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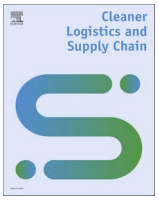

Analysis of internal factors of green supply chain management: An interpretive structural modeling approach

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ABSTRACT

The industrial revolution in the world brings environmental concern in industrial and production sector which puts more focuses on the green or sustainable supply chain practice. Green supply chain management is focused on ensuring sustainable production and customer order fulfillment through a series of activities. In this study internal factors of green supply chain management practice are analyzed, and theoretical model is developed according to the driving power and dependence power of the factor. This study is performed in interpretive structural modelling (ISM) approach where industry experts were consulted to include their industry experience in the evaluation process. The study has identified eight factors which can be controlled internally within the organization. Among these eight factors, commitment from the top management is the most crucial factor for its' highest driving power. The reverse logistic process stands on the next, and material storing and management on the upper level.

1. Introduction

Supply chain management has crossed the boundary of procurement, production, distribution activities, environmental concern is a major part of supply chain study. Along with economic benefit, human and environmental welfare policy is an integral part of today's supply chain management. Industrialization has taken the world to achieving new milestones every day. Global policy makers and agencies are emphasizing the environmental protection plan for making our planet more sustainable. That is why companies are implementing green policies in their supply chain management. This necessity comes not only from the regulation and policies, but companies are also now trying to be sustainable for both economic benefit and environmental welfare. Green Supply Chain Management" (GSCM) is relevant the search for greater environmental efficiency in supply chains, it is one of the most significant subjects in the modern research of operations management (Kannan Govindan, 2011). Green supply chain management can be illustrated as a combinational step of green purchasing; green procurement, green manufacturing, green logistics (Singh and Sharma, 2015). In today's business practice; the green supply chain has become the backbone of many organizations. Green supply chain strategies can reduce the amount of waste in the business and ensure resource maximization with minimal consumption. This brings efficiency in the business process and take organizations towards sustainability (Stentoft and Lüthje, 2012). The organizational development and industrial growth of this world come at a price. And the price we are paying in terms of climate change and its repercussions. The catastrophic impact of climate change is not limited to a particular region or country. For this reason; United Nations organized conventions like Paris Agreement, COP 26, COP 27 summit etc., with the purpose of bringing countries across the globe to a unified sustainable target to achieve and bolster the approach towards a greener and cleaner world. Bangladesh is one of the smallest but one of the most rapidly developing countries in the world and is also bound to the mandates of these global agreements. Being in the low-laying geographical portion, Bangladesh is always threatened by climate change. According to the Global Climate Risk Index 2021, Bangladesh is 7th most affected country by climate change. Almost USD 3.7 billion has been lost due to climate change in Bangladesh in the last 20 years (https://www.thedailystar.net/supplements/new-year-special-2016/paris-agreement-and-the-bangladesh-perspective-195028). However; the growth of the nation has not stopped. Day by day, economic activities are being bolstered with numerous capacities. Even with the

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epidemic, Bangladesh's economy has been expanding significantly. The nation has intensified its initiatives to generate new sectors, job opportunities, and a local workforce. However, the impending threat of climate change can potentially destroy it. Bangladesh, unfortunately, suffers the weight of the climate problem while being one of the countries with the lowest carbon emissions. The nation must emphasize green technologies and zero-carbon growth if it wants to expand its economy sustainably. Instead of making meaningless promises, there is a push to establish a workable "Climate Prosperity Plan." Bangladesh wants to generate one-third of its energy from renewable sources by 2030, providing 4.1 million (https://cpd.org.bd/publication/towards-a-low-carbon-and-climate-resilient-world-expectations-from-cop26/). While industrialized nations may easily transition to a more environmentally friendly economy without suffering economic consequences, it would be challenging for emerging nations to lessen their reliance on fossil fuels and quickly transition towards green supply chain management. What

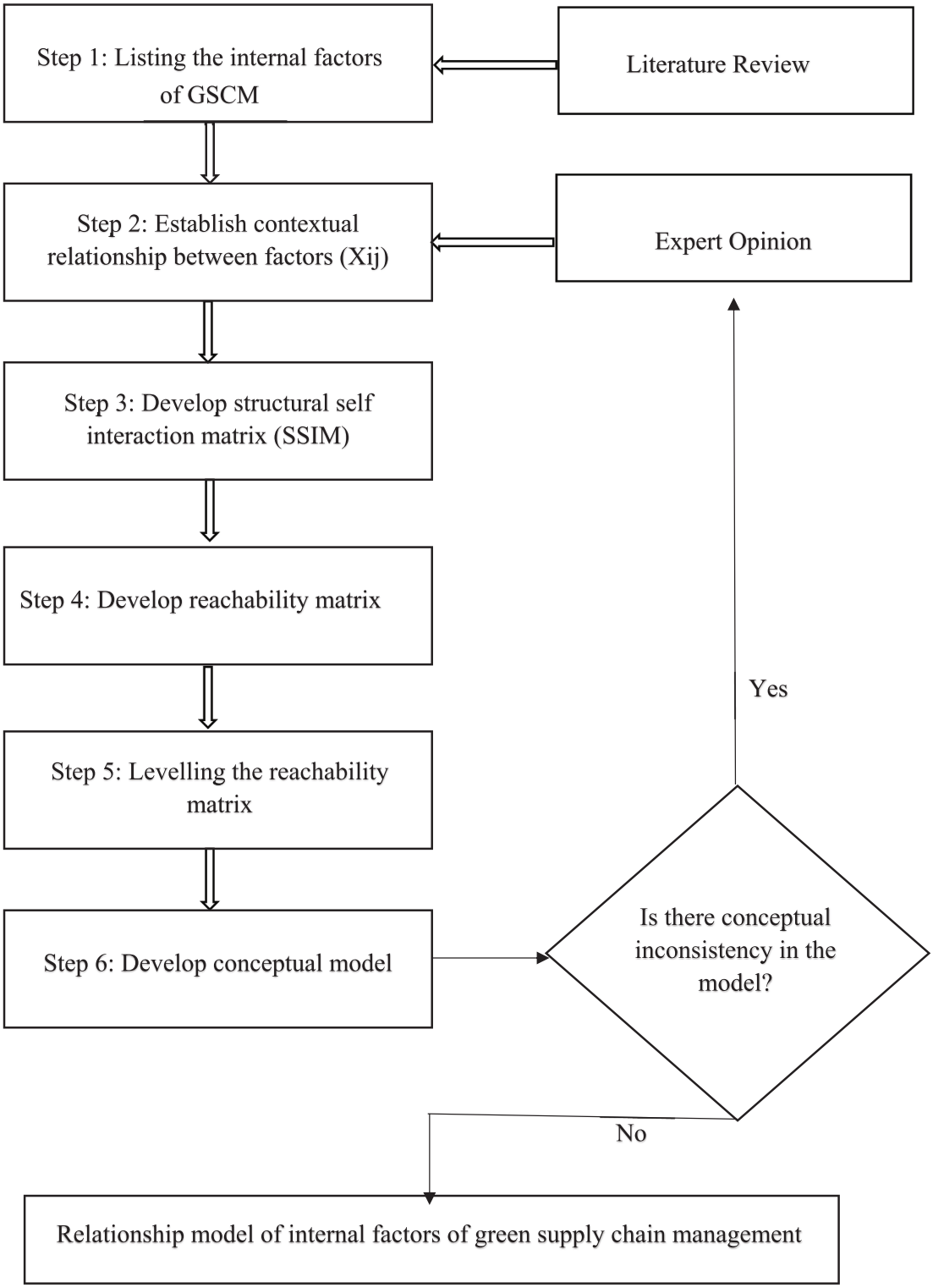

Fig. 1. ISM based model for internal factors of GSCM.

