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Research Article

Benchmarking the Interactions among Green and Sustainable Vendor Selection Attributes

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The primary motive of each and every organization or company is to sustain, strengthen, upgrade, and improve its position and standard in the highly dynamic, constantly changeable, aggressive, and competitive environment. There is a very urgent requirement to develop a framework for green and sustainable vendor selection in the organizations. The main aim of this research is to explore, identify, examine, and evaluate the important, applicable, green, and sustainable vendor selection attributes and to analyze and determine their interactions or relationships in the area of green and sustainable vendor selection. A total of ten important attributes have been determined through review reports and by the assessments of the group of professionals belonging to various organizations. A questionnaire has been prepared for these ten attributes and feedback was maintained from the judgments of the group of professionals in dairy industries. In this paper, a multicriteria decision-making technique namely interpretive structural modeling is implemented to look over the interactions and connections among various attributes and to put forward a constructional representation or digraph. Matriced Impacts Croise's Multiplication Appliqúe and Classment inspection is used to identify which attributes are autonomous, dependent, independent, influencing or not influencing, and importance of one criterion over another according to their driving and dependence powers. It is analyzed numerically from this model that the cost attribute is a very remarkable attribute as it exists in the bottom or sixth level and the attributes economic growth, financial capacity, and research ability are at first or topmost level of this model. The interpretive structural modeling hierarchy constructional representation and Matriced Impacts Croise's Multiplication Appliqúe and Classment inspection will support the company's owner or decision maker for attaining a best decision.

1. Introduction

India is the greatest manufacturer and biggest purchaser of milk on Earth. In India, the dairy company has molded the lives of billions of dairy agronomists. Dairy companies in India have been a remarkable giver to the gross national income and its worth of production has increased outstandingly. The dairy company is the main significant giver to the progress and welfare of the economy of India. The main motive of this paper is to work out an efficient and best fitted vendor selection model by inscribing the several economic, resilient, social, business, and ecological aspects in the organization sand to identify, examine, and evaluate the different types of attributes in green and sustainable vendor selection and establishing the interactions among attributes by building an interpretive structural modeling (ISM) constructional structure and categorizing the attributes based on Matriced Impacts Croise's Multiplication

Appliqúe and Classment (MICMAC) inspection. Many attributes were initially identified, but only ten attributes have been concluded by the guidance of the group of judges composed of managerial and technical experts from the various organizations.

Interpretive structural modeling (ISM) is a multicriteria decision-making (MCDM) method that helps and contributes the decision managers to arrive at the final best and optimal decision from a finite set of identified alternatives and multiple different kinds of competing criteria. Multicriteria decision-making approaches help decision managers to reach the best and most optimal final decision when given a series of different kinds of choices based on several competing criteria for a complex problem. MCDM methodology can be developed to select the best and suitable alternative from an infinite set of alternatives. MCDM also estimates a best-to-worst or worst-to-best ranking of the identified alternatives based on some conflicting criteria.

In multicriteria group decision-making problems, the groups of judges, experts, and decision managers usually come from different disciplines and have different backgrounds. Their knowledge level and opinions may differ. MCDM methods improve the quality of decision-making so that companies can work effectively and efficiently. This makes the decision-making process very simple, clear, effective, and efficient. The goal of multicriteria decision-making techniques is not just to arrive at the best and most optimal solution, but also to give authors and decision managers the ability to maintain a balance between multiple conflicting criteria.

ISM background deals with the interpretation of the object or representation system by systematic iterative application of graph theory resulting in a directed graph for the complex system for a given contextual relationship amongst a set of elements. ISM is a computer assisted interactive learning process whereby structural models are produced and studied. It is a means by which a modeling group can impose order on the complexity of relationships among elements. It interprets the links in terms of the contextual relationship and the direction of the relationship for each pair of elements [1].

ISM examined the interactions among the variables by decomposing the variables into various numbers of levels. It establishes the interactions with factors by categorizing the factors into various kinds of levels. ISM constructional structure was a give and take learning or studying technique where a complete, broad, and global system model is structured by various identified and related variables. In addition to this, ISM is the best structure to answer the complicated interactions among the variables. ISM technique allows single or multiple categories to evolve a plan of the numerous interactions among the different variables that are existing in a complex circumstance.

This paper shows a novelty to implement the ISM constructional structure to analyze the interactions among supply chain activities in dairy industries. Studying, identifying, analyzing, and establishing the interactions and relationships among various attributes and using the ISM constructional structure, this paper looks for establishing and motivating the following objectives: Firstly, an ISM constructional structure or directed graph is structured. This structure gives the significance and applicability of the ten attributes in dairy industries. According to the basis of the significance and applicability of the attributes, the purchasing managers can choose the optimal green and sustainable vendor. Secondly, by using ISM constructional structure, MICMAC inspection is developed to check the validity of the ISM constructional structure.

