

An Interpretive Structural Model for Analyzing the Impact of Sustainability Driven Supply Chain Strategies

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Abstract

The existing ecological imbalance along with the rising social disparities are driving companies towards consideration of adoption of sustainability driven supply chain (SC) strategies which aim at a holistic integration of the economic, ecological and social enhancement of the overall SC. However, the challenge lies in consideration of Triple Bottom Line (TBL). Further, increasing demand from stakeholders for accountability of the sustainability practices has put immense pressure on companies for assessment of their SC activities in terms of sustainability. However in few developing nations like India, even though companies are required to examine the environmental as well as social ramifications of their SC activities, most firms are still focused more on the economic productivity. This brings us to the motivation behind this research, in which a multi-criteria analytical framework is developed for a manufacturing firm for identifying the sustainability practices, which can aid the firm in simultaneously improving on TBL. Interpretive structural modeling (ISM) is utilized for establishing relationships between sustainability strategies identified through extensive literature review and semi-structured interviews with decision makers. Through the analysis of the ISM model developed for the case-based study, it is validated that environmental and social sustainability enables economic sustainability in the long run.

Keywords

Supply chain strategies, electronics manufacturers, Interpretive Structural Modeling (ISM), Triple Bottom Line

1. Introduction

Escalating consciousness of the decision makers regarding environmental and social issues has encouraged most manufacturing companies to increase its attention on adoption of sustainability practices, Darbari et al. (2017). In particular, the growing stakeholder awareness in India is driving the manufacturers to incorporate sustainability into their business, Govindan et al. (2017). The literature has analyzed various factors for implementing sustainable practices for different industries. For instance, Diabat et al. (2011) analyzed the driving factors for carrying out sustainability practices in Indian textile sector. The results show that social sustainability is mainly focused upon due to factors such as employees' involvement, stability and community economic in case of textile industries. Darbari et al. (2016), identified crucial factors for social sustainability in reverse supply chain for electronics industry. The study concluded that top management commitment, government support and stakeholder empowerment are the most imperative and essential facilitators for achieving the desired social performance level for Reverse Logistics (RL) system. Kausar et al. (2016), Investigated the key drivers towards sustainability in supply chain (SC) for various

Indian industries. The authors concluded that ‘Government policies and support systems’ are the foremost enabler for execution of sustainability practices in the Indian industries.

The manufacturing industry is one of the major contributors in the Indian economy with more than 12% share in the overall GDP of the country, Mathivathanan et al. (2018). At present, Indian industries are well positioned for growth, servicing both domestic demand and, increasingly, export opportunities, Kathuria et al. (2015). While the Indian industries has much to look forward to, by way of steady growth, there are some clear challenges accompanying these opportunities in terms of inclusion of sustainability into its operations, Mathiyazhagan et al. (2014). Inclusion of sustainability is desirable, for it brings competitive advantage to the firm’s SC, Gopal et al. (2016). Drive towards sustainability encourages firms to reduce wastage of energy, keep account of their carbon footprint and generate an improved working environment, Beske et al. (2014). However, attaining a sustainable SC is a challenging task for the manufacturers, as it may incur additional financial burden, Kumar et al. (2015). In this regard, the manufacturers need to understand what sustainability initiatives should be adopted so that long term benefits in the form of competitive advantage and improved market share are attained, which would eventually result in economic enhancement of the SC, Hsu et al. (2014). Although stricter governmental legalizations have already led to a majority of Indian manufacturers to adopt measures to improve their environmental performance Luthra et al. (2015), however environmental standards adopted by firms are mostly at the assembly plants of the manufacturers. Since majority of their processes are outsourced and the major pollution occurs at vendors’ site, thus the environmental standards only take care of a very small percent of pollution generated by these companies, Center for Science and Environment of India (CSE, 2011) and thus the environmental performance of the SC is not appreciable. Toke (2017), Identifies key factors behind the successful achievement of environmental sustainability in the Indian manufacturing industry and concludes that top management commitment and green procurement practices are two of the most important factors to be focused upon, if the manufacturing firm wants to improve its environmental and operational performance. Hence, Indian manufacturers must look for support of their top management and incorporate environmental considerations in their value chain for enhancing their ecological footprint. In addition, the social sustainability aspect must also be delved upon, an area mostly neglected by the industries in India.