has to be addressed is how disproportionately vulnerable nations like Bangladesh can become middle-income nations with a sustainable process in business. Bangladesh joined international efforts to keep global warming far below 2 °C to lower it to 1.5 °C when it signed the Paris Agreement in 2016 (https://www.thedailystar.net/supplements/new-year-special-2016/paris-agreement-and-the-bangladesh-perspective-195028). This further demonstrates the nation's commitment to reducing national emissions and mitigating the consequences of climate change. Bangladesh plans to participate in global collective action to decrease future emissions as part of a comprehensive and ambitious international accord. Following the Paris Agreement, Bangladesh promised to cut GHG emission intensity by 15% by 2030. For policy-makers to find a balance between implementing policies to achieve sustainable development and mitigating climate change, they increasingly need to be aware of Bangladesh's capacity to decrease emissions. This target can't be achieved without holistic support from decision-making to process implementation across the organization. With the increasing concern regarding the environmental aspect of global production, achieving sustainability in the supply chain process is also crucial. Supply chain management is involved in fulfilling consumers' requests through procurement, production, transportation, and distribution activities (Kumar et al., 2012). Bangladesh as a country is booming in economic development. The textile industry; manufacturing industry, leather industry, and electrical industry are some major players in the country's growth. With rapid development, environmental concern is also rising in the country. Proper assessment of GSCM practice can help tackle environmental challenges (Shamimul Islam et al., 2018). The purpose of this study is to focus on the key area of the supply chain to implement sustainability culture and provide a decision-making framework in the correlation of the relevant factor based on the pragmatic scenario of the industry (See Fig. 1).

This research focuses on the following research questions:

RQ1: What are the internal factors of green supply chain management practice in Bangladeshi Industries?

RQ2: What are the possible interrelations between these factors?

RQ3: How to classify these factors according to their impact?

In this study, the authors have identified the factors that play an important role to implement green supply chain management within a company. Many related studies have been performed by reflecting the interaction between factors in the green supply chain process. This study uniquely identified the internal factors within a company that affect the supply chain performance towards sustainability. External factors affect consumers' behavior, and internal factors affect companies' internal compatibility (Pakurár et al., 2019). A company may face external pressure, which is beyond the control of the company, but internal factors of the company greatly determine the company's learning capability to practice green supply chain management (Liu et al., 2012).

The authors have chosen ISM (Interpretive Structural Modelling) method in this research to develop the conceptual model. ISM approach is widely used for analyzing qualitative data and identifying the interrelation between the factors (Soni et al., 2020). The ISM method is used to analyze any scenario to determine the connections among elements or factors to describe an issue. This technique starts with identifying the factors and developments in problem-solving techniques. In ISM method the conceptual model is developed according to the driving power and dependence power of each factor. In the research MICMAC analysis is also performed to categorize the factors in 4 clusters according to their driving power and dependence power. In the literature review, Table 1, it is shown in terms of analyzing the problem or issue driving factors ISM approach is effectively used to show the dependency based on the practical experience of the survey participants in a unique platform. This study intends to construct a model based on the relationship among the factors and categorize the factors prioritizing their impact.

The authors are motivated to contribute a better understanding and knowledge management in the green supply chain management practice of Bangladeshi industry. However, to analyze the internal factors of the

Table 1
Literature review.

Origin of Work	References	Method of Study
Analyzing factors of green supply chain management and develop theoretical model between them.	(Al-Refaie and Momani, 2018)	Collected responses from the experts and performed focused group discussion (FGD)
Interpreting variables driving power in the green supply chain management implementation requires higher attention. Here a model of barriers is proposed in ISM-based structure to identify the preference of variables in GSC.	(Jayant and Azhar, 2014)	Expert analyses are evaluated in FGD method
It proposes an ISM based model and analysis of green supply chain management factors in order identify the driving power and dependence power of the factors in the context of knowledge management to improve the green efficiency of textile industry in India.	(Lim et al., 2017)	Survey based approach and focused discussion among the experts.
This paper aims to develop a theoretical framework of the barriers and drivers of factors of flexible green supply chain management.	(Shibin et al., 2016)	Survey collection method
This paper attempts to develop a theoretical framework to explain the driving power and dependence power of green supply chain management drivers by using the TISM method.	(Shibin et al., 2017)	Survey collection approach
This study identifies the barriers of GSCM implementation, develops a theoretical model of the barriers and performs Micmac analysis to categorize the barriers in 4 clusters: autonomous, independent, dependent and linkage.	(Menon et al., 2021)	Survey and review method.
In this study factors in green supply chain management implementation in steel industry are identified according to expert opinion. Driving power and dependence power of the factors are analyzed and a theoretical model is developed by using ISM method.	(Agi and Nishant, 2017)	Focused group discussion process among the experts.
This study demonstrates the use of ISM method in knowledge management of barrier analysis process	(Singh and Kant, 2008)	Focused group analysis
This study analyzed the lucid changes of green supply management in Indian timber industry in ISM method. The study identified the driving power and dependence power of the factors which impact the change.	(Goel et al., 2020)	Survey based approach.
	(Gardas et al., 2019)	

(*continued on next page*)

Table 1 (*continued*)

Origin of Work	References	Method of Study
This study provided a factor analysis in the field of green supply chain management implementation in Indian Agro industry by using ISM approach.		Survey method and review.
This study analyzed the drivers of green supply chain management practices from expert opinion and constructed a conceptual model which was validated by expert evaluation in ISM method.	(Panpatil and Kant, 2022)	Survey review approach.
This study presented an integrated framework of critical factors of supply chain management by using AHP and ISM method. In this research authors have analyzed the critical factors of success by using expert opinion and literature review and then developed the model. The model is validated further by expert review.	(INTERNATIONAL JOURNAL OF SUSTAINABLE ENGINEERING, 2021)	Focused group review.

green supply chain management, this article aimed to satisfy the following objectives.

i To identify the internal factors of green supply chain management practice.
ii To develop a conceptual model of the internal factors of green supply chain management.
iii To classify the factors in different clusters according to their driving power and dependence.
iv To identify a green supply chain implementation strategy from a managerial perspective.

To accomplish the above objectives, the rest of the paper is organized as follows: The literature review is in Section 2; Research Methodology are in Section 3; Data Analysis & Discussions are in Section 4; Conclusions, Implementation, Limitations, and future research scope are in Section 5.

1.1. Literature review

In this study the researchers analyzed the internal factors of green supply chain management and developed a conceptual model. In the ISM method the conceptual model is developed according to the driving power and dependence power of each factor. Interpretive structural modelling has been used to develop such models in many similar studies of supply chain management field. These literature reviews have been organized in Table 1.

From the analysis of several literature review the authors have identified 8 internal factors of green supply chain management for Bangladeshi industries.

1.2. Top management commitment

Top management of an organization works in the policy making role. This factor is linked with external factors of green supply chain management policy (Van Hock and Erasmus, 2000). Government rules, industry policy, external affairs are being handled by top management and based on those they decided the policy of their company (Zhu and Sarkis, 2004). Company's financial, environmental, external affairs, human resource policy, manufacturing, distribution policy is basically determined by this factor (Hugo and Pistikopoulos, 2005). Top management works as mediator between internal and external environment of a company. Goodwill from management and their policy guides the organization towards sustainability and efficiency in the supply chain.

