**The Impact of Knowledge Management Capability and Green Supply Chain Management Practices on Firm Performance**

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**Abstract:** Knowledge management is one of the most important strategic resources of the firm which has been ascertained to many organizations to acquire and apply it before their competitor for achieving competitive advantages. Similarly, due to rising environmental awareness among customers, governments, NGOs, and researchers, firms are facing increasing pressure to implement environmental management practices in their operations. The purpose of this paper is to identify the influence of knowledge management capability (KMC) on green supply chain management (GSCM) practices adoption of the manufacturing firm and subsequently the impact on firm performance. The data were collected from 262 Bangladeshi textile manufacturing firms and analyzed using structural equation modeling, typifying that exploratory and quantitative research. Drawing upon the resource-based view the study reveals that KMC has a significant positive effect on internal and external-GSCM practices adoption. Further, the study reveals that internal-GSCM practices have significantly positive effects on both economic and environmental performance while the external-GSCM practice has positive environmental performance but negatively affects the economic performance. Finally, this study indicates that KMC is an intuitive resource of a firm that can bring sustainable performance through GSCM practices.

**Keywords:** Knowledge management capability, green supply chain management practices, firm performance, textile industry, resource-based view.

# **1. Introduction**

Organization is facing challenges of rapid customer demand change, technological development, and higher competition (Attia et al. 2018) in the global business era. To sustain in this competitive environment organizations must improve their capability to know the market insight, customer and as well as adopt technology and sustainability practices to progressively improve their performance. In the resource-based view, a resource is stated to a firm tangible or intangible assets which develop its capability to maximum use of the resources to accomplish the necessary tasks or activities (Weldy et al. 2010). A resource is the rare and valuable assets which required to achieve superior benefits for the firm. The benefits can be achieved over a longer period to which extent the firm can manage their resource and protect it from imitation, transfer or substitution. If the resource can be made into the capabilities it will create competitive advantages and that leads to superior firm performance(Wade et al. 2004).

Knowledge has been known as a strategic resource which is ascertained to be the notion of an organization to properly manage this resource to achieve competitive performance. So that, to successes in the long run organization would need to develop their knowledge-based assets (Bolisani et al. 2017). Knowledge has been considered of an organizational strategic resource, were obtaining, assimilating, storage, share and apply knowledge which are essential elements to develop them sustainable competitive advantages (Zaim et al. 2018). Knowledge is valuable, rare, inimitable and non-substitutable resources of an organization that would not easily be copied by other competitors. Knowledge-based resource generates value creation subsequently to achieve outstanding sustainable performance (Attia et al. 2018).Nasir Uddin (2010) stated that knowledge management is a rare and valuable asset for the firm to develop organizational learning and consequently contribute to competitive performance. In knowledge-based organizations are cooperate and share information among employees, capable of making the right decision and enhance firm productivity (Attia et al. 2018; Gharakhani et al. 2012). Knowledge management improves organization competitive position through sharing knowledge and information among supply chain partners and take strategic decisions by knowing their competitor action. (Kyobe 2010).

End of the twentieth century, just-in-time and lean production considered for firms to gain maximizing the production benefit through on-time delivery, less waste, synchronize production and integration (Womack et al. 1990). Nowadays, supply chain collaboration gains much attention to get knowledge about the suppliers and customers to gain competitive advantages through coordination and integration of the product and information flow within the supply chain network (Verwaal et al. 2004). In a competitive business, many firms develop collaborative knowledge sharing with their partners in the supply chain network for long term benefits. They closely work together in planning, information sharing, joint decision making, risk-bearing to get win-win benefits(Cao et al. 2009). In the GSCM practices, the firm closely works with its supplier and customer for improvement of overall environmental impact. Likely assist with suppliers for the manufactured product in a sustainable way and closely monitor and jointly work together to achieve sustainable completive advantages.

In a competitive business environment, the organization is giving the effort to produce their product in a sustainable manner and manage their supply chain link to shorten the product time to market (Cao et al. 2009). In the essence of knowledge management and share information among the supply chain partner can only be possible to reach a sustainable competitive goal (Halley et al. 2005). In present business world, green supply chain management practice emerged into sustainable business to work closely with supply chain partners to achieve sustainable competitive advantages (Attia et al. 2018). Nowadays, GSCM practices gain much attention on to the researchers, NGOs, practitioners (Need Reference). Many researchers identified GSCM not only improve environmental performance but also improve economic performance (Eltayeb et al. 2011; Zhu et al. 2007b). Prior research established the importance of GSCM practices for sustainable firm performance. Most of the prior research emphasized on direct simple effect(Foo et al. 2018), some of them are identified as the components or drivers of GSCM practices (Khan et al. 2017). Most of the researchers emphasized institutional pressure for the adoption of GSCM practice. But till now there is a lack of research that exists in knowledge management as the antecedent of GSCM practice. Thus, our study focuses on the impact of knowledge management on the implementation of green supply chain management practices and subsequently the firm performance. KMC develop the internal and external business environmental knowledge to adopt the sustainable practice to gain competitive advantage. KMC is an intuitive resource of a firm to identify the possible opportunity and reconfigure the firm resource to abreast the opportunity. Hence GSCM to build outperform practices for the firm in the essence of sustainable competitive advantages. Many organizations lagging of GSCM practice due to lack of knowledge and owing to its importance. Only KMC oriented firms are aware of the importance of GSCM and leverage their internal resources to produce their product in a sustainable manner. By fulfilling the above research gap, this study is the early attempt to identify the impact of knowledge management, GSCM practices on firm performance. This study addresses the following research questions:

1. How knowledge management capability influence firms to adopt green supply chain management practices?

2. What is the impact of green supply chain management practices on firm environmental and economic performance?

Based on the research questions above, this study develops a conceptual framework, validates it based on the data from the textile industry in Bangladesh. The study specifically examines the relationship of KMC, GSCM practice and firm performance. Relevant literature is reviewed and described in Section two, hypotheses for empirical testing are developed in section three. In Section four, the research methodology, instrument development, and analysis procedure are discussed. Data analysis and results are presented in section five followed by the discussion, conclusion, and limitations.

