

Research Article

Modeling Enablers of Transporter's Performance in Downstream Logistics of the Indian Oil Sector

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Oil industry in India has entered the competitive world, and each organization used probing strategies to reduce cost. India is a non-oil-producing country, and the scope for this lies in reducing supply chain cost in downstream logistics. This research provides an integrated model of key enablers for transporter's performance in downstream logistics excellence of Indian oil sector to provide oil marketing companies' a direction for design of future strategies to reduce downstream logistics cost. The sequential mixed-methods design is adopted. It identifies the enablers through literature review and interviews with transporters, working managers, and logistics experts (qualitative), and then, interpretive structural modeling (ISM) and MICMAC analysis (quantitative) are used to develop the diagraph and matrix to establish the contextual relationship and find their role and influence on each other. This readymade, unique, and unified model provides enablers for transporters' performance in different individual categories, namely, dependent, independent, and autonomous enablers, and link them based on their driving power and dependence power along with their influencing behavior to enable transporters, working managers, and top management to focus on for reducing the logistics cost and shall add value for the ultimate customers. The academicians shall be benefited by appreciating practical aspects of this business.

1. Introduction

The oil industry, in India, has entered in competitive mode with the implementation of the Government of India's policies to create value for the customer in petroleum products, and therefore, customer service is now a strategic topic for oil industry top management and has gained importance in the last decade more due to so many reasons. First, the power, being displayed by oil companies due to its only available brand, in market has progressively decreased, making products almost undifferentiated in terms of trademarks. In oil industry, the specifications of petroleum products are as per BIS standards, and therefore, there is no difference in the product. Second, due to technology diffusion, as pointed out by Ref. [1], the functional and technological features of product are almost the same. The new customers can not be impressed with a brand of product and can also not be impressed with technical specifications

as all the products are nearly the same. As a result of this change in customer expectations towards service, customers have become more and more demanding about logistics performances [2]. Customer service is, therefore, to be clearly understood as the service performance felt by customers as a result of logistics/transport processes and actions. Transportation is a part of logistics services. Transport plays a very important role in the survival of a firm by serving the customers with goods and services. The modern customer in today's society can be impressed, and the society can be effectively functional by only having an effective transport and logistics system. Customers are ready to shell out more money for quality of goods and service; i.e., the transportation system must work effectively to distribute those goods on customer's demand [3–10]. The oil marketing companies (OMCs) in India, therefore, want strategies to improve efficiencies to reduce cost in downstream logistics because the number and width of services by

logistics, related to product, may play a significant role in the competitive scenario [11, 12]. The only specific use of transportation is to satisfy the requirement for mobility, since transportation can only exist if it takes people and freight around. The transportation, in all businesses, is expected to be flexible and delivered in time, which increases the importance of an efficient and reliable transportation facility. It is an accepted and acknowledged fact that transport plays a crucial role in development. Ref. [13] has concluded that the influence of transportation on market increase is often underestimated and statistical information is not sufficient to evaluate this and the creation of an efficient transport sector is very important in the competitive arena. For the OMCs, the customer service is very important to create the difference between various performance aspects of firms, which can improve the market share of the companies. The transportation plays a major role in customer satisfaction. The customers of OMCs have different expectations for customer service, which has been identified by the oil marketing firms, and they are now additionally interested in developing and embracing some strategy to reduce the supply chain cost, for which transportation of petroleum products is one area, where organizational effectiveness can be made more competitive and achieve organizational goal of improved customer value by better utilization of resources and in turn increased profitability. Transportation uses approximately forty percent of total production cost and 50% is through road [14]. It is virtually impossible in recent times and in economy for a firm to survive without effective and efficient use of transportation. The road freight transportation is the part of the supply chain in oil industry, which makes possible the seven Rs mostly used in supply chain effectiveness in any industry. These are the right product, the right quantity and right condition, the right place and right time, and the right customer at right cost. Transportation is one of the most important links in supply chain and is an important part of logistics as it connects customer with the firm. It takes care of the customers of the firm who can be miles away and without transportation the firm cannot make its product reach the ultimate customer, and it shows the importance of transportation. The transportation system working efficiently and effectively can improve the bottom line of the firm. Based on this argument, the paper identifies the enablers for transporters' performance in oil marketing companies of India to have more satisfied customers, resulting in more profit to the company. In oil industry in Indian downstream logistics from the terminals and depots to the retail outlets and bulk consumer transportation of petroleum products, transporters' tank trucks are on contract as all the terminals and depots cannot be near the ultimate consumer. The transportation service needs to change for improvement to add value to the product, which can satisfy and attract customers by making them feel important and wanted. The enablers are the change agents as per change management theory, which acts as a catalyst in change from one level to another level. The enablers identified, in this research, shall help the working managers, transporters, and all the stakeholders to improve the efficiency of transportation in downstream

logistics in oil industry in India. The academicians shall have a readymade model to understand the complexity of transportation in oil industry in particular and others in general to move further for research on the aspects.

1.1. Gaps in Literature. The researchers are agreeing that logistics activity affects firm's performance. Stenberg and Harispuru [15] have maintained that other SC partners account for a significant portion of transporters' efficiency. Transportation is necessary and crucial for any logistics system and impacts logistics activity significantly, but many businesses have no understanding of how transporters operate (Nilsson et al. [16]). Extensive study of existing literature on the subject revealed that it had not been studied with the perspective that reducing non-value-adding activities can improve the efficiency of the transporters. Naim et al. [17] underline the gap in literature on supply chain collaboration with transporters in general. The activity of road transporters in general, and distribution in particular, is inefficient. Given the importance of road transportation and sector's low quality, road transporters must improve their operations and address inefficiencies in a systematic way (Stenberg and Harispuru [15]). Blanquart and Burmeister [18] have said that the performance of freight transportation does not depend on a single factor and a heuristic multidimensional framework model is required for performance management. There exists a gap in literature as enablers for transporters' performance in oil industry in India have not been modeled so far. Hence, the factors, called as enablers, are change agents for the improvement of transporters' performance in oil industry, and by tackling inefficiencies, removing the wasteful activities and non-value-adding activities is being identified to enable the OMCs and their transporters to enhance performance towards excellence. This is the objective of this research. It will reduce the risks from the complete system of transportation of petroleum products to improve the efficiency, reduce the cost, and improve the bottom line of the companies, ultimately affecting the economy of the country positively. The research questions are what are the factors that can enable reducing the waste and risks in the transportation of petroleum products in India to enable the enhancement of downstream logistics performance and how these factors are contextually related to each other.