1.3. Supplier development

Suppliers play a pivotal role in achieving sustainability in the organization. Many companies outsource their key work to suppliers. But in general companies are dependent on raw material and equipment supply on the suppliers. They play a major portion of work in the total business process (Singh, 2013). Company must select and develop suppliers' capacity according to company's EHS policy (Kannan et al., 2014). Companies must maintain carbon emission limits in their process. Suppliers are controlling a portion of the business; hence the company must monitor and develop the supplier to maintain the proper principle and regulation (Bansal et al., 2014).

1.4. Materials store and management

Material storage system is a vital source of waste in the production line (Cox and Blackstone, 1998). Storage of material in a proper manner safes the product from being damaged. Storing is very crucial for Agro industry and FMCG industry (Zhang et al., 2020). Smart material handling and management in the warehouse can save inventory management cost and effort (Seroka-Stolka and Ociepa-Kubicka, 2019). Transportation and movement of material in the warehouse, material handling activities cause the organization good amount of energy resources and cost. Proper management in this area plays a significant role in greening the supply chain.

1.5. Logistics system

Green logistics system is the combination of environmental philosophy in product development, procurement, storage, transportation activity (Seroka-Stolka and Ociepa-Kubicka, 2019). More than 70% of a company's carbon footprint is caused by transportation activities which is a major sector of concern to achieve greening policy in the supply chain management (Dzwigol et al., 2021). Green logistics policy can integrate several functions in an organization which are highly correlated with other factors (Osintsev et al., 2020).

1.6. Pollution prevention and hazardous waste management

Environmental concerns are mainly focused on waste management activities. Production procedure consumes energy and resources to transform raw material into final product. In the life cycle of the product pollution occurs in many steps (Agrawal et al., 2014). Steel Industry, cement industry, bricks industry, and textile industry are creating major hazardous waste and pollutes the environment (Tavana et al., 2021). Changes in their sludge treatment policy and air purification process can play a vital role. Economical sustainability in supply chain policy is highly dependent on the waste management system.

1.7. Reverse logistic management

Reverse logistics management is the process which indicates the retrieval of goods from the final stage of supply chain which is consumer with the purpose of reuse and recycle (Ramos et al., 2014). This process involves product collection, acquisition, examination, categorization, redistribution, disposition of the product (Agrawal et al., 2015). Disposition procedure involves five processes of repair, remanufacture, refurbish, recycle and cannibalize (Chen et al., 2019). In green supply chain procedure, the role of reverse logistics is very dynamic inclusion

compared to generic supply chain procedure (Lamming and Hampson, 1996).

1.8. Environmentally friendly packaging

Product packaging protects the product from damage or being wasted (Singh, 2008). Packaging management is very crucial from an economic perspective also. Organizations usually prefer economical packaging material like plastic, polythene which are major cause of environmental pollution (Gardas and Raut, 2019). FMCG companies, automobile companies, electronic companies are highly accused of plastic and metal pollution in their packaging. Companies must focus on eco-friendly and recyclable packaging components for the purpose of greening the supply chain (Meherishi et al., 2019).

1.9. Application of advance technology and IT tools

Implementation of advanced technology increases the supply chain surplus by resource optimization (Dong et al., 2021). Use of IT tools brings better visibility and transparency in the total supply chain process. Information sharing and communication is a key driver of supply chain. Technology facilitates communication and better integration among different stages in the supply chain (Morella et al., 2020). Application of advanced technology creates impact in transportation network optimization, better inventory management, inventory coordination, preventive maintenance, quality checks and assurance process.

From the analysis of previous literature in Table 1, and the research protocol of this study, two significant areas have been identified where this study provides a unique contribution.

i) Providing Specific Discussion about Internal Factors of GSCM: This study uniquely separates the external factor and internal factors of GSCM. In external factors, an organization has little capacity to control, where the factors are controlled by Government or Legislation Body. But this study intends to provide a guideline from a managerial perspective to facilitate the implementation of GSCM within the organization. Moreover, when internal and external factors are analyzed in a single correlation module, the relations between the factors become more complex. This research intends to derive the relation among internal factors of GSCM and makes the decision-making process accessible.
ii) Specific Research on Bangladeshi Industry: Bangladeshi economy is experiencing a massive surge in diversified sectors. But in proportion to that, the amount of research on GSCM in the country's industrial sector is not substantial. The approach of sustainability practice depends on the industrial culture and varies from region to region. From this perspective, this study reflects the green supply chain management action plan from the diversified industrial perspective of Bangladesh. This enables the authors to provide a holistic guideline about the implementation of these factors for a country like Bangladesh. However, this study can be referenced in other regions also where the industrial practice is like Bangladesh.

2. Research methodology

For effectively analyzing the green supply chain factors, interpretive structure modelling (ISM) has been used in this study. ISM is well known as a computer-based technique to analyze the relations among different groups of factors and develop a graphical representation of the system. ISM approach is more useful in analyzing real life complexities among the factors, comparing with other factor analyzing tools such as Analytical Hierarchy Process (AHP) and Analytical Network Process (ANP) (Jayant and Singh, 2015). It is different from AHP, DEMATEL, GTMA and other analytical methods as it establishes interrelations among the factors and makes a prioritization-based levelling of them (Soni et al., 2020). In this research 18 industrial experts are consulted to perform the survey. The discussion was performed in a focused group discussion method. In ISM approach the number of survey responders should be between 10 and 30 to maintain unity in response (Renukappa et al., 2020; Kvale, 1996). After the discussion the responses were collected. By the consensus of the survey participants the result was obtained. Another focused group discussion was performed to validate the result and to identify whether there was any inconsistency or not. The steps involved in ISM approach are following.

- **Step 1.** Variables affecting the system under consideration are listed.
- **Step 2.** A contextual relationship is established among variables with respect to which pairs of factors would be examined.
- **Step 3.** A structural self-interaction matrix (SSIM) is developed for factors, indicating pair-wise relationship among the factors of the system.
- **Step 4.** Reachability matrix is developed from the SSIM. It helps in developing "final reachability matrix". The transitivity of contextual relations is a basic assumption made in ISM. It states that if variable A is related to B and B is related to C, then A will be necessarily related to C.
- **Step 5.** Partition the reachability matrix into different levels.
- **Step 6.** According to the derived relationship from the reachability matrix and identified values for variables, a correlational framework/digraph of the identified factors will be derived.

2.1. Listing the internal factors

In this study, the authors have identified the following factors from the literature review to identify their impact on implementing GSCM. The listed factors and the sources are shown in Table 2. From literature reviews and similar studies, the authors proposed important factors for the group discussion. In the group discussion, industry experts considered the factors based on the industry scenario of Bangladesh, their implementation capability in the industry and the controllability. Industry practice and culture differ from region to region as the practice of industrialization depends on many variables. The study is focused on the practical scenario of the study. As mentioned earlier, the collaborators of this research intended to develop a pragmatic approach for the near

Table 2
Description of factors.

