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Analyzing Enablers for Adopting Integrated Green and Circular Supply Chain in Bangladeshi Textile Industries

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Abstract

The garment manufacturing sector plays a very large role in the economy of Bangladesh with exports contributing more than 80 percent of earnings and millions of people being employed in it. The green and circular supply chains need to be incorporated in sustainable growth to minimize the environmental effect and to preserve resources. Through the Best Worst Method (BWM) this study identifies and ranks 29 enablers to the adoption of these integrated practices where Corporate Social Responsibility was ranked top. Interpretive Structural Modeling The ISM indicates the vertical association in which the lowest in hierarchy is the Eco-Friendly Production Process Design and the highest is the Top Management Commitment. MICMAC analysis also implies that it should be strategic planning and dedication of the top management. The results provide practical implications to stakeholders in the industry and those who come up with their policies on how to put a priority on making their industries more sustainable. The gap of the study is also relevant because it integrates the green and circular supply chains to provide a well-granted framework that may help in sustainable supply chain management around the textile industry. Research in the future should be focused on reinforcing these interrelationships, including discovering other enablers to even to make sustainable practices stronger.

Keywords
Green Supply Chain, Circular Supply Chain, Textile Industries in Bangladesh, Best Worst Method (BWM), Interpretive Structural Modeling (ISM).

1. Introduction
The textile industry is of great significance to the Bangladesh economy as it contributes to more than 80 percent of the earnings in exportation and it employs over four million people. Nonetheless, it is a leading harmful industry with the second-biggest pollutant status of the world. The industry produces a large volume of carbon emission, industrial waste, and consumes huge quantity of water, chemicals, and energy (Griffin et al. 2018). The emergence of a concept known as fast fashion and the growth of consumer demands aggravates these effects putting the environment in danger of long term sustainability. The traditional textile supply chain is based on a linear business model which is highly resource consuming and also produces many wastes thus not sustainable in a long-term view (Das et al. 2025).

To solve these dilemmas, there is the need to ensure the integration of green and circular supply chain practices based on their importance to solve these dilemmas. Green manufacturing is practice that emphasizes waste-reducing, pollution-reducing, and resource-conserving behaviors, whereas circular supply chains is a similar practice that stresses on recycling, reuse and remanufacturing of products to achieve a greater product life and less in terms of environmental impact. The six R-concept that promotes sustainable resource management includes recover, recycle, reuse, refurbish, repair and remanufacture (Nosková 2025). Nonetheless, the increasing popularity however, there is a lack of research in successfully implementing the green and the circular supply chains into the textile industry.

This paper finishes this gap by detecting some of the main enablers of combining these frameworks, which will enable competitive and sustainable textile supply chains.

1.1 Objectives

- To determine and prioritize on the central facilitators towards the integration of the green and circular supply chain practices in the textile industry.
- To study the hierarchical pattern of relationships with respect to these enablers through an application of suitable method of analysis like Best Worst Method (BWM) and Interpretive Structural Modeling (ISM).
- To investigate the inter-connectedness of these enablers and its impacts in the overall supply chain performance.
- To offer practical information that can be used to inform the decisions of industry owners and regulatory authorities to design competent policies to adopt the integrated green and circular supply chains in the textile industries.

2. Literature Review

2.1 Green supply chain

Green supply chain management (GSCM) is concerned with lowering the environmental toll by lessening waste, pollution, and resource use, in the whole product life chain (Nosková 2025). It streamlines environmental goals and combines the business plans to enhance market share, legal congruence, and ecological output. The GSCM activities within the textile industries are preservation of ecofriendly production methodologies, green procurement, and the perfect coordination of the laws. Barriers and critical success factors to GSCM implementation have been studied in Bangladesh and Pakistan with special attention being paid to the government regulations and buyer demand (Rahman et al. 2020).

2.2 Circular Supply Chain

One of the main characteristics of circular supply chains is an emphasis on sustainability through promoting recovery, reuse, recycling, and remanufacturing of products in order to reduce the amount of waste and extracted resources (Sehnem et al. 2019). This is unlike a linear approach because it focuses on efficiency of resources, and the approach involving the 6 R's, which include: recover, recycle, reuse, refurbish, repair, and remanufacture. The principle of circular economy in the textile industry will be helpful in the context of countries like Indonesia, Vietnam, and India through the theoretical concept and practical guidelines to enhance resource use and minimized impact on the environment. In this regard, circular supply chains can result in cost reduction and regulatory compliance.

