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Assessing green supply chain practices in Bangladesh using fuzzy importance and performance approach

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ABSTRACT

The contribution of this study is to apply a hybrid method to identify critical green supply chain practices (GSCP) based on importance and performance level under linguistic preferences. The leather industry in Bangladesh is facing acute pressure to minimize environmental pollution. Proper assessment of GSCP ensure effective implementation and thereby helping the industry face environmental challenges. However, there is lack of methods available for the assessment of GSCP concerning their importance and performance attributes under linguistic preferences. This study uses fuzzy set theory to handle fuzziness of human perceptions since the GSCP attributes usually expressed in linguistic preferences. Then, fuzzy importance and performance analysis (FIPA) approach was applied to identify GSCP importance and performance levels. Moreover, FIPA matrix was plotted to determine the critical GSCP as enablers of environmental performance enhancement. Additionally, a comprehensive measurement structure is also absent that requires the inclusion of supply chain partners as aspects. The objective is to assess GSCP based on importance and performance level. The study reveals that supplier and manufacturer viewpoints are the most critical aspects. Furthermore, designing for recycling water and minimizing waste during manufacturing, participation in an ISO 14001 environmental certification system, selection of suitable suppliers based on environmental criteria are the critical GSCP attributes. The managerial implications also are presented. The study presents certain limitations and thus proposes future studies.

1. Introduction

The leather industry has been relocated from the developed world to the developing world primarily of being the cause of environmental vulnerability (Karn and Harada, 2001). Accordingly, this industry has been established in Bangladesh due to having indigenous raw materials in plenty. Although each year the industry earns a considerable amount of foreign currencies through exports (EPB, 2016); it is facing acute pressure in the form of government regulations due to environmental degradation (Arias-Barreiro et al., 2010; Institute, 2013). Because of the government regulation the industry could not expand much despite its huge economic potential. The industry could easily excel in earning more revenue if the environmental issues were properly addressed and remedied. In addition to the government regulations, the industry is facing additional environmental pressures from environmentally conscious customers, as well as domestic and international environmental groups. Hence, the industry urgently needs to take care of the environmental issues. Tseng et al. (2014) highlight that manufacturers can overcome environmental regulatory pressure by integrating environmental concerns into their supply chain practices. The integration of environmental concerns into supply chain practices is referred to as green supply chain practices (GSCP) (Sarkis et al., 2011). Thus, the adoption of GSCP can improve the environmental performance and thereby make the industry more sustainable. However, the lack of GSCP assessment method in the literature has made it difficult for practitioners to monitor and implement GSCP in the leather industry. Prior to such assessment, there is a need to develop a set of measures to properly assess and implement GSCP in the leather industry.

In the literature, Tseng (2009) presents that the integration of environmental concerns within supply chain management has emerged as a separate and growing discipline. Govindan et al. (2015a) presented GSCP as a hands-on solution to operations managers to achieve competitive advantages and improve their environmental performance. Rao and Holt (2005) concluded that GSCP achieves an efficiency and synergy effect among partner firms with the aim of improving environmental performance, saving costs and minimizing waste. The GSCP acts

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as a proactive measure when facing environmental pressure from national and international agencies by effectively meeting the environmental goals. The objective of the study is to assess GSCP in the leather industry of Bangladesh and identify the critical GSCP attributes for implementation. The question is, what is the proper method to address GSCP?

Previous studies have proposed various methods in assessing GSCP. For example, Tseng and Chiu, (2013) assessed GSCP in a printed circuit board manufacturer in Taiwan using fuzzy-grey relational analysis to select the best environment-friendly suppliers from among the alternatives. Rostamzadeh et al. (2015) employed a fuzzy VIKOR method to evaluate GSCP of a laptop manufacturer in Malaysia to identify the best partners who are concerned about the environment and to rank the important criteria based on preferences. Wu et al. (2015) evaluated GSCP in the Vietnamese automobile manufacturing industry using fuzzy DEMATEL to explore the effect of criteria within GSCP. In addition, Kusi-Sarpong et al. (2016) applied fuzzy-DEMATEL and an Analytical Network Process (ANP) to identify the perceived impact of GSCP on organizationally sustainable performance. However, prior studies are unable to identify the current state of GSCP implementation based on their importance and performance level. Because, it is not clear to what extent the leather industry is practicing GSCP. Thus, an appropriate method is essential to understand the current state of implementation. Moreover, there is a need to identify the critical GSCP for performance enhancement. The industry is currently under pressure to improve its environmental performance. Martilla and James (1977) developed importance and performance analysis (IPA) approach as an assessment tool. IPA is a useful technique to evaluate the attributes based on two-dimensional aspects such as importance and performance. Prior studies evaluate GSCP based on either its performance level or importance level. Thus, a proper assessment method should consider both the dimensions of each GSCP attribute. Therefore, this study applies IPA approach to understand GSCP status-quo properly based on importance and performance levels.

Regarding the measure structure, previous studies suggest that assessment requires set of multiple GSCP attributes. However, there is a lack of studies that concentrate and organized the attributes according to the viewpoints of supply chain partners such as suppliers, customers, logistics service, and manufacturers. Literature suggests that there is a need to develop the GSCP measurement structure based on the viewpoint of supply chain partners (Tseng et al., 2017). Therefore, this study developed a set of GSCP attributes as measurement structure based on four aspects such as suppliers, customers, logistics service providers, and manufacturers.

GSCP attributes typically express in a qualitative manner which requires human subjective perceptions. Subjective perceptions or linguistic descriptions sometimes reflect fuzzy human judgment. However, traditional IPA is based on human subjective perceptions which result in uncertainty. There is a need to address the limitation of uncertainties tainted with human subjective perceptions. Therefore, this study applies fuzzy set theory (Zadeh, 1965) to minimize the uncertainty of human subjective preferences. Finally, the current study employs fuzzy importance and performance analysis (FIPA) to assess GSCP in the leather industry. The applied FIPA hybrid method is useful in collecting and analyzing the data under uncertainties. For instance, Tseng and Bui (2017) had used FIPA to conduct performance and importance levels of qualitative information in the textile industry. Additionally, Chen (2016) applied FIPA technique to identify the critical attributes in the in Asia's cruise tourism industry. The application of the FIPA technique in assessing GSCP is scarce in the existing literature. The study questions are as follows:

- What are the GSCP attributes in this study?
- What is the current GSCP importance and performance level?
- How effective is the FIPA approach for identifying critical GSCP for environmental performance enhancement?

The contributions of this study to the existing literature are threefold. First, this study has developed a novel measure for evaluating GSCP in the leather industry. Second, the proposed FIPA technique in the assessment of GSCP is new. Thus, this study contributes to the existing literature from the methodological aspect. Third, the data from emerging countries also add value to existing knowledge. Moreover, there is lack of scientific study on GSCP from Bangladeshi context (Malviya and Kant, 2015). Therefore, the current study contributes to the literature from an emerging country context. The managerial contributions of this study are twofold. Firstly, this study provides managers with an understanding of how to evaluate GSCP in the leather industry and identify the critical GSCP for performance enhancement. Secondly, this study helps managers to face the challenges from environmentally-conscious buyers and to comply with the environmental regulations by implementing critical GSCP.

The rest of the paper is structured as follows: Section 2 begins with the concepts of GSCP and theoretical background. Section 3, discusses the method used in this study while the results of the study are presented in Section 4. The theoretical and managerial implications are discussed in Section 5. The study is finalized with the conclusion, limitations and direction for future research in Section 6.

2. Theoretical background

This section presents the green supply chain concept and GSCP to understand the debates from prior studies. The sub-sections discuss the proposed measures and assessing method.

2.1. Green supply chain (GSC)

The practice of a GSC among operations managers is gaining popularity, especially those who are pursuing environmental performance within their operations. GSC management refers to environmental management including sharing of information and knowledge with a mutual willingness among customers, suppliers, and logistics service providers to improve environmental performance (Tseng et al., 2016). In the literature different authors defined GSC management in different fashions (Ahi and Searcy, 2013). However, the definitions use several common terms (Sarkis et al., 2011) such as supply chain environmental management, green purchasing and procurement, green logistics and environmental logistics, sustainable supply network management, etc. The GSC network encompasses the suppliers to the manufacturer then to customers, and finally closes the loop (reverse logistics) via the logistics service provider with the help of the customer (Zhu et al. (2008); (Tseng et al., 2017). Suppliers are part of the firms' upstream integration and play a significant role in GSC. Conversely, customers are the part of the downstream integration who can collaborate with the firms to protect the environment. Additionally, the logistics service is another partner who works between upstream and downstream and plays a vital role in minimizing the environmental impact through reverse logistics. Finally, the manufacturer is the key partner in the GSC who not only takes care of the environmental impact but also collaborates with customers, suppliers, and logistics service providers to minimize the negative environmental impact.

Several studies have concluded upon the importance of the GSC to minimize environmental regulatory pressure, to handle environmentally conscious customers and community pressure, and to achieve competitiveness (Tseng and Chiu, 2013; Tseng et al., 2018; Zhu et al., 2005). Savita et al. (2016) and Eltayeb et al. (2011), studying ISO14001 certified manufacturing firms in Malaysia, found that GSC management practices significantly improve environmental performance. Rao and Holt (2005), studying the GSC management practices among the organizations in South East Asia, conclude that GSC management not only improves environmental performance but also leads to competitiveness and economic performance. Zhu and Sarkis (2004) conducted empirical research among Chinese manufacturing firms and

conclude that GSC management practices are strong predictors of the firms' environmental and economic performance. Since the leather industry is currently suffering environmental pollution problems, studies on GSC management are essential to offer a practical solution to improve the environmental performance for the industry.

