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Critical success factors for green supply chain management practices: An empirical study on data collected from food processing companies in Saudi Arabia

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The aim of this research paper is to explore critical success factors required to implement green supply chain management. A descriptive analytical method was used by which a questionnaire was developed based on literature review and suggestions of academics as well as experts. It was distributed to a sample of 360 managers selected from food processing companies in Saudi Arabia. Out of 360 questionnaires, 278 were returned valid with a response rate of 77%. Using the principal component analysis to reduce the available data along with the confirmatory factor analysis to confirm the structure of extracted factors as observed variables and latent variables, the results revealed 16 critical success factors loaded on the major dimensions, which were management-led drivers (awareness of GSCM effects, management commitment, organizational involvement, investment recovery practices, green purchasing, environment-oriented TQM, and green information systems), external drivers (government drivers, cost drivers, customer drivers, supplier drivers and energy consumption reduction) in addition to product processing and recycling factors (society drivers, product end-of-life processing, eco-designed product-sand ISO 14001 certification). Considering these results, it was concluded that green supply chain management implementation is an integrated process consisted of activities directed to produce ecofriendly products oriented by internal and external drivers. This paper contributes to the literature through conceptualizing green supply chain management as a construct which embodies three major elements, management, environment and product. Managers in food processing companies who seek to achieve a successful implementation of green supply management initiative should take these three dimensions into their account.

Key words: Green supply chain management implementation, critical success factors, food processing companies, Saudi Arabia.

INTRODUCTION

The Green Supply Chain Management (GSCM) provides the resource optimization and seen as a solution to solve environmental problems and consumption patterns within the whole supply chain. The GSCM implementation and

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performance assessment is relatively important for survival in an ever-increasingly competitive environment.

In Saudi Arabia more and more of the CEOs of the food processing companies are paying great deal of attention to the measurements and precautions of the environmental damage. This paper focuses on Critical Success Factors (CSF) for GSCM in food processing companies in Saudi Arabia.

The introduction of green supply chain management practices was a result of thinking of the negative effects of supply chain management (SCM) practices on the environment (Kaur et al., 2018). Researchers cited numerous reasons that call companies to adopt and implement GSCM practices. Examples of these reasons encompass social pressure to protect the environment (Mumtaz et al., 2018) and to improve the reputation of the company (Longoni and Cagliano, 2018) as well as government, market, supplier customer demands (Mathiyazhagan et al., 2018). In the literature, forces that spur companies on addressing green practices in their SCM were named drivers of GSCM (Dhull and Narwal, 2018). In the current study, these and other drivers were analyzed and prioritized under CSFs of GSCM implementation in line with prior research (Luthra et al., 2016; Rautet al., 2017; Mathiyazhagan et al., 2018; Prasad et al., 2018).

CSFs to GSCM implementation has been investigated in different industries in various countries such as manufacturing companies in India (Mumtaz et al., 2018), food retailing in Croatia (Petljak et al., 2018), automobile industry in China (Dou et al., 2018), cashew industry in West Africa (Agyemang et al., 2018), construction industry in India (Mathiyazhagan et al., 2018), and electrical and electronic companies in Taiwan (Hu and Hsu, 2010). Some studies in the same context were conducted to examine GSCM implementation using samples of companies in numerous countries (Wang et al., 2018).

Investigating CSFs of GSCM implementation, researchers identified several factors that play a significant part in the implementation of these practices. In general, CSFs that found out by researchers can be systematized as internal factors and external factors. Examples of critical internal success factors for GSCM implementation include management commitment (Agyemang et al., 2018), awareness of GSCM implementation implications (Irum et al., 2018). On the other hand, government, market, supplier, customer, and environment driversand institutional external pressures (Zhu et al., 2013) were hold as external factors of GSCM implementation (Mathiyazhagan et al., 2018).

Although many studies have confirmed the importance of GSCM implementation to address environmental problems and challenges, some companies remain unconvinced about the feasibility of GSCM implementation; other companies have many barriers that prevent them to engage in such implementation.

Therefore, the present study aims to identify and prioritize CSFs for implementing GSCM practices in order to help them and to encourage the adoption of GSCM practices that benefit companies in Saudi Arabia, communities and the entire world.

