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Integration of Lean with Sustainable Strategies for Productivity Improvement

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Abstract: Lean remanufacturing (LM) is a newly evolved manufacturing process concerned with manufacturing of products to effectively utilise available energy and resources, while reducing wastes in the process and thereby increasing efficiency. Sustainable Manufacturing (SM) as a method for manufacturing that minimises the waste and reduces the environmental impact. These goals are to be obtained mainly by adopting practices that will influence the product design, process design and operational principles. Integrating lean and sustainable system together can benefit not only to manufacturers and customers, but to the environment as well. With today's competitive market, scarcity of raw materials, higher transportation cost, increased global warming, the integration of lean and sustainable manufacturing systems can facilitate competitive advantage and profitability that many organizations are aiming for. A structural model needs to be developed to clarify the interrelationships among factors influencing integration of lean with sustainable strategies . In this study, Interpretive Structural Modelling (ISM) method has been used to develop the structural model depicting interrelationships and most dominant and least dominant factors. MICMAC analysis has been conducted to categorise the factors. The inferences based on the study have been derived.

I. INTRODUCTION

The contemporary manufacturing organisation has been adopting lean manufacturing for enabling speedy, smooth and economical manufacture of products. The goal of Lean Manufacturing (LM) is to become highly responsive to customer demand by reducing the waste in human effort, inventory, time to market, and manufacturing space while producing quality products efficiently and economically. Lean manufacturing provides competitive edge to the manufacturer due to reduced cost, and improved productivity and quality.

Sustainability concepts are being adopted to develop environmentally conscious products. Sustainable manufacturing integrates product and process design issues with issues of manufacturing, planning and control in such a manner to identify, quantify, assess, and manage the flow of environmental waste with the goal of reducing the environmental impact. It promotes the self-recovery capability of the earth could deal with while maximizing the resource efficiency.

Implementation of integrated system will provides combined benefits in terms of waste elimination, value enhancement, streamlined process, and minimizing environmental impacts in comparison to conventional manufacturing processes. So a decision making tool is introduced to fully identify and analyse the factor relationships. The technique is known as interpretive structural modelling (ISM). It is a tool that for understanding of complex situations and is very effective for planning exercises . In this article, Mechanics of the tool is applied to understand the possible organizational factors and their relationships that influence the implementation of lean sustainable system. Based on the experts opinion, 20 drivers governing the integrated lean sustainable system have been identified. The novel aspect of the study is that it presents a modelling approach for systematically prioritizing the factors influencing the performance of integrated lean sustainable manufacturing system. A structural model has been developed using ISM approach.

II. LITERATURE REVIEW

Cheah et al. (2012) applied ISM to develop hierarchical model for challenges of lean manufacturing implementation. They considered nine factors among which knowledge, training, and project implementation are identified as important factors. Grover et al. (2012) applied ISM approach to model enablers in the implementation of total productive maintenance (TPM). TPM is one of the important tools of lean manufacturing. They selected 10 enablers and prioritized it using ISM approach. They found that 'top management commitment and support' and 'integration of TPM goals and objectives into business plans' are top most enablers and 'cultural change' and 'total employee involvement' as least enablers. Kumar et al. (2013) formed a structural model of variables that is important to implement lean manufacturing system in Indian Automobile Industry using ISM. They identified 18 variables, out of which relative cost benefits has been identified as top level dependent and Top-management commitment as bottom level independent variable.