2.3 Textile Industries in Bangladesh

Textile industry in Bangladesh is a major economic development that contributes more than 80% of the export earnings and millions of employment is in the textile industry. Nonetheless, it encounters some citizens challenges of water, use of chemicals and pollution. The research conducted in Bangladesh has started sinking in sustainable practices such as green and circular supply chain integration (Sehnem et al. 2019). Largely due to the environmental upheaval, the textile sector is striving towards boosting sustainability and is facing pressure from increased awareness and regulatory pressures the world over. However, there is still a line of research, which addresses the combined implementation of green and circular methods, or, more precisely, in the given industry.

2.4 Best Worst Method (BWM)

BWM is an MCDM methodology to rank criteria/criteria based on expert pairwise judgments, which would be high in consistency and reliability in its determination of the prioritized criteria/criteria (Trivedi et al. 2024). It keeps the decision-making process simple by labeling the best, and the worst criteria, and calculating optimal weights that avert inconsistency. More recent applications of BWM include prioritizing enablers and barriers in healthcare expert systems as well as manufacturing supply chains (Rahman et al. 2020).

2.5 Interpretive Structural Modeling (ISM)

Interpretive Structural Modeling (ISM) is an analytical tool, which describes convoluted associations between variables and models a hierarchical mechanism by mapping direct and indirect impacts (Attri et al. 2013). ISM breaks down complex issues into sub-components and it creates a multilevel structural framework, which helps in the clear realization of the interconnections between the enablers (Sethi et al. 2025). Such a methodology has been extensively applied to supply chain management studies in determining major drivers and typologies in order to build strategic implementation frameworks. ISM increases stability and orderly concerns about what should be prioritized and what should be studied as far as the structural analysis of elements that affect the supply chain sustainability (Movahedipour et al. 2017).

2.6 PRISMA Framework

A systematic search of the literature was made using the PRISMA framework to find the scientific literature related to the topic of the study enablers of the integrated green and circular supply chain adoption in the textile industry in Bangladesh (Figure 1) (Affan et al. 2024). Our initial search in the dimension.ai database with keywords associated with green supply chain, circular supply chain and enablers showed 33,250 articles. After omitting papers that are not in English, duplicates, non-full-text papers, 176 papers remained. Additional filtering by conference papers, book chapters, and non-open-access papers contributed to the pool to 48 full-text articles. Finally, 23 articles that were specifically enablers of green and circular supply chain were sampled and analyzed into it. The fact that this review process was well organized ensured that the literature review of the study was done intensively.