The paper sets out to literature review underpinning theory and research design along with the identification of enablers through interviews and literature review. The next section contains the methodology and identification of enablers. Thereafter, the paper provides the results of ISM and gives major findings of the study. Lastly, the practical uses, of findings, are highlighted and further research questions are also enumerated in the end.

2. Literature Review, Underpinning Theory, Research Design, and Data Collection

2.1. Literature Review. The extensive literature on freight transportation, outsourcing of transportation function, performance of transportation, and effects of transportation

on logistics indicate that there is an increased interest in the management of transportation. Several studies have been conducted in past to show major classes, namely barriers and enablers for effective implementation of performance-based logistics, multi-stage transportation system in supply chain management, role of transportation in logistics system, effect of logistics on firms' performance, and its management and transport cost optimization. In India, there are certain studies on logistics and supply chain practices in India and SWOT analysis and risk management in oil industry supply chain and downstream supply chain.

2.2. Theoretical Framework. Resource-based view theory (RBV) and change management theory are the underpinning theories for this research. The transporters and their assets being engaged by OMCs are the resources for them as they have obtained rent-generating capacity and are the resources to save cost for their transportation needs and improve their logistics service. The OMCs are interested in developing strategies to manage their performance. The strategies are dependent on the knowledge about the variables, which can act as a catalyst for the same. This brings the change management theory as another theory underpinning this research.

2.3. RBV and Change Management Theory: A Brief Review. RBV says that organizations gain competitive advantage by combining their resources through complex and unique patterns. The RBV states that in a firm, the resources comprise skills, technologies, capabilities, and infrastructure. To gain a competitive advantage, resources must be coordinated and deployed [19]. Capabilities are complex bundles of skills and acquired knowledge that enable organizations to coordinate activities and make use of their assets through organizational processes [20]. Hafeez et al. [21] define the capability as the ability to employ resources to complete a task or activity, and define a resource as anything tangible or intangible that a corporation owns or acquires. The firm's RBV provides vital insights into how competitive advantage is developed within organizations and how that advantage is maintained over time. RBV asserts, in summary, that organizations gain a competitive advantage by amassing internal resources and talents that are unique, valuable, and difficult to duplicate [22–24].

The change management theory by Kurt Lewin discusses planned change, and in its large form, it can be defined as process that people learn and discover continuously. Korir et al. [25] defined change management as an effective change in a business in which all participate from leader to front-line employee. The presence of change management methods has a beneficial impact on firm performance, as it tends to make a substantial contribution to organizational capabilities, which in turn becomes a wonderful boost for further boosting innovativeness. Change management methods are becoming increasingly important in today's organizations. This level of awareness in a system is a vital component of an organization's performance (Edward & Rees [26]). Change management methods are linked to the optimization of

performance in organizations. Academics, consultants, and practitioners have all looked at change management approaches. Management nowadays is driven by rapid and uncertain changes, increased competition among organizations, and the demand for more complex client services. Change management (CM) highlights the need of developing change management plans and plans in the context of the organization's overall strategies and objectives, as well as being sensitive to the changing nature of the external environment (Armstrong [27]). It is a method that practitioners must interpret and adjust to create the best possible match between corporate strategy and plans. The integration of all institutional functions, commitment to broad organizational goals, and response to the external environment are thus the overall themes of change management (Armstrong [27]). Change management has been related to a company's competitiveness and ability to respond to environmental changes. Changes occur as a result of firms' desire to capitalize on existing or emerging market possibilities while also addressing market dangers (Ansoff & Mc Dowell [28]). The oil industry in India wants to change the performance of its transporters due to competition and is interested in knowing the catalyst to bring the change to develop strategies because in today's dynamic and rapidly changing workplace and globalized economy, the development of organizational performance is associated with the development of personal performance, skills, knowledge, and experience (Covey [29]). These catalysts are called enablers as per change management theory.

2.4. Data Collection. The interview and survey 1 have been conducted from 9 top executive directors of OMCs, 10 chief general managers, 16 general managers of state, zonal, or regional operation head of all three OMCs, 16 location in charges, 17 transporters, 300 drivers and helpers, and 70 retail outlet dealers and official of STU, railways and army, air force, and navy. 10 divisional retail heads and 10 divisional institutional business heads of OMCs were also interviewed. 6 bulk customers were interviewed. It was done to collect primary data regarding views and ideas, in which all these respondents understood about the working of different actors who are responsible for transporters' performance and who are affected by transporters' working. The pie chart indicating the respondents and their percentage is shown in Figure 1. The second survey was conducted with 6 executive directors, 10 CGMs and GMs, and 13 operating-level officials/location in charges, and it was carried out in different geographical social setups to get a proper understanding. The respondents of the second survey were different from the respondents of the first survey to have the correct interaction between the factors identified. The three OMCs have been considered because in India these three companies are moving products from locations to retail outlets and bulk customers. The demographic position of the respondents is as per Table 1. This survey was conducted to finalize the enablers to transporters' performance and then establish the relationships among the various variables. The interviews were structured, semi-structured, and

