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Interactive Modeling of Green Supply Chain Management Components in Sports Businesses: A Process-Oriented and Hierarchical Approach

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ABSTRACT

This article aims to identify the relationships among components of green supply chain management (GSCM) in sport businesses through interpretive structural modeling (ISM) and classifying those components according to their driving and dependence power. This study developed in two phases. In the first phase, literature was reviewed and 12-components of GSCM were identified. Then, in the second phase, the GSCM components in sports businesses were structured using ISM and the hierarchical and interactive model of GSCM in sports businesses was developed. The results showed that among the 12-components, 'internal/external pressure', 'rules, regulations and standards' and 'green resources' were the drivers and cornerstones of the formation and change of other factors. Based on the research findings, the key driver and components for achieving GSCM in sports businesses are providing infrastructure (green resources), adhering to norms (internal and external pressure), and setting its executive guarantees (rules, regulations and standards). Therefore, to achieve 'economic benefits' and create 'green market' in the sports industry, emphasis and investment on these issues will be helpful. The current paper attempts to develop a conceptual framework for GSCM in sports businesses.

Introduction

Today, with increasing environmental pollution and its devastating consequences, consumers' environmental concerns for environmentally friendly products and services have received increasing attention (Albayrak, Aksoy, & Caber, 2013; Testa & Iraldo, 2010). Increasing awareness of

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environmental impacts has attracted the attention of many researchers to focus more on the study of green supply chain management in various fields and sectors (Jemai, Chung, & Sarkar, 2020). Following the increase in these concerns, organizations have made changes in their environmental strategies and performance (Lee & Lim, 2020; Thieme, Royne, Jha, Levy, & McEntee, 2015), and theaconcept of 'green supply chainymanagement' as an effective solution in this area (Malviya, Kant, & Gupta, 2018; Yildiz Çankaya & Sezen, 2019).

These organizations have gained a competitive advantage by turning to green supply chain management, improving their environmental performance by complying with environmental laws and standards, increasing customer awareness (Abdel-Baset, Chang, & Gamal, 2019; Koplin, Seuring, & Mesterharm, 2007).

Supply chain management is an activity with unique capabilities. It includes a specific starting and ending point that can play an influential role in reducing costs and preventing the waste of financial and human resources (Meyer & Torres, 2019) and, lead to reforming the structure of energy consumption. In the traditional view, supply chain management involves guiding all members of the supply chain in an integrated and coordinated manner with the aim of improving performance to upgrade productivity and increasing the organization's profit. In this view, supply chain managers seek faster delivery of goods and services and advanced quality. But in recent years, the role of organizations in society and their responsibilities in minimizing their impact on the environment has become more critical (Hsu & Hu, 2008; McWilliams, 2000). Therefore, production with minimal waste and environmental damage became one of the serious goals of organizations, which eventually led to the formation of the concept of "green supply chain management" (Balon, 2019).

The basis of the green supply chain is minimizing and preferably eliminating the adverse effects of the supply chain on the environment (Islam, Karia, & Mohamed Soliman, 2017). The concept of green supply chain management is related to the management of sustainable operations and supply chains, with the aim of achieving economic, social and, environmental goals. Green supply chain management means striving for greater environmental productivity in supply chains and is one of the most critical and topics in the modern study of operations management (Jabbour & de Sousa Jabbour, 2016). Green supply chain management has benefits for companies, both individually and nationally. At the individual level, green supply chain programs offer competitive advantages such as lower costs, greener products, and better integration with suppliers(Khan et al., 2021; Yang, Movahedipour, Zeng, Xiaoguang, & Wang, 2017; M. Zhang, Tse, Dai, & Chan, 2017). At the national level, the green supply chain can lead to better adaptation of suppliers to environmental issues by creating specific markets for green products (Dubey, Gunasekaran, & Papadopoulos, 2017; Gamboa Bernal, Orjuela Castro, & Moreno Mantilla, 2020).

At the macro level and considering the green awareness of the society, the market demand for environmentally friendly products has a significant impact on the critical decisions of organizations to implement green methods. These activities can ultimately create a sustainable strategy for the organization (Malviya et al., 2018; Tseng & Chiu, 2013). Green supply chain management helps organizations achieve more profit and maintain the market share by reducing environmental risks and increasing their environmental productivity (Mohamed, Mahmood, Muhamad, & Yusup, 2020). In this approach, in addition to minimizing supply chain costs, organizations seek to meet the organization's social responsibility and improve productivity to create value and meet customer needs.

Research suggests a potential relationship between green supply chain management and improving an organization's economic performance (Rao & Holt, 2005; Samar Ali, Kaur, Ersöz, Lotero, & Weber, 2019). If an organization wants to improve its business performance, it requires proper and sufficient knowledge of the factors that can affect the management of the organization's green supply chain.

One of the pioneers of research in green supply chain management is the study of Sarkis & Rasheed (1995) which emphasized the importance of combining environmental issues with production

management and operations management in companies (Sarkis & Rasheed, 1995). According to Handfield and his colleagues (1997), green supply chain management applies environmental management principles to the entire set of activities across the whole customer order cycle, including design, procurement, manufacturing and assembly, packaging, logistics, and distribution (Handfield, Walton, Seegers, & Melnyk, 1997). Gunasekaran and his colleagues (2001) have introduced green supply chain management as a conscious green trading method as the central philosophy of the organization to increase profits and achieve market goals by reducing the environmental impact of products and improving the environmental productivity of organizations (Gunasekaran, Patel, & Tirtiroglu, 2001). Sarkis (2010) continued his studies in this field by proposing models of complexity and decision-making models of green supply chain management to adopt environmental business practices (Sarkis, Gonzalez-Torre, & Adenso-Diaz, 2010).