LITERATURE REVIEW

GSCM definition

GSCM has been taken by a number of authors as a process that integrates environment-directed thinking into SCM (Mumtaz et al., 2018). Some features of green practices can be found by reviewing the definitions quoted by the researchers. The definitions cited by Zhu and Sarkis (2004), for example, show that GSCM is a concept that makes allowance for SCM innovation in the milieu of the environment as well as a set of processes directed to reuse and recycling of materials, and a practice of environmental performance of the SCM.

Srivastava (2007) defined GSCM as an integration of environmental issues into SCM that echoed in products design, material purchasing, products manufacturing, products delivery to customers and management of products end of life. For Jayant and Tiwari (2018), GSCM is an organizational philosophy introduced to meet the standards of improving processes and products in conformity with environmental regulations that need companies to take part in diminishing environmental threats. Based on these definitions, GSCM was conceptualized as a construct covers three key aspects related to organizations' environmental responsibility, environmental performance as well as ecofriendly products.

Critical success factors of GSCM implementation in the literature

CSFs have been defined as variables that ensure the success of the company's efforts in the case of effective and sustainable management of these variables (Prasad et al., 2018). In order to identify these factors, a review of the literature was conducted. Research that approaches GSCM initiative particularized a set of factors that play an efficacious role in the success of GSCM implementation.

These factors can be categorized into two major sets: organizational internal factors and institutional external factors (Testa and Iraldo, 2010). Internal GSCM was defined as organization-founded practices in the context of achieving the environmental objectives, while external GSCM was defined as collaboration-based efforts with organization's stakeholders that are directed to enhance the environmental performance (Zhang et al., 2018).

Mumtaz et al. (2018) carried out a research in Pakistan to discern the impact of GSCM practices on organizational

performance. They consider four practices of GSCM. The first one includes practices that implemented by the company itself such as organizational support and known as internal practices. The second one is related to practices of external parties such as suppliers, customers and government. The third practice was investment recovery that concern excess and scarab materials and finally, eco-design, which is a practice of designing and production of environment friendly products.

Agyemang et al. (2018) studied barriers of GSCM implementation in cashew industry in West Africa and highlighted three major obstacles concerned lack of top-management commitment, integrated management information as well as traceability systems. On the basis of a sample encompassed subjects from Chinese companies, Zhu and Sarkis (2004) examined the effect of GSCM on organizational performance. They measured GSCM practices by internal factors of environment management, external factors of GSCM, eco-design, and investment recovery. The authors measured the internal environment management using indicators such as management commitment, cooperation for environmental improvements, and environment-oriented total quality management (TQM).

Three critical factors of GSCM were identified by Hu and Hsu (2010), which were product recycling, organizational involvement and life cycle management.An examples of GSCM external factors embraced by Hu and Hsu (2010) was supplier management. According to Hervani et al. (2005), cooperation at the organizational level as a whole is required for successful implementation of GSCM. In a multinational research covered 246 companies by Wang et al. (2018), cost and customer drivers were found to significantly affect GSCM implementation.

Irum et al. (2018) reviewed GSCM literature in Asian countries and concluded that GSCM practices are strongly associated with organizational performance as measured by economic, operational and environmental performance. It was understood from these results that companies' awareness of the effects of GSCM implementation encourages or prevents the intention to adopt GSCM initiative. Mathiyazhagan et al. (2018) explored the motivational factors that encourage Indian companies in construction sector to implement GSCM. Their results suggested that the most vital factors were government, market, supplier, customer, internal and environment motivations.

Diabat and Govindan (2010) analyzed the drivers of GSCM implementation in an industrial company in Southern India and identified 11 drivers of GSCM implementation; green design, government regulations, environment-directed collaboration between the company and its suppliers, energy consumption reduction, material recycling, environment-directed collaboration between the company and its customers, reverse logistics, ISO 14001 certification, suppliers' environmental management system, co-design and integration of quality environment management into planning and operational processes.

Investigating factors of sustainable SCM in manufacturing industry in China, Wu et al. (2018) specified the following factors: customer pressure, industry pressure, management awareness, and government participation. According to Pourjavad and Shahin (2018), green design and green manufacturing were the most important factors that have significant effects on company performance. Petljak et al. (2018) conceptualized GSCM in terms of three dimensions: green purchasing, green logistics and cooperation with suppliers. In a review of 365 papers on GSCM from 1996-2016 by Jayant and Tiwari (2018), the following GSCM related dimensions were discussed: green procurement, green design, green operations, green purchasing, green manufacturing, and green marketing. Table 1 summarizes CSFs of GSCM found in the literature. These twenty factors were tabulated as internal GSCM (1-10) and external GSCM (11-20).