The remainder of this paper is organized as follows: We provide the introduction and literature review in Sections 1 and 2. Objective of the proposed model in Sections 3 and 4 shows the concept of ISM. Significance and assumptions in Sections 5 and 6, respectively. Formulation of ISM modeling in Section 7 and numerical analysis is given in Section 8. Finally, the conclusion, managerial benefits, limitations, and future work are summarized in Sections 9–11, respectively.

2. Literature Review

Maintaining effectiveness and sustainable practices in the food processing companies can be perceived through transformation, distribution channel cooperation, and eradication of unpredictability together with environment friendly capabilities. More attention is required to examine the crucial trends, drivers, and factors of the dairy companies. Moreover, nowadays, the dairy companies should be capable of research & development (R & D) ability, technological capability, economic growth, financial capability, maintaining government policies, etc. (see Mor et al. [2], Mor et al. [3], and Mor et al. [4]).

The most essential development of the dairy company is to upgrade their planning, regulation, and determination so that they can fulfill the good quality, stability, and security grades of the transport market (Bhardwaj et al. [5]). To be competitive, the companies should apply a scope of sustainable processes such as reuse of products, recycling of products, green technology, green packaging, and eco-friendly. (Mor et al. [6]). Mor et al. [7] stated that the greater expertise in the dairy sector is the outcome of supply chain processes loyal towards good quality of items, flexible delivery processes, reliability, normal price of items, etc.

Parthiban et al. [8], Chen et al. [9], and Girubha et al. [10] applied ISM technique to determine the relations among the factors in the process of the selection of suppliers. Kumar et al. [11] implemented the ISM modeling from the professionals to choose variables in the process of the vendor selection. Gupta and Walton [12] applied Interpretive structural modeling to assess third party logistics providers. Raut et al. [13] developed ISM to identify the critical success factors of sustainable supply chain management practices in the context of oil and gas industries. Sahu and Panigrahi [14] analyzed interactions among the enablers of green supply chain management using interpretive structural modeling. Li et al. [15] analyzed risk assessment in thermal power plants using ISM methodology. A number of prior studies integrated ISM and MICMAC to assess the criteria of multicriteria decision-making problems in various fields to rank the options or select the most suitable alternative (Ahmad et al. [16], Farooq et al. [17], and He and Chen [18]).

ISM has been used for determining the contextual interactions among the criteria or factor analysis in the field of sustainable supply chain management (Thamsatitdej et al. [19] and Zayed and Yaseen [20]). Tan et al. [21] applied ISM technique in evaluating barriers to building information modeling (BIM) implementation in China's prefabricated construction. Singh and Gupta [22] developed a framework for a sustainable maintenance system by implementing the techniques of ISM-fuzzy MICMAC and TOPSIS. Bakhtaria et al. [23] implemented the ISM model and fuzzy AHP technique in evaluating Industry 4.0 implementation challenges.

After studying and analyzing review reports, it has been concluded that the research in the field of identifying, determining, and evaluating important, applicable, green, and sustainable vendor selection attributes in the vendor selection process are limited particularly in establishing the contextual interactions among green and sustainable vendor selection criteria in organizations. Table 1 clarifies the research gap and the contributions of the proposed study. Hence, this paper is an attempt to determine and evaluate the green and sustainable vendor selection attributes and their connections by developing an ISM constructional structure and MICMAC inspection in dairy industries.

3. Objectives of Study

(i) To identify and evaluate the green and sustainable vendor selection attributes in dairy industries

(ii) Establishing the interactions among green and sustainable vendor selection attributes in dairy industries

4. Interpretive Structural Modeling (ISM)

The ISM technique was given by Warfield [24]. In ISM technique, the word interpretive is used in which the investigators identify, explain, clarify, translate, determine, and opt the variables. The word structural is used in which the investigators can construct the simplified structure by modifying the complex structure. The word modeling is used in which the investigators can represent a directed graph by the simplified structure so formed. It is a give and take studying technique. It can determine the interactions with variables which are connected and dependent separately or in batches.

ISM technique was applied by investigators as it gives more accurate results and provides straight interactions among variables as the variables are decided by a group of experts rather than individuals taken in segregation. The researchers choose this approach due to its goodness and positive and negative relationships among the factors according to the circumstances which are shown far more appropriately and correctly rather than solitary variables taken in segregation. ISM allows researchers to apply the opinions of judges on the basis of various management methods such as brainstorming in developing contextual interconnections among the various kinds of variables. Furthermore, authors should discuss with industry experts and professionals in determining the interconnections among the variables.