Zhu & Xu (2019) describe green supply chain management as an integrated supply chain, from green purchasing from suppliers to manufacturing, customer delivery, and reverse logistics (J. Zhu & Xu, 2019). According to Kainuma & Tawara (2006), it covers all production processes such as purchasing raw materials, production, recycling, reuse and, reproduction (Kainuma & Tawara, 2006). Srivastava (2007) considers green supply chain management includes product design, selection and sourcing, manufacturing, production of the final product to the customer, and product management after consumption and its useful life (Srivastava, 2007).

Because the environmental costs can be very challenging for manufacturing organizations, macroscopically, green supply chain management can make significant progress by enabling the development and implementation of green programs and actions (Yildiz Çankaya & Sezen, 2019; Q. Zhu, Sarkis, & Lai, 2012).

Sports businesses will not be exempt from the change made to achieve environmental goals. Since the 1970s, the sport has assumed an ever-increasing role within the globalization of business and public events with the sport participants, capital, and labor moving around the world. Since then, sport has played a vital role in the development of businesses and public events with the participation of sporting participants, capital and labor around the world. (J. J. Zhang, Kim, Mastromartino, Qian, & Nauright, 2018). Various studies show that the sports industry in different ways can affect the economy of societies and play a significant role in the prosperity, growth and, development of the economy(Huang, Mao, Kim, & Zhang, 2014; Igel, 2017).

Sports businesses play a critical role in the production and consumption of sports goods and services in most countries. In developed countries, the value-added of the sports industry constitutes a significant part of GDP and leads to generating income, employment, as well as recreation and entertainment(Holt, 2007). 3.7% of Europe's GDP comes from sports; about 15 million persons in various industry sectors have involved in sports, and the share of sports in employment is 2.12%, which is comparable to the major industries in the union (SPEA, 2012).

In recent years, it has also become common for athletes and sports enthusiasts to start sports businesses. Creating businesses generates new sources of wealth and creates new opportunities for businesses. Despite the significant size of sports businesses, research suggests that these businesses are still not performing well and effectively, which has led to more customer dissatisfaction in these businesses. Therefore, supply chain management can present as an effective indicator in improving quality and creating value for the customer in sports businesses(Yektayar, 2019). Given the undeniable impact of green supply chain management on cost reduction (Balon, 2019; Schmidt, Foerstl, & Schaltenbrand, 2017), improving environmental performance (Balon, 2019; Geng, Mansouri, & Aktas, 2017; Samar Ali et al., 2019), Quality improvement (Balon, 2019; Priya, Soni, & Deshpande, 2014) and ultimately customer satisfaction (Mudgal, Talib, & Raj, 2010; Testa & Iraldo, 2010); sports business managers must be aware of the factors affecting green supply chain management so that they can eliminate the existing shortcomings and play an influential role in the development of the sports industry as well as their business. However, under market pressures and

proactive government policies the developing countries' firms have realized the importance of improving the environmental image.

Despite the components of green supply chain management in many businesses are same but these components are not equal importance and have a different interactive and hierarchical impact in each business. However, the present article aims to identify the relationships components of among green supply chain management in sports businesses through interpretive structural modeling (ISM) and by classifying those components according to their driving and dependence power. So, the present study seeks to answer the following two questions:

What are the factors and components of green supply chain management in sports businesses?
How does the interactive model of influential factors and components of green supply chain management in sports businesses based on structural-interpretive modeling?

Methodology

The main purpose of this research is to understand the dynamics between the components of green supply chain management and design and develop a relationship model for green supply chain management. This research has been conducted through two phases. In the first phase, the components and critical factors of green supply chain management have been identified, extracted and then classified. In the second phase, using the structural-interpretive modeling method, these factors (components) were classified and, the interactive model was presented.

Interpretive structural modeling (ISM) is a systematic methodology and an interactive process for learning and decision-making developed by Warfield in 1974 (Marak & Pillai, 2021; Sindhu, 2022). This method transforms unclear, poorly articulated models of systems into explicit and well-defined models. The ISM uses experts to judge the variables, and the relations among the variables are interpreted (Bag, 2017). In the present research, 15 experts (5 faculty members with Ph.D. in management and ten managers of sports businesses) were invited for expert panel discussions and for developing a relationship among the components. The experts have been selected purposefully (by snowball method) according to their education, experience and, previous familiarity with the research subject.

Results

Six steps were conducted to develop the hierarchical and prosses-based relationship:

Step 1: Identiifcationeofevariables(greenSsupply chainamanagement components)r

In the first phase and the initial review of literature, 12 components of green supply chain management in sports businesses were identified which are shown in Table 1.