METHODOLOGY

Research strategy

This study can be sorted out as an empirical paper conducted with the aim of exploring CSFs of GSCM implementation. According to Prasad et al. (2018), using empirical strategy in research refers to a procedure of conducting a research on the basis of a target sample, a questionnaire development, data gathering as well as data analysis via descriptive and factor analysis. In the current research paper, all these exigencies of empirical strategy were considered.

Questionnaire development

A questionnaire was developed based on CSFs that were identified in the literature review, which were 20 dimensions in addition to suggestions of a panel of experts consisted of ten academics and professional experts. Considering the suggestions, the initial version of the questionnaire was refined, and then the final version of the questionnaire was developed. Each dimension was assessed using two items. In total, the questionnaire contained 60 items. The questionnaire was anchored using five-point Likert scale, where 5 = very important, 4 = important, 3 = fairly important, 2 = slightly important, 1 = not important (Brown, 2011).

Research sample and data collection

The target sample of this research was selected from managers working at food processing companies in Saudi Arabia. It was consisted of 360 participants randomly selected from managers in top, middle and first-line management levels. Referring to sample-to-variable ratio (N:P), where N = 360 and P = 20, the sample of the current research was regarded suitable and representative since N:P was 18:1. According to Williams et al. (2010), a sample-to-variable ratio is accepted when N:P ranged between 15:1 and 20:1. Myers et al. (2011) indicated that an adequate sample-to-variable ratio that required for the application of factor analysis is N:P ≥ 10. In terms of data collection, a total of 360 questionnaires were distributed to research participants and 278 were returned valid with a response rate of 77%.

Table 1. Critical success factors of GSCM found in the literature.

Factors		Code	References
Internal factors: Factors that implemented by the organization itself.	Organizational involvement	GSCM1	Zhu and Sarkis (2004); Hervani et al. (2005); Srivastava (2007); Walker et al. (2008); Hu and Hsu, (2010); Diabat and Govindan (2010); Green Jr et al. (2012); Luthra et al. (2015); Mumtaz et al. (2018); Wu et al. (2018);Agyemang et al. (2018); Fang and Zhang (2018); Wang et al. (2018); Irum et al. (2018); Petljak et al. (2018); Dhull and Narwal (2018); Sellitto (2018); Zhang et al. (2018); Jayant and Tiwari (2018); Mathiyazhagan et al. (2018).
	Management commitment	GSCM2	
	Eco-designed products.	GSCM3	
	Investment recovery practices	GSCM4	
	Traceability systems.	GSCM5	
	Integrated management information.	GSCM6	
	Awareness of GSCM effects	GSCM7	
	Environment-oriented TQM	GSCM8	
	Green information systems	GSCM9	
	Green purchasing	GSCM10	
External factors: Factors related to external parties such as suppliers, customers, government and non-government institutions	Cost drivers	GSCM11	
	Customer drivers	GSCM12	
	Government drivers	GSCM13	
	Market drivers	GSCM14	
	Supplier drivers	GSCM15	
	ISO 14001 certification requirements	GSCM16	
	Society drivers	GSCM17	
	Energy consumption reduction	GSCM18	
	Product end-of-life processing	GSCM19	
	Reverse logistics	GSCM20	

Principal component analysis (PCA)

Factor analysis was used to extract factors on the basis of the principal component analysis (PCA). According to Fabrigar et al. (1999), since the goal of the researcher is data reduction, PCA is the most appropriate approach. In order to investigate factorability of these 20 factors for factor analysis, two tests were used: Kaiser-Meyer-Olkin (KMO) and Bartlett Test of Sphericity. An acceptable value of KMO should be no less than 0.5, in addition Bartlett Test of Sphericity should be significant (Williams et al., 2010). The results of KMO and Bartlett Test of Sphericity emphasized that all factors used in the initial version of the questionnaire were adequate for conducting factor analysis since the value of KMO equals 0.871, Bartlett's test of Sphericity was significant at 0.01 (P-value = 0.000) (Prasad et al., 2018).