An ISM constructional structure is used in the present paper to answer and establish the interactions among the green and sustainable vendor selection attributes to implement the effective vendor selection process in dairy industries. The theory of ISM depicts complicated structure into a simplified constructional structure by partitioning of levels. Experimentally, it allows a basic analysis of complicated structure, which is followed by taking actions for problem solving. ISM was used to examine the interactions between the characteristics or attributes of different variables which are identified for an issue. ISM technique is interpretive as the interactions and relationships identified among the attributes are assessed by the judgments of the group of experts and also through literature or writings.

The final pace is MICMAC inspection (Matriced Impacts Croise's Multiplication Appliqúe and Classment). The purpose of this inspection is to examine the driving powers and dependence powers of various kinds of attributes. MICMAC inspection is a validation of the ISM constructional structure. In MICMAC inspection, attributes are categorized into four parts, namely, autonomous attributes (Quadrant I), dependent attributes (Quadrant II), linkage attributes (Quadrant III), and independent attributes (Quadrant IV).

5. Significance of ISM

(i) Helps in presenting a complex system in a simplified way

(ii) Provides interpretation of the embedded object

(iii) Transforms unclear and poorly articulated mental models of systems into visible well-defined models, thereby helping in answering what and how in theory building

(iv) Facilitates the identification of the structure within a system

6. Assumptions of ISM

(i) Basically, ISM is a multicriteria decision-making (MCDM) method which helps the decision managers to arrive at the final best and optimal decision from a finite set of identified alternatives and multiple different kinds of competing criteria

(ii) ISM deals with the interpretation of the object or representation system by systematic iterative application of graph theory resulting in a directed graph for the complex system for a given contextual relationship amongst a set of elements

(iii) ISM is a computer assisted interactive learning process whereby structural models are produced and studied

(iv) It is a means by which a modeling group can impose order on the complexity of relationships among elements

Table 1: Literature review.

S. No.	Authors	Findings
	Mor et al. [2], Mor et al. [3], and Mor et al. [4]	Maintaining effectiveness and sustainable practices in the food processing companies can be perceived through transformation, distribution channel cooperation, and eradication of unpredictability together with environment friendly capabilities. More attention is required to examine the crucial trends, drivers, and factors of the dairy companies. Moreover, nowadays, the dairy companies should be capable for research & development (R & D) ability, technological capability, economic growth, financial capability, maintaining government policies, etc.
	Bhardwaj et al. [5]	The most essential development of the dairy company is to upgrade their planning, regulation, and determination so that they can fulfill the good quality, stability, and security grades of the transport merchandise.
	Mor et al. [6]	To be competitive, the companies should apply a scope of sustainable processes such as reuse of products, recycling of products, green technology, green packaging, eco-friendly.
	Mor et al. [7]	Mor et al. stated that the greater competency in dairy sector is the outcome of supply chain processes loyal towards good quality of products, flexible in delivery processes, reliability, normal price of products, etc.
	Parthiban et al. [8], Chen et al. [9], and Girubha et al. [10]	They applied ISM technique to determine the relations among the factors in the process of the selection of suppliers.
	Kumar et al. [11]	They implemented the ISM modeling from the professionals to choose variables in the process of the vendor selection.
	Gupta et al. [12]	They applied interpretive structural modeling to assess third party logistics providers.
	Raut et al. [13]	They developed ISM to identify the critical success factors of sustainable supply chain management practices in the context of oil and gas industries.
	Panigrahi et al. [14]	They analyzed interactions among the enablers of green supply chain management using interpretive structural modeling.
	Li et al. [15]	Analyzed risks assessment in thermal power plants using ISM methodology.
	Ahmad et al. [16], Farooq et al. [17], and He and Chen [18]	A number of previous studies integrated ISM and MICMAC to assess the criteria of multicriteria decision-making problems in various fields, to rank the alternatives or select the most suitable alternative.
	Thamsatitdej et al. [19] and Zayed and Yaseen [20]	ISM has been used for determining the contextual interactions among the criteria or factor analysis in the field of sustainable supply chain management.
	Tan et al. [21]	They applied ISM technique in evaluating barriers to building Information modeling (BIM) implementation in China's prefabricated construction.
	Singh and Gupta [22]	They developed a framework for sustainable maintenance system by implementing the techniques of ISM-fuzzy MICMAC and TOPSIS.
	Bakhtaria et al. [23]	Bakhtaria et al. implemented the ISM model and fuzzy AHP technique in evaluating industry 4.0 implementation challenges.
	Warfield [24]	The ISM technique was given by Prof. J. Warfield [24]. He stated that, in ISM technique, the word interpretive is used in which the investigators identify, explain, clarify, translate, determine, and opt the variables. The word structural is used in which the investigators can construct the simplified structure by modifying the complex structure. The word modeling is used in which the investigators can represent a directed graph by the simplified structure so formed.
	Dube and Gawande [25]	He analyzed green supply chain barriers using integrated ISM-fuzzy MICMAC approach.
	Yadav and Singh [26]	He developed an integrated fuzzy-ANP and fuzzy-ISM approach using block chain for sustainable supply chain.
	Liu et al. [27]	He analyzed on influencing factors of cross border e-commerce supply chain resilience based on integrated fuzzy DEMATEL-ISM techniques.