Table 1. Green supply chain management Components in sports businesses

Row		(Rehman & Shrivastava, 2011)	(Diabat & Govindan, 2011)	(Bag & Anand, 2014)	(Tippayawong, Niyomyat, Sopadang, & Ramingwong, 2016)	(Dube & Gawande, 2016)	(Jabbour & de Sousa Jabbour, 2016)	(Yang et al., 2017)	(Dubey et al., 2017)	(M. Zhang et al., 2017)	(Mishra, Gunasekaran, Papadopoulos, & Hazen, 2017)	(Chiappetta Jabbour, Mauricio, & Jabbour, 2017)	(Islam et al., 2017)	(Mafini & Loury-Okoumba, 2018)	(Abdullah, Sarfraz, Qun, & Javaid, 2018)	(J. Zhu & Xu, 2019)	(Laosirihongthong, Samaranayake, Nagalingam, & Adebanjo, 2020)	(Mohamed et al., 2020)	(Gamboa Bernal et al., 2020)	(Khan et al., 2021)	(Herrmann, Barbosa-Povoa, Butturi, Marinelli, & Sellitto, 2021)
1	Internal and external management, communications and collaborations and (stakeholder communication, customer relations, supplier selection, customer demand response, foreign green participation, green customers, supplier		*	*		*	*	*	*	*	*	*	*	*		*	*	*	*	*	*

Row		(Rehman & Shrivastava, 2011)	(Diabat & Govindan, 2011)	(Bag & Anand, 2014)	(Tippayawong, Niyomyat, Sopadang, & Ramingwong, 2016)	(Dube & Gawande, 2016)	(Jabbour & de Sousa Jabbour, 2016)	(Yang et al., 2017)	(Dubey et al., 2017)	(M. Zhang et al., 2017)	(Mishra, Gunasekaran, Papadopoulos, & Hazen, 2017)	(Chiappetta Jabbour, Mauricio, & Jabbour, 2017)	(Islam et al., 2017)	(Mafini & Loury-Okoumba, 2018)	(Abdullah, Sarfraz, Qun, & Javaid, 2018)	(J. Zhu & Xu, 2019)	(Laosirihongthong, Samaranayake, Nagalingam, & Adebanjo, 2020)	(Mohamed et al., 2020)	(Gamboa Bernal et al., 2020)	(Khan et al., 2021)	(Herrmann, Barbosa-Povoa, Butturi, Marinelli, & Sellitto, 2021)
	cooperation, customer cooperation, distributor, external stakeholders, external management, supplier relationship management, Supply Chain, Environmental Performance, Efficiency, Motivation, Skills Development, Internal Management,																				

Row		(Rehman & Shrivastava, 2011)	(Diabat & Govindan, 2011)	(Bag & Anand, 2014)	(Tippayawong, Niyomyat, Sopadang, & Ramingwong, 2016)	(Dube & Gawande, 2016)	(Jabbour & de Sousa Jabbour, 2016)	(Yang et al., 2017)	(Dubey et al., 2017)	(M. Zhang et al., 2017)	(Mishra, Gunasekaran, Papadopoulos, & Hazen, 2017)	(Chiappetta Jabbour, Mauricio, & Jabbour, 2017)	(Islam et al., 2017)	(Mafini & Loury-Okoumba, 2018)	(Abdullah, Sarfraz, Qun, & Javaid, 2018)	(J. Zhu & Xu, 2019)	(Laosirihongthong, Samaranayake, Nagalingam, & Adebanjo, 2020)	(Mohamed et al., 2020)	(Gamboa Bernal et al., 2020)	(Khan et al., 2021)	(Herrmann, Barbosa-Povoa, Butturi, Marinelli, & Sellitto, 2021)
	Energy Consumption, Resource Management)																				
2	Green market (green marketing, market share, new market opportunities, green image of the organization, green shopping, competition)	*		*		*	*		*	*	*	*	*	*		*	*	*	*	*	*
3	Management commitment, support and activities (organizational interaction, top	*		*		*		*	*	*	*	*	*		*	*		*	*	*	*

Row		(Rehman & Shrivastava, 2011)	(Diabat & Govindan, 2011)	(Bag & Anand, 2014)	(Tippayawong, Niyomyat, Sopadang, & Ramingwong, 2016)	(Dube & Gawande, 2016)	(Jabbour & de Sousa Jabbour, 2016)	(Yang et al., 2017)	(Dubey et al., 2017)	(M. Zhang et al., 2017)	(Mishra, Gunasekaran, Papadopoulos, & Hazen, 2017)	(Chiappetta Jabbour, Mauricio, & Jabbour, 2017)	(Islam et al., 2017)	(Mafini & Loury-Okoumba, 2018)	(Abdullah, Sarfraz, Qun, & Javaid, 2018)	(J. Zhu & Xu, 2019)	(Laosirihongthong, Samaranayake, Nagalingam, & Adebanjo, 2020)	(Mohamed et al., 2020)	(Gamboa Bernal et al., 2020)	(Khan et al., 2021)	(Herrmann, Barbosa-Povoa, Butturi, Marinelli, & Sellitto, 2021)
	management commitment, operational and senior management support, financial support such as lending and facilities, social responsibility, quality management and improvement, green education)																				
4	Green production (green production and operations, producer, services or operating			*	*	*		*	*		*	*	*	*		*	*	*	*	*	*