Sarkis et al. (2006) developed ISM model for evaluating environmentally conscious manufacturing (ECM) barriers considering 11 factors. They also identified top-management commitment as important independent factor. Tseng (2010) developed framework for modelling production indicators. 21 factors are proposed as main sustainable product indicators and prioritized them using ISM approach. Vinodh and Joy (2012) have done a study on the sustainable manufacturing practices across industrial sectors and to identify the critical factors for its success implementation and shown the correlation between sustainable manufacturing practices and organizational performance among the industries being surveyed. Govindan et al. (2014) analysed the drivers of sustainable manufacturing. They considered 12 factors among which compliance with regulation is proved essential. Mittal and Sangwan (2014) developed a hierarchy and interrelationship among barriers to ECM adoption. They identified five levels of hierarchies and classified them into three categories-internal barriers, economy barriers and policy barriers using an ISM technique. Vinodh et al. (2011) have done a study on exploration of various issues of sustainability using lean initiatives. Also, they presented some of the strategies/ techniques that would enable the achievement of sustainability objectives using lean initiatives. Du¨es et al. (2013) compared the attributes of lean production and green management to identify their similarities and differences. By explaining various literature studies, they highlighted that lean and green practices share a focus on reduction techniques, lead time reduction, people and organization, supply chain relationships, key performance indicators (KPIs), and common tools and practices. Because of these overlapping attributes, they conclude that lean and green practices impart benefits to firm performance. Pampanelli et al. (2014) applied lean and green concepts together in production cell level then presented findings from an application of the model in a major international engineering corporation. Such findings applied in a major international engineering corporation reduced resource usage from 30 to 50 % on average and have the potential to reduce the total cost of mass and energy flows in a cell by 5–10 %. The relationships between lean and environmental aspects are influenced by various factors such as top-management commitment, and that they also vary depending on the Lean principles under consideration. Some implementation schemes have been initiated since 2008, but few frameworks exist. A concrete general outline to simultaneously implement lean and sustainable paradigms is still lacking (Verrier et al. 2013). Vinodh et al. (2015) presented a method for value stream mapping integrated with life-cycle assessment for ensuring sustainable manufacture which provides insights to practitioners to visualize process performance from traditional and environmental perspectives .

III. PROBLEM DESCRIPTION

In a competitive market, the customer expects a product with less cost that fulfils all needs. Today all manufacturing companies are having a lot of pressure from the government to adopt legal requirements. Legal requirements now diversify regarding pollution, employee welfare, social welfare and growth rate. These contribute to sustainable manufacturing. Lean is the process, which helps to get sustainability in the organization. India is not well positioned to handle the growing resource scarcity to sustain a steady growth in future. Indian government has also begun to focus more on resource efficiency and extended the investments towards sustainable manufacturing and Industry 4.0. Currently, only about 10% of the automotive industries in India are actually on a lean and sustainability framework because businesses are still in a position to decide whether to adopt sustainable measures or not. Therefore, India needs to ensure that its manufacturing process, approaches and even cities become sustainable by backing lean and sustainability in India.

The Company under study is a leading auto components manufacturer which produces components like IC Engine Valves, Tie Rod Ends, Friction Material Products and Manual Steering Gears, aluminium die cast products, electric power steering and airbags. Due to the Government legislations and the scarcity of raw material demand around the globe, the company is focusing on implementing Lean and Sustainable manufacturing practices together. Choosing the drivers that are important for the implementation requires the exhaustive literature survey on these strategies and a in-depth consultation with the industrial experts. Understanding the relationships between the drivers is more important to develop a successful implementation road map. Hence, the project aims at selection of the appropriate drivers and development of the structural model to understand the relationship between the drivers for the implementation of the lean sustainable strategies.

IV. SOLUTION METHODOLOGY

The procedure followed is shown in Figure 1. The factors influencing the implementation of lean remanufacturing practices have to be identified based on literature review and expert opinion. Steps in ISM method have been applied, namely: formation of ISM matrix, reachability matrix and level partitions, and finally the ISM model is developed. MICMAC analysis has been carried out subsequently to understand the driving power and dependence power of the variables

V. ISM METHODOLOGY

ISM is a communication tool in which set of independent and dependent variables are structured into a comprehensive model . The fundamental concept of ISM is to use experts' practical experience and knowledge to decompose a complicated system into several sub-systems (elements) and construct a multilevel structural model to highlight the dominance factors involves in implementation of a particular system. The model developed depicts the structure of a complex issue or problem in a carefully designed pattern . Features of the ISM method include (1) incorporating the subjective judgments and the knowledgebase of experts systematically, (2) to provide ample opportunity for revision of judgments, and (3) computational efforts involved are far less for criteria ranging from 10 to 25 numbers as well as used as a handy tool for real-life applications . These features make this method more suitable for this present analysis compared with all other methods

Various steps involved in the ISM technique include:

1) *Step 1:* The drivers affecting the implementation of green supply chain management for the firm under study are listed.
2) *Step 2:* For each pair of drivers identified in Step 1, a contextual relationship is established.
3) *Step 3:* A Structural Self-Interaction Matrix (SSIM) is developed, which indicates pairwise relationships among drivers of the system under consideration.
4) *Step 4:* A reachability matrix is developed from the SSIM and the matrix is checked for transitivity. The transitivity rule states that if a variable 'A' is related to 'B' and 'B' is related to 'C', then 'A' is necessarily related to 'C'.
5) *Step 5:* The reachability matrix obtained in Step 4 is partitioned into different levels.
6) *Step 6:* Based on the relationships given above in the reachability matrix, a directed graph is drawn and the transitive links are removed.
7) *Step 7:* The resulting digraph is converted into an ISM by replacing the variable nodes with statements.
8) *Step 8:* The ISM model developed in Step 7 is reviewed to check for conceptual inconsistencies, and necessary modifications are made.