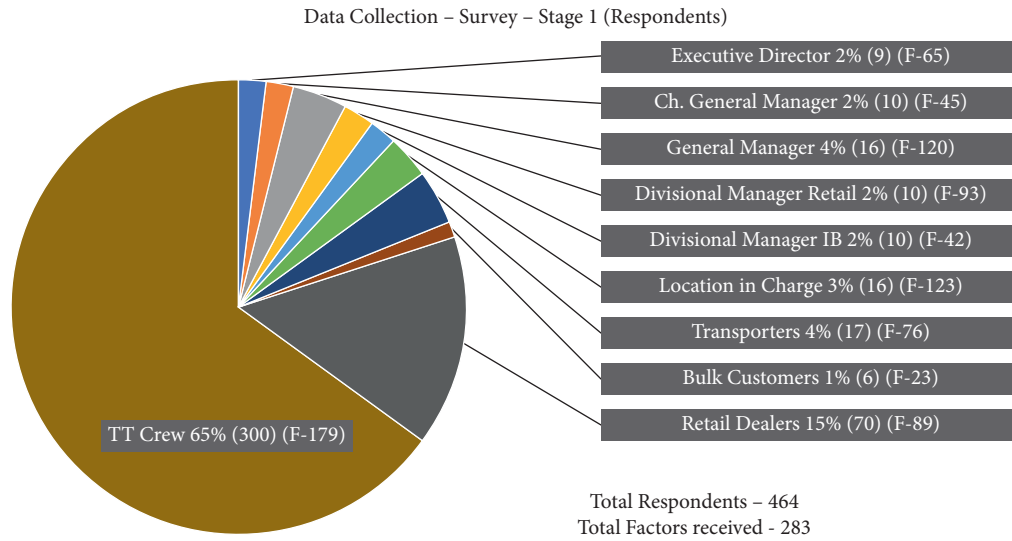


FIGURE 1: Data collection responses for survey 1.

TABLE 1: Demographic profile of respondents for survey 1.

Sr. No.	Position of interviewee in organization	Location
1	Executive director (supplies) IOC, executive director (operations), HPC, executive director (operations) (BPC)—3 nos.	Head office of Indian Oil, head office of Hindustan Petroleum, head office of Bharat Petroleum
2	Executive director and state head (IOC), executive director (zonal), HPC, executive director (region), BPC—6 nos.	Delhi, Ahmedabad, Chennai, Bihar, Kolkata, Chandigarh
3	Chief general manager, general manager—26 nos.	Lucknow, Jaipur, Cochin, Hyderabad, Bhubaneswar, Chandigarh, Bhopal, Mumbai, Bangalore, Chennai, Ahmedabad, Patna, Delhi
4	Divisional managers (retail, institutional business), location in charges—30 nos.	Lucknow, Jaipur, Cochin, Hyderabad, Bhubaneswar, Chandigarh, Bhopal, Mumbai, Bangalore, Chennai, Ahmedabad, Patna, Delhi

unstructured depending on the respondent’s position and time available. The interviews have been conducted face to face. The data collection stages are indicated in Figure 2. The details and responses for survey 1 are indicated in Figure 1, and total responses for survey 2 are depicted in Figure 3.

This method of interview has got following advantages:

- (a) Interviews can look for clarifications when respondents’ answer is unexpected or ambiguous
- (b) Interviews provide an effective rapport-building opportunity
- (c) Interviewing can be done for a wider range of subjects, for example, unanticipated views that may come up when subsequent to a reply

The interviews have been used to get the following specific information from different respondents:

- (a) Job specific information
- (b) Problems and issues
- (c) Respondents perceptions and feelings
- (d) Personal information

A sequential mixed-methods design was used for this study. The mixed-methods design involves methods from

qualitative and quantitative methods to reply research question. The mixed-methods designs are used to utilize the strength of all the approaches of data collection. This design provides the researcher foundation for answering confirmatory and explanatory questions at the same time, and the researcher is able to construct and confirm theory in the same study. Many researchers prefer mixed approaches to gain access to a broader variety of divergent perspectives.

The generation of researchable questions in a content field of interest is probably the most challenging intellectual exercise that people go through while doing their own research. The research questions in the research objective of this research are best suited for mixed-methods design because the questions are separate quantitative and qualitative questions followed by the nature of integration [30]. According to Creswell and Plano [31], the researcher collects the qualitative data first and then the quantitative data in an exploratory sequential mixed-methods design.

3. Identification of Enablers to Study Their Influence and Classification

The literature review includes published literature and related journals such as Transportation Research,

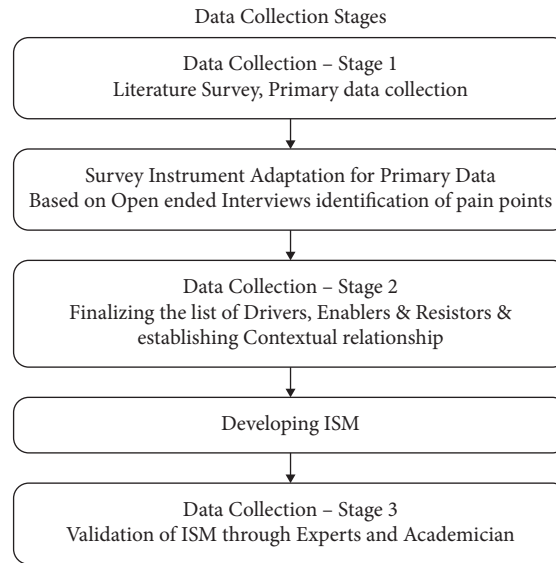


FIGURE 2: Data collection stages.

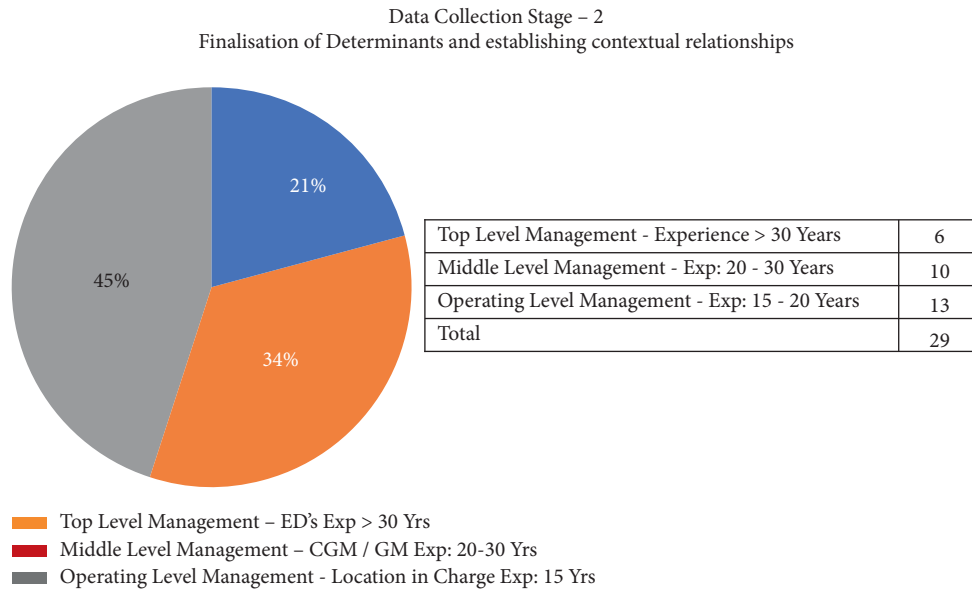


FIGURE 3: Data collection stages for survey 2.