2.2. GSCP

Supply chain covers a broad range of activities such as transmitting information, materials, and goods from suppliers to consumers, as well as the transformation of raw materials (Handfield and Nichols, 1999). The Supply Chain Council (2007) defines supply chain management as the process that integrates suppliers, manufacturers and customers to coordinate activities from buying raw materials to manufacturing, warehousing, inventory tracking, managing order entry and managing distribution channels. The GSC management practices refer to the process of integrating environmental concerns into supply chain activities (Zhu and Sarkis, 2004). Many studies referring to GSCP can be found in the literature (Islam et al., 2017). However, previous studies did neither include nor focused the GSCP according to the viewpoint of suppliers, customers, manufacturers, and logistics service providers. Therefore, there has been a vital vacuity in the literature of GSCP in studying the practices from the outlook of the associated supply chain partners which is critically important in understanding the GSCP comprehensively (Tseng et al., 2017).

Tseng et al. (2015) argue that GSCP includes interrelationships among suppliers to reduce hazardous materials. Rao and Holt (2005) identified GSCP that consist of reverse logistics, collaboration with suppliers and customers, product recovery and reuse of used products, green design, and green purchasing. In an empirical setting, Rao and Holt (2005) found that GSCP is a strong predictor of economic performance and competitiveness. Zhu and Sarkis (2004) conducted empirical research in China to find the relationship between GSCP and environmental performance. The findings of their study reveal that several GSCP including internal management support, cooperation with customers and suppliers, investment recovery and eco-design have positive relationship with environmental performance. Kusi-Sarpong et al. (2016), in assessing GSCP in the mining industry of Ghana, found that strategic supplier-collaborations and lean initiatives have positive relationship with the sustainable objectives of the firm. Additionally, Stephan and Robert (2006) assessed environmental collaboration and monitoring with suppliers and customers as GSCP, and found that technological integration is necessary to collaborate with customers and suppliers in order to effectively minimize environmental impact. Thus, GSCP are diverse as well as industry-specific and, hence, are implemented through various practices and initiatives (Rao and Holt, 2005; Srivastava, 2007). Nevertheless, a new set of measures is required to address the skills and capabilities of the leather industry.

Proactive GSCP allows organizations not only to gain improved environmental performance but also to achieve long-term economic benefits such as sustainable competitive advantage and market share (Youn et al., 2013). Similarly, Rao and Holt (2005) conclude that adoption of different eco-friendly initiatives in the supply chain leads to an integrated green supply chain, which ultimately leads to competitiveness and economic efficiency. Tseng et al. (2013b), by employing a hybrid methodology to evaluate green innovation practices and performance, found that different greening aspects such as managerial, process, product and technology lead to improved internal efficiency and reduction of emissions and waste. Additionally, Wu et al. (2015), in investigating the impact of GSCP in the automobile industry, conclude that recycling and recovering practices are critical criteria in influencing economic performance. Govindan et al. (2015a) assessed the relationship between GSCP and performance, concluding that several practices such as green purchasing, internal management support, and ISO 14001 certification are critical for performance enhancement. Thus, proper implementation of GSCP is necessary to improve firms' environmental and economic performance. While proper implementation requires the identification of important practices, there is, however, a lack of studies related to the identification of importance and performance aspects of GSCP.

To summarize, assessing GSCP comprehensively is the first action towards successful implementation. To this end, Identifying the level of practices and their importance, and the performance aspects can lead to a - comprehensive understanding of GSCP (Kusi-Sarpong et al., 2016). This study aims to gain a better understanding of GSCP through capturing linguistic preferences from respondents in the leather industry of Bangladesh.

2.3. Proposed method

In the literature, many prior studies evaluate the relationship between GSCP practices and performance while others present the selection methods of partners based on GSCP (Tseng et al., 2015; Rostamzadeh et al., 2015). Tseng et al. (2015) applied fuzzy Delphi method to identify the competitive determinants in electronic industry in Taiwan. Rostamzadeh et al. (2015) applied fuzzy VIKOR method to select the best eco-friendly supplier from among alternatives. Additionally, Zhu and Sarkis (2004) studied the relationship between GSCP and environmental performance among firms who already adopted GSCP. However, there is still lack of clarity how to assess the implementation level of GSCP. For example, the studies between the relationship of GSCP and environmental performance are unable to answer the question of what is the current implementation level of GSCP. Since it is not clear whether the leather industry adopted GSCP or not it is invalid to link their practices with environmental performance. The leather industry urgently needs a solution to improve the environmental performance.

Martilla and James (1977) introduced importance and performance analysis (IPA) technique as an assessment tool which considers attributes' two-dimensional aspects such as importance and performance. Most of the prior assessment tool consider either attributes importance level or performance level of GSCP. There is a need to consider both attributes importance and performance level in order to evaluate comprehensively (Martilla and James, 1977). The application of IPA in the literature is many (Boley et al., 2017; Horng and Lin 2013; Chen, 2016). For example, Boley et al. (2017) used the IPA technique to identify the performance and importance levels of sustainable initiatives taken by firms in the tourism industry. However, the application of IPA technique is relatively scarce in the GSC literature. Thus, this study proposes the IPA technique to identify the critical GSCP attributes based on importance and performance level.

Moreover, previous studies have ignored the uncertainty concerning human subjective preferences since the traditional IPA technique is based on human subjective preferences which are uncertain (Zadeh, 1965). GSCP attributes quite often address subjective human preferences in reality. Human subjective preferences sometimes involve vagueness or uncertainty. Thus, the current study integrates fuzzy set theory to deal with this limitation. Zadeh (1965) initially developed the concept of fuzzy set theory to minimize the vagueness of qualitative information or human perceptions about attributes (Tseng and Chiu, 2013). The fuzzy set theory works based on the membership function. Then, the qualitative data is transformed into a crisp value based on the degree of membership function. Thus, the integration of fuzzy set theory with traditional IPA results in FIPA. The application of FIPA is useful to identify essential attributes under uncertainty that managers can focus on for improvement of environmental performance. For example, Tseng and Bui (2017) used the FIPA method to determine key attributes in industrial symbiosis within the industry. Moreover, Chung et al. (2016) use FIPA to evaluate suppliers' performance and importance levels and suggest suppliers work on priority improvements. However, there is a lack of studies in assessing GSCP using a FIPA approach. Thus, this study employs FIPA approach for assessing GSCP

under uncertainty.

Briefly, the proposed method assists manufacturing firms in assessing GSCP in the industry. This study explores the measurement attributes and identifies importance and performance levels of those practices using subjective human preferences. The FIPA method is becoming popular and has been tested in the past as an established method helping managers to solve real-life problems. Moreover, this approach can transform human linguistic perceptions into a measurable scale using fuzzy set theory. The FIPA method has the advantage of prescribing managers specifically where they need to pay more attention by identifying critical GSCP. Hence, this study can assist manufacturing firms to build their competitive advantages by ensuring proper implementation of GSCP in the industry.

2.4. Proposed measures

Since there are few prior studies in the leather industry in assessing GSCP, thus, there are few prior measures available to adopt as a framework. Moreover, resource-based view theory suggests that each industry is different from another regarding its resources and capabilities. Since GSCM capabilities are complex bundles of individual skills, employee capabilities, assets and accumulated knowledge (Zhu and Sarkis, 2004), a new set of measures is necessary that addresses these skills, capabilities, assets, knowledge, etc., to evaluate the performance of GSCP in this industry.

Assessment of green practices is a challenging task and should be undertaken on a continuous basis. Organizations need to monitor internal and external activities to ensure proper implementation of GSCP. Proper implementation of GSCP ensures increased market share and economic benefit by eliminating environmental pollution aspects (Tan et al., 1998). This study contributes to the existing literature by integrating 34 GSCP attributes based on the literature and industry experts for the leather industry. Evaluating GSCP requires a diverse set of attributes. However, there is a need to organize these attributes according to the viewpoints of suppliers, customers, logistics service providers and manufacturers (Tseng et al., 2017).

Regarding the viewpoint of suppliers, Tseng (2011) presents that the (C1) selection of a suitable green supplier by considering the environmental criteria is essential for the sustainable development of firms. Additionally, Enarsson (1998) proposes the monitoring of suppliers' products, processes, transportation and international management to make sure they are (C2) not using hazardous or dangerous elements in their product, (C3) they are saving energy and minimizing waste, (C4) using environmentally friendly transportation and (C5) have an environmental goal and mission in their management. Additionally, organizations need to consider carbon emission as an important element while considering GSCP and thereby they need to design a carbon management framework to minimize this aspect. (Lee, 2011). Hsu et al. (2013) resulted that the supply chain contributes to around 80% of carbon emissions. Thereby, companies are trying to minimize carbon emissions to increase their market share and minimize the threat of climate change (Lee, 2011). Thus, Dwyer et al. (2009) argue that firms should engage their suppliers as part of carbon emission control and set up (C6) carbon reduction targets to manage suppliers' carbon emissions. Moreover, firms' (C7) collaboration with suppliers to build programs to reduce or eliminate waste, (C8) share environmental management techniques and knowledge with suppliers and (C9) monitor environmental compliance status and practices of suppliers' operations are also considered green practices in prior studies (Tseng et al., 2014; Govindan et al., 2015a,b,c).