A. Structural Self Interaction Matrix (SSIM)

ISM methodology suggests the use of the expert opinions based on various management techniques such as brain storming, nominal group technique, etc. in developing the contextual relationship among the variables . For this purpose, experts from the industry should be consulted in identifying the nature of contextual relationship among the drivers. These experts from the industry should be well conversant with the problem under consideration. For analysing the factors, a contextual relationship of 'leads to' or 'influences' type must be chosen. This means that one factor influences another factor. On the basis of this, contextual relationship between the identified driver is developed.

The following four symbols are used to denote the direction of relationship between two factors (i and j):

1) V for the relation from factor i to factor j (i.e., factor i will influence factor j)
2) A for the relation from factor j to factor i (i.e., factor i will be influenced by factor j)
3) X for both direction relations (i.e., factors i and j will influence each other)
4) O for no relation between the factors (i.e., barriers i and j are unrelated).

Based on the contextual relationships, the SSIM is developed. To obtain consensus, the SSIM should be further discussed by a group of experts. These experts from the Industry had rich experience in sustainable and lean manufacturing implementation in industries. The experts provided their opinion based on complete understanding of the factors and based on the interrelationships. Hence, the inputs are found to have practical validity. The consensus opinion of the experts has been used as inputs. With respect to their view, the contextual relationship has been developed in SSIM matrix. The obtained SSIM matrix is provided in TABLE 2.

B. Reachability Matrix (RM)

The next step in ISM approach is to develop an initial reachability matrix from SSIM. For this, SSIM is converted into the initial reachability matrix by substituting the four symbols (i.e., V, A, X or O) of SSIM by 1s or 0s in the initial reachability matrix.

The rules for this substitution are as follows:

1) If the (i, j) entry in the SSIM is V, then the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry becomes 0.
2) If the (i, j) entry in the SSIM is A, then the (i, j) entry in the matrix becomes 0 and the (j, i) entry becomes 1.
3) If the (i, j) entry in the SSIM is X, then the (i, j) entry in the matrix becomes 1 and the (j, i) entry also becomes 1.
4) If the (i, j) entry in the SSIM is O, then the (i, j) entry in the matrix becomes 0 and the (j, i) entry also becomes 0.

Following these rules, the initial reachability matrix is prepared. 1* entries are included to incorporate transitivity to fill the gap, if any, in the opinion collected during development of structural self-instructional matrix. After incorporating the transitivity concept as described above, the final reachability matrix is obtained (TABLE 3,4).

C. Level Partitions

From the final reachability matrix, for each factor, reachability set and antecedent sets are derived. The reachability set consists of the factor itself and the other factor that it may impact, whereas the antecedent set consists of the factor itself and the other factor that may impact it. Thereafter, the intersection of these sets is derived for all the factors and levels of different factor are determined. The factors for which the reachability and the intersection sets are the same occupy the top level in the ISM hierarchy. The top-level factors are those factors that will not lead the other factors above their own level in the hierarchy. Once the top-level factor is identified, it is removed from consideration. Then, the same process is repeated to find out the factors in the next level. This process is continued until the level of each factor is found. The final iterated level partition table is shown in Table 5 . These levels help in building the ISM model.

D. Representation of Factors as ISM Based Model

From level partitions, a structural model known as digraph is developed. After removing the transitivity links and replacing nodes by factor statements, the ISM model is formed (FIGURE 1).

VI. MICMAC ANALYSIS

The objective of MICMAC is to analyse and group the factors based on its driving and dependence powers. A graph is plotted with driving power along X-axis and dependence power along Y-axis.

In MICMAC analysis, factors are classified as follows:

1) *Autonomous Factors:* These factors have weak driving and weak dependence power. They are represented in Quadrant III. They are relatively disconnected with few links. 2.
2) *Dependent Factors:* These factors have weak driving power but strong dependence power. They are represented in Quadrant IV. They are greatly affected by many factors.
3) *Linkage Factors:* These factors have strong driving as well as strong dependence power. They are represented in Quadrant I. These variables are very important. Their action affects others and also possesses back effect on themselves.
4) *Driving Factors:* They have strong driving power but weak dependence power. They are represented in Quadrant II. They have greater driving power over many factors.