(v) It interprets the links in terms of the contextual relationship and the direction of the relationship for each pair of elements

(vi) ISM examined the interactions among the variables by decomposing the variables into various numbers of levels

(vii) ISM is the best structure to answer the complicated interactions among the variables

7. Formulation of Interpretive Structural Modeling (ISM)

The ISM constructional structure and the MICMAC inspection are discussed below.

Step 1: Identification of attributes. In this step, attributes are identified for the organization.

Step 2: Construction of self-structured matrix (SSIM). In this step, SSIM is constructed to determine the connections among the attributes.

Step 3: Construction of initial reachability matrix (Initial RM). Initial RM is constructed from SSIM and further examined for transitivity which defines that if variable L is in relation with M and M is in relation with N, then L is compulsory in relation with N.

Step 4: Construction of final reachability matrix (Final RM). After trying the transitive relations in the initial RM, we can construct the final RM. After constructing the final RM, driving and dependence powers have been computed. Driving power states an enterprise forcing additional enterprises and dependence power states an enterprise forced by additional enterprises. The driving power is computed by adding all 1's in the corresponding horizontal lines of that attribute while the dependence power is calculated by adding all 1's in the corresponding vertical lines of that attribute from final RM. This is contemplated as an input to construct a graph to categorize the various attributes.

Step 5: Partitioning the attributes into various levels. The final RM is partitioned into various levels. This partition is applied to show the arrangement of attributes level-wise. The reachability sets, antecedent sets, and intersection sets for all the attributes are evaluated. In reachability set, the attributes in the rows are 1, and in antecedent set, the attributes in the columns are 1. The reachability set includes the attribute itself and additional attributes, which it may assist to reach, whereas the antecedent set includes the attribute itself and additional attributes, which may assist reaching it. The intersection sets are then calculated in case of all the attributes. The attributes which have the equal reachability and intersection sets consist of the first-level attributes. The first-level attributes would not assist to reach any other attribute above their own level in the ISM constructional structure. Once first-level attributes are evaluated, it is isolated from other attributes. Then, this process is replicated to determine the succeeding level of attributes.

Step 6: Construction of directed graph. Based on interactions defined in the final RM, a directed representation is developed, and transitive associations are eliminated. Directed graph or digraph interprets the links in terms of the contextual relationship and the direction of the relationship for each pair of elements. The attributes are categorized strongly in levels, and the directed associations are constructed according to the interactions appearing the final RM. An initial directed graph is constructed by removing the transitive interactions stepwise. Only those transitive interactions may be kept whose explanation is important. In ISM, the explanation of the directed graph can be performed in two aspects, i.e., nodes and connections.

Step 7: Construction of ISM structure. The developed directed graph is modified into an ISM structure, by eliminating nodes with statements.

Step 8: Construction of MicMac inspection was proposed by Duperrin and Godet [21] in 1973. MicMac inspection is implemented to scrutinize the rightness of the ISM constructional structure. It consists of framing a graph to divide the attributes according to their driving and dependence powers into four parts, i.e., autonomous, dependent, linkage, and independent attributes. The flowchart of ISM hierarchy is shown in Figure 1.

(a) Autonomous attributes: they consist of the first part and have both weak driving and dependence powers

(b) Dependent attributes: they consist of the second part and have weak driving power but strong dependence power

(c) Linkage attributes: they consist of the third part and have both strong driving and dependence powers

(d) Independent attributes: they consist of the fourth part and have strong driving power but weak dependence power

8. Numerical Analysis

In this paper, ISM is implemented to examine the green and sustainable vendor selection attributes to identify the performance of the green and sustainable vendors in dairy industries. Researchers planned a survey questionnaire and spread among a group of professionals to identify and select the attributes. A questionnaire is used to obtain expert opinion on the relationships between each criterion and the other criteria. A questionnaire will be sent to a group of experts. After evaluating, data will be aggregated in terms of variables, namely, V, A, X, and O and is shown in Table 2. In present work, total ten green and sustainable vendor selection criteria, namely, At 1-quality, At 2-delivery, At 3-cost, At 4-eco-friendly, At 5-green technology, At 6-worker's right, At 7-flexibility, At 8-economic growth, At 9-financial capacity, and At 10-research ability have been identified. The first objective of this paper is satisfied with the identification of the attributes.