# **2. Literature review**

## **2.1 Resource-based view and knowledge management capability**

In this study, we employed the resource-based view (RBV) of the firm as the theoretical background and hypothesis development process. Wernerfelt (1984) stated that RBV views are the bundle of resources and capabilities of the firm. The resource is the combination of tangible and intangible assets. Tangible components include property, plant, equipment, and whereas intangible components such as human capital, technology know-how (Barney 1991 ). Capabilities are "invisible assets", such as information and knowledge which need to be developed over a period of time (Nath et al. 2010). The firm's resources and capabilities are the two valuable assets to make organizational performance development (Sarkis et al. 2011). According to the resource-based view, firms possessing rare, valuable and inimitable resources are the important assets that can make them sustainable competitive advantages (Barney 1991 ; Yu et al. 2017). RBV suggests that firm internal resources such as assets, capabilities, information, and knowledge can bring competitive advantages and sustained over time (Eisenhardt et al. 2000). Firm's competitive advantages can be achieved through the creation of new resources, develop its capabilities platform, and makes the capabilities stronger and inimitable so that it is difficult for the competitor to duplicate (Barney 1991 ; Peteraf 1993). Knowledge-based resources and capabilities are important assets for organizational learning which can create a superior firm performance as well as achieve sustainable competitive advantages. (Attia et al. 2018). KM is the capability of an organization to “acquire, create, transfer, integrate, share and apply knowledge-based resources and activities” into the internal and external environment of the firm to generate new knowledge (Attia et al. 2018; Chuang 2004). KM is a powerful asset and strategic resource for organizational survival, growth, and development. KM is developing organizational capabilities to sustain in the competitive environment and improve the organizational ability in innovation and efficiency (Darroch 2005). The OECD (2003) defines KM as " any intentional and systematic process or practice of acquiring, capturing, sharing and using productive knowledge, wherever it resides, to enhance learning and performance in organizations". Many organizations undertake the KM initiative due to it makes them quicker in the innovation, sharing knowledge among business partners, improvement in the decision-making process, minimizing the duplication of work and enhancing the overall business process (Hassan et al. 2019). Thus, KM possesses in discovering, capturing, sharing and applying knowledge to improve innovation and creativity in strategies and practices of the organization for enhancing sustainability performance (López-Torres et al. 2019). So, KM helps the firms to effective way incorporate the sustainability practices in operations. Organizational sustainability practices such as green supply chain management is a well-recognized practice to improve the overall environmental situation (Eltayeb et al. 2011; Khan et al. 2017; Zhu et al. 2007b).

## **2.2. Green supply chain management practices**

Since the last three decades, GSCM has been gained much attention in the business (Zhao et al. 2017). Organizations are investing in GSCM practices to increase profit, market share, develop a brand image, and acquire a competitive advantage. Peng et al. (2007) stated that GSCM practices can minimize the overall environmental impact by producing eco-friendly products via green marketing, green R&D, and green production. Foo et.al (2018) studied ISO14001 certified manufacturing organization and found GSCM practice has positive economic, environmental and social performance. In the GSCM context, developing environmental cooperation among suppliers and customers is related to better sustainability performance (Yu et al. 2017). KMC of the organization can identify the importance of environmental demand and adopt sustainability practices such as GSCM to prove them a sustainable firm and consequently achieve the competitive advantages (López-Torres et al. 2019). In prior research, there are different dimension has been found as GSCM practice. Consistency with Zhu et al. (2007b) we consider the internal environmental management, eco-design as internal-GSCM practices and green purchasing, investment recovery, cooperation with customers as external-GSCM practices.

Internal Environmental Management (IEM) refers to GSCM initiatives in the operations which incorporate the top management decision, middle management support for successful implementation , ISO 14001 certification, cross-departmental collaboration, environmental management system, and environmental compliance and auditing program (Vanalle et al. 2017; Zhu et al. 2007a). Zhu et al. (2012) highlight that top management initiative is most important to adopt GSCM practices in the Chinese firm. Top management perception likely influences their behavior to sustainability practice (Vijayvargy et al. 2017; Zhu et al. 2005). The firm with a higher environmental management system, compliance, and auditing practices can lessen the environmental impact of their manufacturing (Zhu et al. 2007b).

Eco-design (ED) consider that design of the product required less material and energy consumption during production and those can be reuse, recycle, and recovery of component parts and materials, also consider the minimize or avoid the use of toxic and harmful materials during production process (Zhu et al. 2008). ED emphasizes to design of the product those are manufactured considering the product lifecycle analysis to minimize the environmental impact. Many researchers focused on ED as a GSCM practice which incorporates the environmental aspects from product idea to usage and finally disposal (Vanalle et al. 2017; Vijayvargy et al. 2017; Zhu et al. 2007b).