The four sectors are autonomous, dependent, linkage, and driver/independent. In the final reachability matrix, shown in Table 4 , the driving power and dependence of each of the drivers are calculated (GRAPH 1).

TABLE 2

i \ j	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20
D1		0	0	A	A	A	A	V	V	A	V	V	0	X	A	0	A	A	V	0
D2			X	V	V	0	V	V	0	0	X	V	V	V	V	V	V	0	0	0
D3				X	A	0	0	X	0	0	X	A	0	0	A	A	A	0	0	0
D4					A	V	V	V	V	V	A	X	X	A	V	V	A	A	A	V
D5						0	V	X	V	V	X	V	V	A	A	X	A	A	A	X
D6							V	A	X	X	A	A	0	0	A	0	A	A	V	0
D7								A	V	A	A	V	A	X	0	0	A	V	V	A
D8									X	V	V	X	X	A	V	X	A	A	V	A
D9										X	A	X	A	0	0	V	0	A	0	V
D10											A	X	0	A	0	0	A	V	A	A
D11												V	V	X	X	V	A	A	V	V
D12													0	A	A	X	V	X	A	V
D13														A	A	0	A	0	0	A
D14															V	V	X	A	0	V
D15																X	X	A	0	V
D16																	A	A	V	A
D17																		V	0	X
D18																			X	X
D19																				X
D20																				

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TABLE 3

i \ j	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	DRIVING POWER
D1	1	0	0	0	0	0	0	1	1	0	1	1	0	1	0	0	0	0	1	0	7
D2	0	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	0	0	0	13
D3	0	1	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	5
D4	1	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1	0	0	0	1	13
D5	1	0	1	1	1	0	1	1	1	1	1	1	1	0	0	1	0	0	0	1	13
D6	1	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	1	0	6
D7	1	0	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0	1	1	0	7
D8	0	0	1	0	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	0	13
D9	0	0	0	0	0	1	0	1	1	1	0	1	0	0	0	1	0	0	0	1	7
D10	1	0	0	0	0	1	1	0	1	1	0	1	0	0	0	0	0	1	0	0	7
D11	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	1	1	16
D12	0	0	1	1	0	1	0	1	1	1	0	1	0	0	0	1	1	1	0	1	11
D13	0	0	0	1	0	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	5
D14	1	0	0	1	1	0	1	1	0	1	0	1	1	1	1	1	1	0	0	1	13
D15	1	0	1	0	1	1	0	0	0	0	1	1	1	0	1	1	1	0	0	1	11
D16	0	0	1	0	1	0	0	1	0	0	0	1	0	0	1	1	0	0	1	0	7
D17	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	0	1	16
D18	1	0	0	1	1	1	0	1	1	0	1	1	0	1	1	1	0	1	1	1	14
D19	0	0	0	1	1	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1	7
D20	0	0	0	0	1	0	1	1	0	1	0	0	1	0	0	1	1	1	1	1	10
DEPENDENCE POWER	10	3	10	11	11	10	12	14	12	12	9	15	10	7	9	13	6	7	9	11	201

TABLE 4

i \ j	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	DRIVING POWER
D1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	17
D2	0	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	0	0	0	13
D3	0	1	1	1	1	0	0	1	0	0	1	1	1	0	0	1	0	0	0	0	9
D4	1	0	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	0	0	1	14
D5	1	0	1	1	1	0	1	1	1	1	1	1	1	0	0	1	0	0	0	1	13
D6	1	0	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	1	0	8
D7	1	0	0	0	0	1	1	1	1	1	0	1	0	1	0	1	0	1	1	1	12
D8	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	1	15
D9	0	0	0	0	0	1	0	1	1	1	0	1	0	0	0	1	0	0	0	1	7
D10	1	0	1	1	0	1	1	1	1	1	0	1	0	0	0	1	0	1	0	1	12
D11	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	1	1	16
D12	0	0	1	1	1	1	0	1	1	1	0	1	0	0	0	1	1	1	0	1	12
D13	1	0	1	1	0	0	1	1	1	1	0	1	1	0	0	1	0	0	0	1	11
D14	1	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	0	0	1	14
D15	1	0	1	1	1	1	0	0	0	0	1	1	1	0	1	1	1	0	0	1	12
D16	0	0	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	0	1	1	13
D17	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	17
D18	1	0	0	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	16
D19	0	0	0	1	1	0	1	0	0	1	0	1	0	0	0	0	0	1	1	1	8
D20	1	0	1	1	1	0	1	1	1	1	0	1	1	0	0	1	1	1	1	1	15
DEPENDENCE POWER	12	3	14	18	15	12	16	16	14	17	10	20	13	7	10	18	6	7	9	17	254