Row		(Rehman & Shrivastava, 2011)	(Diabat & Govindan, 2011)	(Bag & Anand, 2014)	(Tippayawong, Niyomyat, Sopadang, & Ramingwong, 2016)	(Dube & Gawande, 2016)	(Jabbour & de Sousa Jabbour, 2016)	(Yang et al., 2017)	(Dubey et al., 2017)	(M. Zhang et al., 2017)	(Mishra, Gunasekaran, Papadopoulos, & Hazen, 2017)	(Chiappetta Jabbour, Mauricio, & Jabbour, 2017)	(Islam et al., 2017)	(Mafini & Loury-Okoumba, 2018)	(Abdullah, Sarfraz, Qun, & Javaid, 2018)	(J. Zhu & Xu, 2019)	(Laosirihongthong, Samaranayake, Nagalingam, & Adebanjo, 2020)	(Mohamed et al., 2020)	(Gamboa Bernal et al., 2020)	(Khan et al., 2021)	(Herrmann, Barbosa-Povoa, Butturi, Marinelli, & Sellitto, 2021)
	methods, commodity risk, product life cycle)																				
5	Green design (green design, ecology)	*	*			*	*		*	*	*					*	*	*	*	*	*
6	Internal and external pressures (supplier pressures, community pressures, stakeholder pressures, media pressures, competitive market pressures, employee	*		*		*		*	*		*	*	*		*	*		*	*	*	*

Row		(Rehman & Shrivastava, 2011)	(Diabat & Govindan, 2011)	(Bag & Anand, 2014)	(Tippayawong, Niyomyat, Sopadang, & Ramingwong, 2016)	(Dube & Gawande, 2016)	(Jabbour & de Sousa Jabbour, 2016)	(Yang et al., 2017)	(Dubey et al., 2017)	(M. Zhang et al., 2017)	(Mishra, Gunasekaran, Papadopoulos, & Hazen, 2017)	(Chiappetta Jabbour, Mauricio, & Jabbour, 2017)	(Islam et al., 2017)	(Mafini & Loury-Okoumba, 2018)	(Abdullah, Sarfraz, Qun, & Javaid, 2018)	(J. Zhu & Xu, 2019)	(Laosirihongthong, Samaranayake, Nagalingam, & Adebanjo, 2020)	(Mohamed et al., 2020)	(Gamboa Bernal et al., 2020)	(Khan et al., 2021)	(Herrmann, Barbosa-Povoa, Butturi, Marinelli, & Sellitto, 2021)
	pressures, customer pressures, regulatory pressures, culture, customer awareness)																				
7	Green technology (green innovation, industrial network development, information such as environmental database)	*		*		*		*	*		*	*	*			*		*	*	*	*
8	Rules, Regulations and Standards	*	*		*	*		*	*		*		*		*	*		*	*	*	*

Row		(Rehman & Shrivastava, 2011)	(Diabat & Govindan, 2011)	(Bag & Anand, 2014)	(Tippayawong, Niyomyat, Sopadang, & Ramingwong, 2016)	(Dube & Gawande, 2016)	(Jabbour & de Sousa Jabbour, 2016)	(Yang et al., 2017)	(Dubey et al., 2017)	(M. Zhang et al., 2017)	(Mishra, Gunasekaran, Papadopoulos, & Hazen, 2017)	(Chiappetta Jabbour, Mauricio, & Jabbour, 2017)	(Islam et al., 2017)	(Mafini & Loury-Okoumba, 2018)	(Abdullah, Sarfraz, Qun, & Javaid, 2018)	(J. Zhu & Xu, 2019)	(Laosirihongthong, Samaranayake, Nagalingam, & Adebanjo, 2020)	(Mohamed et al., 2020)	(Gamboa Bernal et al., 2020)	(Khan et al., 2021)	(Herrmann, Barbosa-Povoa, Butturi, Marinelli, & Sellitto, 2021)
	(Standards, Rules and Regulations, Executive Limitations, Supplier Environmental Management System Certification, ISO 14002 Certification)																				
9	Green logistics (green external logistics, green internal logistics, reverse logistics, transportation and green distribution)		*		*	*	*		*		*		*	*		*	*	*	*	*	*

Row		(Rehman & Shrivastava, 2011)	(Diabat & Govindan, 2011)	(Bag & Anand, 2014)	(Tippayawong, Niyomyat, Sopadang, & Ramingwong, 2016)	(Dube & Gawande, 2016)	(Jabbour & de Sousa Jabbour, 2016)	(Yang et al., 2017)	(Dubey et al., 2017)	(M. Zhang et al., 2017)	(Mishra, Gunasekaran, Papadopoulos, & Hazen, 2017)	(Chiappetta Jabbour, Mauricio, & Jabbour, 2017)	(Islam et al., 2017)	(Mafini & Loury-Okoumba, 2018)	(Abdullah, Sarfraz, Qun, & Javaid, 2018)	(J. Zhu & Xu, 2019)	(Laosirihongthong, Samaranayake, Nagalingam, & Adebanjo, 2020)	(Mohamed et al., 2020)	(Gamboa Bernal et al., 2020)	(Khan et al., 2021)	(Herrmann, Barbosa-Povoa, Butturi, Marinelli, & Sellitto, 2021)
10	Green waste and recycling management (green waste and recycling management, greenhouse gas management, pollution reduction)		*	*					*		*		*			*		*	*	*	*
11	Economic benefits (such as profitability and economic justification, perceived usefulness, return on investment, cost reduction)	*		*		*	*	*	*		*		*	*		*		*	*	*	*