Collaboration with the customers for enhancing better environmental performance emerged as another critical GSCP (Zhao et al., 2018). Zhu et al. (2017) emphasized that firms should focus on effective customer relationships to improve firms' environmental and economic performance through GSCP. Organizations can build cooperative tasks to minimize their environmental impact in the supply chain process by (C10) collaboration with the customer to develop environmental management solutions (Eltayeb et al., 2011; Vachon and Klassen, 2007). The customer can play a critical role in the reverse logistics because manufacturers can take back unused items, packages or leftovers from the customer after the useful life of the product to minimize the environmental hazard. Thus, the mere initiative from the manufacturer is not possible without the active participation from the customers. Therefore, (C11) collaborating with customers to take back materials and packaging (C12) working with customers to change product specifications (Azevedo et al., 2011) (C13) supplying customers with regular voluntary information about environmental management (Tseng et al., 2015) and (C14) cooperation with customers for eco-design (Rostamzadeh et al. (2015) are considered important criteria.

As far the as the viewpoint of logistics service providers is concerned, effective logistics systems are critical for the leather industry. Thus, the industry needs to ensure a (C15) proper logistics integration with the operations to minimize environmental impact through delivery equipment on time (Wiengarten et al., 2014). Additionally, an effective logistics system can efficiently handle reverse logistics. Typically, in logistics, items are flowing from manufacturers to either customers or suppliers whereas in reverse logistics items are being returned to manufacturers from customers. More comprehensively, reverse logistics refers to the collection of the company's end of life items or discarded items including sorting and inspecting followed by recycling, reuse, remanufacturing and disposal of items (Büyüközkan and Çifçi, 2012; Govindan et al., 2015c). Efficient reverse logistics systems are essential for GSCP because they protect the environment by collecting unused items which may eventually turn into waste. Some unused items might have a salvage value or remaining value and, thus, may not become a total waste. Reverse logistics focuses on the (C16) recovery of the company's end-of-life items into the forward supply chain to make sure obsolete items are being used or replaced thereby maximizing the value of the returning items (Rao and Holt, 2005). Additionally, González-Benito and González-Benito (2006) and Murphy and Poist (2000) emphasize that environmentally-friendly logistics services are another green initiative because of their significant impact on the environment. The literature reveals that the transportation sector contributes to greenhouse gas and carbon dioxide emission (CO_2) by 15% and 23% respectively. Another study reveals a 45% growth trend in CO_2 emissions from 1990 to 2007 and further predicts that it would continue at a rate of 40% until 2030 (Salimifard et al. (2012). Therefore, firms must pay attention to (C17) community, employee health, and safety concerns while concentrating on transportation and (C18) using environmentally-friendly fuels such as low sulfur content and liquid natural gas (Karia and Asaari, 2016) as part of their GSCP.

Regarding the role of the manufacturer, many studies have examined the relationship between GSCP and the internal management commitment of manufacturers. Internal management commitment involves the organization's top management initiatives in the supply chain to protect the environment (Olugu et al., 2011; Rao and Holt, 2005) such as (C19) availability of mission statements on protecting the environment, (C20) availability of environmental award systems (C21) and environmental compliance monitoring and auditing (Olugu et al., 2011). Additionally, a few studies focus on environmental management systems (EMS) or environmental certification. The International Organization for Standardization (ISO) 14001 is one of the most popular EMS systems (Nawrocka et al., 2009; Robèrt, 2000). The objective of the ISO 14001 series is to improve environmental performance by imposing a strict set of rules such as compliance of legal and ecological regulations, documentation of internal environmental audits, etc. (ISO, 2010; Prajogo et al., 2012). Hence, (C22) the participation in ISO 14001 environmental certification systematically reduces the negative environmental impact, reduces waste and resource consumption and improves environmental performance (Azevedo et al., 2011; Govindan et al., 2015a).

Tseng and Bui (2017) mentioned industrial symbiosis as part of the

green initiative. Firms can gain a competitive advantage in industrial symbiosis through eco-innovation. Iindustrial symbiosis can play a vital role in the leather industry because of limited facilities in the industry. Here, one firm can (C23) share others' waste treatment plants and can (C24) use waste from other firms to achieve a win-win status in supply-chain networks (Tseng and Bui, 2017). Industrial symbiosis is all about saving money and reducing consumption by working together to maximize the outputs that can be generated from resources. However, there are a few cases in the leather industry where one company uses other firms' waste to produce poultry feed by recycling their toxic tanning waste. The hazardous chemicals then transfer to chickens through consumption of toxic feed. The contaminated chicken further transfers this toxic chemical to humans through consumption. Several studies reveal that there is a potential risk to consumers through consumption of contaminated chicken (Bari et al., 2015; Hossain et al., 2007; Islam et al., 2014; Mazumder et al., 2013). Therefore, recycling of waste does not necessarily testify to a green initiative in all cases. So, another attribute should be used here to ensure the green manufacturing process throughout its product life cycle such as (C25) recycling waste to produce environmentally-friendly products.

(Walker et al., 2014)emphasize the eco-friendly manufacturing process throughout the entire lifecycle of the product in order to minimize the adverse environmental effects such as (C26) does not use hazardous or restricted materials, (C27) internal recycling of waste, generate minimum waste and reduce environmental pollution. Additionally, (Fiksel and Fiksel, 1996; Tseng et al., 2013a) suggest consideration of design issues along with a green manufacturing process. The design of green manufacturing involves the management of environmental risk, prevention of pollution aspects, ensuring product safety, and recycling waste (Lin, 2013). Green design ensures (C28) design for reduction of environmentally hazardous substances during manufacturing and (C29) design for recycling water and minimizing waste during manufacturing (Büyüközkan and Çifçi, 2012; Jabbour and Jabbour, 2009). Design for remanufacturing and design for recycling are critical for sustainable production in today's green economy (Tseng et al., 2013a).

Hsu et al. (2016) indicate that green packaging includes the consideration of cost, performance, convenience, compliance, and environmental impact. Moreover, it should address all packaging issues, including size, shape, and materials. So, the green packaging must be (C30) environmentally friendly packaging (eco-packaging) and (C31) returnable, reused, and recyclable packaging (Hsu et al., 2016; Wu and Dunn, 1995). Moreover, evaluating GSCP requires the inclusion of diverse practices such as green information technology which contributes to improving environmental performance (Koo and Chung, 2014; Sarkis et al., 2013). Therefore, (C32) the use of energy efficient hardware and data center and (C33) use of eco-labeling of IT products can be considered as GSCP (Kusi-Sarpong et al., 2016). The literature suggests that the use of green IT helps firms to minimize the negative environmental impact (Bhadauria et al., 2014) and overall energy consumption of the industry (Bilal et al., 2014). Moreover, some studies emphasize (C34) buying environmentally-friendly raw materials aims to ensure the firm's eco-friendly goals (Carter and Ellram, 1998; Saghiri and Hill, 2014).

Finally, assessing the green practices in the leather industry requires multidimensional attributes. In doing so, this study has reviewed existing literature and also consulted with industry experts. In summary, this study proposes 34 attributes for evaluating GSCP in the leather industry.

3. Method

3.1. Industry background

The leather industry in Bangladesh has grown due to its plentiful source of indigenous raw materials. In addition to the regular flow of a domestic supply of raw materials throughout the year, Eid-Ul-Adha, a special spiritual day for Muslim, provides abundant raw material to the leather industry. Because more than 134 million Muslims living in this country sacrifice cattle as spiritual festival. In the 2015-16 fiscal year the country was, internationally, one of the top 20 exporters of leather goods and, domestically, among the top five of the country's total exporters (EPB, 2016). However, the industry is currently facing enormous challenges from the government, community, and local and international environmental groups. The challenges include polluting water through releasing toxic waste into nearby rivers, lakes and drains; polluting the air through extremely nasty smells due to its untreated waste; leading to a health hazard for the community living around the industry due to air and water pollution (Arias-Barreiro et al., 2010; Institute, 2013; Roy, 2016) because, the operational process of the leather industry involves activities that use a lot of water and chemicals to convert raw hides into finished leather. Additionally, the unused parts that come with the raw hides including tails, flesh, fat, etc., also remain untreated which eventually pollute the environment. In summary, the industry needs a practical solution to face the challenges.

Different solutions have been proposed to improve the environmental performance of the industry. One of the solutions is the implementation of GSCP because the concept of GSC has emerged as part of improving the environmental performance of the firms. This study identifies the most important GSCP and their performance levels to understand the implementation state. To achieve this aim, the study consulted with experienced operational managers and professional experts. Thus, this study presents valuable insights for practitioners. A three-stage analytical process has been designed. First, a literature review and consultation with the experts was undertaken in order to design the preliminary study structure. Second, the fuzzy set theory was used to convert qualitative fuzzy human perceptions into quantitative crisp values. Third, the IPA method was employed to identify the critical GSCP as an enabler for improving environmental performance. This study contributes a practical solution to the problems the leather industry is currently facing.

3.2. Committee of experts

This study consulted three members committee of experts including academician, industry expert and consultant. These experts are working in their respective professions for more than ten years. Their role is to validate the questionnaire and examine the reliability of responses. The committee assigns weights to each response based on the reliability of the data. The weights ranges from 1 to 100. The committee gives importance to certain issues while assigning the weights such as age, size and reputation of the establishments, position and experience of the respondents etc. This local weight is then converted into global weight (Tseng and Bui, 2017). The global weights then integrated with the importance and performance perceptions to have more reliable data. This study calculated the global weights using the following formula:

Global weight = Individual local weight/sum of local weights

3.3. Fuzzy set theory

Conventional measurement tools are based on ordinal or cardinal scales. However, there is an ongoing debate concerning the score-based measurement scales. Critics have shown that scores do not necessarily represent human subjective preferences. They argue that respondents select the score by converting preferences into a numeric value which they calculate instantly in their memories. Thus, the transformation of subjective preferences into a quantitative value may not represent what they actually intended to express.