Green Purchasing (GP) is referred to environmental aware purchasing practices that considering waste reduction, free from hazardous and toxic (Vijayvargy et al. 2017), and the ability to reuse, recycle of purchased materials with maintaining its required performance (Min et al. 2001). Due to growing consumer awareness on eco-friendly clothing product (Hustvedt et al. 2009), retailers are promoting and sourcing environmental friendly product to lower the environmental impact (Zsidisin et al. 2001), hence they strictly control their suppliers' to confirm their products are manufactured and delivered in a sustainable manner (Petljak et al. 2018). For example, the world's largest clothing retailers H&M reported that at present they collect 59% of their cotton products from a sustainable source and they have a goal to source 100% by 2020 (H&M 2017). As a major exporter, Bangladeshi clothing supplier needs to improve its sustainability practice in their operation.

Investment recovery (IR) refers to the effective, efficient and profitable recycling, recovery, reselling and disposal of waste, excess inventory, scrap, defective, obsolete product in order to economic benefit for firm and improve environmental impact (Vijayvargy et al. 2017; Zhu et al. 2008). IR in terms of the entire supply chain system manager must focus on the closed-loop system to reuse, recycle, remanufacture of initial materials (Zhu et al. 2008). The company manager is on the pressure to reduce the waste and sales of excess inventories, scrap for economic benefit. The textile industry generated a huge volume of waste in different stages of production (Saeidi et al. 2017).

Cooperation with customer (CC) refers to collaboratively work together to design and develop an environmentally friendly product, cooperate with the supplier to maintain cleaner production in the manufacturing plant and finally maintain green packaging(Zhu et al. 2007b). Customers are the key driver and can directly influence their suppliers to implement GSCM practices into their manufacturing plant (Khan et al. 2017). Research emphasizes that collaborative work with the upstream and downstream supply chain can bring sustainable competitive advantages (Vachon et al. 2006).

**3. Research framework and hypothesis development**

Following the resource-based view, the firm knowledge management capability is hypothesized as a resource that leads to improving the green supply chain management practice and subsequently improves the firm economic and environmental performance. Based on the extant literature review, we theoretically propose that KMC has a positive influence of GSCM practices adoption which leads to firm performance, and conceptually develops a theoretical model (Fig. 1) and proposed six hypotheses.



**Figure-1**: Conceptual research model

## **3.1. Knowledge management capability and internal green supply chain management practices**

Knowledge management capability is the valuable organizational resources that acquire, generate, transferal, share knowledge-oriented activities within different functional areas of the organization (Attia et al. 2018). Internal-GSCM practice is the set of activities that encompasses organizational internal environmental management, eco-design practice (Zhu et al. 2007b). Recently, knowledge management capability gains much attention to organizational green initiatives. In a recent study de Guimarães et al. (2018) identified that knowledge management orientation has a positive effect on cleaner production and subsequently enhance organizational competitive advantages. Disseminate of knowledge within the different segments of the organization may only the source of organizational learning capability(Zhu et al. 2008). Generally, there are two kinds of knowledge can be identified. One is managing technology orientated which can be easily copied, stored and distributed. Another is human capital knowledge which is difficult to copied, stored and distributed. Tactical knowledge has in the internal human which generate from their activities, brainstorming, and experience. This is inimitable assets of the organization (Zaim et al. 2018).

Internal environmental management of an organization depends on the top management and senior manager decision. They are generally acquiring knowledge from the external environment and taking the strategic and policy-making decision for internal operation (Ye et al. 2013). Top management act as a contingent role in implementing diverse strategies and practices to achieve organizational performance. Knowledge management capability of top management is the inception of organizational learning which ultimately reflects on organizational culture, practice, norms, and routine(Yeung et al. 2007). Particularly the top management knowledge is vital to initiate GSCM practices in their internal environmental process. Environmental monitoring and impact assessment can minimize environmental damage.

Prior research emphasis on the strategic importance of KM for the successful implementation of GSCM practices in the organization (López-Torres et al. 2019). Internal-GSCM required inter-organizational knowledge of product and process development (Zaim et al. 2018). Prior research establishes the KM enhances organizational innovation performance. Innovation performance depends on accurately identify the customer demand and accumulate the internal process to innovate the required product(du Plessis 2007). Iqbal et al. (2019) stated that knowledge management has a direct and indirect positive effect on organizational performance through innovations. Recently raising environmental awareness customers are willing to prefer the eco-friendly product. The KMC oriented firm grasp this opportunity to identify the environmental friendly customer demand and innovate eco-design product to meet such requirement(Jiang et al. 2018). From the above discussion we can assume the following hypothesis:

Hypothesis H1: Knowledge management capability has a positive and significant influence to adopt internal GSCM practices.