Row		(Rehman & Shrivastava, 2011)	(Diabat & Govindan, 2011)	(Bag & Anand, 2014)	(Tippayawong, Niyomyat, Sopadang, & Ramingwong, 2016)	(Dube & Gawande, 2016)	(Jabbour & de Sousa Jabbour, 2016)	(Yang et al., 2017)	(Dubey et al., 2017)	(M. Zhang et al., 2017)	(Mishra, Gunasekaran, Papadopoulos, & Hazen, 2017)	(Chiappetta Jabbour, Mauricio, & Jabbour, 2017)	(Islam et al., 2017)	(Mafini & Loury-Okoumba, 2018)	(Abdullah, Sarfraz, Qun, & Javaid, 2018)	(J. Zhu & Xu, 2019)	(Laosirihongthong, Samaranayake, Nagalingam, & Adebanjo, 2020)	(Mohamed et al., 2020)	(Gamboa Bernal et al., 2020)	(Khan et al., 2021)	(Herrmann, Barbosa-Povoa, Butturi, Marinelli, & Sellitto, 2021)
12	Green resources (green consumption, resource constraints, green materials)				*			*	*		*		*	*		*	*	*	*	*	*

Step 2: Demonstrate the pair-wise relationship between variables and create a structural self-interaction matrix (SSIM).

Following the identification of 12 factors through literature review, utilize ISM method to establish the linkages among these variables. This approach is appropriate to study the interrelationship among the identified factors. The signs and states used in a conceptual relationship are:

V: One-way relationship from i to j

A: One-way relationship from j to i

X: Two-way relationship from i to j and vice versa

O: There is no relationship between i and j

After summarizing the results, the final pair-wise relationship shows in Table 2.

Table 2. Structural self-interaction matrix of green supply chain management component

Row	j / i	2	3	4	5	6	7	8	9	10	11	12
1	Internal and external management, communications and collaborations	V	X	A	O	A	A	A	O	X	V	O
2	Green Market		O	A	A	O	A	O	O	O	V	A
3	Commitment and managerial support			A	O	A	A	A	O	X	V	O
4	Green production				X	A	X	A	O	V	V	O
5	Green design					A	X	A	V	O	V	A
6	Internal and external pressure						O	X	V	V	O	X
7	Green technology							A	V	V	V	A
8	Rules, regulations and standards								V	V	O	X
9	Green logistics									V	O	A
10	Waste management and green recycling										V	O
11	Economic benefits											A
12	Green resources											

Step 3: Formation of initial reachability matrix

Initial reachability matrix is formed by converting SSIM to a binary matrix, that V & X replaced by '1' and A & O replaced by '0'. The conversion process is show in Table 3.

Step 4: Developing the final reachability matrix from the initial reachability matrix

This step checks the transitivity of the matrix. Transitivity is the basic assumption in the ISM, such as if variable x influences y and y influences z, then x will influence z transitively. Also, in this matrix, the penetration power and the degree of dependence of each stimulus are shown (Table 3). The numbers marked with '*' indicate that the initial reachability matrix is zero and has become number one after compatibility.

Table 3. Final reachability matrix

Row	Variable	1	2	3	4	5	6	7	8	9	10	11	12	**Driving Power**
1	Internal and external management, communications and collaborations	1	1	1	0	0	0	0	0	0	1	1	0	**5**
2	Green Market	0	1	0	0	0	0	0	0	0	0	1	0	**2**
3	Commitment and managerial support	1	0	1	0	0	0	0	0	0	1	1	0	**4**
4	Green production	1	1	1	1	1	0	1	0	0	1	1	0	**8**

Row	Variable	1	2	3	4	5	6	7	8	9	10	11	12	**Driving Power**
5	Green design	0	1	0	1	1	0	1	0	1	0	1	0	**6**
6	Internal and external pressure	1	0	1	1	1	1	0	1	1	1	0	1	**9**
7	Green technology	1	1	1	1	1	0	1	0	1	1	1	0	**10**
8	Rules, regulations and standards	1	0	1	1	1	1	1	1	1	1	0	1	**10**
9	Green logistics	0	0	0	0	0	0	0	0	1	1	0	0	**2**
10	Waste management and green recycling	1	0	1	0	0	0	0	0	0	1	1	0	**4**
11	Economic benefits	0	1	0	0	0	0	0	0	0	0	1	0	**2**
12	Green resources	0	1	0	0	1	1	1	1	1	0	1	1	**8**
	Dependence	**7**	**7**	**7**	**5**	**6**	**3**	**5**	**3**	**6**	**8**	**9**	**3**	

Step 5: Leveling variables using reachability and antecedent sets.

The reachability and antecedent set for each variable are obtained from the final reachability matrix. The reachability set includes the variable itself and the other variables that they may influence. Whereas, theeantecedent set consistsyof the variable's elementssitselfoandtheaother variable elements, which may reach it. The intersection for the reachability and antecedent sets derived for all the variables. After the identification of the top-level factors, these discarded from the other remaining variables. This iteration is continued till the levels of each variable are obtained. In Table 5, the first iteration reveals that 'Green Market' and 'Economic benefits' have been identified as the first level and occupy the lowest level of the hierarchy model. The results of all iterations are summarized in Table 4.