However, the qualitative expression of human subjective preferences is tainted with uncertainty. For example, the terms "excellent,"

Table 1
Proposed GSCP attributes.

SC view	Criteria	
Suppliers	C1	Selection of a suitable green supplier by considering the environmental criteria
	C2	Suppliers are not using hazardous or dangerous elements in their products
	C3	Suppliers are saving energy and minimizing waste
	C4	Suppliers are using environmentally-friendly transportation
	C5	Suppliers have an environmental goal and mission in their management
	C6	Suppliers have carbon reduction targets to control their carbon emissions
	C7	Collaboration with suppliers to build programs to reduce or eliminate waste
	C8	Share environmental management techniques and knowledge with suppliers
	C9	Monitor environmental compliance status and practices of supplier's operations
Customers	C10	Collaboration with customers to develop environmental management solutions
	C11	Collaborating with customers to take back materials and packaging
	C12	Working with customers to change product specifications
	C13	Supplying customers with regular voluntary information about environmental management
	C14	Cooperation with customers for eco-design
Logistics Providers	C15	Proper logistic integration with the operations to minimize environmental impact
	C16	Recovery of the company's end-of-life items into the forward supply chain
	C17	Community, employee health and safety concerns while under transportation
	C18	Using green fuels such as low sulfur content and alternative fuels such as liquid natural gas
Manufacturer	C19	Availability of mission statements on environmental protection
	C20	Availability of environmental award systems
	C21	Environmental compliance monitoring and auditing
	C22	The participation in ISO 14,001 environmental certification
	C23	Share others' waste treatment plants
	C24	Use of waste of other firms
	C25	Recycle waste to produce environmentally-friendly products
	C26	Does not use hazardous or restricted materials
	C27	Internal recycling of waste, generating minimum waste
	C28	Deign for reduction of environmentally-hazardous substances during manufacturing
	C29	Design for recycling water and minimizing waste during manufacturing
	C30	Environmentally friendly packaging (eco-packaging)
	C31	Returnable, reused, and recyclable packaging
	C32	Use of energy efficient hardware and data center
	C33	Use of eco-labeling of information technology (IT) hardware
	C34	Buying environmentally-friendly raw materials

C = Criteria.
SC view = Supply chain view.

"not good," "poor" expressed by humans contain vagueness or fuzziness. This fuzziness of human perceptions should be considered before making a decision otherwise, the result will be misinterpreted from its originality. To solve this weakness, this study uses fuzzy set theory. Zadeh (1965) is the pioneer who introduced the fuzzy set theory and later Bellman and Zadeh (1970) presented the decision-making approach in uncertainty. Fuzzy set theory converts qualitative into quantitative data based on membership functions. The membership function can take a form called triangular fuzzy number (TFN). TFN represents the range (upper, middle, lower) of values of the membership function. u represents the upper limit of the perception value, m represents the median value and l represents the lower limit of original perception value. Unlike the traditional Likert Scale, the application of TFN is widespread and can use linguistic variables that originally came from the human subjective perception. The linguistic scale that represents various levels of importance and performance aspects is presented in Table 2. The term "Extreme" represent most likely perception and its associated TFN is 0.75, 1.00, and 1.00 where 0.75 represent lower limit (l), 1.00 represents middle or most promising value (m) and 1.00 represents upper limit (u). Similarly, the term 'Equal' represents least likely perception and its associated TFN is 0.00, 0,00, and 0.25.

The experts (k) have to integrate the fuzzy weight $\bar{W}_{ji}^{k} = \left(l_{ij}^{k}, m_{ij}^{k}, u_{ij}^{k}\right)$ of the ith criteria, and the jth criteria influenced by the global weights given by the committee of experts to each respondent as parameters. The equations are below.

Normalization process:

$$w_{l_{ij}^{k}} = \left(\frac{l_{ji}^{k} - min\ l_{ji}^{k}}{\Delta_{min}^{max}}\right)$$

$$w_{m_{ij}^{k}} = \left(\frac{m_{ji}^{k} - min\ m_{ji}^{k}}{\Delta_{min}^{max}}\right) \text{where } \Delta_{min}^{max} = max\ u_{ji}^{k} - min\ l_{ji}^{k} \quad (1)$$

$$w_{u_{ij}^{k}} = \left(\frac{u_{ji}^{k} - min\ u_{ji}^{k}}{\Delta_{min}^{max}}\right)$$

Calculation of left (ls) and right (rs) normalized values:

$$w_{ls} = \frac{x}{(1 + w_{m_{ij}^{k}} - w_{l_{ij}^{k}})}$$

$$w_{rs} = \frac{x}{(1 + w_{u_{ij}^{k}} - w_{m_{ij}^{k}})} \quad (2)$$

Developing total normalized crisp value:

Table 2
TFN membership functions.

Linguistic Terms (Performance/Importance)	Linguistic values (l, m, u)
Extreme	(0.75, 1.00, 1.00)
Demonstrated	(0.50, 0.75, 1.00)
Strong	(0.25, 0.50, 0.75)
Moderate	(0.00, 0.25, 0.50)
Equal	(0.00, 0,00, 0.25)

Table 3
Expert weights to each respondent.

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Expert 8	Expert 9
Expert weights	0.100	0.107	0.100	0.107	0.120	0.113	0.120	0.120	0.113

$$z_{ji}^{k} = \frac{[w_{ls}(1-w_{ls}) + (w_{rs})^2]}{[1-w_{ls} + w_{rs}]} \quad (3)$$

Summation of crisp values.

The aggregate value of the k evaluators' subjective perception:

$$\overline{W}_{ji}^{k} = \frac{(\overline{w}_{ji}^{1} + \overline{w}_{ji}^{2} + \overline{w}_{ji}^{3} + \ldots \overline{w}_{ji}^{k})}{[1-w_{ls} + w_{rs}]} \quad (4)$$

3.4. Fuzzy IPA (FIPA)

The IPA proposes a two-dimensional matrix such as importance and performance resulting in a four quadrant matrix (Martilla and James (1977). Quadrant (I) represents a high level of importance and high performance attributes. Thus, it is recommended to keep up the good works. The items falling in this category are the source of its competitive advantage. Quadrant (II) represents a high level of performance attributes but low level of importance. Hence, these practices are possibly killing the resources (possible overkill). Therefore, the manufacturer should not invest further on these attributes due to its lower importance in current operating settings. Quadrant (III) represents the attributes of the lower level of importance and performance. This quadrant is the least focus area of the company. The weakness of this area can be taken into consideration after an emphasis on the improvement of Quadrant (IV). Finally, Quadrant (IV) represents the attributes which are of high importance, but their performance level is poor. Thus, managers should focus on heavy investment in this area to increase the performance level of the attributes. This quadrant is considered as the primary source of weakness of the firm because these are critical for competitiveness and prospects.

3.5. Integrating the importance and performance weights

The study adopted two types of weights ($w_i$is the importance weight and w_p is the performance weight) for the analysis. It is assumed that the importance and performance weights are equally important to the management. The calculation of the weights (w_c) can be done as follows:

$$w_c = (w_i + w_p)/2 \quad (5)$$

3.6. Proposed analytical steps

This study has undergone the following steps (Tseng and Bui, 2017):

1 Develop the measures based on a literature review, studying industrial background, and consulting with experts. This study has formed a three member committee including industry experts, academicians and consultant to verify the measures and responses obtained from experts.
2 Collect perceptions from operations managers and industry experts for importance and performance of attributes identified above in linguistic terms.
3 Develop triangular fuzzy number (TFN) to the perceptions.
4 Develop crisp values by converting fuzzy numbers, e.g., by defuzzification process. Initially, translate linguistic information into fuzzy linguistic scale. Then apply Eqs. (1)–(4) to obtain normalized crisp value.
5 Compute the crisp value of importance and performance by applying Eq. (5). Consider importance aspect as the horizontal axis and performance aspect as the vertical axis.
6 Finally, develop a plot for four quadrants using the mean values of importance and performance of attributes. The plot can be generated using SPSS and Excel. The attributes with most priority fall in Quadrant IV (Concentrate Here).

4. Results

The results section presents the data analysis process and the output. The first section introduces the process of defuzzification and the second section introduces the IPA plot.

4.1. Expert validity and weights

Table 1 presents the criteria used in this study. These criteria are the result of the extensive literature review. The expert committee initially assessed the validity of the criteria. Data were collected from nine experts who belong to the top and mid-level management of the firms. The respondents are experienced and well aware of supply chain management. The respondents expressed their perception in linguistic form. Table 2 presents various linguistic forms along with their triangular fuzzy numbers. The experts' committee evaluated the responses and applied weights to each respondent. Then their local weights were converted into global weights. Table 3 presents the weights.

4.2. Reliability analysis of the questionnaire

The study collected the data through a questionnaire. The questionnaire was translated into the local language and verified by the expert committee as part of increased reliability. The committee ensured that the questionnaire was easy to communicate with experts working at the operations level in the leather industry. After collecting the data from industry experts, the study used SPSS software to undertake reliability analysis. The study conducted reliability analysis for both the performance and importance questionnaire. Each section contained 34 items. According to the scale, overall reliability reaches Cronbach's alpha 0.883 for performance items and 0.933 for importance items. The recommended threshold for scale reliability is an alpha value higher than 0.70 (Nunnally and Bernstein, 1994; Hair et al., 2010). Thus, the study confirms the minimum threshold of alpha value. Therefore, the questionnaire used in this study indicates good reliability criteria.