## **3.2. Knowledge management capability and external green supply chain management practices**

External green supply chain management composed of green purchasing, investment recovery, and cooperation with customer (Zhu et al. 2007b). Knowledge management capability ascertains the information link of the organization within its supplier and customer. Tseng (2014) mentions that the knowledge management capability orientated firm is continuous communicating, improving and maintain good relationships with their suppliers for enhancing the business performance. Halley et al. (2005) stated that real knowledge management processes always incorporation of internal organization management system with external suppliers and customers. Many researchers have argued environmental oriented knowledge sharing and cooperation within the supply chain member has significant benefits for firm performance (du Plessis 2007; Gharakhani et al. 2012). GSCM oriented firm needs to appropriately choose their supplier and then maintain a good relationship and monitor their activities through a collaborative mindset. KMC helps to improve environmental performance through environmental knowledge dissemination among supply partner(Paulraj 2011). Similarly, knowledge management capability can identify how customer needs and wants change and how the firm needs the allocation of its resources to meet customer demand. According to Wilburn Green et al. (2015) knowledge of the customer is a valuable resource for the firm to develop its capability to meet the current requirement. Due to the raising of environmental concern, the customers are more demanding environmental friendly product hence firm strategic are on GSCM orientation are increasing (Jiang et al. 2018). The firm is willing to cooperate with their customer to produce their product in an ethical and environmentally sustainable way. KMC is an intuitive characteristic of the firm to acquire knowledge of external agency's interests such as government, NGOs to minimize the environmental impact. (Khan et al. 2017). KMC determines the importance and benefits of the reuse, recycle and re-selling of scrap, surplus product(Zhu et al. 2008), to protect the environment and subsequently gain financial benefit(Nasir Uddin 2010). Hence our proposed hypothesis is as follows:

Hypothesis H2: Knowledge management capability has a positive and significant influence to adopt External green supply chain management practice.

## **3.3. Internal green supply chain management practices and firm performance**

Internal-GSCM practice consists of internal environmental management and eco-design. According to the resource-based view, firm GSCM practices develop a higher-order capability to systematically maintain environmental aspects into their production(Yu et al. 2017). Previous research established a positive relationship between internal GSCM practices and firm performance (Saeed et al. 2018; Zhu et al. 2013). Economic performance (ECP) can be achieved through GSCM practices by cost minimization in material purchasing, energy consumption, waste treatment, and waste discharge. ED practice reduces material consumption which improves economic performance. GSCM practices contribute to the environment performance through reduce the consumption of water, energy, hazardous and toxic materials in the production as well as reduce the generation of wastes, effluent, air emission, environmental accidents and improvement of the health and safety of worker and community (Eltayeb et al. 2011; Wilburn Green et al. 2015). Environmental performance (ENP) can be achieved from the internal environmental management system by implementing the environmental management program such as adopting 14001 environmental certification system, information technology, and total quality environmental management(Namagembe et al. 2019). Zhu et al. (2007b) conducted an empirical study in the Chinese automotive industry, and reveal that internal environmental management such as top management commitment, middle management support, environmental compliance, and auditing programs, the environmental management system has a significant positive impact on environmental performance. From the above discussion we can assume the following hypothesis:

Hypothesis H3: Internal green supply chain management practices are positively associated with firm H3a-Environmental performance (ENP), and H3b-Economic performance (ECP).

## **3.4. External green supply chain management practices and firm performance**

External-GSCM practices such as investment recovery contribute economic performance (ECP) through reselling and reusing of unused, scrape and surplus material (Zhu et al. 2007b), and at the same time contribute to the environmental performance by minimize the waste generation, remanufactured and recycled (Namagembe et al. 2019). Some researchers argue that GP and CWC do not directly earn economic benefits rather in the long run they bring sustainable competitive advantages (Green et al. 2012; Zhu et al. 2007b). Collaboratively work with suppliers and customers in the upstream and downstream supply chain may gain competitive advantages(Attia et al. 2018).

GSCM practices improve environmental performance (ENP) through reducing the energy consumption, carbon emissions, waste of water and solid, minimize the use of toxic and hazardous materials, and minimize the environmental accidents(Green et al. 2012). External GSCM practices such as IR and GP are common environmental management which reduces the environmental impact through reuse, remanufacturing, recycling, repairs, and refurbishing of manufacturing materials(Zhu et al. 2008). Customer cooperation may bring positive environmental performance by providing necessary instruction for developing eco-product innovation and minimizing the inbound and outbound logistics activities in the supply chain may reduce the environmental impact (Vachon et al. 2008). Hence our conceptualize hypothesis is as follows:

Hypothesis H4: External green supply chain management practices are positively associated with firm H4a-Environmental performance (ENP) and H4b Economic performance (ECP).

# **4. Research methodology and data analysis**

## **4.1. Sample and data collection**

We tested our theoretical model in the context of the Bangladeshi textile industry for several main reasons. First, textile manufacturing industries are the major source of environmental damage through the release of both toxic and hazardous wastes (Khan et al. 2009). Particularly the textile dyeing industry has been recognized as the highest polluter of freshwater after agriculture production. To lessen the environmental impact, the new regulation has placed on the textile industry to properly treat their effluents before discharge to the ecosystem (Hussain et al. 2018). For example; zero discharge of hazardous chemicals (ZDHC) programme has been formed by 24 signatory brands, 59 value chain affiliates and 15 associates to eliminate hazardous chemicals as well as to ensure the wastewater quality from global textile, leather and footwear industries to improve the environment and human well-being(ZDHC 2016). But in practice, some of the industries in Bangladesh unethically discharge untreated effluent, sludge, and solid waste directly to the environment, hence surrounding river, irrigation and even drinking water became highly polluted (Islam et al. 2011). Secondly, Bangladesh is the second-largest readymade garment exporter in the world for the last eight years (BGMEA 2019). At present this textile sector has become the economic backbone of the country and rapidly transformed into the emerging developing country(Yadlapalli et al. 2018). Recent studies found that many Bangladeshi textile firms are accused of cleaner production, less environmental concern, higher water and air pollution, violation of laws in water and solid waste management in their practices (Ahmed et al. 2018). In this situation, Bangladeshi textile industries need to realize the necessity of GSCM practices for sustainable firm performance but until recently it's adoption is still infancy (Reza et al. 2017). However, without knowledge management, stakeholder pressure, top management support it is not easy to adopt GSCM practices (Chu et al. 2017; Saeed et al. 2018; Zhu et al. 2007b).