SL No.	Name of Factors	References
1	Top management commitment	(Van Hock and Erasmus, 2000; Zhu and Sarkis, 2004; Hugo and Pistikopoulos, 2005; Hamprecht et al., 2005; Green et al., 2012)
2	Supplier development	(Lee, 2009; Singh, 2013; Kannan et al., 2014; Bansal et al., 2014; Bowen et al., 2001; Singh and Sharma, 2015)
3	Materials store and management	(Cox and Blackstone, 1998; Zhang et al., 2020; Seroka-Stolka and Ociepa-Kubicka, 2019)
4	Logistics system	(Seroka-Stolka and Ociepa-Kubicka, 2019; Dzwigol et al., 2021; Osintsev et al., 2020; Beamon, 1999)
5	Pollution prevention and hazardous waste management	(Agrawal et al., 2014; Tavana et al., 2021)
6	Reverse logistic management	(Ramos et al., 2014; Agrawal et al., 2015; Chen et al., 2019; Lamming and Hampson, 1996)
7	Environmentally friendly packaging	(Singh, 2008; Gardas and Raut, 2019; Meherishi et al., 2019; Klassen and Vachon, 2003)
8	Application of advance technology and IT tools	(Dong et al., 2021; Morella et al., 2020; https://www.unilever.com/planet-and-society/waste-free-world/rethinking-plastic-packaging/)

future. In this consideration implementation ability of the Bangladeshi is sincerely considered in decision-making. And the controllability of the factors is important in this research. This study focuses on internal factors which are not dependent on the external environment. In terms of targeting the internal factors, authors intend to work on the area which can be implemented by the internal practice of an organization or controlled by the effort of a particular organization in their ecosystem.

3. Structural self interaction matrix

A structural self-interaction matrix (SSIM) is developed for variables, Indicating pair-wise relationship among variables of the system under consideration. Four symbols are used to denote the direction of relationship between the criteria.

V: Criterion i will lead to criterion j.
A: Criterion j will lead to criterion i.
X: Criterion i and j will lead to each other.
O: Criterion i and j are unrelated.

From individual survey reports and focused group discussion reports of the industry experts the structural self-interaction matrix is identified.
In Table 2 the SSIM matrix is shown.
From this matrix, it is indicated that.

- Factor 1 will lead to factor 2, which means top management commitment will lead to supplier development policy and their relation is denote by "V".
- Factor 8 will lead to factor 2, which means application of advanced technology and information technology tools will lead to supplier development and the relation between factor 2 and factor 8 are denoted by "A".
- Factor 2 and factor 4 will lead to each other, which means supplier development and logistics system will lead to each other and their relation is denoted by "X".
- No factor is unrelated. It is all inclusive.

3.1. Reachability matrix

Reachability matrix is developed from the SSIM. It helps in developing "final reachability matrix". The transitivity of contextual relations is a basic assumption made in ISM. It states that if variable A is related to B and B is related to C, then A will be necessarily related to C. It has been designed by using Microsoft Excel 2016.

- If relation of (i, j) entry in the SSIM is V, the value of (i, j) entry in this reachability matrix is 1 and consequently the value of (j, i) entry is 0.
- If relation of (i, j) entry in the SSIM is A, the value of (i, j) entry in this reachability matrix is 0 and consequently the value of (j, i) entry is 1.
- If relation of (i, j) entry in the SSIM is X, the value of (i, j) entry in this reachability matrix is 1 and consequently the value of (j, i) entry is 1.
- If relation of (i, j) entry in the SSIM is O, the value of (i, j) entry in this reachability matrix is 0 and consequently the value of (j, i) entry is 0.

In Table 3 the reachability matrix is identified from SSIM. It is achieved by using the transitivity effect of the factors.

- Factor 1 will lead factor 2, relation is denoting by "V" in SSIM. Hence, in the reachability matrix, the value is 1. And reciprocally the value of relationship between factor 2 and factor 1 is 0.
- Factor 8 will lead to factor 2, their relation is denoted by "A" in SSIM. Hence in the reachability matrix the relationship value of factor 8 and factor 2 is 1. And reciprocally, the relationship value of factor 2 and factor 8 is 0

Table 3
SSIM Matrix.

		j							
i		1	2	3	4	5	6	7	8
1	Top management commitment	X	V	V	V	V	V	V	V
2	Supplier development		X	V	X	V	V	V	A
3	Materials store and management			X	A	V	A	V	A
4	Logistics system				X	V	V	V	A
5	Pollution prevention and hazardous waste management					X	A	X	A
6	Reverse logistic management						X	V	A
7	Environmentally friendly packaging							X	A
8	Application of advance technology and IT tools								X

- Factor 2 and factor 4 will lead to each other, their relation is denoted by "X" in SSIM. Hence the relationship value of factor 2 and 4 is 1. The relationship value of factor 4 and factor 2 is also 1.

The final reachability matrix in Table 4 is achieved from the initial reachability matrix at Table 3. The driving power of each factor is denoted by adding the values of the row. The driving power of a factor indicates its capacity to lead other factors. The factor which has higher driving power indicates its higher ability to lead other factors to achieve green supply chain management in the organization. Dependence of each factor is identified by adding the value in the column. The dependence power of factor indicates its dependency on other factors. Higher value of dependence power indicates the factor is more dependent on other factors.

3.2. Level partitions

The reachability set is classified or partitioned in multiple levels. From the reachability matrix, the reachability set, antecedent set, and intersection set is identified. The reachability set includes the factor itself and the factors it will lead to achieve in GSCM. Antecedent set includes the factor itself and the factors will lead this. Intersection set includes the intersecting factors between reachability set and antecedent set. Factors that have lowest reachability set are partitioned at the top level. It indicates this factor will not lead to any other factors.

In Table 5, it is observed factor 5 and factor 7 have same reachability set which are the lowest. That is why factor 5 and factor 7 are in the level 1. In the same way iteration 2, 3, 4, 5 and 6 are achieved (See Tables 6–10).

The iterations and level portions of the factors are summarized in Table 11.

4. Result & discussion

Green supply chain management practice is the combination of

Table 4
Reachability Matrix.

Serial No.	Enablers	1	2	3	4	5	6	7	8
1	Top management commitment	1	1	1	1	1	1	1	1
2	Supplier development	0	1	1	1	1	1	1	0
3	Materials store and management	0	0	1	0	1	0	1	0
4	Logistics system	0	1	1	1	1	1	1	0
5	Pollution prevention and hazardous waste management	0	0	0	0	1	0	1	0
6	Reverse logistic management	0	0	1	0	1	1	1	0
7	Environmentally friendly packaging	0	0	0	0	1	0	1	0
8	Application of advance technology and IT tools	0	1	1	1	1	1	1	1

Table 5
Finale reachability matrix.

Serial No.	Enablers	1	2	3	4	5	6	7	8	Driving power
1	Top management commitment	1	1	1	1	1	1	1	1	8
2	Supplier development	0	1	1	1	1	1	1	0	6
3	Materials store and management	0	0	1	0	1	0	1	0	3
4	Logistics system	0	1	1	1	1	1	1	0	6
5	Pollution prevention and hazardous waste management	0	0	0	0	1	0	1	0	2
6	Reverse logistic management	0	0	1	0	1	1	1	0	4
7	Environmentally friendly packaging	0	0	0	0	1	0	1	0	2
8	Application of advance technology and IT tools	0	1	1	1	1	1	1	1	7
	Dependence Power	1	4	6	4	8	5	8	2	

Table 6
Iteration 1 for of Level Partition.

Factor	Reachability Set	Antecedent Set	Intersection Set	Level
1	1,8,2,4,6,3,5,7	1	1	
2	2,4,6,3,5,7	1,8,2,4	2,4	
3	3,5,7	1,8,2,4,6.3	3	
4	2,4,6,3,5,7	1,8,2,4	4,2	
5	5,7	1,8,2,4,6,3,5,7	5,7	Level I
6	6,3,5,7	1,8,2,4,6	6	
7	5,7	1,8,2,4,6,3,5,7	7,5	Level I
8	8,2,4,6,3,5,7	1,8	8	

Table 7
Iteration 2 for of Level Partition.