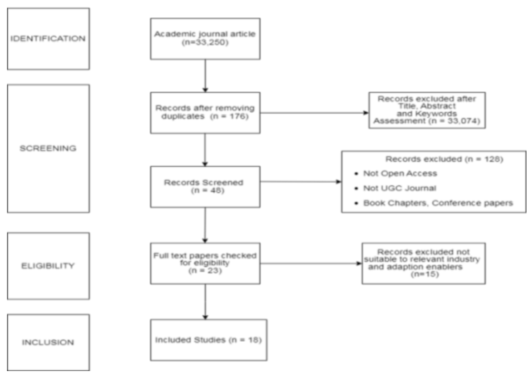

Figure 1. PRISMA framework

2.7 Key Enablers of Bangladeshi Textile Industry

Table 1 has categorized the factors as per their levels of hierarchy. The textile business in Bangladesh is critical towards the national economy of the country exporting more than 80 percent of the earnings and providing jobs to more than four million individuals. This, however, provokes diverse problems in the awareness and policing of the environmental character and the socio-economic dimensions of this particular sector: this is some of the most polluting industries that take place on the planet as it consumes a significant amount of resources and produces an absolute amount of waste. Green and circular supply chain practices integration has become necessary to deal with these problems. The primary enablers to introducing these practices are a high level of corporate social responsibility (CSR) and top management commitment as they could play an essential role in creating organizational culture and strategic alignment to the sustainability. Transparency and efficiency are also improved throughout the supply chain with the use of technological innovation, including blockchain, IoT, and big data (Rejeb et al. 2019). Implementation is also enhanced by proper strategic planning by the leadership as well as relevant favorable government regulations and policies (Oriekhoe et al. 2024). The core factors of operation such as green manufacturing processes, efficient waste management, and reverse logistic systems are all direct operations helping the organization in the environmental performance (Hsu et al. 2016). Also, the green procurement practices, information flow being open and above board, and awareness campaigns help to encourage market demand and the involvement of the stakeholders. These complex dynamics work in close coordination with one another and thus have a call to adopt a holistic and proximate mechanism of entrenching sustainability in the textile supply chain in Bangladesh. The paper points out such critical aspects using several techniques such as the Best Worst Method (BWM) and Interpretive Structural Modeling (ISM), present prioritized and hierarchical information to implement efficiently integrated green and circular supply chain regimes by industry sovies and policymakers.

Table 1. Key Enablers of Bangladeshi Textile Industry

Category	Enabler	Code	Description
Technological & Infrastructure	Technological Innovation (Blockchain, IoT, Big Data)	E1	Innovations such as blockchain, IoT, and Big Data enhance transparency, traceability, and efficiency in supply chains. These technologies enable real-time monitoring and data analytics for better decision-making and sustainable practices.
	Availability of Advanced Green and Circular Technology and Information	E2	Adoption of advanced green technologies, such as energy-efficient machinery and waste reduction systems, is essential for minimizing environmental impact.
	Energy-Saving and Consumption-Reducing Production Technology	E3	Energy-saving technologies and advanced manufacturing processes lower consumption, improve efficiency, and reduce the environmental footprint.
	Reverse Logistics Infrastructure	E4	Systems for collecting, sorting, and recycling returned goods support the circular economy by reusing and recycling materials.
	Competent Research and Development Team	E5	Skilled R&D teams drive innovation in sustainable technologies, processes, and materials, ensuring continuous improvement.
Governmental & Regulatory	Government Regulation and Policies	E6	Regulations covering environment, labor, and product safety influence adoption of green and circular supply chain practices.
	Environmental Regulation and Support Factors	E7	Regulations and incentives, such as subsidies for renewable energy, encourage eco-friendly initiatives.
	Fiscal, Tax, and Other Preferential Policies	E8	Tax incentives, grants, and subsidies promote investment in sustainable supply chain initiatives.
	Strict Penalty Policy	E9	Penalties for non-compliance (e.g., waste disposal or emissions) motivate businesses to adopt sustainable practices.
	Development of Green Product Standards	E10	Standards guide businesses to design and produce environmentally sustainable products.
	ISO 14001 Certification	E11	Certification requires implementing environmental management systems aligned with green supply chain principles.
Organizational & Managerial	Top Management Commitment	E12	Leadership commitment drives sustainability initiatives and encourages employee engagement.
	Business Strategy	E13	Integrating sustainability into business strategy ensures alignment with long-term organizational goals.
	Strategic Planning by Top Authority	E14	Top-level planning sets clear objectives, allocates resources, and monitors performance of green initiatives.
	Corporate Social Responsibility (CSR)	E15	CSR activities (e.g., community outreach, philanthropy) reflect commitment to social and environmental concerns.
	Corporate Culture	E16	A sustainability-oriented culture promotes innovation, accountability, and collaboration for circular practices.
Supply Chain & Financial	Green Procurement Driving Powers	E17	Procurement of eco-friendly materials encourages suppliers to adopt green practices.
	Establishment of Long-Term Relations with Partners	E18	Long-term collaboration fosters trust, knowledge sharing, and joint innovation for sustainability.
	Demand for Green Products	E19	Rising consumer demand drives businesses to prioritize eco-friendly manufacturing and products.
	Improvement of Competitiveness	E20	Sustainable practices lower costs, reduce risks, and improve brand reputation.
	Competent Research and	E21	R&D ensures development of sustainable technologies and

