and their suppliers. Comparatively, high mean score (m=3.23) disclose that majority of the firms share design specification with their suppliers and compel them to ensure environmental requirements in their supplies.

Table 3: Green/Sustainable Practices - Knowledge Dissemination Effort (OEM’s Response)

Sr. No.	VARIABLES	Mean Score	Standard Deviation
1.	We organize seminars, training sessions and/or workshops etc for our suppliers to disseminate knowledge regarding sustainable/ green practices.	3.53	0.66
2.	We share exclusive documents, reports, manuals etc. with our suppliers to disseminate knowledge regarding sustainable/ green practices	3.44	0.93
3.	We consider environmental measures and/or certificates like ISO-14000 and/or ISO-26000 etc. as key selection parameters for new vendors	3.30	0.57
4.	We conduct seminars, training sessions and/or workshops etc. to share techniques with our suppliers to minimize the use of packaging material.	3.34	0.34
4.	We assist our suppliers to introduce design & material that can be reused, recycled, recovered and/or remanufactured.	1.67	1.26
6.	We educate our suppliers to use eco-logistics system for the movement of products/parts.	1.54	1.06
7.	We provide design specification to our suppliers that include environmental requirements for purchased items	3.23	0.32
8.	We educate our suppliers and extend our cooperation for the purchase of eco-friendly products/parts from next tier suppliers.	3.11	0.44
9.	We educate & assist our suppliers in attaining ISO 14000 and/or ISO 26000 certificate/s.	2.54	1.97
10.	We educate our suppliers to adopt eco-labeling/eco-logo in their products/parts/supplies.	3.37	0.72
11.	We share techniques with our suppliers to implement eco-inventory system in stock planning.	1.21	0.19

Sr. No.	VARIABLES	Mean Score	Standard Deviation
12.	Our suppliers to communicate & share environmental procurement criteria/requirements to their marketing staff, employees, stakeholders and customers.	2.77	0.58
13.	We share techniques with our suppliers to avoid or minimize the amount of hazardous material in production.	2.97	0.53
14.	We educate & assist our suppliers to introduce lean measures to reduce possible wastage in material, water & energy usage in manufacturing.	2.26	1.54
15.	We educate & assist our suppliers to adopt eco-friendly technologies in manufacturing.	3.21	0.71
16.	We extend our cooperation by providing customer feedback in developing eco-friendly designs/products.	2.14	1.27
17.	We financially assist & motivate our suppliers for the purchase of eco-friendly technologies.	1.86	0.63

Eighth variable asked was, “we educate our suppliers and extend our cooperation for the purchase of eco-friendly products/parts from next tier suppliers”. Outcome (m=3.11) disclose that organizations are extending their cooperation by educating their suppliers to establish links (integrate) only with those suppliers (next tier) those engaged in green/sustainable practices. Outcome substantiates the effort of OEM’s in promoting green/sustainable practices within and across their supplier network. In response to next variable i.e. “we educate & assist our suppliers in attaining ISO 14000 and/or ISO 26000 certificate/s”, mean score and stand deviation (m=2.54 & sd=1.97) depicts that some organization facilitate their supply chain partner (suppliers) in attaining ISO 14000 and/or ISO 26000 certificate/s, while, others assume it as the responsibility of their suppliers to attain environmental certificate/s i.e. ISO 14000 and/or ISO 26000 by themselves.

Next, variables under investigation became; “we educate our suppliers to implement eco-labeling/eco-logo in their products/parts/supplies”. High mean score (m=3.37) reveal that organizations (OEM’s) educate their suppliers to adopt & implement eco-labeling/eco-logo in their products/parts/supplies. Findings substantiate the effort of OEM’s in promoting eco-labeling/eco-logo within their supplier network. As opposed to above results, low mean score (m=1.21) for eleventh variable i.e. “we share techniques with our suppliers to implement eco-inventory system in stock planning”, negate the efforts of OEM’s in promoting

green/sustainable practices. Indeed, eco-inventory practices itself are not well-known in Pakistan; hence, low sharing has been reported.