Factor	Reachability Set	Antecedent Set	Intersection Set	Level
1	1,8,2,4,6,3,5,7	1	1	
2	2,4,6,3,5,7	1,8,2,4	2,4	
3	3,5,7	1,8,2,4,6.3	3	Level II
4	2,4,6,3,5,7	1,8,2,4	4,2	
6	6,3,5,7	1,8,2,4,6	6	
8	8,2,4,6,3,5,7	1,8	8	

Table 8
Iteration 3 for of Level Partition.

Factor	Reachability Set	Antecedent Set	Intersection Set	Level
1	1,8,2,4,6,3,5,7	1	1	
2	2,4,6,3,5,7	1,8,2,4	2,4	
4	2,4,6,3,5,7	1,8,2,4	4,2	
6	6,3,5,7	1,8,2,4,6	6	Level III
8	8,2,4,6,3,5,7	1,8	8	

Table 9
Iteration 4 for of Level Partition.

Factor	Reachability Set	Antecedent Set	Intersection Set	Level
1	1,8,2,4,6,3,5,7	1	1	
2	2,4,6,3,5,7	1,8,2,4	2,4	Level IV
4	2,4,6,3,5,7	1,8,2,4	4,2	Level IV
8	8,2,4,6,3,5,7	1,8	8	

Table 10
Iteration 5 for of Level Partition.

Factor	Reachability Set	Antecedent Set	Intersection Set	Level
1	1,8,2,4,6,3,5,7	1	1	
8	8,2,4,6,3,5,7	1,8	8	Level V

several factors in a structural manner. According to the reachability matrix and the leveling partitions relational diagraph of green supply is presented in Fig. 2. MICMAC analysis is presented in Fig. 3 to classify the

Table 11
Iteration 6 for of Level Partition.

Factor	Reachability Set	Antecedent Set	Intersection Set	Level
1	1,8,2,4,6,3,5,7	1	1	Level VI

factor (See Table 12).

4.1. Conceptual model

In this study it is identified that top management commitment is the most crucial factor in implementing green supply chain management practice. Top management decisions and commitment towards sustainability goals play the major role in green supply chain management implementation. After the recent COP26 summit top management of companies like Unilever have taken policies like reducing plastic use, focusing on recyclable plastic use, using plant based ingredient instead of harmful chemical ingredient, making the packaging of their product eco-friendly (https://www.reckitt.com/sustainability/policies-and-reports/). FMCG companies like Reckitt are focusing to achieve net zero carbon emission within next year 2040 (https://www.arla.com/articles/can-milk-be-carbon-neutral-info/). Dairy product-based companies like Arla have committed to reduce the emission of methane gas from cattle burps by using more healthy food and grass (Al-Refaie and Momani, 2018). Top management commitment leads the application of advanced technologies and IT tools in the company to optimize the process and reduce waste. Advance technology and its tool leads to improve the logistics system and supplier development. By using advanced technology, the logistics system can be optimized and become more efficient. Use of IT tool also helps a company to monitor suppliers' activity and provide better visibility of their process. Thus, it becomes easier for organizations to select and develop supplier's performance. Logistics system and supplier development are equally dependent on each other. Supplier development and selection process is dependent on their logistics system efficiency. Logistics system and supplier development leads to efficient reverse logistics system which minimizes the waste in reverse logistics and reduce reverse logistics transportation. A reverse logistics system will lead to material store and management. Reverse logistics system pushes the development of efficient material storing and management (See Table 13).

Materials store and management leads to achieve environmentally friendly packaging to ensure sustainability in the store, warehouse and reduce plastic percentage there. Efficient material storing and management also focuses on reducing hazardous waste and preventing pollution in the inventory and product storing. Finally, environmentally friendly packaging and pollution prevention and waste management are equally dependent on each other in an organization.

4.2. MICMAC analysis

According to the basis of driving power and dependence power of the factors, the factors are classified in 4 categories: autonomous,

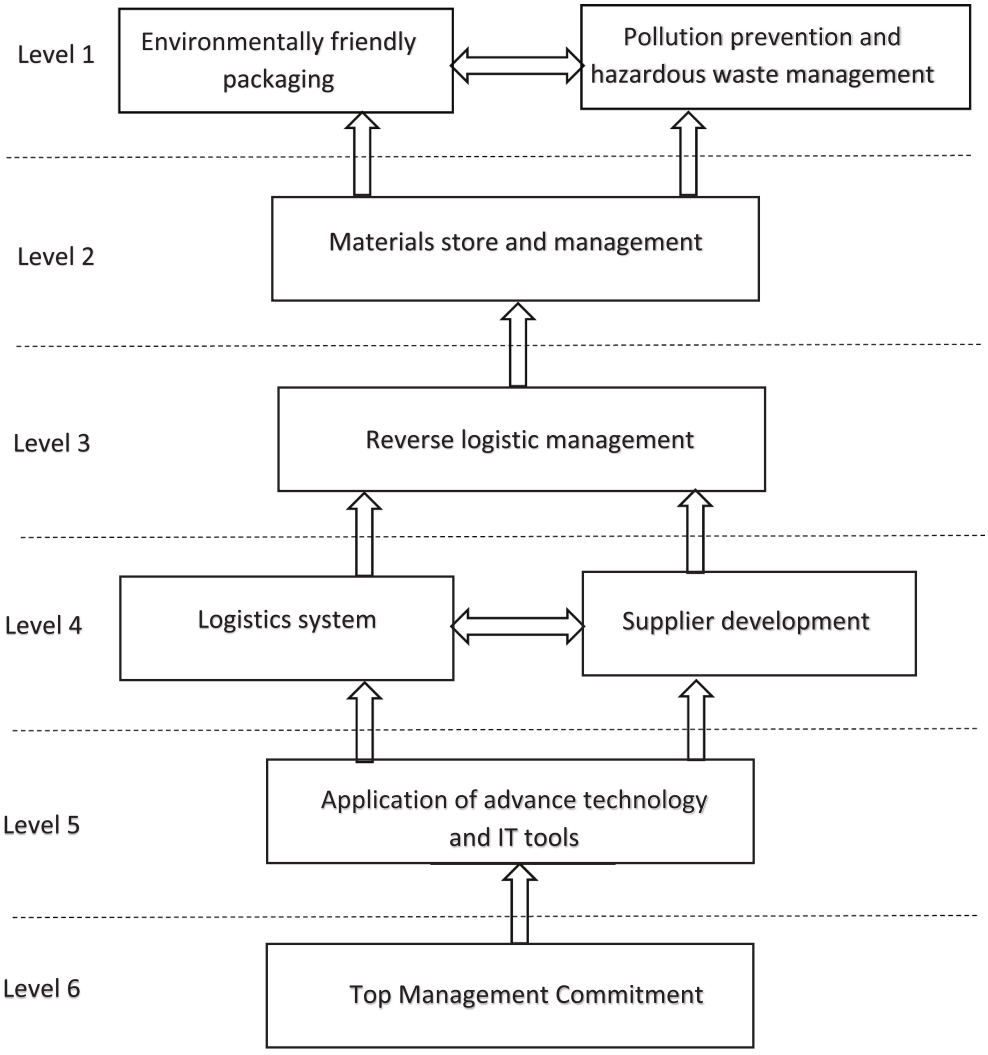

Fig. 2. Classification of factors.