	Development Team		continuous improvement.
	Improvement of Transparency Across Supply Chains	E22	Transparent information flow ensures accountability, collaboration, and informed decision-making.
Ope-rational & Process	Green Marketing Strategy	E23	Promoting eco-friendly products and practices strengthens market position and drives consumer demand.
	Eco-Friendly Production Process Design	E24	Process design focused on lean manufacturing, efficiency, and waste reduction minimizes environmental impact.
	Waste Recycling System	E25	Recycling processes recover materials, reduce pollution, and conserve natural resources.
	Proper Disposal of Waste	E26	Safe waste disposal ensures compliance and reduces ecological and health risks.
	Appropriate Training & Development Programs	E27	Training equips employees with skills to implement and improve sustainable practices.
	Reduction of Waste and Energy-Related Cost	E28	Optimizing production reduces costs while lowering environmental impact.
	Awareness Campaigns for the Public	E29	Public campaigns encourage sustainable consumption and environmental stewardship.

3. Methods

3.1 Survey Design

In the study, the design of the survey followed four stages. The first step involved an in-depth literature review that was used to determine the possible drivers of integrated green and circular supply chains in the textile industry. These enablers were refined and validated with the help of the experts in textile industries, supply chain sector, and academicians where six new factors were added and four factors eliminated. The condensed list of 29 enablers, was then ranked based on expert ratings as rated using Best Worst Method (BWM). Finally, the 16 highest-ranked enablers were analyzed using Interpretive Structural Modeling (ISM), whereby experts were used to gather data on interrelationships between the enablers with a view to performing a hierarchical modeling and MICMAC. The type of the expert selection was purposive with the criterion being age and relevant experience or knowledge, whereas the data was collected in the form of online surveys, which permitted confidential data collection without the identifications of the participants.

3.2 Data Collection

The data collection was done in two ways consisting of two major surveys A relevancy survey on the enablers was carried out where a Google form targeted towards the distribution to supply chain professionals and academicians via email and LinkedIn was undertaken. Out of 15 responses 7 complete and valid responses were retained, that is a 46 percent response rate. In the Best Worst Method (BWM) and Interpretive Structural Modeling (ISM) surveys, nine experts participated but the responses are unknown to them. In the case of experts, they filled out the surveys separately on the internet Averaged data were calculated on the mode of responses relating to BWM rankings and structural self-interaction matrices. This information was used to underpin the integrated BWM- ISM-MICMAC analysis in Figure 2.

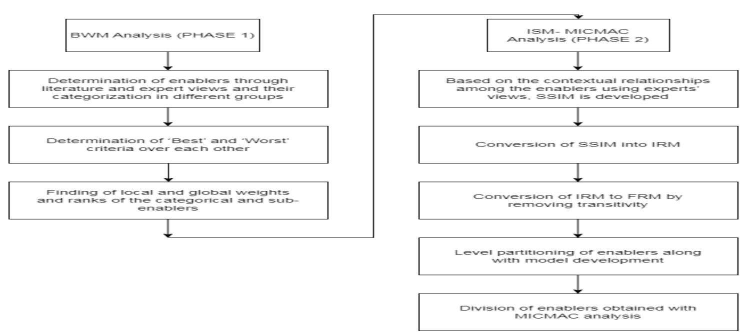

Figure 2. An Integrated two-phased BWM-ISM-MICMAC analysis

3.3 Best Worst Method (BWM)

The procedure employed to fulfill the objectives of the research, called the Best Worst Method (BWM), is a multi-criteria decision-making method (Rezaei 2015). It presupposes the determination of most significant (best) and the least significant (worst) criteria in a set. Then experts offer a pairwise comparison of the best criterion to others and vice versa, and the worst critique to others and vice versa, using a scale of 1 to 9. The strategy computes the optimality weights by minimizing the difference between such comparisons and derived weights that are consistent with a consistency ratio (CR). The resulting weights enable criteria to be ranked to facilitate decision-making. Using the BWM methodology, the explanations of this study ranked enablers of adopting the integrated green and circular supply chains in the textile industry.