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TABLE 5

	REACHABILITY SET	ANTECEDENT SET	INTERSECTION SET	LEVEL
D1	1,14	1,14,17,18	1,14	9
D2	2	2	2	12
D3	2,3,4,5,8,11,12,13,16	1,2,3,4,5,8,10,11,12,13,15,16,17,20	2,3,4,5,8,11,12,13,16	1
D4	1,4,5,6,8,13,15,16	1,2,4,5,6,8,11,13,14,15,16,17,18,19	1,4,5,6,8,13,15,16	3
D5	1,5,8,11,16	1,2,5,8,11,14,15,16,17,18,19	1,5,8,11,16	4
D6	1,6	1,6,8,11,15,17,18	1,6	6
D7	1,6,7,8,10,14,16,18,19,20	1,2,4,5,6,7,8,10,11,13,14,16,17,18,19,20	1,6,7,8,10,14,16,18,19,20	2
D8	8	1,2,8,14,17,18	8	8
D9	6,8,9,10,12,16,20	1,4,5,6,7,8,9,10,11,12,13,16,18,20	6,8,9,10,12,16,20	1
D10	1,4,6,7,8,10,16,18,20	1,4,5,6,7,8,10,11,13,14,16,17,18,19,20	1,4,6,7,8,10,16,18,20	2
D11	2,11,14,15	1,2,8,11,14,15,17,18	2,11,14,15	7
D12	3,4,5,6,8,9,10,12,16,17,18,20	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,20	3,4,5,6,8,9,10,12,16,17,18,20	1
D13	1,4,8,13,16	1,2,4,5,8,11,13,14,15,16,17	1,4,8,13,16	3
D14	1,14,17	1,2,7,14,17,18	1,14,17	9
D15	1,11,15,17	1,2,8,11,14,15,17,18	1,11,15,17	7
D16	8,15,16	1,2,8,11,14,15,16,17,18	8,15,16	6
D17	17	2,17	17	11
D18	18	10,17,18	18	10
D19	18,19	1,6,8,11,16,18,19	18,19	5
D20	1,4,5,7,8,10,13,16,17,18,19,20	1,4,5,7,8,10,11,13,15,16,17,18,19,20	1,4,5,7,8,10,13,16,17,18,19,20	2