The above discussion leads us to the understanding that there is a dire need for manufacturers to adopt a holistic approach for improving the overall sustainable performance throughout the SC. However, there is lack of research on analysis of prominent strategies for evaluation of sustainability for Indian companies. This brings us to the following research questions that have guided this work:

- 1) What are the strategies which facilitate sustainability in firm?
- 2) What is the interrelationship between these strategies and strength of the influence between them?
- 3) Which are the prominent strategies which can drive the other strategies?

To achieve these research questions, the present paper presents a multi-attribute decision making model to identify and measure the factors for enhancing sustainability of an electronics-component manufacturer’s SC. Interpretive Structural Modeling (ISM) technique is employed to obtain the interrelationship diagram connecting the variables and for deriving the hierarchical structural model. A hierarchy establishing the appropriate relationships among the sustainability factors would aid the decision makers in identifying the independent factors and the influencing factors for aptly executing a sustainable SC network. MICMAC theory is used to classify the enablers on the basis of their driving and dependence power. The contribution of the study is in developing a structural framework and identifying the key factors, which can be focused upon by the managers for improving upon the sustainability performance of SC.

2. Case Study

The company under consideration in the study is one of the leading electronics-component manufacturing firms looking for incorporating feasible sustainable practices into their SC. The firm produces electronic products such as Battery Cables, Headlights, and electric side/rear view mirrors, battery terminals. These products are distributed to various states through a distribution network. To begin with, identifying and analyzing the practices that are responsible for the overall sustainability is extensively time consuming and difficult. Moreover, the firm is also struggling to identify the variables that are used for measuring the sustainability of the SC. The concerns of the firm can be addressed by the following research objectives of the study:

- (1) To identify the variables which measure the sustainability performance of SC.
- (2) To analyze the relative importance of the variables and understand their impact on the potential performance outcomes of the SC.
- (3) To identify the hierarchy of actions to be taken for the conduct of sustainability operations in the electronics-component supply chain, in order to achieve overall sustainability.

3. Research Methodology

The above-mentioned objectives of the paper are achieved using ISM, which is widely used as an analytical model in complex decision making situations. Methodology of the paper adopted entails the following:

- (1) *Identification of strategies*: The strategies relevant to the study are identified with the help of literature survey and interactions with decision makers.
- (2) *Application of ISM*: for building an inter-relationship among the strategies under consideration.
- (3) *Categorization of strategies*: MICMAC analysis is carried for finding the driving and dependence power of the strategies.

3.1 Identification of sustainability driven SC strategies

The strategies for evaluation of sustainability score of the company are identified with the help of extensive literature survey and interactions with decision makers (DMs). A total of 18 strategies were shortlisted as Waste Reduction (M1), Cleaner Technology (M2) SC Risk Management (M3), Flexible Transportation (M4), Reverse Logistics (M5), ISO Certification (M6), Just-in-time (M7), Management Commitment (M8), /Quality Assurance (M9), Environmental Collaborations (M10) Utility Process Management (M11), Consumer Satisfaction (M12), Process Optimization (M13), Supplier Commitment (Towards Sustainability) (M14), SC Responsiveness (M15), Customer Involvement (M16), Employee Training and Safety (M17), Government Policies and Schemes (M18) for understanding the prominence relationship among them.

3.2 Interpretive Structural Modeling

ISM proposed by Warfield et al. (1974), is used for complex and subjective problems, where poorly and unorganized models are analyzed and converted into comprehensive well-defined models for better understanding. This decision-making technique is interpretive as the decisions related to strategies interdependencies are based on the experts' committee judgments. The basic idea of adopting this methodology is that it uses practical knowledge and experiences of experts to identify the inter-relationships among the strategies and represents it in a systematic hierarchal structure. ISM is a powerful tool and has been applied successfully to numerous fields, which include reverse logistics, green SC management, Third party logistics, supplier selection, SC risks and carbon management.

Following are the steps involved in the ISM model development:

1. *Structural Self-Interaction Matrix (SSIM)*: Is developed using pair-wise relationship among the strategies under consideration.
2. *Initial Reachability Matrix*: The SSIM is converted into a binary matrix and checked for transitivity's.
3. *Levels*: The matrix obtained in step (4) is partitioned into various levels.
4. *Diagraph*: Using relationship obtained among the strategies from Reachability matrix, Diagraph is constructed and further transitivity links are removed.
5. *ISM Model*: Diagraph is then converted to ISM by replacing strategy nodes to statements and checked for inconsistencies if any.