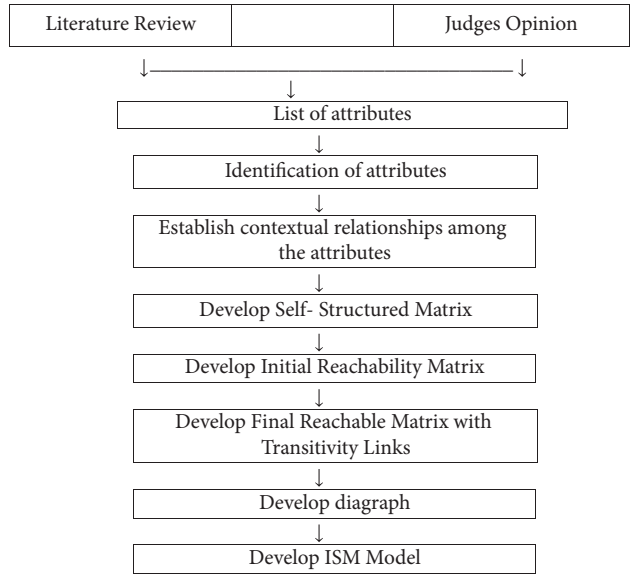

Figure 1: Flowchart of ISM hierarchy.

Table 2: Self-structured interaction matrix (SSIM).

S. no.	Attributes	At 10	At 9	At 8	At 7	At 6	At 5	At 4	At 3	At 2	At 1
(1)	At 1	*V*	*V*	*V*	*V*	*O*	*V*	*V*	*A*	*O*	*X*
(2)	At 2	*O*	*O*	*O*	*O*	*O*	*V*	*V*	*O*	*X*	
(3)	At 3	*V*	*V*	*V*	*V*	*O*	*V*	*V*	*X*		
(4)	At 4	*V*	*A*	*V*	*V*	*O*	*V*	*X*			
(5)	At 5	*V*	*A*	*V*	*V*	*O*	*X*				
(6)	At 6	*V*	*A*	*V*	*V*	*X*					
(7)	At 7	*V*	*A*	*V*	*X*						
(8)	At 8	*V*	*A*	*X*							
(9)	At 9	*X*	*X*								
(10)	At 10	*X*									

After determining the attributes, the connections among the attributes have been established with the arguments of the group of experts. For this, an SSIM matrix has been developed for these attributes. SSIM matrix is illustrated in Table 1. The four variables have been identified to designate the direction of relations between two attributes (a and b). For each (a, b), the relationship between these two attributes is analyzed as follows:

(i) *V*: variable *a* will assists to attain variable *b*

(ii) *A*: variable *a* will be attained only through variable *b*

(iii) *X*: both *a* and *b* will assist to attain one another

(iv) *O*: variables *a* and *b* are not attaining each other

Now, SSIM is transfigured into an initial RM. It is a bipartite matrix which includes 0 and 1 and transforms the interactions into binary encrypting form (0 and 1).

Following directions are helpful to form initial RM:

(i) If the (a, b) arrival is V in matrix SSIM, then in the initial RM, the (a, b) arrival will be 1 and (b, a) arrival will be 0

(ii) If the (a, b) arrival in SSIM is A, then in the reachability matrix, the (a, b) arrival will be 0 and the (b, a) arrival will be 1

(iii) If the (a, b) arrival is X, then in the reachability matrix, the (a, b) arrival and the (b, a) arrival will be 1

(iv) If the (a, b) arrival is zero, then in the reachability matrix, the (a, b) and (b, a) arrivals will be 0

Initial RM is developed from SSIM using these correlations and it is given in Table 3.

Then, the initial RM is transformed into the final RM with transitive connections. The final RM is shown in Table 4. The star notified numbers indicate that the specific interactions obtain value as 1^* after identifying the transitivity concept. After constructing the final RM, driving and dependence powers have been computed.

Now the final RM so formed is partitioned into various kinds of levels. The reachability, antecedent, and intersection sets are calculated in case of all the attributes and is given in Table 5.

Table 3: Initial reachability matrix.