Table 12
Summary of Level Portion.

Factor	Reachability Set	Antecedent Set	Intersection Set	Level
1	1,8,2,4,6,3,5,7	1	1	Level VI
2	2,4,6,3,5,7	1,8,2,4	2,4	Level IV
3	3,5,7	1,8,2,4,6.3	3	Level II
4	2,4,6,3,5,7	1,8,2,4	4,2	Level IV
5	5,7	1,8,2,4,6,3,5,7	5,7	Level I
6	6,3,5,7	1,8,2,4,6	6	Level III
7	5,7	1,8,2,4,6,3,5,7	7,5	Level I
8	8,2,4,6,3,5,7	1,8	8	Level V

Table 13
Level of the factors.

Factor	Level
Top management commitment	Level VI
Supplier development	Level IV
Materials store and management	Level II
Logistics system	Level IV
Pollution prevention and hazardous waste management	Level I
Reverse logistic management	Level III
Environmentally friendly packaging	Level I
Application of advance technology and IT tools	Level V

dependent, linkage, independent in Fig. 3. It is called Micmac analysis. It helps to analyze the driving power and dependence power of each factor that influences the implementation of GSCM in the industry. This classification makes it easier for organizations to make their decision regarding the factor prioritization.

4.3. Cluster 1: Autonomous factors

This group has low dependence power and low driving power. Factors in this group are called excluded factor. Factors from this zone can be easily excluded from the system. In this study no factor belongs in autonomous zone.

4.4. Cluster 2: Dependent factors

Factors in this zone have weak driving power and strong dependency. These factors have little influence on others but have higher dependency. That's why these factors are called dependent factors. In this study there are 4 factors in this zone. Factor 5 pollution prevention and factor 7 hazardous waste management and environmentally friendly packaging belong in the lower portion of this zone. Which means they have higher dependency on other factors among this zone. Factor 3 Materials store and management is also in this zone. Factor 6 reverse logistic management is in the top corner of this zone.

This factor has high dependency. But depending upon the situation

and organizational demand this factor can be in cluster 3 and cluster 4, which means it may have more influence on the system.

4.5. Cluster 3: Linkage factors

Factors in this zone have high dependence power and high driving power. They have very high linkage in the system. These factors should be handled more carefully. Any change of the factor impacts the system. In this study no factor belongs in such zone.

4.6. Cluster 4: Independent factors

These factors have high driving power and lower dependency on other factors. Which means they are not so dependent rather can influence other factors in the system. That's why they are called independent factors. These factors are the most vital elements of the system. In the present study, 4 factors belong to this zone. Factor 1 top management commitment has highest driving power, which is the most crucial factor in implementing green supply chain management practice in an organization. Factor 8 application of advanced technology and IT tools is the 2nd most crucial factors of the system which is found in this study. Factor 2 supplier development and factor 4 logistics system also belong in this zone.

4.7. Comparison with similar studies

The result found in this study can be analyzed with similar literature. In Jordanian industry they also consider management commitment as most crucial factor among the internal factor of green supply chain management implementation (Jayant and Azhar, 2014). It was also evaluated that governmental policy, financial situation, customer awareness, global competition motivated the top management to develop their strategy. A study in Indian steel industry showed that Government regulation drives top management decision in green supply chain management decision and top management directly influences implementation of IT in the next level of hierarchy in the model (Agi and Nishant, 2017).

It also showed the direct influence of IT in waste management and supplier management. Another study showed some interesting output in the model (Jena et al., 2017). It showed that the size of the company is a major determinant of green supply chain implementation policy which influences companies' relation with the supplier and that affects the top management commitment in the next level of the hierarchy. This study depicted some difference in the level compared to our model of this study. But there are similarities in the next levels. That study found top management commitment influences the implementation of IT tools. That also found implementation of IT tool and collaboration between supply chain partners equally influences each other belonging on the same level. That study focused on employee training and empowerment in achieving green supply chain practice. Another study tried to develop theoretical model of green supply chain management factor, but they used TISM model to achieve direct and significant transitive linkages among the factors (https://www.lightcastlebd.com/insights/2022/02/cop26-consequences-on-bangladeshs-economy/). Many researchers prefer TISM model over ISM model for achieving transitive linkages (https://cpd.org.bd/publication/towards-a-low-carbon-and-climate-resilient-world-expectations-from-cop26/). That study showed how corporate commitment or top management commitment directly influence other supplier management, collaboration with partner and employee management. From these studies similarities are identified with the developed model of this research.

5. Conclusion

Supply chain management is the core of the business. The world's focus has shifted heavily to sustainable supply chain management in the business. To be sustainable, companies' supply chain policy is prioritizing being green. The integration of environmental factors in the supply chain has now become very crucial.

Developed countries have adopted this practice early. But now the manufacturing is being shifted in Asian region. Developing countries like Bangladesh, and India are experimenting with potential growth in their supply chain activity, and it becomes equally important for them to adopt green practices in supply chain management.

5.1. Implementation of the study

In this study the link between the 8 internal factors of green supply chain have been identified by the authors. Green supply chain practice adaptation depends greatly on the internal practice of the company. This research will provide proper direction from the basis of expert opinion to the manager regarding how to plan the supply chain model. The company has resource barriers. Within their limited resources, a company must make the best choice to achieve efficiency. In this study the factor is decorated in the level in the hypothetical model. The interconnection between the levels is easily understandable that company can develop their green supply chain planning according to the model. Further the factors are classified in 4 clusters: independent, dependent, linkage, autonomous. Linkage factors have very high driving power and dependence power, independent factors have high driving power and lower dependence. These two clusters are very crucial to achieve in GSCM practice. Managers must consider these relations between factors during the implementation process.

5.2. Managerial insights

The approach of GSCM implementation should be 360°from a managerial perspective. In an organizational structure, the functional manager responsible for GSCM practice must monitor the proper implementation in the cross-functional department. Each department can be given a specific KPI to achieve sustainability parameters like waste disposal rate, CO2 and GHG emission target, water usage target, and energy usage target. The targets must be monitored in operation. Proper fulfilment or partial fulfilment of the KPIs should be evaluated in the top management discussion, and CAPA (corrective action preventive action) should be decided with a completion timeline to ensure the approach's success. In terms of establishing the KPIs for the department, this study shows which sector should be focused on first as the priority. Regular audit performance will be pivotal for monitoring the growth of implementation. Management should perform an audit about the progress to check legal compliance, implementation of global or regional standards, local regulatory or statutory requirement implementation guidelines like ISO 14001 etc. Based on the performance or mentioned criteria, management should provide a rating and develop an action plan. External experts can conduct this function to have better visibility and transparency in the process. Moreover, the organization must develop the plan by considering economic sustainability also. This consideration should be made when the CAPEX (capacity expenditure) budget is allocated. From the ranking, we can see that "Application of advanced technology and IT tools" is the second most critical factor for implementation. The managerial body must decide on a roadmap for what technologies will be implemented and in which timeline. As IT implementation ranks higher than supplier development, the initial priority will be on the development of IT infrastructure. The reason is that proper IT infrastructure influences supplier selection procedures. Without better technology, supplier development initiatives can't be effective, and the GSCM implementation will be hampered. The perspective of developing a management approach towards GSCM implementation is guided here. Organizations must consider this strategic correlation in their approach development.