3.2.1 Structural Self-Interaction Matrix (SSIM)

Developing structural self-interaction matrix $M = \{a_{ij}\}$ that shows the inter-relationships among the strategies is the very first step of ISM. A contextual relationship thus obtained among the strategies identified is carried out using interactions with various DMs and experts, with the help of various techniques such as nominal group technique. Experts' opinions from various industries are used in identifying the nature of contextual relationship between various strategies. Contextual relationship of a strategy (if selected) diagnoses inter-dependencies among other strategies. If we assume strategies under study are 'i' and 'j' then relationship between strategies (i and j) is denoted

using four symbols:

- (1) V: strategy i will help in achieving strategy j.
- (2) A: strategy j will help in achieving strategy i.
- (3) X: strategy i and j will help in achieving each other.
- (4) O: strategy i and j are not related.

3.2.2 Reachability Matrix

- (1) The initial reachability matrix (RM) represented by $R1 = (r_{ij}^1)$ is obtained using SSIM, where SSIM is converted to a binary matrix by substituting V, A, X, O with '1' and '0' with the following substitution rules:
- (2) If (i, j) entry in the SSIM is V, then (i, j) entry in the RM becomes 1 and the (j, i) entry will become 0.
- (3) If (i, j) entry in the SSIM is A, then (i, j) entry in the RM becomes 0 and the (j, i) entry will become 1.
- (4) If (i, j) entry in the SSIM is X, then (i, j) entry in the RM becomes 1 and the (j, i) entry will become 1.
- (5) If (i, j) entry in the SSIM is O, the (i, j) entry in the RM becomes 0 and the (j, i) entry becomes 0.
- (6) Further final RM represented by $R2 = (r_{ij}^2)$ is constructed using SSIM incorporating transitivities, which states that if a strategy 'x' is related to strategy 'y' and 'y' to 'z' then strategy 'x' is directly related to strategy 'z'.

3.2.3 Level Partitions

Reachability matrix developed in the previous section is partitioned into various different levels. For this purpose, we require reachability, antecedent and intersection sets, which are obtained from the reachability matrix. Reachability set for each strategy consists of strategies itself and others, which it may help to achieve. Whereas, antecedent set consists of the strategies itself and others, which may help in achieving them. Then, intersection of both the previous sets is also derived for all the strategies. If for any given strategy, the reachability and intersection sets are same, then that strategy is considered to be at level I and attains the bottom position in hierarchical model. Further strategies that form level I are removed and with the remaining strategies process continues, until all strategies attain some level.

3.2.4 ISM Based Model

Using the final reachability matrix, a structured model is developed. The relationship between the two strategies is represented with help of arrows, pointing upwards from one strategy to the other. The graph is called Direct Graph or Diagraph, whose finalized version is developed after removing the transitivities. The diagraph is then converted into an ISM Model, in which strategies are placed based on their levels, with level I strategy placed on the top and last level strategy at the bottom. Strategies at the first level have minimum or no influence on other strategies but can be influenced easily by other strategies. On the other hand, strategy at the last level has the maximum influence, which can influence other strategies.

3.3 MICMAC Analysis

MICMAC analysis is done in order to analyze the driving and dependence power of the strategies. These strategies can be broadly classified into four categories, namely autonomous, dependent, linkage, and independent. Autonomous category consists of the strategies with low dependence and driving power. These variables are relatively disconnected from the system, they have only a few links, and these links may not be strong, Barve (2009). Dependent category consists of the strategies with high dependence and low driving power. Linkage category consists of the strategies with high driving and dependence power but they are unstable in nature. Lastly, independent category consists of strategies with high driving and low dependence power. Each strategies fall into one and only one category and this can be graphically represented with autonomous in first quadrant, dependent in second, linkage in third and independent in fourth quadrant.