3.4 Interpretive Structural Modeling (ISM)

Interpretive Structural Modeling (ISM) introduced by Warfield in 1974 is a methodology which is utilized to examine the complicated interactions involving variables by structuring the influence the variables have on each other. It simplifies complex issues by turning them into a sub-problems and it aids the construction of a structural model with multiple levels which comes quite in handy when decision-making. In the present study, ISM was applied to describe ties between the top-ranked 16 enablers as identified with the Best Worst Method (BWM). Experts based the relative associations between these enabling factors to create a Structural Self-Interaction Matrix (SSIM) and this was hemispherical to initial and final reachability matrices with the binary values and those transitive being discarded. The partitioning was done on the hierarchical arrangement of enablers using the concept of reachability and antecedent sets. The last ISM model was designed, which shows the hierarchical framework of enablers of implementing integrated green and circular supply chains within the textile industry and MICMAC analysis was conducted to study driving and dependence powers.

4. Results

In the section, the weights of the enablers and the sub-enablers were calculated by the BWM. The enablers were then prioritized on the basis of their calculated weights. The top-sixteen priority enablers were further grouped and analyzed on how they interact with ISM.

4.1 Calculation of weights with the help of best worst method

In the Best-Worst Method (BWM) the enablers or sub-enablers are compared pair-wise using a 1-9 Scale where 1 represents equal and 9 extreme importance of the attribute. The Best-to-Others (BO) matrix equates the best enabler with others and the Others-to-Worse (OW) matrix equates all enablers with the worst. Expert evaluation scores lead to the following matrices in Table 2.

Table 2. "Best to others" and "others to worst" matrix for challenges

Best to Other (BO)	**Technological & Infrastructure**	**Governmental & Regulatory**	**Organizational & Managerial**	**Supply Chain & Financial**	**Operational & Process**
Organizational & Managerial (Best)	2	3	1	5	4
Others to Worst (OW)	Worst Enablers (Supply Chain & Financial)				
Technological & Infrastructure	5				
Governmental & Regulatory	3				
Organizational & Managerial	5				
Supply Chain & Financial	1				
Operational & Process	2				

To obtain local weights, BWM was also used within each category. Main category weights were further multiplied with local weights, and global weights computed, which were used to determine final rankings of enablers in Table 3.

Table 3. Final weights and ranks of enablers by BWM

Enablers	Categorical weights	Local Weight	Global Weight	Rank
Technological Innovation (Blockchain, IoT, Big Data) (E1)	0.243902439	0.3	0.073170732	4
Availability of Advanced Green and Circular Technology and Information (E2)		0.214285714	0.052264808	5
Energy-Saving and Consumption-Reducing Production Technology (E3)		0.214285714	0.052264808	7
RL Infrastructure (E4)		0.214285714	0.052264808	6
Competent Research and Development Team (E5)		0.057142857	0.013937282	18
Government Regulation and Policies (E6)	0.162601626	0.464576074	0.075540825	3
Environmental Regulation and Support Factors (E7)		0.276422764	0.044946791	8
Fiscal, Tax, and Other Preferential Policies (E8)		0.078977933	0.01284194	19
Strict Penalty Policy (E9)		0.069105691	0.011236698	21
Development of Green Product Standards (E10)		0.069105691	0.011236698	21
ISO 14001 Certification (E11)		0.041811847	0.006798674	24
Top Management Commitment (E12)	0.406504065	0.405201916	0.164716226	2
Business Strategy (E13)		0.058179329	0.023650134	12
Strategic Planning by Top Authority (E14)		0.093086927	0.037840214	9
Corporate Social Responsibility (E15)		0.405201916	0.164716226	1
Corporate Culture (E16)		0.038329911	0.015581265	16

As our final rankings are obtained, MICMAC Analysis and Interpretive Structural Equation Modeling (ISM) were performed on the top 16 enablers that were selected based on the expert opinion using Best-Worst method. Table 4 presents the top sixteen enablers to adopt integrated green and circular supply chain in the Bangladesh textile sector.