Table 4. Determining the level (Iteration) of green supply chain management component

Row	Variable	reachability set	Antecedent set	intersection set	Level
1	Internal and external management, communications and collaborations	1,2,3,10,11	1,3,4,6,7,8,10	1,3,10	2
2	Green Market	2,11	1,2,4,5,7,11,12	2,11	1
3	Commitment and managerial support	1,3,10,11	1,3,4,6,7,8,10	1,3,10	2
4	Green production	1,2,3,4,5,7,11	4,5,6,7,8	4,5,7	4
5	Green design	2,4,5,7,9,11	4,5,6,7,8,12	4,5,7	4
6	Internal and external pressure	1,3,4,5,6,8,9,10,12	6,8,12	6,8,12	5
7	Green technology	1,2,3,4,5,7,8,9,10,11	4,5,7,8,12	4,5,7	4
8	Rules, regulations and standards	1,3,4,5,6,7,8,9,10,12	6,8,12	6,8,12	5
9	Green logistics	9,10	5,6,7,8,9,12	9	3
10	Waste management and green recycling	1,3,10,11	1,3,4,6,7,8,9,10	1,3,10	2
11	Economic benefits	2,11	1,2,3,4,5,7,10,11,12	2,11	1
12	Green resources	2,5,6,7,8,9,11,12	6,8,12	6,8,12	5

The results of this classification indicate that among the 12 variables identified, 'internal and external pressure' (6), 'rules, regulations and standards' (8) and 'green resources' (12) are placed at the down of the hierarchy model, which shows them as the most critical factors that drive the 12 other factors. in other words, these variables are the drivers and critical factors for the formation and change of other components of green chain management in the sports business. The two components of 'green

market' (2) and 'economic benefits' (11), which are in the first level,t are also considered the consequences and outputs of the measures taken in the green supply chains.
Level I factor, 'green market' (2) and 'economic benefits' (11), have maximum dependence and the least driving power as compared to the factors in former levels (i.e., level IV, III, and II). These factors are highly dependent on the factors from the other green supply chains components.

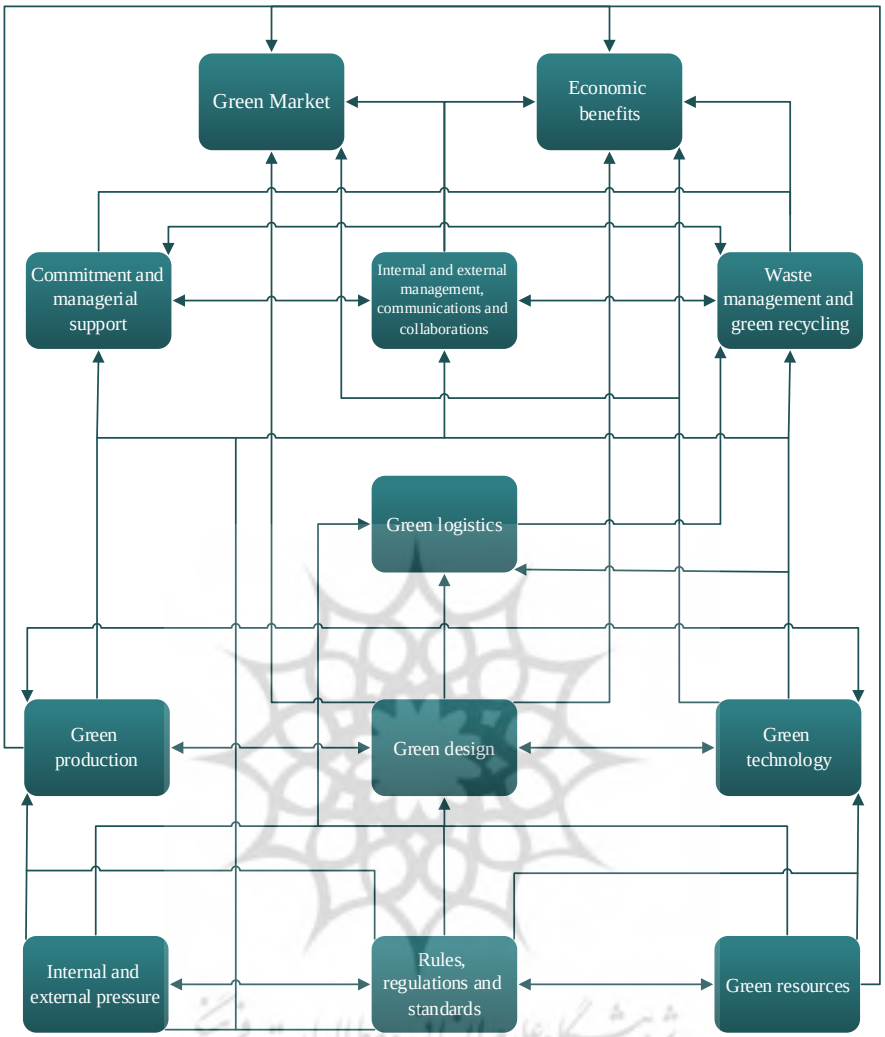

Figure 1. Hierarchy model of green supply chain management component based on ISM

Step 6: Developing Power-dependence Diagram (MICMAC analysis)
MICMAC analysis involves the development of a graph that classifies factors based on driving power and dependence power. It uses to classify the factors and validate the interpretive structural model factors. Based on their drive power and dependence power, variables have been classified into four categories as follows (Figure 2):