4. Case Illustration

The ISM methodology is applied to the strategy analysis problem of the company in consideration. Firstly, we construct the SSIM which describes the subjective judgments of the DMs based on the pairwise comparison of the strategies. Table 1 illustrates that "Employee training and safety"(M17) will help in improving the strategy "Waste

reduction”(M1), therefore a_{171} is represented as “A”. Similarly strategy “Cleaner Technology”(M2) will help in improving strategy “Total Quality Management”(M9), therefore a_{29} is represented as “V”. “Flexible Transportation”(M4) and “ISO Certification”(M6) are not related to each other; hence a_{26} is represented as “O”. Similarly relationship among all the strategies is formed.

Table 1. SSIM

FACTORS	M18	M17	M16	M15	M14	M13	M12	M11	M10	M9	M8	M7	M6	M5	M4	M3	M2
M1	O	A	A	O	O	A	O	O	A	A	O	O	A	A	O	O	O
M2	O	A	O	O	O	O	O	O	O	V	O	O	A	O	O	O	.
M3	O	O	O	A	O	O	O	O	O	A	A	O	O	O	O	.	
M4	O	O	O	V	O	O	O	O	O	O	A	O	O	V	.		
M5	O	O	A	O	A	O	O	O	O	O	A	O	V	.			
M6	A	V	O	O	A	O	V	O	V	V	A	O	.				
M7	O	O	O	V	X	O	O	O	O	O	O	.					
M8	A	V	O	O	O	V	O	O	V	V	.						
M9	O	A	O	O	O	O	V	V	O	.							
M10	O	O	A	O	X	O	O	O	.								
M11	O	A	O	O	O	O	O	.									
M12	O	O	O	A	O	O	.										
M13	O	A	O	O	O	.											
M14	O	O	O	O	.												
M15	O	A	A	.													
M16	O	O	.														
M17	A	.															
M18	.																

Initial RM as shown in Table 2 is next formed using the rules from previous section. Cell number a_{11} holds a value ‘A’ and thus is converted to ‘0’ and cell a_{17} is updated with value ‘1’. Similarly cell number a_{41} holding value ‘V’ is replaced with value ‘1’ while the entry a_{15} is converted to ‘0’. The cells with the value ‘O’ are updated with value ‘0’.

Table 2. Initial Reachability Matrix

	M18	M17	M16	M15	M14	M13	M12	M11	M10	M9	M8	M7	M6	M5	M4	M3	M2	M1
M1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
M2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
M3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
M4	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0
M5	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1
M6	0	1	0	0	0	0	1	0	1	1	0	0	1	0	0	0	1	1
M7	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0
M8	0	1	0	0	0	1	0	0	1	1	1	0	1	1	1	1	0	0
M9	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	0	1
M10	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1
M11	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
M12	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
M13	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
M14	0	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0	0	0
M15	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	1	0	0
M16	0	0	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	1

M17	0	1	0	1	0	1	0	1	0	1	0	0	0	0	0	0	1	1
M18	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0

Final RM shown in Table 3 incorporates transitivity that help in illustrating the driving and dependence power for all the strategies. For example, cell a_{21} and a_{23} were holding value '0' in the initial RM but in the final RM these cells gets updated to value '1' because of transitivity. The final RM so obtained is further partitioned into various levels. In order to derive levels of the hierarchal structure, reachability set (RS) and antecedent set (AS) is obtained from final RM.

Table 3. Final Reachability Matrix

	M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12	M 13	M 14	M 15	M 16	M 17	M 18
M1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M2	1	1	1	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0
M3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M4	1	0	1	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0
M5	1	1	0	0	1	1	0	0	1	1	0	1	0	0	0	0	1	0
M6	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	0
M7	0	0	1	0	1	1	1	0	0	1	0	1	1	1	1	0	0	0
M8	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0
M9	1	0	1	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0
M10	1	0	0	0	1	1	1	0	0	1	0	0	0	1	0	0	0	0
M11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
M12	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
M13	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
M14	1	1	0	0	1	1	1	0	1	1	0	1	0	1	1	0	1	0
M15	1	0	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0
M16	1	0	1	0	1	1	0	0	0	1	0	1	1	1	1	1	0	0
M17	1	1	1	0	0	0	0	0	1	0	1	1	1	0	1	0	1	0
M18	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1

The first column in the Table 4 represents RS consists of the strategies it influences and AS consists of strategies influencing it. The intersection of the two sets is represented by column 'Z' = (RS+AS). Strategy with RS = Z are assigned with a LEVEL, that is when the strategy level is set it cannot influence any other strategy above that level, hence its discarded. Strategies number M1, M3, M11, M12 were found to be at level I.