4.3. Fuzzy IPA

Tables 4 and 5 present the application of TFN to all viewpoints and attributes respectively. These TFN values are the results of integration of experts' weights with all respondents. TFN values were then defuzzified using the center of gravity method. The importance and performance weights in tables 4 and 5 presented the crisp values after defuzzification. By applying the Eqs. (1)– (5) the study found the importance and performance weights. The means of importance and performance weights of viewpoints are 0.779 and 0.533 respectively. Additionally, the mean values of importance and performance weights of criteria are 0. 697 and 0.441 respectively.

The positive results in the (I–P) column indicate that there remains room for enhancement in practices. The importance values in Table 4 are all greater than the performance values which indicates that there is

Table 4
Results of importance and performance weights of viewpoints.

	Importance-TFN			Performance-TFN			Importance	Performance	(I-P)
Viewpoints	l	m	u	l	m	u			
Vs 1	0.607	0.855	0.968	0.272	0.520	0.768	0.810	0.520	0.290
Vs 2	0.580	0.828	0.993	0.383	0.632	0.855	0.801	0.623	0.177
Vs 3	0.362	0.585	0.833	0.273	0.497	0.745	0.593	0.505	0.088
Vs 4	0.745	0.993	0.993	0.242	0.490	0.713	0.911	0.482	0.429
Mean							0.779	0.533	

Table 5
Importance and performance analysis of criteria.

	Importance-TFN			Performance-TFN			Importance weights	Performance weights	(I-P)
Criteria	l	m	u	l	m	u			
C1	0.608	0.858	1.000	0.188	0.380	0.630	0.822	0.399	0.423
C2	0.520	0.770	0.940	0.173	0.398	0.648	0.743	0.407	0.337
C3	0.305	0.555	0.805	0.102	0.325	0.575	0.555	0.334	0.221
C4	0.225	0.475	0.725	0.232	0.455	0.705	0.475	0.464	0.011
C5	0.537	0.787	0.948	0.243	0.493	0.717	0.757	0.484	0.273
C6	0.393	0.643	0.893	0.103	0.323	0.573	0.643	0.333	0.310
C7	0.398	0.648	0.872	0.080	0.302	0.552	0.639	0.311	0.328
C8	0.335	0.585	0.835	0.132	0.382	0.632	0.585	0.382	0.203
C9	0.393	0.643	0.893	0.210	0.373	0.598	0.643	0.394	0.249
C10	0.590	0.840	0.975	0.157	0.407	0.657	0.802	0.407	0.395
C11	0.447	0.697	0.922	0.185	0.435	0.660	0.688	0.427	0.262
C12	0.525	0.775	0.970	0.278	0.498	0.748	0.757	0.508	0.248
C13	0.423	0.648	0.898	0.193	0.417	0.667	0.657	0.426	0.231
C14	0.418	0.668	0.893	0.172	0.395	0.645	0.660	0.404	0.256
C15	0.453	0.703	0.923	0.167	0.417	0.667	0.693	0.417	0.277
C16	0.450	0.700	0.920	0.105	0.302	0.552	0.690	0.319	0.371
C17	0.470	0.720	0.943	0.417	0.667	0.892	0.711	0.658	0.053
C18	0.433	0.683	0.857	0.500	0.723	0.920	0.658	0.714	(0.057)
C19	0.642	0.892	1.000	0.273	0.523	0.773	0.844	0.523	0.321
C20	0.530	0.780	0.975	0.050	0.270	0.520	0.762	0.280	0.482
C21	0.722	0.972	1.000	0.213	0.463	0.688	0.898	0.455	0.443
C22	0.750	1.000	1.000	0.177	0.400	0.600	0.917	0.392	0.524
C23	0.277	0.527	0.777	0.080	0.248	0.498	0.527	0.276	0.251
C24	0.193	0.418	0.668	0.050	0.242	0.492	0.427	0.261	0.166
C25	0.638	0.888	1.000	0.183	0.405	0.630	0.842	0.406	0.436
C26	0.695	0.945	1.000	0.370	0.595	0.845	0.880	0.603	0.277
C27	0.563	0.813	0.948	0.075	0.297	0.547	0.775	0.306	0.469
C28	0.533	0.783	0.975	0.357	0.607	0.857	0.764	0.607	0.157
C29	0.698	0.948	1.000	0.190	0.440	0.690	0.882	0.440	0.442
C30	0.527	0.777	0.972	0.250	0.475	0.725	0.758	0.483	0.275
C31	0.442	0.692	0.917	0.112	0.362	0.612	0.683	0.362	0.322
C32	0.080	0.305	0.555	0.365	0.588	0.838	0.313	0.597	(0.284)
C33	0.183	0.433	0.658	0.257	0.482	0.732	0.425	0.490	(0.065)
C34	0.607	0.857	1.000	0.473	0.723	0.973	0.821	0.723	0.098
Mean							0.697	0.441	

room for improvement in the aspects of all viewpoints. Similarly, Table 5 shows that the importance values of all but three attributes indicates positive results which mean that the performance level is not satisfactory and there is a need to improve the performance level.

Based on the defuzzified values of importance and performance the study then developed the IPA plot for viewpoints and criteria in Fig. 1 in 3 respectively. Fig. 1 shows that the customer viewpoint (V3) stands at quadrant I which is the high importance and performance quadrant area. Quadrant I recommends to keep up the good work. Viewpoints of suppliers (V1) and manufacturers (V4) falls within Quadrant IV. Quadrant IV suggests concentrating here, meaning that suppliers and manufacturer viewpoints show a low level of performance but with high importance. Finally, the viewpoint of logistics falls within Quadrant III which is the low priority area. The importance level and performance level of logistics viewpoint are low. On the other hand, none of the items fall within quadrant II which is the possible overkill area.

Fig. 2 shows a broad range of variations of attributes. This figure represents the IPA plot of all attributes measuring the level of GSCP in

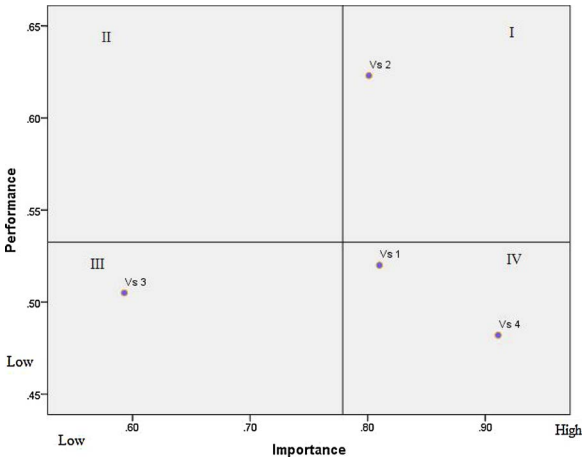

Fig. 1. IPA plot for viewpoints.

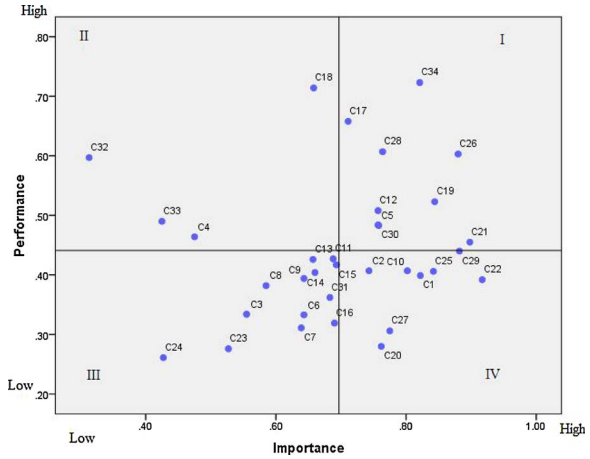

Fig. 2. IPA plot for attributes.

the leather industry. This figure is explained according to quadrants.

First, Quadrant I, called “keep up the good work”, in other words the high importance and high-performance quadrant. There are nine practices falling within this quadrant such as (C5)suppliers have an environmental goal and mission in their management, (C12) working with customers to change product specifications, (C17) community, employee health and safety concerns while under transportation, (C19) availability of mission statements on environmental protection, (C21) environmental compliance monitoring and auditing, (C26) does not use hazardous or restricted materials, (C28) design for reduction of environmentally hazardous substances during manufacturing, (C30) environmentally-friendly (eco-packaging) packaging, and (C34) buying environmentally-friendly raw materials. Out of nine practices, only one practice is related to the viewpoint of suppliers while each relates to both customer and logistics viewpoints and the remaining practices belong to the manufacturer point of view.

Second, Quadrant II, called “possible overkill”, in other words the low importance and high-performance quadrant. Only a few attributes (four items) fall within this quadrant such as (C4) suppliers are using environmentally-friendly transportation, (C18) using green fuels such as low sulfur content and alternative fuels such as liquid natural gas, (C32) use of energy efficient hardware and data center and (C33) use of eco-labeling of information technology (IT) hardware.

Third, Quadrant III, called “low priority”, in other words the low importance and low-performance quadrant. Twelve items falls in the third quadrant such as (C3) suppliers are saving energy and minimize waste, (C6) suppliers have carbon reduction targets to control their carbon emissions, (C7) collaboration with suppliers to build programs to reduce or eliminate waste, (C8) share environmental management techniques and knowledge with suppliers, (C9) monitor environmental compliance status and practices of supplier’s operations, (C11) collaborating with customers to take back materials and packaging, (C13) supplying customers with regular voluntary information about environmental management, (C14) cooperation with customer for eco-design, (C15) proper logistic integration with the operations to minimize environmental impact, (C16) recovery of the company’s end-of-life items into the forward supply chain, (C23) share others’ waste treatment plants, (C24) use of waste of other firms, and (C31) returnable, reused, and recyclable packaging.