Data were merely collected from textile industries in Bangladesh. There are a variety of textile industry from yarn production to garments manufacturing. From the Bangladesh Textile Mills Association (BTMA) list there are 425 yarn manufacturing, 796 fabric manufacturing, 240 dyeing industry (BTMA 2019), and from the Bangladesh Garments Manufacturing and Exporters Association (BGMEA) list there are 4560 garments manufacturing industries in Bangladesh (BGMEA 2019). Some of the industries are vertically orientated those have all the facilities from yarn production to garments manufacturing and those factories are listed in these two association. Majority of the textile industry situated near the Dhaka city named Gazipur, Savar and Narayanganj region. To obtain a representative sample, a random sampling of 500 textile manufacturing industries were selected. The survey includes a wide range of different types of textile manufacturing industries such a yarn manufacturing, fabric manufacturing, garments manufacturing, dyeing industry, printing industry, washing industry, home textiles, sweater manufacturing, and textile chemical industry.

We collected the data from currently employed managers in Bangladeshi textiles firm. The sampling frame of this study is the textile industry manager of the different cities of Bangladesh ( Dhaka, Savar, Gazipur, Narayanganj, Narsingdi, Munshiganj, Chittagong). The questionnaire in a hard copy was distributed to the manager of the different textile firms with mentioning the objectives of the study in the cover letter. The participants in the survey are mainly doing the job in the operations, supply chain, marketing, and production department. The majority of the respondents are the general manager, manager, and executive. It is expected that respondents are well understanding the questionnaire because all the respondents are well educated studied at the graduate and postgraduate levels. Data were collected from March to June’ 2019. To improve the response rate, after three weeks later follow up calls and reminder emails were sent to the respondents, in the first phase 124 and second phase 138 and a total of 286 questionnaires were received, representing 57.2% of response rate. From this record, 24 answers were excluded due to incomplete and the same answer to all questions and missing answers. Finally, a usable sample of 262 valid answers was kept for analysis which accounted for 91.6% valid response of this study.

Table-1 indicates that the majority of the respondent was in the supply chain, production and operation department. Approximately 53.8 % of the respondent has more than 11-15 years of experience in the textiles industry, about 37% respondent are working as post of assistant manager. The highest number of the firm are higher size enterprise. Approximate employee ranges over 2000. The highest no of the firm was doing business more the 20 years. Most of the firm is ISO 9000 and ISO 14000 certified.

**Table-1:**

**Demographic profile of the sample:**

|  |  |  |
| --- | --- | --- |
|  **Category** | **Frequency (N)** | **Percentage (%)** |
| **Gender** |  |  |
| Male | 231 | 88.2 |
| Female | 31 | 11.8 |
| **Education of respondent** |  |  |
| Undergraduate | 33 | 12.6 |
| Graduate | 155 | 59.2 |
| Post Graduate | 72 | 27.5 |
| Doctorate | 2 | 0.8 |
| **Work experience (in years) of respondent:**  |  |  |
| Less than 5 years  | 38 | 14.5 |
| 5-10 years  | 52 | 19.8 |
| 11-15 years | 141 | 53.8 |
| 16-20 years | 29 | 11.1 |
| More than 20 years | 2 | 0.8 |
| **What is your current position?**  |  |  |
| Executive Officer | 83 | 31.7 |
| Senior Executive Officer | 28 | 10.7 |
| Assistant Manager | 97 | 37.0 |
| Senior Manager/Manager  | 28 | 10.7 |
| General Manager/DGM | 14 | 5.3 |
| Managing Director/Director/CEO | 12 | 4.6 |
| **What is the type of your company?** |  |  |
| Yarn manufacturing | 10 | 3.8 |
| Fabric manufacturing | 32 | 12.2 |
| Garments manufacturing | 112 | 42.7 |
| Dyeing industry | 75 | 28.6 |
| Printing industry | 7 | 2.7 |
| Washing industry | 7 | 2.7 |
| Home textiles | 2 | 0.8 |
| Sweater manufacturing | 7 | 2.7 |
| Accessories industry | 6 | 2.3 |
| Textile chemical industry  | 4 | 1.5 |
| **Which department you are working on?** |  |  |
| Production | 93 | 35.5 |
| Supply chain | 101 | 38.5 |
| Operations | 31 | 11.8 |
| Marketing | 29 | 11.1 |
| Research and Development | 8 | 3.1 |
| **What is the age of your company?**  |  |  |
| Less than 5 years | 29 | 11.1 |
| 6 to 10 years | 43 | 16.4 |
| 11 to 15 years | 58 | 22.1 |
| 16 to 20 years | 38 | 14.5 |
| More than 20 years | 94 | 35.9 |
| **How many employees work at your company?**  |  |  |
| Under 200 employees | 51 | 19.5 |
| Over 200 to 500 employees | 28 | 10.7 |
| Over 500 to 1000 employees | 32 | 12.2 |
| Over 1000 to 2000 employees | 37 | 14.1 |
| Over 2000 employees | 114 | 43.5 |
| **Is your company ISO 9000 certified?**  |  |  |
| Yes | 190 | 72.5 |
| No | 72 | 27.5 |
| **Is your company ISO 14001 certified?**  |  |  |
| Yes | 147 | 56.1 |
| No | 115 | 43.9 |
| Total | 262 | 100 |