Table 4. I-Iteration

S.No.	REACHABILITY	ANTICEDENT	INTERSECTION	LEVEL
1	1	1,2,4,5,6,8,9,10,13,14,15,16,17,18	1	I
2	1,2,3,9,11,12	2,5,6,8,14,17,18	2	
3	3	2,3,4,6,7,8,9,15,16,17,18	3	I
4	1,3,4,5,6,12,13,15	4,8,18	4	
5	1,2,5,6,9,10,12,17	4,5,7,8,10,14,16,18	5,10	
6	1,2,3,6,9,10,11,12,13,14,15,17	4,5,6,7,8,10,14,16,18	6,10,14	
7	3,5,6,7,10,12,13,14,15	7,10,14,18	7,10,14	
8	1,2,3,4,5,6,8,9,10,11,12,13,14,15,17	8,18	8	

9	1,3,9,11,12	2,5,6,8,9,14,17,18	9	
10	1,5,6,7,10,14	5,6,7,8,10,14,16,18	5,6,7,10,14	
11	11	2,6,8,11,17,18	11	I
12	12	2,4,5,6,7,8,9,12,14,15,16,17,18	12	I
13	1,13	4,6,7,8,13,15,16,17,18	13	
14	1,2,5,6,7,9,10,12,14,15,17	6,7,8,14,15,16,17,18	6,7,10,14	
15	1,3,12,13,15	4,6,7,8,14,15,16,17,18	15	
16	1,3,5,6,10,12,13,14,15,16	16	16	
17	1,2,3,9,11,12,13,15,17	5,6,8,14,17,18	17	
18	1,2,3,4,5,6,7,8,9,10,11,12,13,15,17,18	18	18	

To obtain next strategy level, strategies M1, M3, M11, M12 are excluded and new RS, AS and Z are determined. The second iteration leads to assignment of strategy number M9, M10, and M13 in the second level. The process is continued until all the strategies are assigned a specific level. Total of nine iterations were carried out to obtain nine different levels. Strategies with their corresponding level can be seen in Table 5. Further these levels help in obtaining the hierarchy of ISM model, which identifies the influencing behavior of all strategies and aids in nodes positioning of the diagram.

Table 5. Levels

Factor	LEVEL	Factor	LEVEL
M1	I	M10	II
M2	III	M11	I
M3	I	M12	I
M4	VII	M13	II
M5	VI	M14	VII
M6	V	M15	II
M7	VII	M16	VIII
M8	VIII	M17	IV
M9	VII	M18	IX

The digraph is generated from the final RM (after removing transitivity), which is converted into an ISM model as shown in Figure 1. Among all the strategies identified in the study the most important one that aids in achieving the overall sustainability of manufacturing firm is strategy M18 “Government rewards and recognitions”, which will lead to better *customer involvement* (M16) and *management commitment* (M8). While those at the top of the hierarchy namely, *waste reduction* (M1), *utility process management* (M11), *customer satisfaction* (M3) and *supply chain risk* (M12) hold much less importance as compared to other strategies. Hence, the firm should work with an aim to make its practices environment friendly, incorporating all the parameters defined by the government, to get recognized and rewarded. This will lead to enhancement of all the strategies responsible for sustainability.

MICMAC analysis is performed with the help of Table 4 (final RM). All the 18 sustainability strategies are classified and positioned into one of the four quadrants (as shown in Figure 2). For the study, there are no autonomous strategies. Absence of strategies from I-Quadrant indicates the success of identification of sustainability strategies, as they would create hindrance in achieving sustainability. The II-Quadrant consists of strategies *waste reduction* (M1), *supply chain risk* (M3) and *customer satisfaction* (M12) with high dependence power. Sustainability can also be achieved without directly focusing on them as they are highly dependent on other

strategies. Those in the Linkage-Quadrant have ability to influence/getting influenced and any change in them can affect the other strategies (and vice-versa), which includes *cleaner technology* (M2), *effective transportation* (M4),



Figure 1. ISM Model

reverse logistics efficiency (M5), *just in time* (M7), *quality* (M9), *environmental collaborations* (M10), *UPM* (M11), *process optimization* (M13) and *employee training and safety* (M17). The last and most important quadrant is Independent-Quadrant, which includes *Management Commitment* (M8), *ISO Certification* (M6), *Supplier Commitment (Towards Sustainability)* (M14), *SC responsiveness* (M15) and *Government rewards and recognition* (M18). These strategies have the ability to influence others without getting affected by others, hence they are also termed as ‘**key strategies**’.