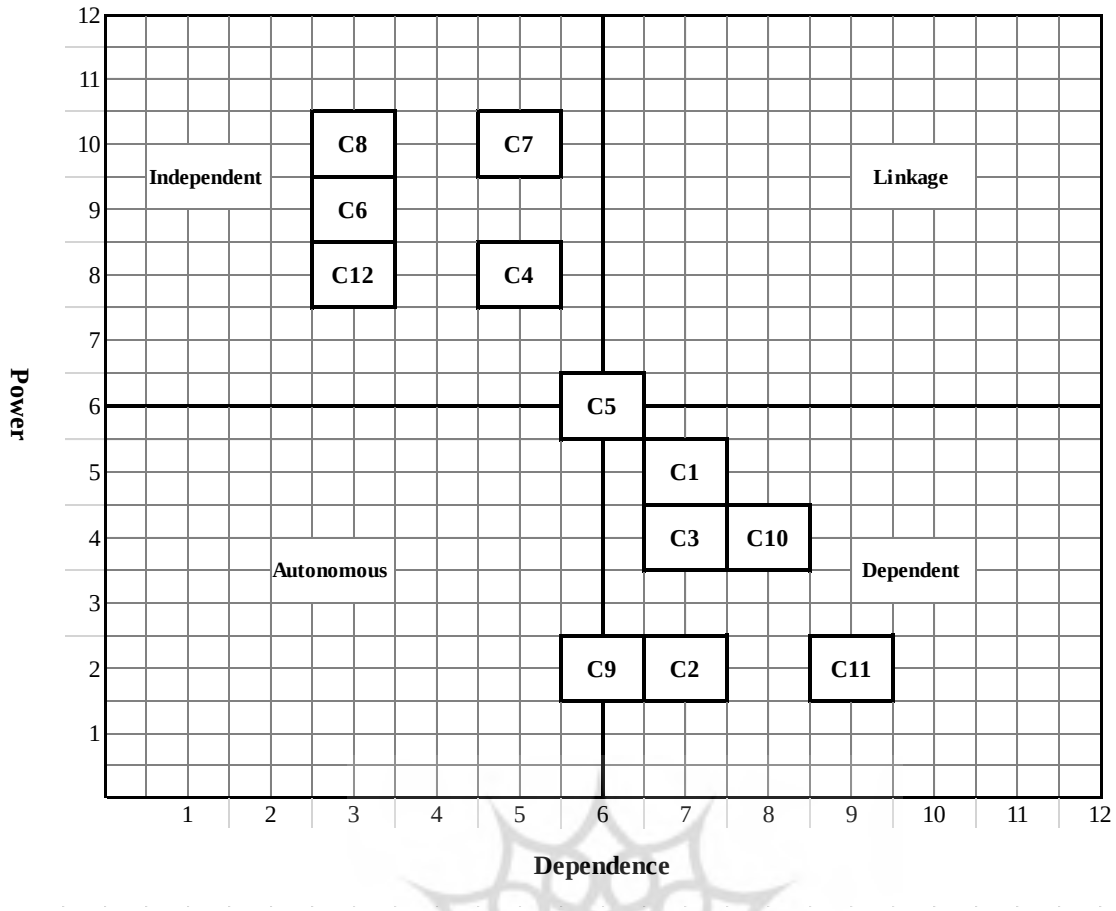

Figure 2. Power-dependence diagram (MICMAC analysis)

Autonomous variables (I): these variables have weak driving power and weak dependence. Variables 5 and 9 are recognized as autonomous variables under this category.
Dependent variables (II): these variables have weak drive power but strong dependence power. Variables 1, 2, 3, 10 and 11 come under this cluster.
Linkage variables (III): These variables lie in the third quadrant and have strong driver power along with the strong dependence power. These variables will affect others and vice versa. No variables are not under this category.
Independent variables (IV): These variables have strong drive power but weak dependence power is called the 'key variable'. Variables 4, 6, 7, 8 and 12 are variables.

Discussion and Conclusion

The sports industry has one of the largest supply chains with a large number of shareholders and processes includes sportspersons, corporates, advertisers, or the sports bodies tasked with administering the game which The global value of the sports industry is estimated at 756 billion US dollars annually (Bas, Martin, Pollack, & Venne, 2020). Green supply chain management - as an integrator of environmental management and supply chain management, can help sports business managers to achieve economic goals by reducing environmental risks and increasing environmental efficiency and help them succeed. In the present study, by reviewing literature in the field of green supply chain management, 12 factors were identified as the main factors affecting green supply chain management in sports businesses and the relationship between them and their effect on each other was analyzed. Initially, five dependent factors, 5 Independent factors, 1 Linkage factor and 1 Autonomous factor have determined. Then, using interpretive structural modeling (ISM), the relationships between the factors were determined and their interactive model was drawn.

According to the conceptual model of factors affecting green supply chain management in sports businesses, 'internal and external pressure', 'rules, regulations and standards' and 'green resources' can be considered at the lowest level of the model as drivers and basis factors. These variables are on the same level and affect each other, but another factor does not have a significant effect on them. It can be seen in the conceptual model that these factors are the basis and source of many other factors because they are the strongest motivators in green supply chain management in sports businesses. Dube & Gawande (2016) showed that the laws and regulations that governments make in the environment, along with internal and external pressures and customer awareness, are the main factors affecting green supply chain management (Dube & Gawande, 2016). Significant changes in other variables will occur if these factors improve. To mobilize other factors, environmental laws, regulations, and standards imposed on organizations (especially sports businesses) must first be stimulated, in addition to internal and external pressures (such as community and customer pressures). Also, Ling(2013) has identified 'legal requirements and regulations' and 'internal environment management' asnthe most critical factors in green supply chain management. So that if sports businesses want to achieve economic benefits (such as profitability and economic justification of their activities), they must consider the limited resources and internal and external pressures in all aspects of their supply chain management (Lin, 2013).