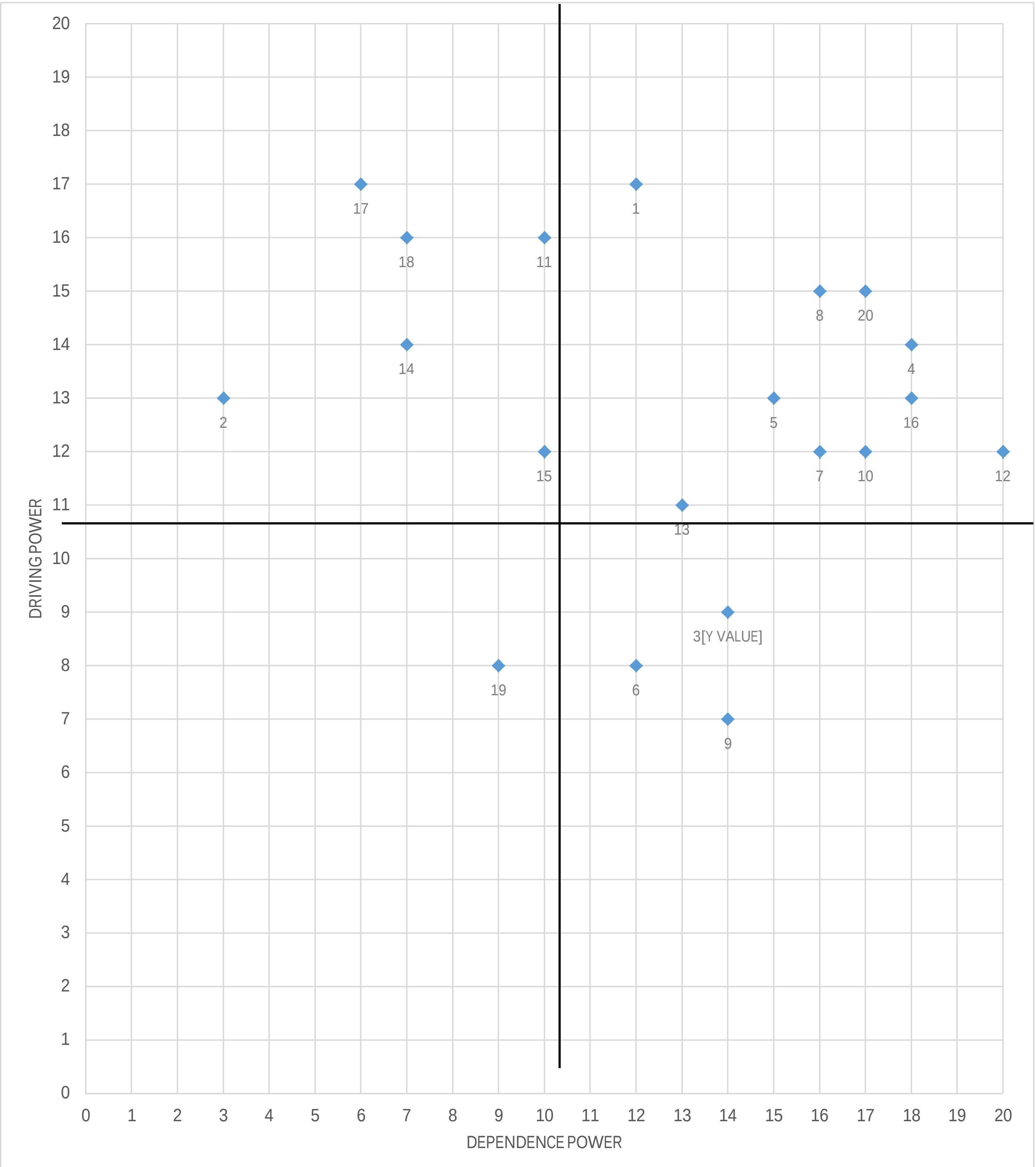
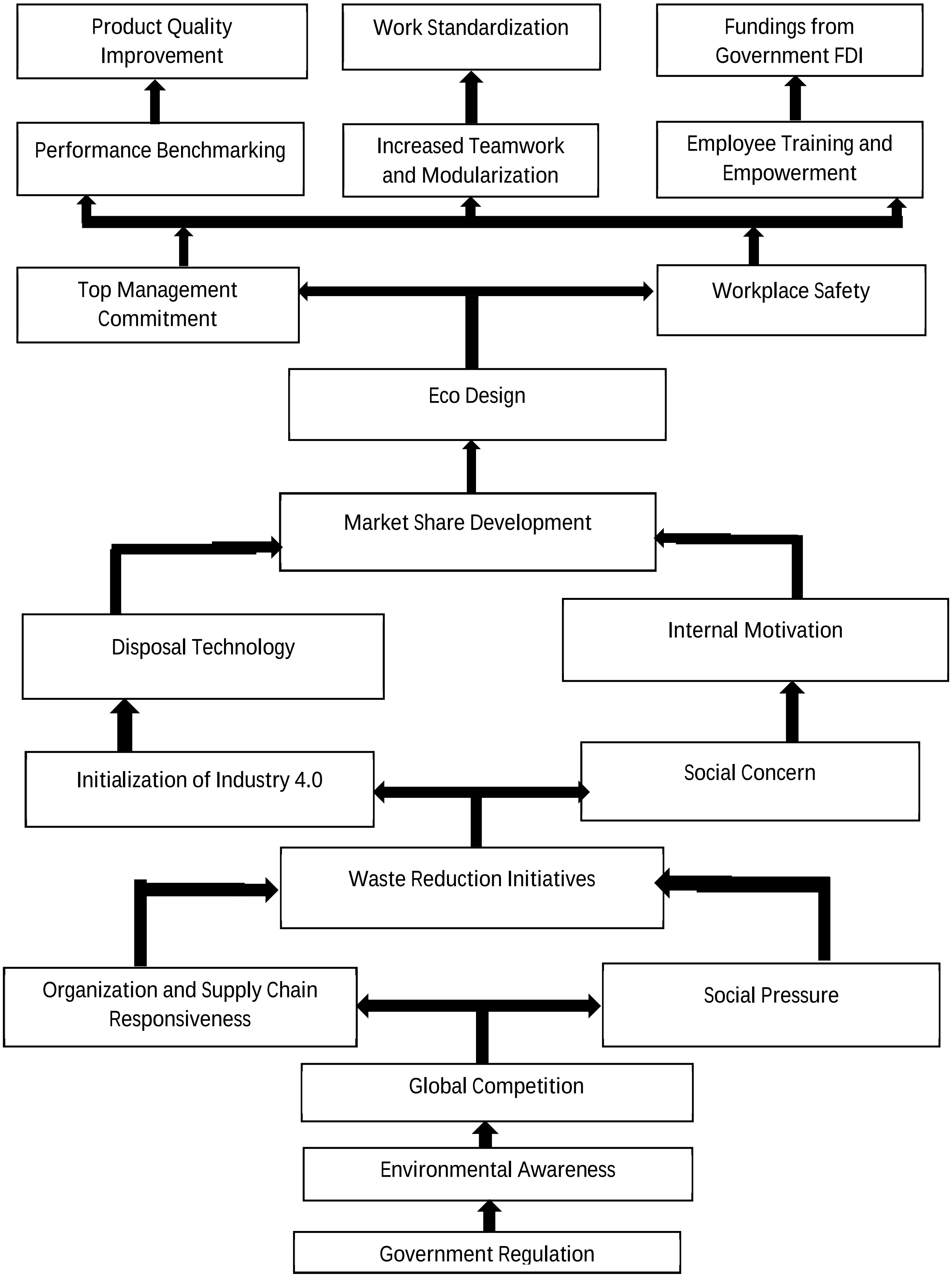