## **4.2. Variable measurement and questionnaire design**

Initially, to developing the questionnaire we conduct an extensive literature study to find out the appropriate questions and measurement scale. The survey questionnaire is designed into three sections namely knowledge management capability, GSCM practices, and firm performance. To ensure the reliability and validity of the measurement, we consider the scale exists in the relevant literature. We invited two academicians and four textile industry experts who have good knowledge about GSCM to ensure the logical consistency, appropriateness, content, and questions clarity of the measurement. A pilot test was conducted from 20 persons of an industry expert who have sufficient knowledge about GSCM and hold a senior position in the industry. Questions were divided into two-part. Part-A describes the demographic information of the respondent including gender, year of experience, working type, industry age, etc. Part-B consists of questions for different constructs. Each item is measured on a five-point Likert scale ranging from (1) "strongly disagree" to (5) "strongly agree". The eight measurement items of knowledge management capability are adopted from (Attia et al. 2018). These items have considered evaluating the influence of knowledge management capability to employ a significant influence on the firm to adopt GSCM practices. Eighteen items are used to measure GSCM practices adopted from Zhu et al. (2007b) including internal-GSCM practices ( internal environmental management, Eco-design) and external-GSCM practices ( green purchasing, investment recovery, cooperation with customer). These items are used to determine the firms existing GSCM practices to enhance firm performance. Finally, the scale of firm performance consists of ten items, which is adopted from Paulraj (2011) which consists of economic and environmental performance. The constructs and items have given in Table -2 and appendix-I.

**4.3. Common method bias:**

Our study is the kind of self-reported type of data collection technique, so that, there is a possibility of common method bias present in this study. The characteristics of the item and the single methodological nature of the study are to be the thread of CMB and the test is required to the validity of the data. Two methods we test the CMB. First, we test Harman's one-factor test. We have completed the principal axis factor analysis (PAF) (Harman 1976). From the test result we found that a single construct is responsible for 33.20 percent of the total variance which is lower value then suggested 50 percent (Podsakoff et al. 2003). Second, from the full collinearity test, we found the CMB in variance inflation factors (VIF) values (Table-2) of the constructs. Here VIF values were lower than the suggested 3.3(Kock 2015). Thus, CMB might not be an issue for this study.

Table-2: Variance inflation factors (VIF)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | KMC | Internal-GSCM | External-GSCM | ENP | ECP |
| KMC |  | 1 | 1 |  |  |
| Internal-GSCM |  |  |  | 1.551 | 1.551 |
| External-GSCM |  |  |  | 1.551 | 1.551 |

## **4.4. Data Analysis Procedure**

In this study, data were analyzed using SPSS 23.0 and SmartPLS 3.2.8 version software. SEM technique was to measure the reliability and validity of the construct and to test our proposed model and hypotheses(Chin 1998). The SEM technique is the most appropriate method to examine a series of relationships simultaneously(Hair et al. 2016). SEM is a useful software for GSCM research due to it provides a high degree of flexibility between theory and data(Chin 1998b). In this study, we complete the test in two steps. First, we tested and measure the model for proper psychrometric properties. Second, we measure the structural model (Wang et al. 2016).

## **4.5. Measurement Model**

We assessed the measurement model by examining internal reliability, convergent validity and discriminant validity criteria (Hair et al. 2016). For the assessment of the reliability of the construct, we used the value of cronbach's α and composite reliability. For internal reliability, the value of cronbach's α and composite reliability should exceed the value 0.7. (Hair et al. 2006). In our study, we found cronbach's α value range from 0.785 to 0.900 and composite reliability value range from 0.853 to 0.918. This result indicates the strong internal reliability of our study. To assessed the convergent validity, we use the average variance extracted (AVE) and item loading. As can be seen in table table-3, all AVE is exceeded the threshold value > 0.5 (Fornell et al. 1981). The square root of AVE value higher than all other cross-correlations determines the discriminant validity (Henseler et al. 2014). In this study, we found the square root of AVE of each construct is higher than the corresponding cross-correlation construct (see Table-4). This confirms that our study has satisfactory discriminant validity.

**Table-3: Measurement model-quality criteria.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Construct/Measures** | **ITEM** | **Loading** | **CA** | **CR** | **AVE** |
| Knowledge Management Capability  | KM1 | 0.743 | 0.873 | 0.900 | 0.539 |
| KM2 | 0.738 |
| KM3 | 0.762 |
| KM4 | 0.752 |
| KM5 | 0.787 |
| KM6 | 0.705 |
| KM7 | 0.643 |
| KM8 | 0.691 |
| Internal GSCM Practices | Internal Environmental management | IEM1 | 0.738 | 0.900 | 0.918 | 0.556 |
| IEM2 | 0.727 |
| IEM3 | 0.754 |
| IEM4 | 0.759 |
| IEM5 | 0.805 |
| IEM6 | 0.766 |
| Eco-Design | ED1 | 0.726 |
| ED2 | 0.728 |
| ED3 | 0.705 |
| External GSCM Practices | Green Purchasing  | GP1 | 0.705 | 0.877 | 0.901 | 0.504 |
| GP2 | 0.645 |
| GP3 | 0.671 |
| Cooperation with Customer (CC) | CC1 | 0.717 |
| CC2 | 0.776 |
| CC3 | 0.7.02 |
| Investment Recovery | IR1 | 0.685 |
| IR2 | 0.737 |
| IR3 | 0.735 |
| Environmental Performance (ENP) | ENP1 | 0.731 | 0.785 | 0.853 | 0.539 |
| ENP2 | 0.708 |
| ENP3 | 0.782 |
| ENP4 | 0.635 |
| ENP5 | 0.804 |
| Economic Performance (ECP) | ECP1 | 0.839 | 0.888 | 0.918 | 0.691 |
| ECP2 | 0.845 |
| ECP3 | 0.877 |
| ECP4 | 0.778 |
| ECP5 | 0.814 |