International Journal of Logistics Systems and Management, International Journal of Transportation Economics, International Journal of Logistics Research and Applications, Transportation Science Journal, Transportation Journal, and European Journal of Operational Research. The various authors have discussed about different aspects of trucking and the factors that are important for having efficient and effective transportation. The interviews conducted in survey 1 gave a list of 283 factors, which were combined into 23 factors as available in the literature. Then, again these 23 factors were taken to the experts to identify the enablers and then the final list of 14 enablers was arrived at after brainstorming and agreement by all experts. Using interviews and available literature, 14 enablers were zeroed on for the transporters’ performance for downstream logistics in the OMCs in oil industry in India (Table 2). Table 2 also

indicates the name of authors who have spoken about these factors in a different context in the available literature and is important for transportation of petroleum products and was also found during the interviews. The table also explains the reason for these factors being enablers for the transporters’ performance in oil industry in India.

4. ISM Methodology

ISM is a modeling method, which is used for understanding and solving the complex system and converts it into simple understandable form by deriving and spotting the hierarchical relationships between the systems affecting factors in a problem, and is a process that results in learning by group [70]. The technique is noted as interpretive as the combined decisions of the members of a group derive the ways in

TABLE 2: Enablers to transporters' performance in oil industry.

Enablers		The importance and impact of identified enablers for transportation of petroleum products in oil industry in India	Sources
E1	Economical operating cost	Economical operating cost of the tank truck has a principal role in giving cost advantage by creating values for the supplier and the customer. The operating cost depends on speed, maintenance, cost of insurance, license and interest, good infrastructure and less road congestion, and attitude of tank truck driver	Watanatada and Dhareshwar [32]; Levinsonet al. [33]
E2	Economies of scale and fleet availability	Economies of scale is stated as occurring when an expansion of the output capacity of a company, fleet, or plant causes overall production costs to rise less than proportionately to the increase in output capacity. Large fleets may have enough financial strength to venture into costly operational actions that can potentially improve productivity. Larger fleets can obtain bigger discounts or rebates with, for example, bulk purchasing of fuel, spare parts, group short-term insurance, and finance costs (i.e., lower interest rate) with multiple vehicle acquisition, and enable the faster customer service	Heaver [34]; Cowie [35]; Seok-Min [36]
E3	Readiness of fleet as per statutory requirements	The readiness of fleet as per statutory requirement shall result in less maintenance and better safety	Sowik and Sharpe [37]; AEA et al. [38]; Mckinnon [39]
E4	Delivery unloading time span optimization	The optimized delivery unloading time span helps in increasing customer perception of value and enables the nonidling of assets	McCabe et al. [40]; McDonaldet al. [41]
E5	Feedback	Feedback on performance and other aspects of business enable the transporter to understand his position	Huang et al.[42]; Heitmann et al. [43]
E6	Security of products	The ensured security during the travel on road for avoiding theft, etc., of the product and tank truck	Quigley and Mill, [44]; Reniers and Pavlova [45]; Russell and Simpson [46]
E7	Certainty of loads	Certainty of loads enables the transporter to place the tank truck in time to ensure maximum returns	Mcdonaldet al. [47]; Christopher and Lee [48]; Fowkes et al. [49]
E8	Customer service time span optimization	Optimized total time required to serve the customer enables the transporter to utilize his vehicle for maximum returns	Mayhew and Quinlan [50]; Vance [51]; Welles et al. [52]
E9	Financial management	The efficient financial management shall enable the transporter to go for higher performance in the work of transporting	Barrot [53]; Gotzamani et. al. [54]
E10	Infrastructure and congestion	Good infrastructure and less congestion on roads shall enable the transporter to save on fuel cost and time	Pierce and Murray [55]; Wheeler andFigliozi [56]; Golab and Regan [57]; Edirisinghe and Zhihong [58]
E11	Relationship quality	The good relationship with all the stakeholders shall enable the transporter to avoid time wastage on resolving minor abrasions	Knemeyer et al. [59]; Paille et al. [60]
E12	Collaboration and cost optimization	The collaboration with the stakeholders shall enable the transporter to reduce his cost on fuel, insurance, and license	Ozener et al. [61]; Bailey [62]; Min et al. [63]
E13	Information technology	The information technology shall give him real-time feedback regarding his assets and speed as it will enable him to position his tank trucks for maximum utilization	Hubbard [64]; Barla et al. [65]
E14	Outsourcing management process	The outsourcing management process by oil marketing companies will enable the transporter to understand all requirements before making any error in contractual conditions, and it will enable the transporter not to lose contract	Gadde and Hulthen [66]; Hwang et al. [67]; Wong and Karia [68]; Hitt et al. [69]

which the variables are affecting and related to each other. The complex variables are put in a structural form by this method on the basis of relationships among the variables, which are complex, and therefore, it is called the structural method. The ISM is also a modeling technique as it gives results in the form of diagram based on the specific

relationships of variables. ISM techniques have been used by many researchers to solve the complex problems. ISM has been applied in this study because even after the identification of enablers through the interview and literature review, the effect of one enabler and the direction of effect to show the interrelationships among the various enablers are

not established. It makes to understand the relationships of key enablers as it presents the directions of relationships among the enablers.

This approach was chosen because it promotes the discovery of key relationships between particular variables that define a problem or issue [71, 72]. It allows for the identification of key research variables, as well as the imposition of order and direction on the complexity of relationships between variables [73].