DRIVING POWER
DEPENDENCE POWER
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
3[Y VALUE]

Figure 1 ISM Model



VII. PRACTICAL IMPLICATIONS

By diagnosing the dominant factors for the adoption of lean sustainable system, the fear of implementing lean sustainable in manufacturing industries can be eliminated. This also leads to the manufacture of eco-friendly products in the industries, and their ability to sustain in the market is increased. While implementing the lean sustainable system, factors in the lower level have to be concentrated more and implemented first. As it drives all the other factors, then it will be easy to implement all other factors.

Result shows that organization must follow Government Regulations in strict way for the implementation of Integrated Lean and Sustainable Manufacturing strategies. Government legislation is done in order to aware people about the need of implementing Lean and Sustainable strategies together. So, here it leads to global competition. The organization should compete globally to sustain in the market. In order to compete, the Organization and it's Supply chain should posses some kind of responsiveness towards changing trends and also at the same time it should be able to handle societal pressure with good motive. After this, Organization should go for implementing Waste Reduction Initiatives. The Organization is concerned about society and now it should take necessary steps to implement Industry 4.0. Regarding these all, the Organization must motivate employees to get their full potential so it can achieve all the objectives. As earlier said , it's social concern should lead it to implement some best Disposal Technologies. Now the industry should focus on develop its's market share by designing and producing eco-friendly products.These all lead Organization to consider top management's involvement so that they also can consider about safety of workplace. Here the Organisation should benchmark all their performance. Training and empowerment should be provided to employees for implementing Combined Lean and Sustainable Strategies and also there is a need for ensuring teamwork among employees. Ultimately ,The Organisation will experience the Standardized work , so the quality of the product will be increased. By giving proposal to implement the Integrated Lean and Sustainable strategies with all the above factors, the organization can able to get Fundings from Government and FDI.

A. Managirial Implications

The conduct of the study enabled the managers to systematically develop the model for integrated lean sustainable system. The categorization of factors enabled the identification of dominant factors. The practicing managers felt that the modelling approach would help them to implement the integrated lean sustainable system in an effective manner. The developed model act as a logical approach through which factors and their interrelationships are captured which would enable them to prioritize and allocate the resources in an effective way.

VIII. CONCLUSIONS

Increasingly, many organizations are beginning to recognize the importance of becoming green in the era of environmental responsibility. Unlike lean manufacturing, which focuses on ways to improve productivity and minimize waste from customer's perspective, Green initiatives look at ways to eliminate waste from the environment perspective. Bringing lean and sustainable system together can benefit not only to manufacturers and customers, but the environment as well. With today's competitive market, scarcity of raw materials, high price of transportation, global warming and high competition and integration of lean and green manufacturing can provide competitive advantage and profitability that many organizations are aiming for. Such organization recognizes the potential of applying integrated lean sustainable manufacturing system.