Table-4: Discriminant Validity (Fornell-Larcker matrix)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   | ENP | ECP | Ex-GSCM | In-GSCM | KM |
| ENP | ***0.734*** |   |   |   |   |
| ECP | 0.334 | ***0.831*** |   |   |   |
| Ex-GSCM | 0.568 | 0.310 | ***0.710*** |   |   |
| In-GSCM | 0.674 | 0.371 | 0.596 | ***0.746*** |   |
| KMC | 0.577 | 0.384 | 0.677 | 0.592 | ***0.729*** |

Note- The diagonal (in italic) data represent the square root of AVE of the construct

# **5. Data analysis and results**

## **5.1. Structural model and hypothesis testing**

The structural model was developed to analyze the path relationships of different constructs in the hypothetical model. To test the hypothesis a bootstrapping technique was used at a significant level 0.005 (p<0.005) as well as path coefficient. The number of bootstrapping procedure was set at 5000 subsamples to analysis the significance of the path coefficient (Hair et al. 2012). The relationship between the dependent and independent variables was determined by path coefficient (*β)* and t-statistics above 1.96 at a 5 percent level of significance. We used R2 value of the dependent variable to measure the explanatory power of the structural model. The model explains 35.1 percent of the variance in the adoption of internal-GSCM practices, 45.8 percent of the variance in the adoption of external-GSCM practices, 49.7 percent variance for environmental performance and 15 percent variance for economic performance. The bootstrapping results are presented in table-5. The result support the proposed hypothesis H1 (t = 12.007, *β* = 0.592, p<0.001) and H2 (t = 20.878, *β* = 0.677, p<0.001). Thus, a firm with higher KMC will significantly associated with internal and external-GSCM practices. Further, the result support the hypothesis H3a (t = 9.514, *β* = 0.520, p<0.001), H3b (t = 4.263, *β* = 0.289, p<0.001). Thus, a firm with grater internal-GSCM practices is significantly associated with environmental and economic performance. Furthermore, the result support the hypothesis H4a (t = 4.243, *β* = 0.258, p<0.001) but, not support the hypothesis H4b (t = 1.739, *β* = 0.137, p>0.005). Thus, a firm with higher external-GSCM practices is positively associated with environmental performance but a negative association with economic performance. Table-5 presents structural analysis with their results (Figure-2).

Table-5: Structural Model

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Hypothesis** | **Path** | **Path Coefficient** | **T Statistics**  | **P Values** | **Significant**  |
| **H1** | **KMC → In-GSCM** | 0.592 | 12.007 | **0.000\*\*\*** | **Yes** |
| **H2** | **KMC**→ **Ex-GSCM** | 0.677 | 20.878 | **0.000\*\*\*** | **Yes** |
| **H3a** | **In-GSCM** → **ENP** | 0.520 | 9.514 | **0.000\*\*\*** | **Yes** |
| **H3b** | **In-GSCM** → **ECP** | 0.289 | 4.263 | **0.000\*\*\*** | **Yes** |
| **H4a** | **Ex-GSCM** → **ENP** | 0.258 | 4.243 | **0.000\*\*\*** | **Yes** |
| **H4b** | **Ex-GSCM** → **ECP** | 0.137 | 1.739 | **0.082** | **No** |

\*\*\*significant level p<0.001



**Figure- 2**: Structural Model

# **6. Discussion, conclusion and limitation**

## **6.1. Discussion**

Drawing upon the resource-based view, we developed a hypothetical model to examine the relationship between knowledge management capability and green supply chain management practices and the impact on firm performance in the context of the Bangladeshi textile industry. The results show that KMC posited a relationship with internal and external GSCM practices is significantly supported. This proposition is supported from the prior study (du Plessis 2007; Gharakhani et al. 2012) that, knowledge management has a significant positive relationship with innovation performance which gains competitive advantages of the firm. Another study López-Torres et al. (2019) found KM has a significant positive relationship with sustainable operations performance. Similarly, our study indicates that collecting, monitoring, and analysis the external and internal environmental knowledge along with getting customer needs and demands information, also acquiring the knowledge of competitor strategy, the KMC oriented firms are more inclined to adopt GSCM practices to achieve sustainable competitive advantages. Prior research in GSCM practices focused on the pressure as antecedent, basic component, factors of GSCM practices but our research is the first attempt to identify the new antecedent of GSCM practices that is knowledge management capability. This study has unique contribution to the GSCM and KM literature through identifying the new antecedent.

Further, this research significantly supported the hypothesis of internal GSCM practices with environmental and economic performance. Other propositions external GSCM practice found a positive relationship with environmental performance but negative relationship found with economic performance. Consistent with prior research Zhu et al. (2013) found GSCM practice has negative economic performance. This is because external GSCM practices such as green purchasing increase the cost of materials which ultimately impact negative economic performance. Similarly, customer cooperation for environmental concern imposes an extra cost for maintaining the internal environment, sustainable manufacturing, waste management and disposal which lead to the extra cost of production. Moreover, external GSCM practices do not bring economic benefits in a short run period rather, in the long run, the organization can achieve a good reputation and gain sustainable competitive advantages(Zhu et al. 2013).