Based on Eigenvalues greater than 1 with varimax rotation and suppressing small coefficients with absolute value below 0.4, it was clarified that factor loadings of 16 factors out of 20 were high since they were greater than 0.70 (Shevlin and Miles, 1998); therefore, 4 factors were deleted due to their low values of factor loadings, which were tractability systems (GSCM5), integrated management information (GSCM6), market drivers (GSCM14) and reverse logistics (GSCM20). In a similar study conducted by Hu and Hsu (2010) to explore CSFs for GSCM implementation in Taiwan, five factors out of 25 factors were removed due to their factor loadings that appeared less than 0.6.In Prasad et al. (2018)'s study carried out to analyze CSFs for sustainable SCM in India, 20 success factors were identified based on the literature and none of them were eliminated after conduction factor analysis. In their study on GSCM in manufacturing companies in China, Zhu et al. (2008) identified 21 factors of GSCM related to green purchasing, eco-design practices, internal environmental management, cooperation with customers, investment recovery and environmental requirements.

Adopting Hu and Hsu (2010)'s procedure, the remaining 16 factors of GSCM implementation were reanalyzed and loaded on three dimensions; 7 indicators were related to the first dimension (Management-led drivers), 5 indicators were associated with the second dimension (External forces) and 4 indicators were linked to the third dimension (product specifications and recycling). The results of factor analysis are illustrated in Table 2. These results expounded that the extracted 16 indicators were loaded on three factors. All factor loadings were higher than 0.7 (Shevlin and Miles, 1998) and significant at $P < 0.001$ (Carter and Jennings, 2002).

Reliability and validity

Reliability was measured based on composite reliability (CR) and Cronbach's alpha (α). Values of composite reliability were calculated based on lambda, lambda square, epsilon and AVE.Prasad et al., 2018 indicated that reliability should be assessed to ensure The results shown in Table 2 indicated adequate values of CRs since all values were greater than 0.7 (Fornell and Larcker, 1981) and values of and Cronbach's alpha greater than 0.7 (Hu and Hsu, 2010). Convergent validity as well was confirmed based on AVE values that were more than 0.50 (Walter et al., 2001).

Confirmatory factor analysis (CFA)

Based on the results of the principal factor analysis in which sixteen success factors for GSCM implementation were extracted, CFA was conducted using AMOS program in order to examine the goodness-of-fit indices of the proposed model. Five indices were used (Table 3): the chi-square / degree of freedom ration (χ^2/df), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the root mean square residual (RMR) and the comparative fir index (CFI). According to Hooper et al. (2008), one purpose of using the goodness-of-fit

Table 2. Results of factor analysis.

S/N	CSFs	1	2	3	AVE	CR (α)
1	Awareness of GSCM effects (GSCM7)	0.911				
2	Management commitment (GSCM2)	0.935				
3	Organizational involvement (GSCM1)	0.931				
4	Investment recovery practices (GSCM4)	0.951			0.511	0.960 (0.94)
5	Green purchasing (GSCM10)	0.949				
6	Environment-oriented TQM (GSCM8)	0.944				
7	Green information systems (GSCM9)	0.898				
8	Government drivers (GSCM13)		0.901			
9	Cost drivers (GSCM11)		0.888			
10	Customer drivers GSCM12		0.811		0.583	0.910 (0.89)
11	Supplier drivers (GSCM15)		0.797			
12	Energy consumption (GSCM18)		0.799			
13	Society drivers (GSCM17)			0.801		
14	Product end-of-life processing (GSCM19)			0.787	0.594	0.850 (0.84)
15	Eco-designed products (GSCM3)			0.743		
16	ISO 14001 certification (GSCM16)			0.731		
KMO = 0.871, Bartlett's test of Sphericity was significant at 0.01						

Table 3. Results of goodness of fit indices.

Indices	χ^2/df	GFI	AGFI	CFI	RMR
Values	1.94	0.922	0.913	0.919	0.04
Criteria	< 2.00	> 0.90	> 0.90	> 0.90	< 0.05

indices is to assess the measurement model. According to Huang and Cheng-Po Lai (2012), another aim of CFA is to identify the structure latent variables.

The results of these indices as can be seen in Table 3 indicated an adequate fit of the proposed model; χ^2/df was 1.94 which is less than 2 (Carr and Pearson, 2002), GFI was 0.921 which is greater than 0.90, AGFI was 0.913 which is more than 0.90, CFI was 0.919 which is higher than 0.90), and RMR was 0.04 which is less than 0.05 (Carter and Jennings, 2002; Chien and Shih, 2007).