It indicates that ISM and MICMAC have been used for various types of research and are suitable for identifying the relationship among complex factors. The same has been used for this research as the factors being identified have to be related as per their level of dependence and independence.

5. Development of an Integrated Model Using ISM and MICMAC

Various steps involved are illustrated through the flowchart depicted in Figure 4.

The contextual relationships were arrived at using brainstorming method. To develop the contextual relationships, in ISM methodology, the opinion of experts is established by making the experts to discuss the issue through brainstorming or nominal group technique. A total of two brainstorming sessions were required to be conducted: one to verify the enablers identified through literature review and second one to establish the contextual relationships. The brainstorming session started with the introduction and aim of the study to identify the enablers for transporters' performance in downstream logistics of oil industry in India. The second brainstorming session was held after four weeks, in which many enablers identified were put up to the group to find out their reliability to the study. The group had a number of disagreements on the identified enablers, and after a lot of discussions, finally 14 enablers were accepted by the group to work on the modeling. The enablers so earmarked by the group looked complete for further research and model development. The enablers identified and accepted by the group were optimized to minimize the relationship complexity. This helps in developing the manual contextual relationship among the enablers. The group after the group activity finalized the initial relationship among the enablers during the group discussion session. Then, the initial relationships were further reconfirmed through the external expert group. Then, the initial reachability matrix and final reachability matrix (matrix with transitivity) were finalized. The complete model development system is described under the following broad headings:

- (1). Structural self-interaction matrix
- (2). Reachability matrix:
 - (a) Initial reachability matrix
 - (b) Final reachability matrix
- (3). Level partition and lower triangular matrix
- (4). Formation of diagraph

- (5). Direct relationship matrix
- (6). MICMAC analysis

5.1. Structural Self-Interaction Matrix. SSIM is made by showing the contextual relationship among the enablers identified. The brainstorming sessions established the contextual relationship among the various enablers. Expert's opinion is necessary to reconfirm the correctness of the contextual relationship among the various enablers for transporters' performance. Following enablers' relationship, rules are used to indicate the relationship among two enablers (*a* and *b*):

$V = a$ influences b

$A = b$ influences a

$X =$ both a and b influence each other

$O =$ both do not influence each other and either

The contextual relationships among 14 enablers are indicated in a matrix, which is known as SSIM and is depicted in Table 3.

5.2. Reachability Matrix. The reachability matrix has two parts: initial reachability matrix and final reachability matrix. The initial reachability matrix is without transitivity involved among the enablers, while the final reachability matrix takes care of the transitivity.

5.3. Initial Reachability Matrix. The SSIM is changed into binary matrix of 0 and 1 to get the initial reachability matrix by substituting *V*, *A*, *X*, and *O*. The rules followed, for the substitution, are as follows:

- (i) *V* in SSIM is made 1 in the reachability matrix
- (ii) *A* in SSIM is made 0 in the reachability matrix
- (iii) *X* in SSIM is made 1 in the reachability matrix
- (iv) *O* in SSIM is made 0 in the reachability matrix

The initial and modified reachability matrices are as per Tables 4 and 5.

5.4. Final Reachability Matrix. The final reachability matrix is developed by induction of the transitivity. The final reachability matrix after applying the transitivity and showing driving power and dependence power for each enabler is shown in Table 6.

5.5. Level Partition and Lower Triangular Matrix. As per Warfield [74], the reachability set and antecedent set for each enabler are made from the final reachability matrix. The reachability set consists of enabler itself and other enablers, which are influenced by the enabler, and the antecedent set contains the enabler and other enablers, which influence it. Then, the intersection between the antecedent set and the reachability set is seen. If the enabler contained in the reachability set and the intersection set is the same, then it will