5.3. Limitations

This study develops a theoretical model according to the expert opinion. The study is performed by analyzing eight internal factors, which are conducted using a related literature review, but this is not fully comprehensive. It is based on qualitative data from industry experts. ISM model is one of the widely used models for analyzing qualitative data and successfully interpreting them in a theoretical model. But the evaluation of opinion may vary from expert to expert, industry to industry and country to country. As the study is based on experts' knowledge management, there is a possibility of biases in the study. There is no weight score evaluation is assigned with the factors, that's why the classified level of this study can further be analyzed.

5.4. Future scope of study

Green supply chain management practice is getting more attention day by day for the necessity of environmental aspects. This study has tried to construct a theoretical model of internal factors relation in the practice of green supply chain management field. In future studies, the weight of the factors can be brought into consideration in developing the model. After the Covid19 pandemic, the global supply chain has witnessed a major disruption in the industry. Hence, a continuous study should be carried out in this sector to identify the interaction of the factors in different situations in different industries.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors have used survey data. The data is shared in the table

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References

Maher A.N. Agi, Rohit Nishant, Understanding influential factors on implementing green supply chain management practices: An interpretive structural modelling analysis, Journal of Environmental Management, Volume 188, 2017, Pages 351-363, ISSN 0301-4797, 10.1016/j.jenvman.2016.11.081.

Maher A.N. Agi, Rohit Nishant, Understanding influential factors on implementing green supply chain management practices: An interpretive structural modelling analysis, Journal of Environmental Management, Volume 188, 2017, Pages 351-363, ISSN 0301-4797.

Agrawal, S., Singh, R.K., Murtaza, Q., 2014. Forecasting product returns for recycling in Indian electronics industry. J. Adv. Manage. Res. 11 (1), 102–114.

Agrawal, S., Singh, R.K., Murtaza, Q., 2015. A literature review and perspectives in reverse logistics. Resour. Conserv. Recycl. 97, 76–92.

Al-Refaie, A. and Momani, D. (2018) 'ISM approach for modelling drivers to practices of green supply chain management in Jordanian industrial firms', Int. J. Business Performance and Supply Chain Modelling, Vol. 10, No. 2, pp.91–106.

Al-Refaie, A., Momani, D., 2018. ISM approach for modelling drivers to practices of green supply chain management in Jordanian industrial firms. Int. J. Bus. Perform. Supply Chain Modell. 10 (2), 91–106.

Bansal, A., Singh, R.K., Issar, S., Varkey, J., 2014. Evaluation of vendors ranking by EATWOS approach. J. Adv. Manage. Res. 11 (3), 290–311.

Beamon, B.M., 1999. Designing the green supply chain. Logist. Inf. Manag. 12 (4), 332–342.

Bowen, F.E., Cousins, P.D., Lamming, R.C., Faruk, A.C., 2001. Horse for courses: explaining the gap between the theory and practice of green supply. Greener Manag. Int. 35 (1), 41–60.

Daqiang Chen, Joshua Ignatius, Danzhi Sun, Shalei Zhan, Chenyu Zhou, Marianna Marra, Mehmet Demirbag, Reverse logistics pricing strategy for a green supply chain: A view of customers' environmental awareness, International Journal of Production Economics, Volume 217,2019,Pages 197-210, ISSN 0925-5273, 10.1016/j.ijpe.2018.08.031.

Cox, J. and Blackstone, J. (1998), APICS Dictionary, Ninth Edition, APICS, Falls Church, VA, available at: www.apics.org.

Zhiqing Dong, Yusong Tan, Linhui Wang, Jiali Zheng, Shengming Hu,Green supply chain management and clean technology innovation: An empirical analysis of multinational enterprises in China, Journal of Cleaner Production, Volume 310, 2021, 127377, ISSN 0959-6526, 10.1016/j.jclepro.2021.127377.

Dzwigol, H., Trushkina, N., Kwilinski, A., 2021. The organizational and economic mechanism of implementing the concept of green logistics. Virt. Econ. 4 (2), 41–75.

Bhaskar B. Gardas, Rakesh D. Raut, Balkrishna Narkhede,Identifying critical success factors to facilitate reusable plastic packaging towards sustainable supply chain management,Journal of Environmental Management, Volume 236, 2019. Pages 81-92,ISSN 0301-4797, 10.1016/j.jenvman.2019.01.113.

Gardas, B., Raut, R., Jagtap, A.H., Narkhede, B., 2019. Exploring the key performance indicators of green supply chain management in agro-industry. J. Model. Manage. 14 (1), 260–283. https://doi.org/10.1108/JM2-12-2017-0139.

V. Goel S. Khurana Analysis of Factors for Green Supply Chain in Indian Timber Market: An ISM Approach G. Krolczyk C. Prakash S. Singh J. Davim Advances in Intelligent Manufacturing Lecture Notes in Mechanical Engineering 2020 Springer Singapore 10.1007/978-981-15-4565-8_5.

Green, K., Zelbst, P., Meacham, J., Bhadauria, V., 2012. Green supply chain management practices: impact on performance. Supply Chain Manage. Int. J. 17 (3), 1–44.

Hamprecht, J., Corsten, D., Noll, M., Mei, E., 2005. Controlling the sustainability of food supply chains. Supply Chain Manage. Int. J. 10 (1), 7–10.

https://cpd.org.bd/publication/towards-a-low-carbon-and-climate-resilient-world-expectations-from-cop26/.

https://www.arla.com/articles/can-milk-be-carbon-neutral-info/.

https://www.lightcastlebd.com/insights/2022/02/cop26-consequences-on-bangladeshs-economy/.

https://www.reckitt.com/sustainability/policies-and-reports/.

https://www.thedailystar.net/supplements/new-year-special-2016/paris-agreement-and-the-bangladesh-perspective-195028.

https://www.unilever.com/planet-and-society/waste-free-world/rethinking-plastic-packaging/.

Hugo, A., Pistikopoulos, E.N., 2005. Environmentally conscious long-range planning and design of supply chain networks. J. Clean. Prod. 13 (15), 1471–1491.

INTERNATIONAL JOURNAL OF SUSTAINABLE ENGINEERING 2021, VOL. 14, NO. 6, 1496-1508 10.1080/19397038.2021.1966128.

Arvind Jayant, Mohd Azhar, Analysis of the Barriers for Implementing Green Supply Chain Management (GSCM) Practices: An Interpretive Structural Modeling (ISM) Approach, Procedia Engineering,Volume 97, 2014, Pages 2157-2166, ISSN 1877-7058.

Arvind Jayant, Mohd Azhar,Analysis of the Barriers for Implementing Green Supply Chain Management (GSCM) Practices: An Interpretive Structural Modeling (ISM) Approach,Procedia Engineering,Volume 97,2014,Pages 2157-2166,ISSN 18777058, 10.1016/j.proeng.2014.12.459.

Jayant, A., & Singh, P. (2015). Interpretive Structural Modeling (ISM) Approach: A State of the Art Literature Review.

Jena, J., Sidharth, S., Thakur, L.S., Kumar Pathak, D., Pandey, V.C., 2017. Total Interpretive Structural Modeling (TISM): approach and application. J. Adv. Manage. Res. 14 (2), 162–181. https://doi.org/10.1108/JAMR.

Kannan Govindan, T.E., 2011. Environmental supply chain management. Resour. Conserv. Recycl. 55, 557–558.