Table 4. Top 16 enablers for ISM-MICMAC implementation

Final Enablers	Global Weight	Rank
Corporate Social Responsibility (E15)	0.164716226	1
Top Management Commitment (E12)	0.164716226	2
Government Regulation and Policies (E6)	0.075540825	3
Technological Innovation (Blockchain, IoT, Big Data) (E1)	0.073170732	4
Availability of Advanced Green and Circular Technology and Information (E2)	0.052264808	5
RL Infrastructure (E4)	0.052264808	6
Energy-Saving and Consumption-Reducing Production Technology (E3)	0.052264808	7
Environmental Regulation and Support Factors (E7)	0.044946791	8
Strategic Planning by Top Authority (E14)	0.037840214	9
Waste Recycling System (E23)	0.036220458	10
Green Procurement Driving Powers (E17)	0.026463908	11
Business Strategy (E13)	0.023650134	12
Eco-Friendly Production Process Design (E24)	0.022975664	13
Proper Disposal of Waste (E26)	0.022975664	14
Improvement of Transparency of Information Across Supply Chains (E22)	0.016786808	15
Corporate Culture (E16)	0.015581265	16

4.2 Structural Self-Interaction Matrix for Enablers

Quantitative analysis of the study started with structuring a Structural Self-Interaction Matrix (SSIM) of the expert inputs used in capturing pair-wise relationships among the key enablers to adopt integrated green and circular supply chains in the textile industry which is shown in Table 5.

Table 5. Structural self-interaction matrix for the enablers

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
E14		V	V	V	V	V	V	O	O	V	O	V	V	V	V	A
E2			V	V	O	V	V	A	O	O	O	O	O	V	O	A
E3				V	O	O	O	A	O	O	O	O	O	V	O	O
E4					A	A	A	A	O	A	O	A	O	V	A	A
E1						V	V	O	O	O	O	A	O	A	O	A
E7							V	A	A	V	V	A	A	V	A	A
E26								A	A	V	V	A	A	V	A	A
E6									O	O	V	V	O	V	O	A
E13										O	O	A	O	A	A	A
E23											O	A	A	V	O	A
E24												A	A	A	A	A
E15													O	V	A	A
E16														V	O	A
E22															A	A
E17																A
E12																

The bi-directional SSIM used directionality signs (V, A, X and O) to show the directional impacts of one factor to another. Thereafter, the conversion to the binary Initial Reachability Matrix (IRM) was made in Table 6, making the symbols Political in the matrix as 1s, and Uncertain about the relationship with the Political, the 0s, by rules, which dealt with the symbols in an appropriate way.

Table 6. Initial reachability matrix for enablers

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**Driving Power**
E14	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	0	12
E2	0	1	1	1	0	1	0	0	0	0	0	0	1	0	0	1	6
E3	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	3
E4	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	2
E1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	4
E7	0	0	0	1	0	1	1	0	0	1	1	0	1	0	0	0	6
E26	0	0	1	1	0	0	1	1	0	1	0	1	0	1	0	0	5
E6	0	1	1	1	0	1	1	0	0	1	1	0	1	0	0	0	9
E13	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	3
E23	0	0	0	1	0	0	1	0	1	0	0	1	0	1	0	0	3
E24	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
E15	0	0	1	1	1	1	1	1	1	1	1	0	1	0	0	0	9
E16	0	0	0	0	1	0	1	1	1	0	1	1	0	0	0	0	6
E22	0	0	1	0	1	0	0	1	0	1	0	1	0	0	0	0	4
E17	0	0	1	0	1	1	1	1	1	0	1	0	1	0	0	0	8
E12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
Dependence Power	2	4	4	12	5	10	11	2	5	7	9	5	3	13	3	1	96/96

The IRM was then cleaned up to the Final Reachability Matrix (FRM) in Table 7, by including transitivity (i.e., in the event that factor A has an impact on B and B on C, then A on C as well). With the FRM, the reachability set and antecedent set of each enabler was identified. The overlap between the sets allowed clustering the enablers into hierarchical levels: the factors with the same reachability and intersection sets have been assigned the highest level and excluded in subsequent iterations.