S. no.	Attributes	At 1	At 2	At 3	At 4	At 5	At 6	At 7	At 8	At 9	At 10
(1)	At 1	1	0	0	1	1	0	1	1	1	1
(2)	At 2	0	1	0	1	1	0	0	0	0	0
(3)	At 3	1	0	1	1	1	0	1	1	1	1
(4)	At 4	0	0	0	1	1	0	1	1	0	1
(5)	At 5	0	0	0	0	1	0	1	1	0	1
(6)	At 6	0	0	0	0	0	1	1	1	0	1
(7)	At 7	0	0	0	0	0	0	1	1	0	1
(8)	At 8	0	0	0	0	0	0	0	1	0	1
(9)	At 9	0	0	0	1	1	1	1	1	1	1
(10)	At 10	0	0	0	0	0	0	0	0	1	1

Table 4: Final reachability matrix with transitive links.

S. no.	Attributes	At 1	At 2	At 3	At 4	At 5	At 6	At 7	At 8	At 9	At 10	Driving power
(1)	At 1	1	0	0	1	1	1*	1	1	1	1	8
(2)	At 2	0	1	0	1	1	0	1*	1*	0	1*	6
(3)	At 3	1	0	1	1	1	1*	1	1	1	1	9
(4)	At 4	0	0	0	1	1	0	1	1	1*	1	6
(5)	At 5	0	0	0	0	1	0	1	1	1*	1	5
(6)	At 6	0	0	0	0	0	1	1	1	1*	1	5
(7)	At 7	0	0	0	0	0	0	1	1	1*	1	4
(8)	At 8	0	0	0	0	0	0	0	1	1*	1	3
(9)	At 9	0	0	0	1	1	1	1	1	1	1	7
(10)	At 10	0	0	0	1*	1*	1*	1*	1*	1	1	7
	Dependence power	2	1	1	6	7	5	9	10	9	10	

Table 5: Level partitioning of attributes.

S. no.	Attributes	Reachability set	Antecedent set	Intersection set	Levels
(1)	At 1	1, 4, 5, 6, 7, 8, 9, 10	1, 3	1	5
(2)	At 2	2, 4, 5, 7, 8, 10	2	2	5
(3)	At 3	1, 3, 4, 5, 6, 7, 8, 9, 10	3	3	6
(4)	At 4	4, 5, 7, 8, 9, 10	1, 2, 3, 4, 9, 10	4, 9, 10	4
(5)	At 5	5, 7, 8, 9, 10	1, 2, 3, 4, 5, 9, 10	5, 9, 10	3
(6)	At 6	6, 7, 8, 9, 10	1, 3, 6, 9, 10	6, 9, 10	3
(7)	At 7	7, 8, 9, 10	1, 2, 3, 4, 5, 6, 7, 9, 10	7, 9, 10	2
(8)	At 8	8, 9, 10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	8, 9, 10	1
(9)	At 9	4, 5, 6, 7, 8, 9, 10	1, 3, 4, 5, 6, 7, 8, 9, 10	4, 5, 6, 7, 8, 9, 10	1
(10)	At 10	4, 5, 6, 7, 8, 9, 10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	4, 5, 6, 7, 8, 9, 10	1

Now, determining the ranking of the identified attributes through their driving and dependence powers is shown in Table 6.

Level 1: The three attributes, i.e., economic growth, financial capacity, and research ability are in the first or top level of the ISM constructional structure

Level 2: The flexibility attribute stands in the second level

Level 3: The two attributes, i.e., green technology and worker's right stand in the third level

Level 4: The eco-friendly attribute stands in the fourth level

Level 5: The two attributes, i.e., quality and delivery stand in the fifth level

Level 6: The cost attribute stands in the last sixth or bottom level of the ISM constructional structure

Six levels have been confirmed from level partitioning and are shown in Table 7.

From the level partitions, the directed graph is constructed and is shown in Figure 2.

The developed directed graphical representation is transformed into an ISM constructional structure by eliminating nodes with statements and is shown in Figure 3.

After getting the ISM levels, MICMAC inspection graph is constructed to categorize the attributes and to check the

Table 6: Powers-based ranking of attributes.

S. no.	Attributes	Driving power	Driving based rank	Dependence power	Dependence based rank
(1)	Quality	8	II	2	VI
(2)	Delivery	6	IV	1	VII
(3)	Cost	9	I	1	VII
(4)	Eco-friendly	6	IV	6	IV
(5)	Green technology	5	V	7	III
(6)	Worker's right	5	V	5	V
(7)	Flexibility	4	VI	9	II
(8)	Economic growth	3	VII	10	I
(9)	Financial capacity	7	III	9	II
(10)	Research ability	7	III	10	I

Table 7: Six levels of attributes.