Finally, Quadrant IV, called “concentrate here”, in other words the high importance and low-performance quadrant. Eight items fall within this quadrant such as (C1) selection of a suitable green supplier by considering the environmental criteria, (C2) suppliers are not using hazardous or dangerous elements in their products, (C10) collaboration with customer to develop environmental management solutions, (C20) availability of environmental award systems, (C22) the participation in ISO 14001 environmental certification, (C25) recycle waste to produce environmentally-friendly products, (C27) internal recycling of waste, generate minimum waste, and (C29) design for recycling water and minimizing waste during manufacturing.

In short, the study uses means value as the separation point to create the IPA matrix. According to this matrix, it is clear that firms are performing less because out of 34 practices only eight practices fall within the first quadrant. Quadrant IV contains another eight critical practices which suggests firms are not performing well even though their importance levels are high. Quadrant IV suggests that firms should deploy their resources to increase the level of performance of these attributes. In other words, the objective of this matrix is to move on to quadrant I which is a high importance and high-performance area. Conversely, most numbers of attributes falling in Quadrant III indicate that their performance and importance level is low. However, Quadrant II encompasses only four items suggesting that their performance level is good but their importance level is low. Thus, Quadrant II suggests that firms are killing their resources by undertaking unimportant practices. It suggests managers to redesign and refocus their strategies with the aim of investing less in unimportant practices.

5. Implications

This study has presented the theoretical and managerial implications. The first sub-session presented theoretical contributions followed by managerial implications in the second subsection.

5.1. Theoretical contributions

This study presented the GSCP measures by emphasizing that GSCP should be viewed from the supply chain partners including customers, suppliers, logistics service providers, and manufacturers. Additionally, this study highlighted that these viewpoints could be measured based on importance and performance levels. This study contributed to the existing literature by presenting four viewpoints with compliance to the recent literature demand (Tseng et al., 2017). Therefore, the study presented a comprehensive measurement tool for evaluating GSCP. As per the results of this study, suppliers (V2) and manufacturers (V4) viewpoints show low levels of performance despite their high importance level.

Suppliers (V2) are one of the important partners in the supply chain in any industry. Resource dependence theory (RDT) (Pfeffer and Salancik, 1978) argues that firms are dependent on external resources. External resources originate from firms’ external environment. The environment hosts other organizations to a considerable extent and these organizations possess different types of resources (Barney, 1991). Therefore, the resources required by a certain organization are often in the hands of other organizations. According to RDT firms should collaborate with each other to achieve higher performance and gain a competitive advantage in the long run instead of aiming for short run benefits. Additionally, the RDT theory suggests that members’ firms of the supply chain are dependent upon resources supplied by others. Thus, firms can ensure growth for each of the partners, thereby creating a win-win situation within the industry (Pfeffer and Salancik, 1978). The most important assumption of RDT is that firms cannot be fully self-sufficient unless they are able to harness each other’s resources because there are certain resources which are critical to firms’ success and these resources might be sourced from outside partners (Heide, 1994). There is a growing body of literature related to the evaluation and selection of suppliers using environmental criteria (Govindan et al., 2015b). For example, Tseng and Chiu (2013) argue that selecting a suitable supplier from among alternatives is a key strategic decision to reduce the environmental negative impact on supply chain management for manufacturing firms while presenting a model for selecting the best suppliers based on environmental criteria.

Additionally, stakeholder theory (Freeman, 2010) also suggests firms produce externalities that affect internal and external parties or

stakeholders. Consequently, the stakeholders put pressure on the firms to reduce the negative impact of those externalities. Suppliers, as a stakeholder, involved in the supply chain process, especially, when environmental concern is integrated with the supply chain (De Brito et al., 2008). The literature suggests that suppliers have an influence on different GSCP such as closing the loop for greening the supply chain (Sarkis et al., 2010), green purchasing (Maignan and Mcalister, 2003), minimizing waste (Dwyer et al., 2009), and life cycle analysis in the supply chain (Matos and Hall, 2007). Therefore, this study also highlighted suppliers as an important viewpoint.

The manufacturer (V4) as a focal firm or partner in the supply chain entity plays a significant role in greening the supply chain. This study has revealed that the role of the manufacturer should be viewed with high importance to minimize environmental impact in the supply chain because the manufacturers play a critical role in managing relationships with upstream and downstream partners in the supply chain. The manufacturers need to collaborate with suppliers (upstream) and customers (downstream) to minimize the environmental impact of their operations. Top management views of the manufacturer are vital for improving the environmental performance of the firms, especially, by adopting mission statements claiming to nurture environmental concern (Rao and Holt, 2005), and internal design for minimizing waste and water (Jabbour and Jabbour, 2009).

In summary, this study fulfils the literature gap by presenting a measurement structure for evaluating GSCP in the leather industry. This is the first study to develop the measures according to four viewpoints. Additionally, this study contributes to the literature by proposing the FIPA method to evaluate implementation levels of GSCP. The FIPA method can identify which viewpoints are critical and their corresponding performance level.

5.2. Managerial implications

This study presented many insights for managers in different ways. The attributes that fall within Quadrant IV need improvement because these practices are important but their performance level is low. For example, (C1) selection of a suitable green supplier by considering the environmental criteria is one of the attributes that fall within quadrant IV. The study has revealed that companies are not performing well in choosing green suppliers even though its importance level is high. Thus, managers need to choose eco-friendly suppliers as part of improving environmental performance. Additionally, the study found that it is important to monitor suppliers' operations to make sure that (C2) suppliers are not using hazardous or dangerous elements in their products. Local and international reports claim that the leather industry is releasing toxic waste into neighboring rivers. Consequently, the industry is under pressure from community and different environmental groups. Therefore, managers need to make sure suppliers in the upstream supply chain are not mixing dangerous elements in raw materials.

In the downstream element of the supply chain, customers are exerting pressure to minimize the environmental impact of the leather industry. Managers need to take a strategic decision to engage customers in minimizing the pollution aspects of the industry. The results have revealed that (C10) collaboration with the customer to develop environmental management solutions shows a high importance level but poor performance. Firms can collaborate with the customers through the application of information and communication technology (ICT). Through ICT managers can integrate customers to share environmental knowledge to minimize the negative impact of the industry.

Different local and international organizations offer environmental certifications. These award systems testify the improved environmental performance. The firms can face the environmental challenges by gaining environmental award systems. Thus, managers need to ensure they have (C20) the availability of environmental award systems. Additionally, the study has also revealed that (C22) the participation in ISO 14001 environmental certification shows high importance but poor performance. The ISO 14001 is an internationally recognized environmental certification system given to the firms whose environmental performance is high. Eligible criteria for gaining the ceretificate includes having a standard environmental management system (EMS) as prescribed by ISO. Specifically, commitment to prevent pollution aspects, commitment to comply with legal requirements related to environmental protection, creating awareness within and outside the firm, etc. This certificate represents prestige, status and enhances the environmental image of the firm. None of the firms in the leather industry holding an ISO 14001 certificate, consequently indicating the industry is under pressure as a whole. Thus, managers need to take part in ISO 14001 and all other environmental award systems to face the environmental pressure.

Many local and international reports highlight that several firms within the leather industry recycle toxic waste to produce by-products, e.g., poultry feed, which contains toxic chemicals. This toxic by-product further causes human health hazards, including cancer, through the consumption of toxic chicken, placing further pressure upon the leather industry. Managers need to make sure that firms produce by-products by recycling toxic-free waste. Thus, producing an environmentally-friendly by-product is better than recycling toxic waste. This study has revealed that (C25) recycling waste to produce environmentally-friendly products has high importance even though its performance is poor. Therefore, managers have room to take care of this attribute to face the environmental challenge.

Additionally, the study found that (C27) the internal recycling of waste generates minimum waste has a high importance level with poor performance level. Several reports present that the leather industry is releasing untreated waste to neighboring lakes, canals, and rivers. These waters not only create water pollution but also spread nasty smells that annoy the community and even cause a health hazard to many (Paul et al., 2013). Hence, the community also puts pressure on the industry to minimize pollution aspects. This IPA matrix suggests managers should be more responsible to the community and their employees' health while operating their business.

Moreover, (C29) design for recycling water and minimizing waste during manufacturing is very high, but its performance is poor. The leather industry is frequently being reported in the media because of water pollution through untreated water. It was reported that the industry collectively dumps around 22,000 cubic litres of toxic waste every day, including cancer-causing hexavalent chromium, into the Buriganga, Dhaka's main river and water supply (Institute, 2013). Thus, managers can improve the performance of this attributes to minimize the environmental pressure.

In short, the industry is currently facing challenges to combat pollution aspects. The industry can face such challenges by adopting GSCP. However, this study has revealed that the performance levels of several critical GSCP are poor. Specially, the GSCP falling quardrant IV need to be addressed immediately with high priority to improve the environmental performance.

6. Concluding remarks

The leather industry is facing challenges from local and international stakeholders to improve environmental performance. The literature suggests GSCP improves environmental performance by integrating environmental concerns into supply chain activities. Thus, GSCP could be a solution for this industry to face the challenges. Since there is a gap in the existing literature in proposing GSCP for the leather industry, this study was worth undertaking to close the gap. It is necessary to evaluate GSCP properly with appropriate methodology to ensure proper implementation of GSCP. Hence, the study developed a set of measures with 34 attributes by encompassing upstream and downstream GSC partners. Additionally, this study collected data using

original linguistic perceptions to address the limitations of the traditional numerical scale-based data collection method. However, linguistic perceptions involve uncertainty. The study used fuzzy set theory to integrate linguistic variables into quantitative form under uncertainty. Moreover, the study used the expert committee's weights as parameter to increase reliability of the data. Finally, this study plotted an importance-performance matrix using the FIPA approach to identify critical GSCP. Therefore, the methodology used in this study provided reliable results.