Kannan, D., Jabbour, A.B.L., Jabbour, C.J.C., 2014. Selecting green suppliers based on GSCM practices: Using fuzzy TOPSIS. Eur. J. Oper. Res. 233 (2), 432–447.

Klassen, R.D., Vachon, S., 2003. Collaboration and evaluation in the supply chain: the impact on plant-level environmental investment. Prod. Oper. Manag. 12 (3), 336–352.

Kumar, S., Teichman, T., Timpernagel, T., 2012. A green supply chain is a requirement for profitability. Int. J. Prod. Res. 50 (5), 1278–1296.

Kvale, S., 1996. InterViews—An Introduction to Qualitative Research Interviewing. Sage, Thousand Oaks, CA.

Lamming, R., Hampson, J., 1996. The environment as a supply chain issue. Br. J. Manag. 7 (1), 45–62.

Lee, K., 2009. Why and how to adopt green management into business organizations? Manag. Decis. 47 (7), 1101–1121.

Ming K. Lim, Ming-Lang Tseng, Kim Hua Tan, Tat Dat Bui,Knowledge management in sustainable supply chain management: Improving performance through an interpretive structural modelling approach, Journal of Cleaner Production,Volume 162, 2017, Pages 806-816,ISSN 0959-6526, 10.1016/j.jclepro.2017.06.056. (https://www.sciencedirect.com/science/article/pii/S095965261731226X).

Liu, X., Yang, J., Qu, S., Wang, L., Shishime, T., Bao, C., 2012. Sustainable production: practices and determinant factors of green supply chain management of chinese companies. Bus. Strateg. Environ. 21, 1–16. https://doi.org/10.1002/bse.705.

Lavanya Meherishi, Sushmita A. Narayana, K.S. Ranjani, Sustainable packaging for supply chain management in the circular economy: A review, Journal of Cleaner Production,Volume 237,2019, 117582,ISSN 0959 6526, 10.1016/j.jclepro.2019.07.057.

Rakesh R. Menon, V. Ravi, Analysis of barriers of sustainable supply chain management in electronics industry: An interpretive structural modelling approach, Cleaner and Responsible Consumption, Volume 3, 2021, 100026, ISSN 2666 7843, 10.1016/j.clrc.2021.100026.

P. Morella, M. P. Lambán, J. Royo, J. C. Sánchez, and L. del C. Ng Corrales, "Development of a New Green Indicator and Its Implementation in a Cyber–Physical System for a Green Supply Chain," Sustainability, vol. 12, no. 20, p. 8629, Oct. 2020.

Osintsev, N., Rakhmangulov, A., Sładkowski, A., Dyorina, N. (2020). Logistic Flow Control System in Green Supply Chains. In: Sładkowski, A. (eds) Ecology in

Transport: Problems and Solutions. Lecture Notes in Networks and Systems, vol 124. Springer, Cham. 10.1007/978-3-030-42323-0_6.

Pakurár, M., Haddad, H., Nagy, J., Popp, J., Oláh, J., 2019. The Impact of supply chain integration and internal control on financial performance in the jordanian banking sector. Sustainability 11 (5), 1248. https://doi.org/10.3390/su11051248.

Panpatil, S.S. and Kant, R. (2022), "Green supply chain management implementation: modeling the green supply chain practices (GSCPs)", Journal of Advances in Management Research, Vol. ahead-of-print No. ahead-of-print. 10.1108/JAMR-07-2021-0241.

Ramos, T.R.P., Gomes, M.I., Barbosa-Póvoa, A.P., 2014. Planning a sustainable reverse logistics system: Balancing costs with environmental and social concerns. Omega 48, 60–74.

Suresh Renukappa, Subashini Suresh, Saeed Al Nabt, Redouane Sarrakh and Khaled Algahtani Submitted: February 18th, 2019Reviewed: October 9th, 2019Published: March 4th, 2020. DOI: 10.5772/intechopen.90069.

Oksana Seroka-Stolka,, Agnieszka Ociepa-Kubicka, Green logistics and circular economy, Transportation Research Procedia,Volume 39, 2019, Pages 471-479, ISSN 2352-1465, 10.1016/j.trpro.2019.06.049.

Oksana Seroka-Stolka,, Agnieszka Ociepa-Kubicka, Green logistics and circular economy, Transportation Research Procedia, Volume 39, 2019, Pages 471-479, ISSN 2352-1465, 10.1016/j.trpro.2019.06.049.

Md. Shamimul Islam, Ming-Lang Tseng, Noorliza Karia, Chia-Hao Lee, Assessing green supply chain practices in Bangladesh using fuzzy importance and performance approach, Resources, Conservation and Recycling, Volume 131, 2018, Pages 134-145, ISSN 0921-3449, 10.1016/j.resconrec.2017.12.015.

K.T. Shibin, Angappa Gunasekaran, Rameshwar Dubey, Explaining sustainable supply chain performance using a total interpretive structural modeling approach, Sustainable Production and Consumption, Volume 12, 2017, Pages 104-118, ISSN 2352-5509, 10.1016/j.spc.2017.06.003.

Shibin, K.T., Gunasekaran, A., Papadopoulos, T., et al., 2016. Enablers and barriers of flexible green supply chain management: a total interpretive structural modeling approach. Glob. J. Flex. Syst. Manag. 17, 171–188. https://doi.org/10.1007/s40171-015-0109-x.

Singh, R.K., 2008. Green supply chain management: an overview. Product. Promot. 11 (40), 32–40.

Singh, R.K., 2013. Analyzing the factors for VMI implementation: a framework. Glob. Bus. Rev. 14 (1), 169–186.

Singh, R.K. and Sharma, M.K. (2015), "Selecting competitive supply chain using Fuzzy-AHP and extent analysis", Journal of Industrial and Production Engineering, Vol. 31 No. 8,pp. 524-538\.

Singh, M.D., Kant, R., 2008. Knowledge management barriers: An interpretive structural modeling approach. Int. J. Manage. Sci. Eng. Manage. 3 (2), 141–150. https://doi.org/10.1080/17509653.2008.10671042.

Singh, R.K., Sharma, M.K., 2015. Selecting competitive supply chain using Fuzzy-AHP and extent analysis. J. Ind. Prod. Eng. 31 (8), 524–538.

Soni, G., Prakash, S., Kumar, H., Singh, S.P., Jain, V., Dhami, S.S., 2020. An interpretive structural modeling of drivers and barriers of sustainable supply chain management: a case of stone industry. Manage. Environ. Qual. 31 (5), 1071–1090.

Stentoft, J., Lüthje, T., 2012. Global operations and their interaction with supply chain performance. Ind. Manage. Data Syst. 112, 1044–1064. https://doi.org/10.1108/02635571211255014.

Tavana, M., Shaabani, A., Santos-Arteaga, F.J., et al., 2021. An integrated fuzzy sustainable supplier evaluation and selection framework for green supply chains in reverse logistics. Environ. Sci. Pollut. Res. 28, 53953–53982. https://doi.org/10.1007/s11356-021-14302-w.

Van Hock, R.I., Erasmus, 2000. From reversed logistics to green supply chains. Logist. Solut. 2 (1), 28–33.

Wei Zhang, Mingyang Zhang, Wenyao Zhang, Qian Zhou, Xinxin Zhang, What influences the effectiveness of green logistics policies? A grounded theory analysis, Science of The Total Environment, Volume 714, 2020,136731, ISSN 0048-9697, 10.1016/j.scitotenv.2020.136731. (https://www.sciencedirect.com/science/article/pii/S0048969720302412).

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.