Levels	Attributes
I	Economic growth, financial capacity, and research ability
II	Flexibility
III	Green technology and worker's right
IV	Eco-friendly
V	Quality and delivery
VI	Cost

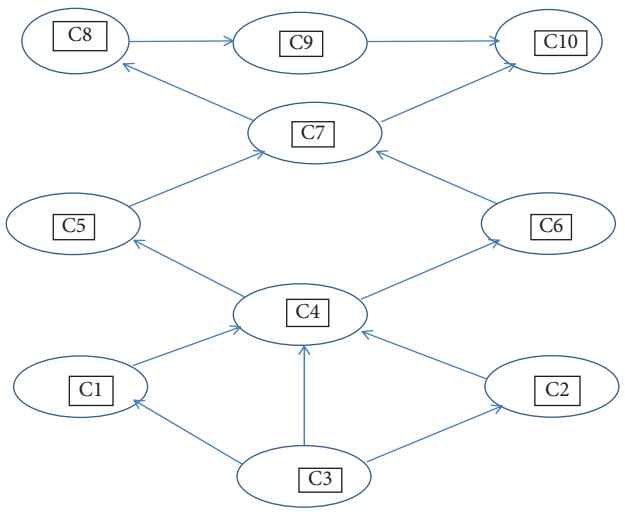

Figure 2: Digraph of ISM.

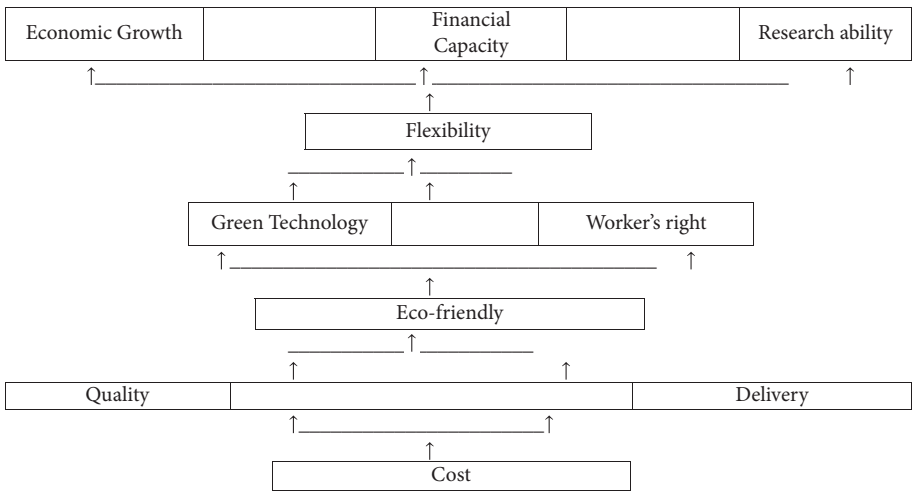

Figure 3: Graphical representation of ISM constructional structure.

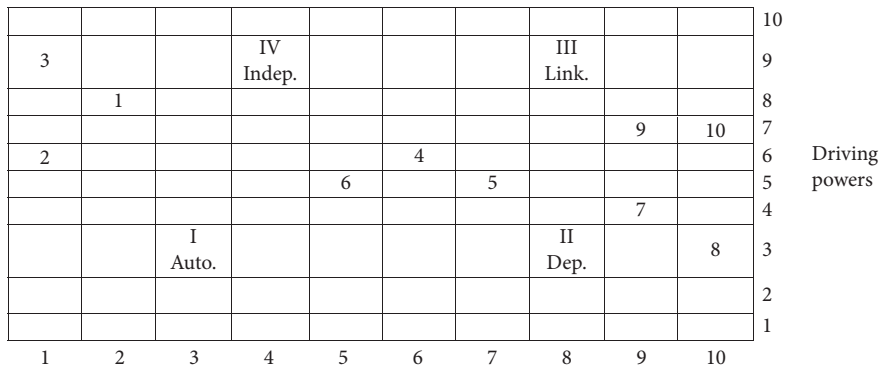

Figure 4: MICMAC analysis of ISM structure.

accuracy and validity of the ISM constructional structure of identified attributes, which is shown in Figure 4.

Autonomous: This part means acting in accordance with one's moral duty rather than one's desires. It includes only one attribute. The attribute worker's right lies in the first part, i.e., autonomous which has both weak driving and dependence powers.

Dependent: The attributes such as green technology, flexibility, and economic growth lies in the second part, i.e., dependent which has weak driving but strong dependence power.