The study has revealed that suppliers and manufactures' viewpoints are the most important aspects in GSCP. Regarding practices, participation in ISO 14001 and other environmental award systems, choosing green suppliers based on environmental criteria, collaboration with customers to improve environmental performance, designing for recycling water and minimizing waste during manufacturing, etc., are revealed as being the most critical GSCP for this industry. However, the study results have revealed that the performance aspects are not satisfactory. Thus, it identified the primary source of weakness of the industry. Therefore, firms need to overcome this weakness by focusing more on those practices whose importance level is high, but performance level is low. Moreover, firms should redeploy resources from those practices whose performance level is high, but the importance level is low. Therefore, the IPA matrix is an easy tool for managers in evaluating the GSCP in reality.

The study provides theoretical and managerial contributions. Theoretical contributions involves the application of a hybrid approach in assessing GSCP. Moreover, the study developed a new set of measurement to fulfill the existing literature gap. The managerial implications include that managers should place more emphasis on suppliers and manufacturers' viewpoints to enhance environmental performance. Additionally, managers need more attention on certain critical GSCP whose importance levels are high but performance level is low.

This study has limitations. First, the study developed the measures structure based on partners involved in the supply chain process. This study is a first attempt to encompass all the attributes of GSCP based on viewpoints of supply chain partners. The attributes within the same viewpoint might have collinearity problems. Since the study did not employ any correlation or regressional studies this problem did not lead to a biased result. However, there is a need to study factor analysis using a larger sample size to improve the validity of the viewpoints as constructs. Additonally, the study compiled the criteria based on existing literature. Hence the view points and attributes used in this study might not be enough to capture all the information. Therefore, future studies can further improve the attributes of viewpoints by adding or deleting attributes or items. Second, the study did not use a larger sample size to undertake this analysis. In contrast, the study collected data from several experts. The adoption of a larger sample size within this hybrid method is time consuming and needs a great deal of committee's patience. However, future studies can employ other methods to accommodate larger sample sizes. Third, the study has revealed the results based on the sample collected from Bangladesh. Future studies may employ this setting in other countries to overcome potential problems related to generalizability. Finally, there is a potentiality of providing a biased result if the experts are not well-familiar with the industry.

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References

Ahi, P., Searcy, C., 2013. A comparative literature analysis of definitions for green and sustainable supply chain management. J. Clean. Prod. 52, 329–341.
Arias-Barreiro, C., Nishizaki, H., Okubo, K., Aoyama, I., Mori, I., 2010. Ecotoxicological Characterization of Tannery Wastewater in Dhaka, Bangladesh.
Azevedo, S.G., Carvalho, H., Machado, V.C., 2011. The influence of green practices on supply chain performance: a case study approach. Transp. Res. E: Logist. Transp. Rev. 47 (6), 850–871.
Bari, M.L., Simol, H.A., Khandoker, N., Begum, R., Sultana, U.N., 2015. Potential human health risks of tannery waste-contaminated poultry feed. J. Health Pollut. 5 (9), 68–77.
Barney, J., 1991. Firm resources and sustained competitive advantage. J. Manage. 17 (1), 99–120.
Bellman, R.E., Zadeh, L.A., 1970. Decision-making in a fuzzy environment. Manag. Sci. 17 (4), B-141–B-164.
Bhadauria, V.S., Toms, L., Green Jr, K.W., Meacham, J., 2014. Do green information systems impact performance? Int. J. Prod. Qual. Manag. 13 (4), 377–394.
Bilal, K., Malik, S.U.R., Khalid, O., Hameed, A., Alvarez, E., Wijaysekara, V., Ali, M., 2014. A taxonomy and survey on green data center networks. Future Gener. Comput. Syst. 36, 189–208.
Boley, B.B., McGehee, N.G., Hammett, A.T., 2017. Importance-performance analysis (IPA) of sustainable tourism initiatives: the resident perspective. Tour. Manag. 58, 66–77.
Büyüközkan, G., Çifçi, G., 2012. A novel hybrid MCDM approach based on fuzzy DEMATEL, fuzzy ANP and fuzzy TOPSIS to evaluate green suppliers. Expert Syst. Appl. 39 (3), 3000–3011.
Carter, C.R., Ellram, L.M., 1998. Reverse logistics: a review of the literature and framework for future investigation. J. Bus. Logist. 19 (1), 85.
Chen, C.-A., 2016. How can taiwan create a niche in Asia's cruise tourism industry? Tour. Manag. 55, 173–183.
Chung, C.-C., Chao, L.-C., Lou, S.-J., 2016. The establishment of a green supplier selection and guidance mechanism with the ANP and IPA. Sustainability 8 (3), 259.
De Brito, M.P., Carbone, V., Blanquart, C.M., 2008. Towards a sustainable fashion retail supply chain in Europe: organisation and performance. Int. J. Prod. Econ. 114 (2), 534–553.
Dwyer, R., Lamond, D., Wittneben, B.B., Kiyar, D., 2009. Climate change basics for managers. Manag. Decis. 47 (7), 1122–1132.
Eltayeb, T.K., Zailani, S., Ramayah, T., 2011. Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: investigating the outcomes. Resour. Conserv. Recycl. 55 (5), 495–506.
Enarsson, L., 1998. Evaluation of suppliers: how to consider the environment. Int. J. Phys. Distrib. Logist. Manag. 28 (1), 5–17.
EPB, 2016. Export Promotion Bureau(EPB), Bangladesh. Statistic Data-2016-2017. Retrieved from http://epb.portal.gov.bd/site/files/51916ae6-a9a3-462e-a6bd-9ef074d835af/Statistic-Data-2016-2017.
Fiksel, J., Fiksel, J.R., 1996. Design for Environment: Creating Eco-Efficient Products and Processes. McGraw-Hill Professional Publishing.
Freeman, R.E., 2010. Strategic Management: A Stakeholder Approach. Cambridge University Press.
González-Benito, J., González-Benito, Ó., 2006. The role of stakeholder pressure and managerial values in the implementation of environmental logistics practices. Int. J. Prod. Res. 44 (7), 1353–1373.
Govindan, K., Khodaverdi, R., Vafadarnikjoo, A., 2015a. Intuitionistic fuzzy based DEMATEL method for developing green practices and performances in a green supply chain. Expert Syst. Appl. 42 (20), 7207–7220.
Govindan, K., Rajendran, S., Sarkis, J., Murugesan, P., 2015b. Multi criteria decision making approaches for green supplier evaluation and selection: a literature review. J. Clean. Prod. 98, 66–83.
Govindan, K., Soleimani, H., Kannan, D., 2015c. Reverse logistics and closed-loop supply chain: A comprehensive review to explore the future. Eur. J. Operat. Res. 240 (3), 603–626.
Hair, J.F., Anderson, R.E., Babin, B.J., Black, W.C., 2010. Multivariate Data Analysis: A Global Perspective, vol. 7 Pearson, Upper Saddle River, NJ.
Handfield, R.B., Nichols, E.L., 1999. Introduction to Supply Chain Management, vol. 183 Prentice Hall, Upper Saddle River, NJ.
Heide, J.B., 1994. Interorganizational governance in marketing channels. J. Mark. 71–85.
Horng, J.S., Lin, L., 2013. Training needs assessment in a hotel using 360 degree feedback to develop competency-based training programs. J. Hosp. Tour. Manag. 20, 61–67.
Hossain, A.M., Monir, T., Ul-Haque, A.R., Kazi, M.A.I., Islam, M.S., Elahi, S.F., 2007. Heavy metal concentration in tannery solid wastes used as poultry feed and the ecotoxicological consequences. Bangladesh J. Sci. Ind. Res. 42 (4), 397–416.
Hsu, C.-C., Tan, K.-C., Mohamad Zailani, S.H., 2016. Strategic orientations, sustainable supply chain initiatives, and reverse logistics: empirical evidence from an emerging market. Int. J. Operat. Prod. Manag. 36 (1), 86–110.
Institute, B., 2013. New Report Cites the World's Worst Polluted Places. Top Ten Toxic Threats in 2013: Cleanup, Progress, and Ongoing Challenges. Retrieved from http://www.worstpolluted.org/2013-press-release.html.
Islam, G.R., Khan, F.E., Hoque, M.M., Jolly, Y.N., 2014. Consumption of unsafe food in the adjacent area of Hazaribag tannery campus and Buriganga River embankments of Bangladesh: heavy metal contamination. Environ. Monit. Assess. 186 (11), 7233–7244.
Islam, M.S., Karia, N., Fauzi, F.B.A., Soliman, M., 2017. A review on green supply chain aspects and practices. Manag. Mark. 12 (1), 12–36.
ISO, 2010. The ISO Survey of Certifications 2009. International Organization for Standardization, Geneva.