To attain the real objective of this study, it was imperative to know whether suppliers' are actively engaged in promoting green/sustainable practices within their organization, hence, next variable probed were; "our suppliers communicate & share environmental procurement criteria/requirements to their marketing staff, employees, stakeholders and customers". This variable was included to look into the current sustainable policy of the suppliers. Mean score ($m=2.77$) indicate that at present, suppliers are communicating & sharing environmental procurement criteria/requirements to marketing staff, employees, stakeholders and customers. However, results provoke the attention of policy makers at OEM's and suggest to re-asses their efforts in disseminating knowledge regarding green/sustainable practices. Continual of above, it was asked, "we share techniques with our suppliers to avoid or minimize the amount of hazardous material in production". Mean score ($m=2.97$) for this variable reveals that OEM's are sharing techniques with their suppliers which may help them in avoiding and/or minimizing hazardous material in production. Results authenticate the role of inter-firm knowledge dissemination in promoting green/sustainable practices.

In response to next variable i.e. "we educate & assist our suppliers to introduce lean measures to reduce possible wastage in material, water & energy usage in manufacturing". Outcomes ($m=2.26$ & $sd=1.54$) indicate that managers disagreed regarding assistance provided to their suppliers in attaining leanness, however, high stand deviation reflect contradiction that means few firms are assisting their suppliers in attaining leanness. As 'leanness' stands for waste reduction and strategies may vary from organization to organization hence some of the organization may reluctant to share lean strategies with their suppliers. Next, fifteenth variable probed was, "we financially assist & motive our suppliers for the purchase of eco-friendly technologies". High mean score ($m=3.21$) symbolizes meaningful assistance provided by OEM's to their suppliers in attaining eco-friendly technologies. Result endorses the efforts of OEM's in promoting eco-friendly technologies within their suppliers' network.

Customer feedback always consider vital for the improvement & advancement in the exiting series of products. Accordingly, to probe the significance of customer feedback in designing eco-friendly products, it was asked i.e. “we extend our cooperation by providing customer feedback in developing eco-friendly designs/products”. Relatively, low mean score ($m=2.14$, $sd=1.27$) depicts denial from managers regarding sharing of customer feedback. Results provoke the attention of strategy formulators at OEM’s to re-asses their knowledge dissemination policy. Finally, to assess the level of financial cooperation between OME’s and their respective suppliers, it was asked, “we financially assist our suppliers in the adoption of eco-friendly manufacturing technologies”. Again, comparatively low mean score ($m=1.86$) indicate negligible financial cooperation between OEM’s and their respective suppliers.

Based on mean analysis presented in Table - 3, it can be concluded that except few area, OEM’s in Pakistan are effectively engaged in disseminating knowledge regarding green/sustainable practices within their supplier network. To further explore the role of inter-firm knowledge dissemination, it is imperative to study the impact of green/sustainable practices on supply chain performance. To attain this objective, various supply chain performance indicators were included in the questionnaire. Respondents were asked to mark their opinion on four point Likert scales, where, 4 stand for strongly agree to 1 - strongly disagree. Table-4 present performance outcomes of suppliers after adopting & implementing green/sustainable practices.

Results in Table-4 disclose significant impact of inter-firm knowledge dissemination on supply chain performance. Supply chain performance indicators reflect valuable gains, for example, suppliers reported ‘scrap reduction and/or elimination’ with mean value i.e. (3.31) as the most valuable gain achieved after the adoption & implementation of green/sustainable practices. Similarly, production capacity optimization ($m=3.17$), reduction in the use of packaging material ($m=3.12$), radical changes in supplier organizational structure & procedure ($m=3.03$), and percentage increase in on-time deliveries ($m=2.98$) are some other prominent gains reported as a result of green/sustainable practices. However, high standard deviation ($s=1.17$) regarding production capacity reflect variation of opinion. It means the level of capacity optimization vary from industry to industry, where, one industry may have better level of optimization as compared to others.

In term of valuable gains, mean analysis also indicates some challenging areas, like, outcomes (m=2.02) regarding inventory reduction reflect almost no gain. Similarly, since the adoption & implement of green/sustainable practices, managers haven't reported significant improvement in the quality of their production process (m=2.12). Results also reveal that green/sustainable practice haven't contributed significantly in the improvement of inbound (m=1.39) and outbound (m=2.03) logistics systems. In similar tune, managers have declined major gains in term of customers' goodwill (m=2.18) and financial improvements (m=2.30). It has been observed that suppliers are still wondering to enjoy worthwhile outputs in some critical supply chain performance areas which provoke serious managerial, social and environmental concerns.