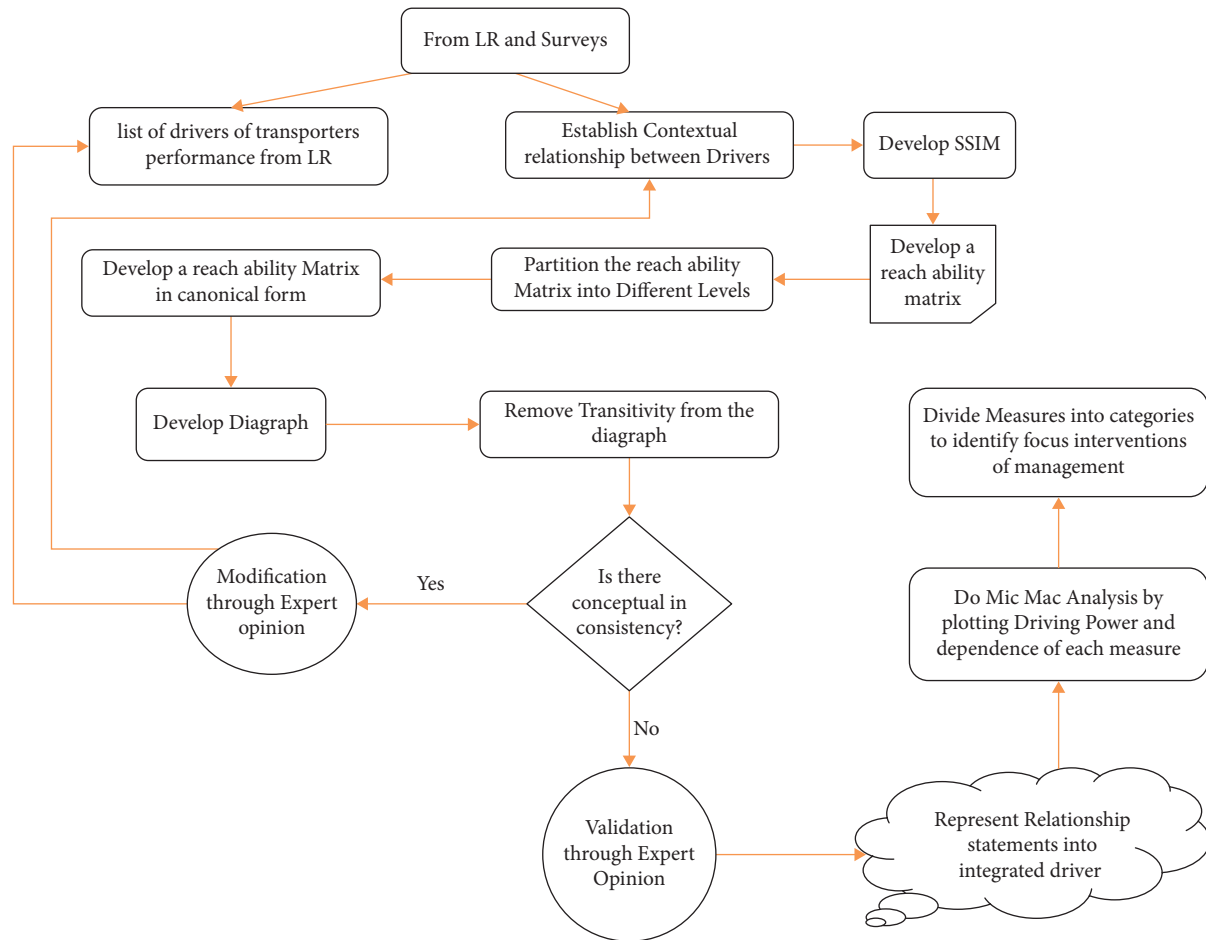


FIGURE 4: Flowchart for ISM.

have the top level and is further removed from the next iteration. This step is again repeated till the final iteration is complete, and the lowest level is obtained. The iteration 1 is explained in Table 6 in which customer service time span is found at level 1; therefore, it is positioned at the top of the ISM hierarchy. Further iterations have also been carried out, and the levels of each enabler are obtained. The iterations 2 to 6 are shown in Table 7. Then, the conical matrix is formed from the final reachability matrix by rearranging the enablers according to their level. The triangular matrix helps in the generation of the structural model. The details are shown in Table 8.

5.6. Formation of Conical Matrix (Table 8). The conical matrix is prepared by showing all the factors as per their levels in level partitioning. It helps in drawing the digraph. Table 8 shows the conical matrix for this system.

5.7. Formation of Diagraph. The initial digraph is created from the final reachability matrix and the levels of enablers found in level partitioning. The digraph is drawn with transitivity, and then, the simplified digraph is made by excluding the transitivity. The digraph, from this ISM on enablers, is shown in Figure 5, and the simplified digraph is as per Figure 6.

It is evident from the simplified digraph that feedback, collaboration, relationship quality, infrastructure and congestion, financial management, and outsourcing management process are at the bottom of diagraph and all of these form the base for ISM hierarchy; thus, they are very important enablers for transporters' performance for downstream logistics excellence in oil industry in India. Readiness of fleet as per statutory requirement is the important enabler connecting the base and the top. Economical operating cost, economy of scale and fleet availability, security of products, certainty of loads, delivery unloading time span optimization, and customer service time span are at the enablers, which depict the effectiveness of enablers for transporters' performance, have been rightly identified as the outcome of an effective enabler for transporters' performance for downstream logistics excellence in oil industry in India, and have been depicted towards the top of hierarchy.

5.8. Validation of Framework. The expert opinion survey technique was applied for the validation of the framework developed. Altogether, 10 experts (manager-in-charge of logistics and transport management in three PSU oil marketing companies and consultants in logistics field) were asked to comment on the models developed. The ISM model

TABLE 3: SSIM for enablers.

Table 3 SSIM		14	13	12	11	10	9	8	7	6	5	4	3	2	1
		Outsourcing Management Process	Information Technology	Collaboration & cost Optimization	Relationship Quality	Infrastructure & Congestion	Financial Management	Customer Service Time Span	Certainty of Loads	Security of Products	Feed Back system	Delivery unloading time span optimization	Readiness of Fleet as per statutory requirements	Economics of scale and Fleet availability	Economical Operating cost
1	Economical Operating cost	A	A	A	A	A	A	V	A	X	A	V	A	O	
2	Economics of scale and Fleet availability	A	A	A	A	A	A	V	X	X	A	V	A		
3	Readiness of Fleet as per statutory requirements	A	A	A	A	A	A	V	O	V	A	V			
4	Delivery unloading time span optimization	A	A	A	A	A	A	V	A	A	A				
5	Feed Back system	V	V	V	V	V	V	V	V	V					
6	Security of Products	A	A	A	A	A	A	V	X						
7	Certainty of Loads	A	A	A	A	A	A	V							
8	Customer Service Time Span	A	A	A	A	A	A								
9	Financial Management	A	X	A	A	X									
10	Infrastructure & Less Congestion	A	X	A	A										
11	Relationship Quality	A	A	A											
12	Collaboration & cost Optimization	X	V												
13	Information Technology	A													
14	Outsourcing Management Process														

was sent to them, and they were asked to comment about each contextual relationship in that model. The contextual relationships were numbered in each model to make suggestions specific and to the point. A total of 6 experts replied back of which four were from the organizations and two were from the consultants. All experts were at the executive director and chief general manager and general manager level and have relevant experience in the field. In general, their responses were as follows:

- (i) Most of the contextual relationships in the model are valid and pertinent to the perspective
- (ii) Measures used in these models are generic and cover all the points of enablers for transporters’ performance

5.9. *MICMAC Analysis.* The Matrice d’Impacts Croises Multiplication Appliquee a un Classement is known as MICMAC. This is also termed as cross-impact matrix multiplication applied to classification, which confirms and indicates a connection between all the elements that are part of a system [75]. This helps in understanding and finalizing the direct influencing connections among the various elements/variables of a system. The use of MICMAC is to indicate the system configuration by studying direct and indirect influence among the variables [76].

The application of MICMAC with the ranking of variables according to their driving power (the degree to which it influences other variables) and dependency (the degree to which it is influenced by other variables) makes it possible to detect this, from a certain order of power of the matrix, and the hierarchy remains stable [77]. The strength of the MICMAC use makes the identification of variables of indirect influence/importance and additionally those that are likely to be left by the analyst [78]. The MICMAC for enablers is shown in Figure 7. The variables in each category are having certain characteristics, which makes them crucial for understanding behavior and stability.