In addition, to study in the specific textile industry, this study highlights the manager and practitioner to understand the importance of GSCM practices for sustainability performance. Textiles and leather industry are considering a heavy polluter industry; those need to adopt the GSCM practice to lessen the environmental impact.

**6.2. Conclusion and limitation**

This research advances the impact of knowledge management capability to adopt GSCM practices and support the role of firm performance. We adopt the resource-based view to examine the performance outcomes of knowledge management capability in terms of implementation of internal and external-GSCM practices in terms of internal environmental management, eco-design, green purchasing, investment recovery, and customer cooperation for environmental concern. We provide empirical evidence to account for the influence of KMC on successful adoption and implementation of internal and external-GSCM practice and subsequently positive effects on economic and environmental performance from internal-GSCM practice and further it is found positive economic performance but negatively affects the economic performance from external-GSCM practice. We provide managerial insights into the necessity of KMC and GSCM practice adoption for achieving sustainable competitive advantages. This study lays the foundation for the manager, practitioner, and environmental management research to highlight the importance of GSCM practice to improve sustainability in their operations. The limitation of the study can be said that this study focused only on the specific textile industry in Bangladesh. Future studies can add more countries to cross-comparison with more leading textile processing countries such as China, India, Pakistan, Vietnam, etc. This study is the simple direct effect of KMC on GSCM practices adoption and subsequently impact on firm performance. Future research could be added mediation effect of GSCM practices and the moderation effect of some variables such as institutional pressure, environmental dynamism, and innovation, etc.

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**Appendix-I:**

|  |  |
| --- | --- |
| **1. Knowledge Management Capability (KMC)** | **Source** |
| **Please assess to what extent of knowledge management capability of your organization influence to adopt Green Supply Chain Management Practices.** *(1=Strongly Disagree, 2=Disagree, 3=Neither Agree nor Disagree 4= Agree, 5=Strongly Agree)* | (Attia et al. 2018) |
| KMC1 | Our organization has clear rules for formatting or categorizing its product Knowledge. |
| KMC2 | Our organization has clear rules for formatting or categorizing process knowledge. |
| KMC3 | Our organization members use technology to cooperate with other persons inside the organization. |
| KMC4 | Our organization structure facilitates the discovery of new knowledge |
| KMC5 | Our organization structure facilitates the creation of new knowledge. |
| KMC6 | Our organization facilitates knowledge exchange across functional boundaries. |
| KMC7 | Our organization members are encouraged to interact with other groups. |
| KMC8 | Our organization members can communicate well not only with their department members but also with other department members. |

|  |  |
| --- | --- |
| **2. Green Supply Chain Management (GSCM) Practice**  | **Source** |
| **Rate the extent to which your firm engages in the following practices.***(1=Strongly Disagree, 2=Disagree, 3=Neither Agree nor Disagree 4= Agree, 5=Strongly Agree)* | **(Zhu et al. 2007b)** |
| **Internal environmental management (IEM)** |
| IEM1 | Senior managers in our firm are committed to green supply chain management |
| IEM2 | Mid-level managers in our firm support for green supply chain management |
| IEM3 | Our firm emphasizes cross-functional cooperation for environmental improvements. |
| IEM4 | Our firm has total quality environmental management. |
| IEM5 | Our firm emphasizes environmental compliance and auditing programs. |
| IEM6 | Our firm has Environmental Management Systems. |
| **Eco-Design (ED)** |
| ED1 | Our firm emphasizes design of products for reduced consumption of material/energy. |
| ED2 | Our firm emphasizes design of products for reuse, recycle, recovery of material, component parts. |
| ED3 | Our firm emphasizes design of products to avoid or reduce use of hazardous products and/or their manufacturing process. |
| **Green Purchasing (GP)**  |
| GP1 | Our firm emphasizes purchasing eco-friendly materials |
| GP2 | Our firm cooperates with suppliers for environmental objectives. |
| GP3 | Our firm evaluates suppliers based on specific environmental criteria |
| **Cooperation with Customer (CWC)**  |
| CWC1 | Our firm cooperates with customers for eco-design. |
| CWC2 | Our firm cooperates with customers for cleaner production. |
| CWC3 | Our firm cooperates with customers for green packaging. |
| **Investment Recovery (IR)** |
| IR1 | Our firm emphasizes investment recovery (sale) of excess inventories/materials. |
| IR2 | Our firm emphasizes sale of scrap and used materials. |
| IR3 | Our firm emphasizes sale of excess capital equipment. |

|  |  |
| --- | --- |
| **3. Firm Performance**  | **Source** |
| Rate the extent to which your firm has made an improvement in its performance based on green supply chain practice adoption**.** *(1=Strongly Disagree, 2=Disagree, 3=Neither Agree nor Disagree 4= Agree, 5=Strongly Agree)* | (Paulraj 2011) |
| **Environmental Performance (ENP)** |
| EP1 | Reduction of air emission. |
| EP2 | Reduction of waste (water and/or solid). |
| EP3 | Decrease of consumption for hazardous/ harmful/ toxic materials. |
| EP4 | Decrease of frequency for environmental accidents. |
| EP5 | Increase in energy saved due to conservation and efficiency improvement |
| **Economic Performance (ECP)** |
| ECP1 | Decrease of cost for materials purchasing |
| ECP2 | Decrease of cost for energy consumption |
| ECP3 | Decrease of fee for waste treatment |
| ECP4 | Decrease of fee for waste discharge |
| ECP5 | Decrease of fine for environmental accidents. |