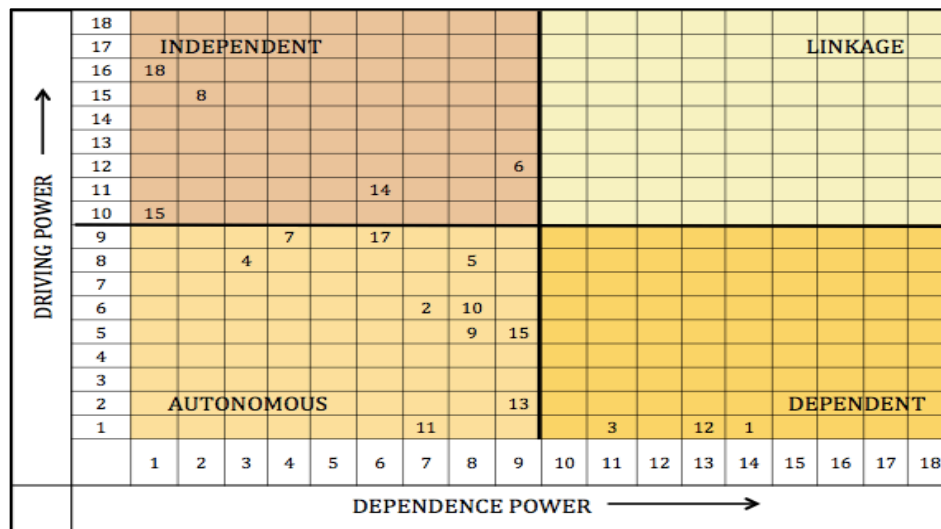


Figure 2. Classification of Strategies (MICMAC)

5. Discussions and Conclusion

Continuous environmental deterioration and depletion of natural resources are forcing nations to look into innovative ways for incorporating sustainability practices. Governments are hence enforcing strict regulations on the firms to resonate sustainability into their SC that will result in economical, ecological and social benefits. Environmental improvements for nations like India are not only essential to attract new customers but also for a sound future. Identification and effective implementation of the right sustainability practices is still a challenge for most firms, particularly in the developing nations. In order to overcome this problem, our research seeks to identify the strategies of sustainability for firms in India and analyze interrelationships among them. Further the study helps in identifying those strategies that can aid an Indian electronics-component manufacturing firm to achieve overall sustainability of the value chain. ISM methodology is implemented for this purpose along with MICMAC analysis. A total of 18 strategies are identified from rigorous literature survey, which are used for evaluation of sustainability performance of the SC. The study resulted in the following observations:

MICMAC analysis shows that none of the strategy was obtained in the autonomous-quadrant and only three strategies were in the dependent-quadrant which shows that there is less instability among the selected ones. That means *waste reduction*, *supply chain risk* and *customer satisfaction* need better attention by DMs, as there is still scope for improvement in them. Linkages-quadrant consists of maximum number of strategies, as this quadrant illustrates high driving/dependence power, which clearly shows the potential of these strategies in influencing the overall SC performance. Further, strategies constituted in the independent-quadrant holds most importance, as focusing more on these can lead the electronics-component manufacturing firm towards higher sustainability score.

The relationships among the strategies are demonstrated with the help of the diagram (Figure 2). Implication drawn from the model is that *Government rewards and recognition*, *management commitment* and *customer involvement* are most essential strategies for the firm. So a firm working towards making its practices environment friendly, incorporating all the parameters defined by the government, gets recognized and rewarded. ISM model shows a practical case of an Indian electronics-component manufacturing firm, which will help DMs for focusing on improving those sustainability strategies that will eventually aid in improving the overall performance of the firm.

Our study can be applied to the general electronics industry. Although the DMs' opinions may change as per each firm's requirements, however the validity of the judgments can be checked used structural equation modeling (SEM) in future.

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