Linkage: The attributes such as eco-friendly, financial capacity, and research ability lies in the third part, i.e., linkage which has both strong driving and dependence powers.

Independent: The attributes such as quality, delivery, and cost lies in the fourth part, i.e., independent which has strong driving power and weak dependence power.

9. Conclusions

The main motive of this paper is to work out an efficient and best fitted vendor selection model by inscribing the several green and sustainable aspects in the dairy organizations and to identify, examine, and evaluate the different types of attributes in green and sustainable vendor selection and establishing the interactions among attributes by building an ISM constructional structure and categorizing the attributes based on MICMAC inspection in dairy industries. It is analyzed from the ISM model that the cost attribute is a very remarkable attribute as it exists at the bottom of the ISM hierarchical model. The bottom attribute, i.e., cost attribute needs most care by the decision managers in dairy industries. The attributes economic growth, financial capacity, and research ability are at first or topmost level of the ISM constructional structure. The attributes such as eco-friendly, financial capacity, and research ability are in the linkage portion which has both high driving and dependence power. The attributes such as quality, delivery, and cost are independent. It is also found that the attributes such as green technology, flexibility, and economic growth will depend on others. Furthermore, the attribute worker's right to be autonomous needs to be analyzed and examined instantly by the company's managers. MICMAC inspection gives details about the importance and the links among the various attributes in dairy industries.

In the review paper, the ISM technique was applied for determining the contextual relationships among the green and sustainable supplier selection criteria. They identified 23 criteria for determining the best green and sustainable supplier. From the results obtained in this paper, they concluded that the criteria "financial position" is at the bottom level of the ISM-based model whereas in the current study "cost criteria" is at the bottom level of ISM-based model, which is more accurate.

The results of this research may demonstrate to be very profitable for the dairy industries to run an effective green and sustainable supply chain processes through optimal green and sustainable vendor on the basis of green and sustainable vendors selection attributes. ISM constructional structure and the MICMAC inspection play a very significant role in this research. Thus, this study focused on the green and sustainable vendor selection attributes causing low productivity on organizations using ISM techniques.

10. Managerial Benefits of the Study

(i) The managerial benefits of this paper is work out an efficient and best fitted vendor selection model by inscribing the several green and sustainable aspects in the dairy organizations and to identify, examine, and evaluate the different types of attributes in green and sustainable vendor selection

(ii) Establishing the interactions among attributes by building an ISM constructional structure and categorizing the attributes based on MICMAC inspection in dairy industries

(iii) It is analyzed from the ISM model that the cost attribute is a very remarkable attribute as it exists at the bottom of the ISM hierarchical model

(iv) Cost attribute needs most care by the decision managers in dairy industries

(v) The attributes economic growth, financial capacity, and research ability are at first or topmost level of the ISM constructional structure

(vi) The attributes such as quality, delivery, and cost are independent. It is also found that the attributes such as green technology, flexibility, and economic growth will depend on others

(vii) The attribute worker's right to be autonomous needs to be analyzed and examined instantly by the company's managers

(viii) MICMAC inspection gives details about the importance and the links among the various attributes in dairy industries

11. Limitations and Future Outlook of the Study

There are certain drawbacks of ISM techniques such as this technique is only used by knowledgeable judges not by individuals. For this technique, knowledge of computers is must. The elucidation of connections is somewhat weak and therefore, it fails to answer the same connections of the ISM constructional structure for dissimilar individuals. It also fails to answer about the mortality of connections. While considering the future study and research, this technique can also be easily implemented to any other assessment problem in various types of real fields, particularly in manufacturing and service organizations. ISM can also be applied in a fuzzy environment in solving various types of problems and can be justified with other MCDM techniques as well to reduce the uncertainties further. Dube and his collaborator analyzed green supply chain barriers using integrated ISM-fuzzy MICMAC approach [25]. Yadav and his co-worker originated an integrated fuzzy-ANP and fuzzy-ISM approach using block chain for sustainable supply chain [26]. Liu and his collaborator analyzed on influencing factors of cross border e-commerce supply chain resilience based on integrated fuzzy DEMATEL-ISM techniques [27].

Data Availability

Data will be made available on reasonable request from the corresponding author.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Reema Agarwal and Ankur Agrawal have equally contributed to conceptualization, literature analysis, and review drafting. Supervision was performed by Nitendra Kumar and Mohd Asif Shah. Project administration was performed by Preeti Jawla and S. Priyan. All authors have read and agreed to the published version of the manuscript. All authors confirm the final authorship for this manuscript. All authors have made significant scientific contributions for the research in the manuscript.

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