Table 4: Supply Chain Performance - After Adopting & Implementing Green/Sustainable Practices

Sr. No.	VARIABLES	Mean Score	Standard Deviation
1.	After green/sustainable practices, reduction in the inventory level has been reported by our suppliers.	2.02	0.63
2.	After green/sustainable practices, reduction or elimination of scarp has been reported by our suppliers.	3.31	0.57
3.	Green/sustainable practices have helped our suppliers to optimize their production capacity.	3.17	1.17
4.	Green/sustainable practices have significantly improved the quality of our suppliers' production process.	2.12	0.77
5.	Green/sustainable practices have significantly helped our suppliers to reduce the use of packaging material.	3.12	0.43
6.	Green/sustainable practices have significantly improved the performance of our suppliers' inbound logistics system.	1.39	0.84
7.	Green/sustainable practices have significantly improved the performance of our suppliers' outbound logistics system.	2.03	1.04
8.	Green/sustainable practices had helped our suppliers' in improving percentage of on-time deliveries.	2.98	0.53
9.	Green/sustainable practices have helped us and our suppliers to attain customer goodwill and have improved our competitive position in the industry.	2.18	1.10
10.	Green/sustainable practices have positively affected the financial performance of our suppliers.	2.30	0.78
11.	Green/sustainable practices have radically changes the structures and procedures of our suppliers.	3.03	0.15

5) CONCLUSION & MANAGERIAL IMPLICATIONS

This study explores some interesting perspectives of “green/sustainable practices in Pakistan”. First, the study exposed that organizations in Pakistan are in various phases of adopting & implementing green/sustainable practices. Second, “environmental pressures” identified as strongest motives behind the adoption & implementation of green/sustainable practices. Moreover, globalization, consistent demands from international players along with competitive (industry) pressures were identified some other effective drivers for the implementation of green/sustainable practices. Third, this study explores the role of inter-firm knowledge dissemination in promoting & implementing green/sustainable practices. In this regard, it has been observed that OEM’s in Pakistan are effectively engaged in knowledge dissemination. OEM’s use both explicit and tacit knowledge to disseminate knowledge within their suppliers network. Regular seminars, training sessions and/or workshops with exclusive & informative documents, reports and manuals have been reported as frequent mean to disseminate knowledge and to promote green/sustainable practices.

Additionally, OEM’s give due consideration to environmental achievements like, ISO 14000 and/or ISO 26000 in their supplier selection that substantiate the efforts of OEM’s in promoting green/sustainable practices. Furthermore, study exposed that OEM’s are disseminating knowledge in almost all the key supply chain areas i.e. production/manufacturing, material (packaging) reduction, designing, procurement, labeling/logos, technologies. However, comparatively weak sharing has been reported in eco-logistics and eco-inventory systems. Lack of sharing is because of the fact that many organizations themselves are struggling hard to adopt & implement eco-logistics and eco-inventory systems, hence, knowledge dissemination in these areas are almost negligible. Finally, this study identifies valuable gains attained from green/sustainable practices. For example, scrap reduction, production optimization, reduction in the use of packaging material, visible achievements in ‘on-time’ deliveries, radical structural & procedural changes have been reported as major gains attained from green/sustainable practices. However, study also pinpoints some challenging areas, particularly, inventory reduction, logistical improvement, customer goodwill and financial improvement. These areas need due attention to ripe benefits from green/sustainable practices.

In context of Pakistan, this study provides valuable insight regarding major motives behind the adoption & implementation of green/sustainable practices. Additionally, the outcome of this shed light on some interesting facts regarding the role of inter-firm knowledge dissemination in promoting & implementing green/sustainable practices. Lastly, through empirical evidences, this study provides useful insight on the major gains attained from green/sustainable practices. Reportedly significant gains itself may purposefully be publicized for promoting & implementing green/sustainable practices. It is argued that the outcomes of this study will help business managers in enhancing their understating towards green/sustainable practices. Findings of this study will also facilities organizations in Pakistan to review their existing green/sustainable practices and revise new strategies accordingly. Based on some bitter facts, prevailing situation invites the attention of Ministry of Production and Ministry of Environmental Affairs (Government of Pakistan), not only to review existing rules & regulations, rather assist organizations and their supply chain networks in implementing green/sustainable practices. Finally, it is argued that the results of this study can be generalized, if the scope of research extends to more industries. Similarly, a more systematic sampling could also add to the validity of findings.

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