Table 7. Final Reachability Matrix for Enablers

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Driving Power
E14	1	1	1	1	1	1	1	0	1*	1	1*	1	1	1	1	0	14
E2	0	1	1	0	1*	1	0	0	1*	1	1*	0	1	0	0	0	10
E3	0	0	1	1	1*	1*	1	0	1*	1	1*	1	0	1	0	0	9
E4	0	0	0	1	1*	1	1*	0	1*	1	1*	0	1	0	0	0	8
E1	0	0	0	1	1	1	0	0	1*	1	1*	0	1*	0	0	0	8
E7	0	0	0	1	1*	1	1	0	1*	1	1	0	1	0	0	0	8
E26	0	0	1	1	1*	1*	1	0	1*	1	1	0	1	0	0	0	8
E6	0	1	1	1	1*	1	1*	0	1*	1	1*	1	1	0	0	0	12
E13	0	0	0	1*	1*	1	1	0	1*	1	1*	0	1*	0	0	0	8
E23	0	0	0	1	1*	1*	1*	0	1*	1	1	0	1	0	0	0	8
E24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
E15	0	0	0	1	1	1	1	1	1	1	1	0	1	0	0	0	9
E16	0	0	0	1*	1*	1	1*	0	1*	1	1	1	0	1	0	0	9
E22	0	0	0	1*	1	1*	1*	0	1	1	1	0	1	0	0	0	8
E17	0	0	0	1	1*	1	1*	0	1*	1	1	1	1	0	0	0	10
E12	1	1	1	1*	1	1	1	1	1	1	1	1	1	1	1	1	16
Dependence Power	2	4	5	15	15	15	15	2	15	15	16	5	3	15	3	1	146/146

The next stage of this study shall be the construction of a level partitioning based upon the final reachability matrix, thus, a hierarchical model. The reachability set, antecedent set and interaction set of each enabler have been tested and partitioning of the final level was based on the three sets. In order to determine the levels of the sixteen enablers taken in the study, there are six iterations computed. Finally, it is possible to divide the factors into six levels, as Table 8 shows. Also, the derived ISM-based hierarchical model is illustrated in Figure 3.

Table 8. Final Level Partitioning (LP)

Elements (Mi)	Reachability Set R(Mi)	Antecedent Set A(Ni)	Intersection Set R(Mi) ∩ A(Ni)	Level
1	1	1, 16	1	5
2	2	1, 2, 8, 16	2	4
3	3	1, 2, 3, 8, 16	3	3
4	4, 5, 6, 7, 9, 10, 14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	4, 5, 6, 7, 9, 10, 14	2
5	4, 5, 6, 7, 9, 10, 14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	4, 5, 6, 7, 9, 10, 14	2
6	4, 5, 6, 7, 9, 10, 14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	4, 5, 6, 7, 9, 10, 14	2
7	4, 5, 6, 7, 9, 10, 14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	4, 5, 6, 7, 9, 10, 14	2
8	8	8, 16	8	5
9	4, 5, 6, 7, 9, 10, 14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	4, 5, 6, 7, 9, 10, 14	2
10	4, 5, 6, 7, 9, 10, 14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	4, 5, 6, 7, 9, 10, 14	2
11	11	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16	11	1
12	12	1, 8, 12, 15, 16	12	3
13	13	1, 13, 16	13	3
14	4, 5, 6, 7, 9, 10, 14	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	4, 5, 6, 7, 9, 10, 14	2
15	15	1, 15, 16	15	4
16	16	16	16	6

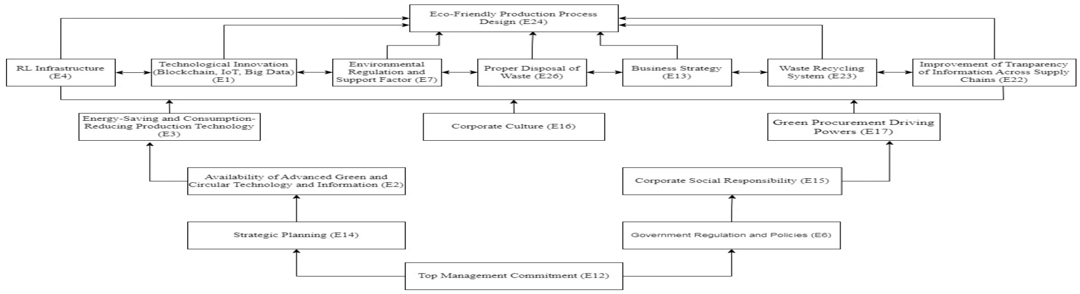

Figure 3. ISM model for enablers to integrated Green and Circular Supply Chain adoption

4.3 MICMAC Analysis

An analysis by the MICMAC (Multiplication [power] Impact Cross Matrix of enablers) classifies enablers into 4 classes based on their driving force and dependence power and are Autonomous, Dependent, Addicted and Renounced challenges.