RESULTS AND DISCUSSION

Figure 1 illustrates that CSFs for GSCM implementation were loaded on three latent factors: management-led drivers, external factors and product specifications and recycling factors. Management-led drivers have seven factors (GSCM1, GSCM2, GSCM4, GSCM7, GSCM8, GSCM9 and GSCM10), external factors were five factors (GSCM11, GSCM12, GSCM13, GSCM15 and GSCM18) and product specifications and recycling factors were four (GSCM3, GSCM16, GSCM17 and GSCM19).

In order to rate CSFs for GSCM; means, standard deviations and ranks of these factors were identified in Table 4. All factors were ranked moderate (fairly important) to very important (4.561). It was noted that management awareness of GSCM effects was the most important factor of GSCM implementation (M = 4.561, SD = 0.842) followed by government drivers (M = 4.522, SD = 0.841), energy consumption (M = 4.191, SD = 0.798), cost drivers (M = 4.114, SD = 0.812), supplier drivers (M = 4.017, SD = 0.745), green purchasing (M = 3.975, SD = 0.821),organizational involvement (M = 3.988, SD = 0.654), product end-of-life processing (M = 3.942, SD = 0.743),management commitment (M = 3.887, SD = 0.654),customer drivers (M = 3.878, SD = 0.657), green information systems (M = 3.858, SD = 0.696), eco-designed products (M = 3.821, SD = 0.696),investment recovery practices (M = 3.801, SD = 0.457), society drivers (M = 3.799, SD = 0.851), ISO 14001 certification (M = 3.795, SD = 0.884), and environment-oriented TQM (M = 3.787, SD = 0.585).

The above-mentioned results emerged in many previous studies as CSFs for GSCM implementation; awareness of GSCM effects (Huang et al., 2015; Malviya and Kant, 2015; Ahmed et al., 2018), management commitment (Luthra et al., 2014), organizational involvement (Muduliet al., 2013), investment recovery practices (Zhu et al., 2005), green purchasing (Zhu and Sarkis, 2004), environment-oriented TQM (Zhu and Sarkis, 2004) and green information systems (Agyemang et al., 2018). In

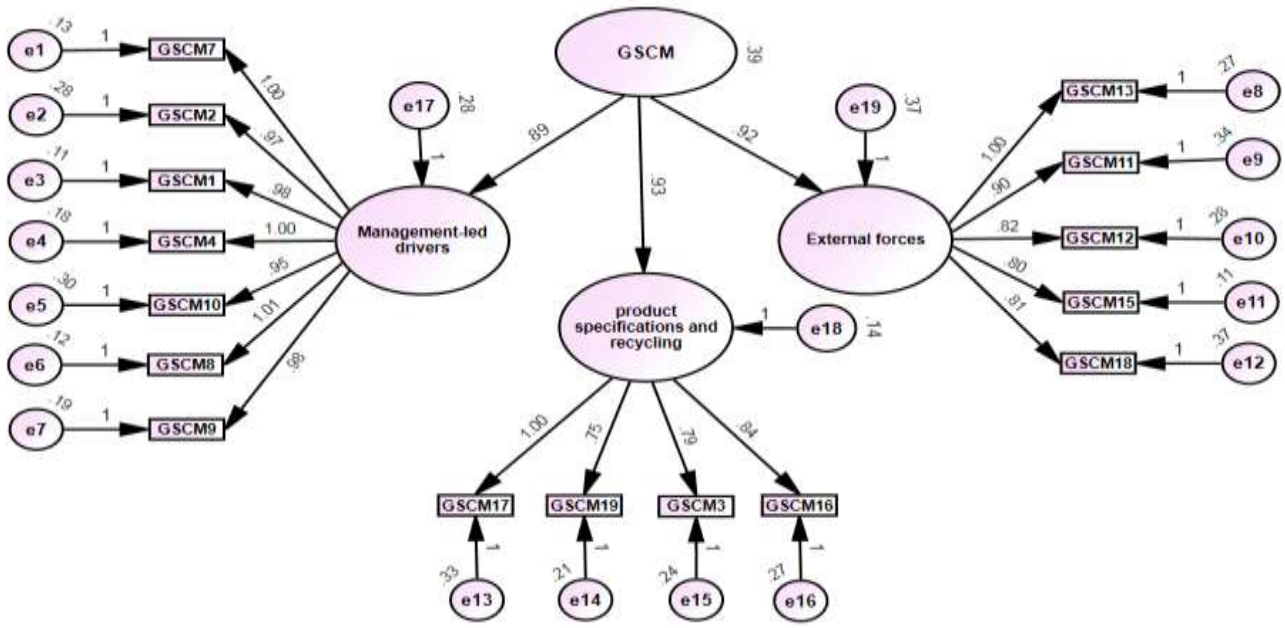

Figure 1. CFA results.