This graph shows the clustering of enablers in the four zones to differentiate the strategic enablers and most critical enablers required to achieve the strategic objectives Table 9. The other purpose of this plot is to identify the stability of the system as a whole also. If the majority of enablers are aligned in the autonomous and linkage zones, the system is unstable, but if clustered in L shape in three categories, namely, independent, autonomous, and dependent then the system is stable. The MICMAC of this system shows that the system is stable.

The driving enablers are the enablers, which are to be manipulated at the operating level so that the dependent level enablers, which are strategic-level enablers, are achieved as per the plans of top management. The tactic-level enablers should be manipulated at the middle

TABLE 4: Initial reachability matrix.

Initial reachability matrix	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	Outsourcing management process	Information technology	Collaboration and cost optimization	Relationship quality	Infrastructure and congestion	Financial management	Customer service time span	Certainty of loads	Security of products	Feedback system	Delivery unloading time span optimization	Readiness of fleet as per statutory requirements	Economies of scale and fleet availability	Economical operating cost
1	0	0	0	0	0	0	1	0	1	0	1	0	0	1
2	0	0	0	0	0	0	1	1	1	0	1	0	1	0
3	0	0	0	0	0	0	1	0	1	0	1	1	1	1
4	0	0	0	0	0	0	1	0	0	0	1	0	0	0
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	0	0	0	0	0	0	1	1	1	0	1	0	1	1
7	0	0	0	0	0	0	1	1	1	0	1	0	1	1
8	0	0	0	0	0	0	1	0	0	0	0	0	0	0
9	0	1	0	0	1	1	1	1	1	0	1	1	1	1
10	0	1	0	0	1	1	1	1	1	0	1	1	1	1
11	0	0	0	1	1	1	1	1	1	0	1	1	1	1
12	1	1	1	1	1	1	1	1	1	0	1	1	1	1
13	0	1	0	1	1	1	1	1	1	0	1	1	1	1
14	1	1	1	1	1	1	1	1	1	0	1	1	1	1

TABLE 6: Final reachability matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Final reachability matrix	Economical operating cost	Economies of scale and fleet availability	Readiness of fleet as per statutory requirements	Delivery unloading time span optimization	Feedback system	Security of products	Certainty of loads	Customer service time span	Financial management	Infrastructure and congestion	Relationship quality	Collaboration and cost optimization	Information technology	Outsourcing management process	Driving power
1	Economical operating cost	1	1*	0	1	1	1*	1	0	0	0	0	0	0	6
2	Economies of scale and fleet availability	1*	1	0	0	1	1*	1	0	0	0	0	0	0	6
3	Readiness of fleet as per statutory requirements	1	1	1	0	1	1	1	0	0	0	0	0	0	7
4	Delivery unloading time span optimization	0	0	1	0	0	0	1	0	0	0	0	0	0	2
5	Feedback system	1	1	1	1	1	1	1	1	1	1	1	1	1	14
6	Security of products	1	1	0	0	1	1	1	0	0	0	0	0	0	6
7	Certainty of loads	1	1	0	0	1	1	1	0	0	0	0	0	0	6
8	Customer service time span	0	0	0	0	0	0	1	0	0	0	0	0	0	1
9	Financial management	1	1	1	0	1	1	1	1	1	1*	0	1	0	11
10	Infrastructure and less congestion	1	1	1	1	1	1	1	1	1	1*	0	1	0	11
11	Relationship quality	1	1	1	0	1	1	1	1	1	1	0	1*	0	11
12	Collaboration and cost optimization	1	1	1	1	1	1	1	1	1	1	1	1	1	13
13	Information technology	1	1	1	0	1	1	1	1	1	1	0	1	0	11
14	Outsourcing management process	1	1	1	0	1	1	1	1	1	1	1	1	1	13
Dependence power	12	12	8	13	1	12	12	14	7	7	7	3	7	3	118

TABLE 7: Level portioning

	Antecedent Set	Reachability Set	Intersection Set	Level
1	1,2,3,5,6,7,9,10,11,12,13,14	1,2,4,6,7,8,	1,2,6,7,	
2	1,2,3,5,6,7,9,10,11,12,13,14	1,2,4,6,7,8,	1,2,6,7,	
3	3,5,9,10,11,12,13,14	1,2,3,4,6,7,8,	3	
4	1,2,3,4,5,6,7,9,10,11,12,13,14	4,8,	4	
5	5	1,2,3,4,5,6,7,8,9,10,11,12,13,14	5	
6	1,2,3,5,6,7,9,10,11,12,13,14	1,2,4,6,7,8,	1,2,6,7	
7	1,2,3,5,6,7,9,10,11,12,13,14	1,2,4,6,7,8,	1,2,6,7	
8	1,2,3,4,5,6,7,8,9,10,11,12,13,14	8	8	1
9	5,9,10,11,12,13,14	1,2,3,4,6,7,8,9,10,11,13,	9,10,11,13	
10	5,9,10,11,12,13,14	1,2,3,4,6,7,8,9,10,11,13,	9,10,11,13	
11	5,9,10,11,12,13,14	1,2,3,4,6,7,8,9,10,11,13,	9,10,11,13	
12	5,12,14	1,2,3,4,6,7,8,9,10,11,12,13,14	12,14	
13	5,9,10,11,12,13,14	1,2,3,4,6,7,8,9,10,11,13,	9,10,11,13	
14	5,12,14	1,2,3,4,6,7,8,9,10,11,12,13,14	12,14	