Within this study in Figure 4, the enablers are empty and cannot belong to the category of Autonomous i.e. those associated with low driving and dependence powers. Adopting the category of Challenges Dependent, it is nevertheless clear that it is dependent on others but not very influential on one party or another one. Linkage issues (E4, E5, E6, E7, E9, E10 and E14) contain some share of motorization and some level of reliance, they are therefore hard to deal with and at the same time critical to the entire system. The most powerful ones consist of the Independent challenges-E1, E2, E3, E8, E12, E13, E15 and E16 which have great driving power yet may have less dependency and they are also influential in change.

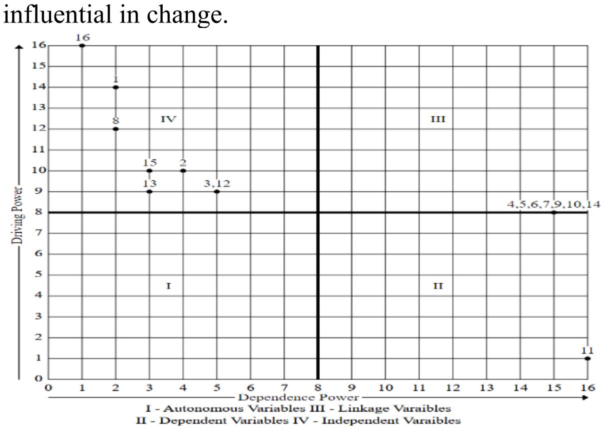

Figure 4. MICMAC Analysis

5. Discussion

The textile industry in Bangladesh among other countries is a critical aspect of economic growth and creation of employment opportunities but SMEs are oriented with the wonder of how the product was produced and how environmental sustainable it is. To enhance the aspect of sustainability of the supply chain, the current study incorporated a bundle of 29 enablers examined through the application of two facilitative approaches which include Best Worst Method (BWM) and Interpretive Structural Modeling (ISM). BWM made CSR come out as the most influential driver and the least important was Culture of the Corporation. The hierarchy provided in the map was as follows where Eco-Friendly Production Process Design was the topmost followed by Key enablers that included RL Infrastructure, Technological Innovation and Environmental Regulations. The analysis indicates that the association between such factors as technology, strategic planning, and government policies is inter-related and is relevant to the world of the green and circular supply chains implementation.

5.1 Theoretical Implications

The given study helps to sustain the theoretical understanding of supply chain sustainability as it provides the detailed framework of BWM and ISM. It gives a clear starting point to create a rank of preference of enablers and makes the preparation ground that future research or studies about the subject of green and circular supply chains should have.

5.2 Practical Implications

Ideally the members of the industry can apply the research in practice. It highlights the importance of the CSR, the establishment of green technology, environmental friendly processes and waste management. Focusing on leadership and strategy and regulatory compliance as the forces to reckon, it believes that the investments that need to be made are in technology, infrastructure, and skills. The findings also indicate that in fact incorporation of the method that is more holistic and collaborative that facilitates cross-organizational cooperation to establish a fully plump supply chain of textile is significant.

6. Conclusion

The study sought to map out enablers to implementation of green and circular business in the textile sector and their relationships and influence in the supply chain performance. Technological innovation, regulatory support, top management commitments are among the 29 critical enablers identified on the basis of techniques such as ISM and MICMAC. The ISM analysis indicated hierarchical structure and thus a need to employ the holistic approach where technology, leadership and policy are combined. MICMAC also noted lack of strategic planning and availability of technology as principal drivers.

Although the findings are useful, the study appreciates a limitation that qualifies it as lacking additional statistical confirmation thus future research should incorporate such a confirmation. Theoretically, the research is a contribution to the field of knowledge about sustainable supply chain dynamics and the basis of future studies. Recommendations should be taking the form of case studies, a greater examination of individual enablers, as well as a study into emerging technology that may support green and circular supply chains such as block-chain and IoT. Holistically, the study is gratifying to sustainable innovation in the textile industry and proponents of sustainable innovation.

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