A survey was conducted among experts who are working in this area and with the help of these 20 drivers which influence the implementation of lean sustainable system were identified. Based on the inputs, a structural self-interaction matrix (SSIM) was formed, and factors are iterated into 12 levels, and MICMAC analysis was used to classify the factors into driving, dependent, autonomous, linkage factors. 10 factors have been identified as Linkage , 6 factors have been identified as driving, 1 factors as autonomous and 3 factors as dependent variables. Understanding these factors and their relationships, through a logical structure, will help managers to better prioritize and target their resources in a more effective way. This prioritization helps management to make appropriate decision. The outcome of this study is communicated to the experts who are involved in this process and they found the results to be useful for further implementation in the organization.

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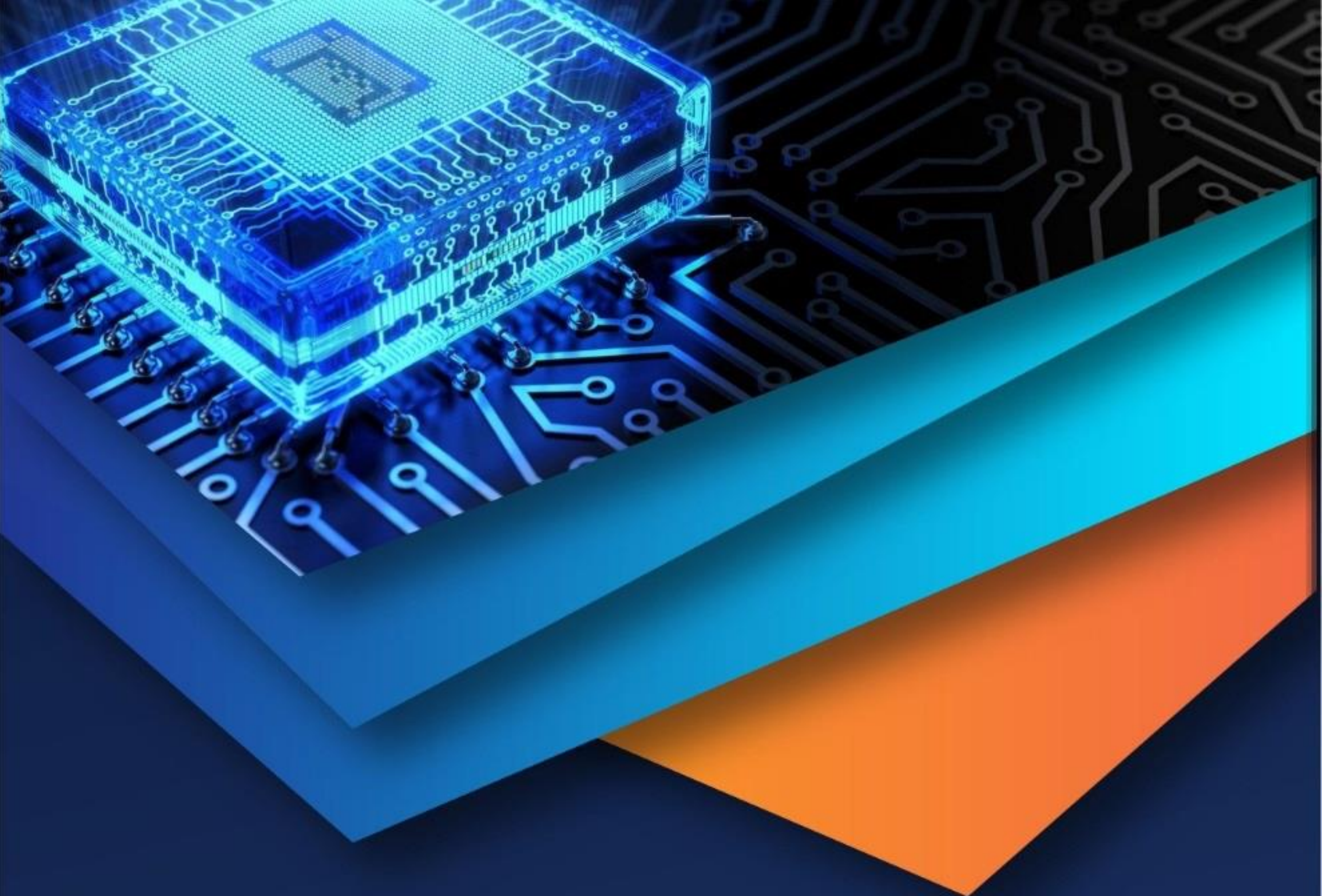

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