Table 4. Means, SD and ranks of CSFs for GSCM.

S/N	CSFs for GSCM	Means	SD	Ranks
Management-led drivers				
1.	Awareness of GSCM effects (GSCM7)	4.561	0.842	1
2.	Management commitment (GSCM2)	3.887	0.654	9
3.	Organizational involvement (GSCM1)	3.988	0.753	7
4.	Investment recovery practices (GSCM4)	3.801	0.457	13
5.	Green purchasing (GSCM10)	3.975	0.821	6
6.	Environment-oriented TQM (GSCM8)	3.787	0.585	16
7.	Green information systems (GSCM9)	3.858	0.696	11
External factors				
1.	Government drivers (GSCM13)	4.522	0.841	2
2.	Cost drivers (GSCM11)	4.114	0.812	4
3.	Customer drivers (GSCM12)	3.878	0.657	10
4.	Supplier drivers (GSCM15)	4.017	0.745	5
5.	Energy consumption (GSCM18)	4.191	0.798	3
Product specifications and recycling factors				
1.	Society drivers (GSCM17)	3.799	0.851	14
2.	Product end-of-life processing (GSCM19)	3.942	0.743	8
3.	Eco-designed products (GSCM3)	3.821	0.773	12
4.	ISO 14001 certification (GSCM16)	3.795	0.884	15

agreement with prior research, external factors include government drivers (Zhu et al., 2013), cost drivers (Wang et al., 2018), customer drivers (Mumtaz et al., 2018), supplier drivers (Hu and Hsu, 2010; Grimm et al., 2014) and energy consumption (Diabat and Govindan, 2010). Finally, product specifications and recycling factors contain society drivers (Zhang et al., 2018), product end-of-life processing (Srivastava, 2007), eco-designed products

(Zhu et al., 2008), and ISO 14001 certification (Diabat and Govindan, 2010).

CONCLUSION, POLICY IMPLICATIONS AND FUTURE WORK DIRECTIONS

Green supply chain management has been regarded as a pivotal cornerstone for organizations strive to make their performance better. As a result, this study was devoted to explore critical success factors required to flourish the management of their green supply chains. A mixed sample including academics, experts and managers in food processing companies in Saudi Arabia was used to investigate those factors.

The results pointed out that critical success factors of green supply chain management can be categorized into three dimensions, which are management-led drivers, external factors and product specifications and recycling. Management-led drivers include managers' awareness of GSCM effects on their organizations, which can be supported by management commitment and involvement, investment recovery, green purchasing as well as green information systems. Moreover, external success factors are related to stakeholders (e.g., government, customers and suppliers) as well as cost drivers and energy consumption. In terms of product specifications and recycling, four factors emerged; society drivers, product end-of-life processing, eco-designed products in addition to ISO 14001 certification. As a matter of fact, these results enrich the literature on critical success factors of green supply chain management. Practically, business managers are invited to pay more attention to these factors. They should enhance the awareness of GSCM effects through workshops, benchmarks and lessons learned from local and global enterprises. Their commitment is essential for GSCM to be successful. Additionally, managers should take organizational involvement into consideration. They are requested to adopt the concept of employee participation and empowerment either in decision making or problem solving.

Likewise, our results require managers to look upon the best practices of investment recovery that suit their business. Examples of these practices include suppliers' engagement in by-product recycling and waste reduction. Environmental management has become a key concept for organizations that seek sustainability through adopting greening. Therefore, it should be integrated into organizational operations and initiatives such as total quality management. There suggestions can be implanted by the aid of environmental information systems. By the same token, the results notified managers to observe the importance of external factors that exert influence ongreen supply chain management such as stakeholders, example, government, customers and suppliers via the introduction of related approaches like supplier efficiency and effectiveness, compliance with governmental regulations, customer satisfaction, cost reduction and energy utilization. Finally, managers are called upon to take an interest in other critical success factors related to products in terms of specifications and recycling. Yet, this study is limited to the industry in which the study was applied; food processing companies. Future studies might repeat the current study using data from other industries such as commercial malls. Our data were collected via across-sectional design; hence, future studies can use longitudinal design to catch a larger well as accurate picture of managers' perspectives on critical success factors of GSCM.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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