Jabbour, A.B.L., Jabbour, C.J., 2009. Are supplier selection criteria going green? Case studies of companies in Brazil. Ind. Manag. Data Syst. 109 (4), 477–495.
Karia, N., Asaari, M.H.A.H., 2016. Transforming green logistics practice into benefits: a case of third-party logistics (3PLs) Kuala Lumpur. Malaysia Paper Presented at the International Conference on Industrial Engineering and Operations Management.
Karn, S.K., Harada, H., 2001. Surface water pollution in three urban territories of Nepal, India, and Bangladesh. Environ. Manage. 28 (4), 483–496.
Koo, C., Chung, N., 2014. Examining the eco-technological knowledge of smart green IT adoption behavior: a self-determination perspective. Technol. Forecast. Soc. Change 88, 140–155.
Kusi-Sarpong, S., Sarkis, J., Wang, X., 2016. Assessing green supply chain practices in the Ghanaian mining industry: a framework and evaluation. Int. J. Prod. Econ. 181 (November (Part B)), 325–341.
Lee, K.-H., 2011. Integrating carbon footprint into supply chain management: the case of Hyundai Motor Company (HMC) in the automobile industry. J. Clean. Prod. 19 (11), 1216–1223.
Lin, R.-J., 2013. Using fuzzy DEMATEL to evaluate the green supply chain management practices. J. Clean. Prod. 40, 32–39.
Maignan, I., Mcalister, D.T., 2003. Socially responsible organizational buying: how can stakeholders dictate purchasing policies? J. Macromark. 23 (2), 78–89.
Malviya, R.K., Kant, R., 2015. Green supply chain management (GSCM): a structured literature review and research implications. Benchmarking 22 (7), 1360–1394.
Martilla, J.A., James, J.C., 1977. Importance-performance analysis. J. Mark. 77–79.
Matos, S., Hall, J., 2007. Integrating sustainable development in the supply chain: the case of life cycle assessment in oil and gas and agricultural biotechnology. J. Oper. Manag. 25 (6), 1083–1102.
Mazumder, L., Hasan, S., Rahman, M., 2013. Hexavalent chromium in tannery solid waste based poultry feed in Bangladesh and its transfer to food chain. IOSR J. Environ. Sci., Toxicol. Food Technol. 3, 44–51.
Murphy, P.R., Poist, R.F., 2000. Green logistics strategies: an analysis of usage patterns. Transp. J. 5–16.
Nawrocka, D., Brorson, T., Lindhqvist, T., 2009. ISO 14001 in environmental supply chain practices. J. Clean. Prod. 17 (16), 1435–1443.
Nunnally, J.C., Bernstein, I., 1994. The assessment of reliability. Psychom. Theory 3 (1), 248–292.
Olugu, E.U., Wong, K.Y., Shaharoun, A.M., 2011. Development of key performance measures for the automobile green supply chain. Resour. Conserv. Recycl. 55 (6), 567–579.
Paul, H., Antunes, A.P.M., Covington, A.D., Evans, P., Phillips, P.S., 2013. Bangladeshi leather industry: an overview of recent sustainable developments. J. Soc. Leather Technol. Chem. 97 (1), 25–32.
Pfeffer, J., Salancik, G.R., 1978. The External Control of Organizations: A Resource Dependence Approach. Harper and Row Publishers, NY.
Prajogo, D., Tang, A.K., Lai, K.-h., 2012. Do firms get what they want from ISO 14001 adoption?: An Australian perspective. J. Clean. Prod. 33, 117–126.
Rao, P., Holt, D., 2005. Do green supply chains lead to competitiveness and economic performance? Int. J. Oper. Prod. Manag. 25 (9), 898–916.
Robèrt, K.-H., 2000. Tools and concepts for sustainable development, how do they relate to a general framework for sustainable development, and to each other? J. Clean. Prod. 8 (3), 243–254.
Rostamzadeh, R., Govindan, K., Esmaeili, A., Sabaghi, M., 2015. Application of fuzzy VIKOR for evaluation of green supply chain management practices. Ecol. Indic. 49, 188–203.
Roy, P., 2016. Hazaribagh reels from pollution. The Daily Star. Retrieved from http://www.thedailystar.net/frontpage/hazaribagh-reels-pollution-1285357.
Saghiri, S., Hill, A., 2014. Supplier relationship impacts on postponement strategies. Int. J. Prod. Res. 52 (7), 2134–2153.
Salimifard, K., Shahbandarzadeh, H., Raeesi, R., 2012. Green transportation and the role of operation research ICTTE. Paper Presented at the Int. Conf. Traffic Transp. Eng.
Sarkis, J., Gonzalez-Torre, P., Adenso-Diaz, B., 2010. Stakeholder pressure and the adoption of environmental practices: the mediating effect of training. J. Oper. Manag. 28 (2), 163–176.
Sarkis, J., Koo, C., Watson, R.T., 2013. Green information systems & technologies-this generation and beyond: introduction to the special issue. Inform. Syst. Front. 15 (5), 695.
Sarkis, J., Zhu, Q., Lai, K.-h, 2011. An organizational theoretic review of green supply chain management literature. Int. J. Prod. Econ. 130 (1), 1–15.
Savita, K., Dominic, P., Ramayah, T., 2016. The drivers, practices and outcomes of green supply chain management: insights from ISO14001 manufacturing firms in Malaysia. Int. J. Inform. Syst. Supply Chain Manag. 9 (2), 35–60.
Srivastava, S.K., 2007. Green supply-chain management: a state-of-the-art literature review. Int. J. Manag. Rev. 9 (1), 53–80.
Stephan, V., Robert, D.K., 2006. Extending green practices across the supply chain: the impact of upstream and downstream integration. Int. J. Operat. Prod. Manag. 26 (7), 795–821.
Tan, K.C., Kannan, V.R., Handfield, R.B., 1998. Supply chain management: supplier performance and firm performance. J. Supply Chain Manag. 34 (3), 2.
Tseng, M.-L., 2009. A causal and effect decision making model of service quality expectation using grey-fuzzy DEMATEL approach. Expert Syst. Appl. 36 (4), 7738–7748.
Tseng, M.-L., 2011. Green supply chain management with linguistic preferences and incomplete information. Appl. Soft Comput. 11 (8), 4894–4903.
Tseng, M.-L., Bui, T.-D., 2017. Identifying eco-innovation in industrial symbiosis under linguistic preferences: a novel hierarchical approach. J. Clean. Prod. 140 (January (Part 3)), 1376–1389.
Tseng, M.-L., Chiu, A.S., 2013. Evaluating firm's green supply chain management in linguistic preferences. J. Clean. Prod. 40, 22–31.
Tseng, M.-L., Chiu, A.S., Liang, D., 2017. Sustainable Consumption and Production in Business Decision-Making Models. Elsevier.
Tseng, M.-L., Lim, M., Wu, K.-J., Zhou, L., Bui, D.T.D., 2018. A novel approach for enhancing green supply chain management using converged interval-valued triangular fuzzy numbers-grey relation analysis. Resour. Conserv. Recycl. 128 (January), 122–133.
Tseng, M.-L., Lin, Y.-H., Tan, K., Chen, R.-H., Chen, Y.-H., 2014. Using TODIM to evaluate green supply chain practices under uncertainty. Appl. Math. Model. 38 (11), 2983–2995.
Tseng, M.-L., Tan, K., Chiu, A.S., 2015. Identifying the competitive determinants of firms' green supply chain capabilities under uncertainty. Clean Technol. Environ. Policy 1–16.
Tseng, M.-L., Tan, K., Chiu, A.S., 2016. Identifying the competitive determinants of firms' green supply chain capabilities under uncertainty. Clean. Technol. Environ. Policy 18 (5), 1247–1262.
Tseng, M.-L., Tan, R.R., Siriban-Manalang, A.B., 2013a. Sustainable consumption and production for Asia: sustainability through green design and practice. J. Clean. Prod. 40, 1–5.
Tseng, M.-L., Wang, R., Chiu, A.S., Geng, Y., Lin, Y.H., 2013b. Improving performance of green innovation practices under uncertainty. J. Clean. Prod. 40, 71–82.
Vachon, S., Klassen, R.D., 2007. Supply chain management and environmental technologies: the role of integration. Int. J. Prod. Res. 45 (2), 401–423.
Walker, H., Seuring, Stefan, Sarkis, P.J., Robert Klassen, P., Dam, L., Petkova, B., 2014. The impact of environmental supply chain sustainability programs on shareholder wealth. Int. J. Oper. Prod. Manag. 34 (5), 586–609.
Wiengarten, F., Pagell, M., Ahmed, M.U., Gimenez, C., 2014. Do a country's logistical capabilities moderate the external integration performance relationship? J. Oper. Manag. 32 (1), 51–63.
Wu, H.-J., Dunn, S.C., 1995. Environmentally responsible logistics systems. Int. J. Phys. Distrib. Logist. Manag. 25 (2), 20–38.
Wu, K.-J., Liao, C.-J., Tseng, M.-L., Chiu, A.S., 2015. Exploring decisive factors in green supply chain practices under uncertainty. Int. J. Prod. Econ. 159, 147–157.
Youn, S., Yang, M.G.M., Hong, P., Park, K., 2013. Strategic supply chain partnership, environmental supply chain management practices, and performance outcomes: an empirical study of Korean firms. J. Clean Prod. 56, 121–130.
Zadeh, L.A., 1965. Fuzzy sets. Inform. Control. 8 (3), 338–353.
Zhao, S., Zhu, Q., Cui, L., 2018. A decision-making model for remanufacturers: considering both consumers' environmental preference and the government subsidy policy. Resour. Conserv. Recycl. 128 (January), 176–186.
Zhu, Q., Feng, Y., Choi, S.-B., 2017. The role of customer relational governance in environmental and economic performance improvement through green supply chain management. J. Clean. Prod. 155 (July (Part 2)), 46–53.
Zhu, Q., Sarkis, J., 2004. Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. J. Oper. Manag. 22 (3), 265–289.
Zhu, Q., Sarkis, J., Geng, Y., 2005. Green supply chain management in China: pressures, practices and performance. Int. J. Oper. Prod. Manag. 25 (5), 449–468.
Zhu, Q., Sarkis, J., Lai, K.-h., 2008. Confirmation of a measurement model for green supply chain management practices implementation. Int. J. Prod. Econ. 111 (2), 261–273.