Furthermore, in the conceptual model, the factors of 'green production', 'green design' and 'green technology' are in the fourth level. They are less effective and more influenced (by other factors) than the last level. Production includes importing raw materials and their conversion into final goods through assembly, manufacturing and packaging activities. Inventory management is one of the most critical issues in the whole supply chain process, which does not consider potential environmental and social costs. From an environmental point of view, it has disadvantages such as additional transportation, road traffic, air pollution and noise pollution. To solve these problems, companies must re-evaluate their location, other members of the supply chain, technology and distribution channel structure. Packaging also has a direct effect on the environment. The use of environmentally friendly and degradable packaging increases popularity and builds brand awareness. In packaging, factors such as size, the shape of packaging, and the type of materials are critical. These factors have a direct effect on supply chain costs, as they affect the characteristics of freight, warehousing, easy access to goods information, reduction of warehousing costs, and modification delays.

Dube & Gawande (2016) showed that green production and green design are the most important factors affecting the management of the green supply chain, which are stimulated and improved by community pressures and customer awareness towards greenery (Dube & Gawande, 2016). Therefore, sports businesses must consider green design and production in all activities related to their green supply chain management to expand their connections and collaborations at the domestic and foreign levels and achieve economic benefits. Wu et al. (2015) also considered "interior management" and 'green design' as important factors in their research. Therefore, sports businesses should pay attention to the impact of green technologies on the management of their green supply chain, in addition to paying attention to legal requirements, regulations and environmental standards. At the third level, only the 'green logistics' is known as the main link with higher levels. 'Internal and external communication, cooperation and management', 'managerial commitment and support' and 'waste management and green recycling' are in the second level and are less effective than 'green logistics' in the third level. External logistics encompasses all physical distribution activities and includes the collection, storage, and distribution of manufactured goods between buyers. Most decisions in external logistics require consideration of the market, customer, product, and resources of the company. Reducing operating points in the supply chain is one of the new trends in distribution network design. The result of this action is saving and eliminating excess energy and many places that exist in the traditional distribution network. Choosing how to transport goods will have a significant impact on the environment. Rail transport is the most desirable option because of the use of less energy than other methods of transporting and also a more efficient use of land, air and noise pollution. Logistics managers should be in their transport fleet from using other fuels (natural gas, electricity) and be careful to use energy more efficiently and with less pollution and vehicles with more fuel efficiency. Also, logistics managers can reduce the number of trips by improving the transportation information system.

Based on the obtained conceptual model, it can have seen that at the highest level, 'green market' and 'economic benefits' have been proposed as factors that are influenced by all other factors and are considered entirely dependent. Therefore, the main goals of green supply chain managers in sports businesses should be in line with achieving these goals. These factors in the organization's green supply chain management can be achieved if managers pay attention to other factors that affect them. The current paper attempts to develop a conceptual framework for green supply chain management in sports businesses. This study helps to expand on previous works that lacked a process-oriented and hierarchical approach to green supply chain components in the sports industry. An overview of the results can be seen that 'internal and external pressure', 'rules, regulations and standards', 'green resources' and then 'green production', 'green design' and 'green technology' are the most basic drivers and infrastructure of green supply chain management in sports business and to achieving 'economic benefits' and 'market share' must be considered more than other factors. In other words, these factors should be considered as the main factors affecting green supply chain management in sports businesses that have more leadership power than other factors, and only by improving these factors, other variables will improve. According to the conceptual model (Figure 1) the main drivers of the green supply chain in the sports sector include 'internal and external pressure', 'rules, regulations and standards', 'green resources', Hens, the following practical suggestions are provided to improve the green supply chain situation in this sector:

Internal and external pressures such as supplier, community, media, competitive market, employee, customer, regulatory, culture and customer are the key variables in GSCM. However, effort to increase stakeholder awareness and adhering to internal and external norms in sports businesses lead to improve GSCM.

Providing infrastructure or green resources and materials and waste management is another strategy to achieve GSCM benefits. Green resources management characteristics include products and services that conserve energy and water, minimize generation of waste and releases of pollutants; products made from recycled materials and that can be reused or recycled; energy from renewable resources such as bio based fuels, solar and wind power; alternate fuel vehicles; and products using alternatives to hazardous or toxic chemicals, radioactive materials and bio hazardous agents.

Finally, adjust of rules, regulations and standards of environmental management such as ISO 14000 family, also, commitment to them in sports businesses as well as provide sufficient executive guarantees for their implementation will lead to increasing economic benefits and market share. ISO 14000 sets out the criteria for an environmental management system and can be certified to. It maps out a framework that a company or organization can follow to set up an effective environmental management system. This is designed for any type of organization, regardless of its activity or sector, it can provide assurance to company management and employees as well as external stakeholders that environmental impact is being measured and improved.

The current paper attempts to develop a conceptual framework for GSCM in sports businesses. This study helps to expand on previous works that lacked a process-oriented and hierarchical approach for green supply chain components in the sports industry. The study results suggest how the sports industry could benefit both operational and financial performance by adopting green supply chain management policies and actions.

In the process of researching with a comprehensive review of factors affecting green supply chain management in sports businesses, it seemed that some factors could be classified into two sets of 'internal factors' and 'external factors'; therefore, conducting more deep studies for modeling and ranking these factors is recommended.

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