	Antecedent Set	Reachability Set	Intersection Set	Level
1	1,2,3,5,6,7,9,10,11,12,13,14	1,2,4,6,7	1,2,6,7	
2	1,2,3,5,6,7,9,10,11,12,13,14	1,2,4,6,7	1,2,6,7	
3	3,5,9,10,11,12,13,14	1,2,3,4,6,7	3	
4	1,2,3,4,5,6,7,9,10,11,12,13,14	4	4	2
5	5	1,2,3,4,5,6,7,9,10,11,12,13,14	5	
6	1,2,3,5,6,7,9,10,11,12,13,14	1,2,4,6,7	1,2,6,7	
7	1,2,3,5,6,7,9,10,11,12,13,14	1,2,4,6,7	1,2,6,7	
9	5,9,10,11,12,13,14	1,2,3,4,6,7,9,10,11,13	9,10,11,13	
10	5,9,10,11,12,13,14	1,2,3,4,6,7,9,10,11,13	9,10,11,13	
11	5,9,10,11,12,13,14	1,2,3,4,6,7,9,10,11,13	9,10,11,13	
12	5,12,14	1,2,3,4,6,7,9,10,11,12,13,14	12,14	
13	5,9,10,11,12,13,14	1,2,3,4,6,7,9,10,11,13	9,10,11,13	
14	5,12,14	1,2,3,4,6,7,9,10,11,12,13,14	12,14	

	Antecedent Set	Reachability Set	Intersection Set	Level
1	1,2,3,5,6,7,9,10,11,12,13,14	1,2,6,7	1,2,6,7	3
2	1,2,3,5,6,7,9,10,11,12,13,14	1,2,6,7	1,2,6,7	3
3	3,5,9,10,11,12,13,14	1,2,3,6,7	3	
5	5	1,2,3,5,6,7,9,10,11,12,13,14	5	
6	1,2,3,5,6,7,9,10,11,12,13,14	1,2,6,7	1,2,6,7	3
7	1,2,3,5,6,7,9,10,11,12,13,14	1,2,6,7	1,2,6,7	3
9	5,9,10,11,12,13,14	1,2,3,6,7,9,10,11,13	9,10,11,13	
10	5,9,10,11,12,13,14	1,2,3,6,7,9,10,11,13	9,10,11,13	
11	5,9,10,11,12,13,14	1,2,3,6,7,9,10,11,13	9,10,11,13	
12	5,12,14	1,2,3,6,7,9,10,11,12,13,14	12,14	
13	5,9,10,11,12,13,14	1,2,3,6,7,9,10,11,13	9,10,11,13	
14	5,12,14	1,2,3,6,7,9,10,11,12,13,14	12,14	

	Antecedent Set	Reachability Set	Intersection Set	Level
3	3,5,9,10,11,12,13,14	3	3	4
5	5	3,5,9,10,11,12,13,14	5	
9	5,9,10,11,12,13,14	3,9,10,11,13	9,10,11,13	
10	5,9,10,11,12,13,14	3,9,10,11,13	9,10,11,13	
11	5,9,10,11,12,13,14	3,9,10,11,13	9,10,11,13	
12	5,12,14	3,9,10,11,12,13,14	12,14	
13	5,9,10,11,12,13,14	3,9,10,11,13	9,10,11,13	
14	5,12,14	3,9,10,11,12,13,14	12,14	

TABLE 7: Continued.

	Antecedent Set	Reachability Set	Intersection Set	Level
5	5	5,9,10,11,12,13,14	5	
9	5,9,10,11,12,13,14	9,10,11,13	9,10,11,13	5
10	5,9,10,11,12,13,14	9,10,11,13	9,10,11,13	5
11	5,9,10,11,12,13,14	9,10,11,13	9,10,11,13	5
12	5,12,14	9,10,11,12,13,14	12,14	
13	5,9,10,11,12,13,14	9,10,11,13	9,10,11,13	5
14	5,12,14	9,10,11,12,13,14	12,14	

	Antecedent Set	Reachability Set	Intersection Set	Level
5	5	5,12,14	5	
12	5,12,14	12,14	12,14	6
14	5,12,14	12,14	12,14	6

	Antecedent Set	Reachability Set	Intersection Set	Level
5	5	5	5	7

Level1	8
Level2	4
Level3	1,2,6,7
Level4	3
Level5	9,10,11,13
Level6	12,14
Level7	5

	Dependence Power	Driving Power
1	12	6
2	12	6
3	8	7
4	13	2
5	1	14
6	12	6
7	12	6
8	14	1
9	7	11
10	7	11
11	7	11
12	3	13
13	7	11
14	3	13

management level to help in giving better performance motivation to the transporters and operating-level management.

The identification as per Table 8 is important for practicing officials, as they will know how to utilize and align their

resources likewise. The other purpose of this plot is to identify the stability of the system as a whole also. If the majority of enablers are aligned to the diagonal of autonomous and linkage zones, the system is unstable; otherwise, if they are clustered in *L* shape in three categories namely independent,

TABLE 8: Conical reachability matrix.

Conical z reachability matrix	8	4	1	2	6	7	3	9	10	13	11	12	14	5
	Customer service time span	Delivery unloading time span optimization	Economical operating cost	Economies of scale and fleet availability	Security of products	Certainty of loads	Readiness of fleet as per statutory requirements	Financial management	Infrastructure and congestion	Information technology	Relationship quality	Collaboration and cost optimization	Outsourcing management process	Feedback system
8	Customer service time span	1	0	0	0	0	0	0	0	0	0	0	0	0
4	Delivery unloading time span optimization	1	1	0	0	0	0	0	0	0	0	0	0	0
1	Economical operating cost	1	1	0	1	0	0	0	0	0	0	0	0	0
2	Economies of scale and fleet availability	1	1	0	1	1	0	0	0	0	0	0	0	0
6	Security of products	1	1	1	1	1	0	0	0	0	0	0	0	0
7	Certainty of loads	1	1	1	1	1	0	0	0	0	0	0	0	0
3	Readiness of fleet as per statutory requirements	1	1	1	1	0	1	0	0	0	0	0	0	0
9	Financial management	1	1	1	1	1	1	1	1	1	0	0	0	0
10	Infrastructure and less congestion	1	1	1	1	1	1	1	1	1	0	0	0	0
13	Information technology	1	1	1	1	1	1	1	1	1	1	0	0	0
11	Relationship quality	1	1	1	1	1	1	1	1	0	1	0	0	0
12	Collaboration and cost optimization	1	1	1	1	1	1	1	1	1	1	1	1	0
14	Outsourcing management process	1	1	1	1	1	1	1	1	1	1	1	1	0
5	Feedback system	1	1	1	1	1	1	1	1	1	1	1	1	1

The conical reachability matrix is prepared based on level partitioning.

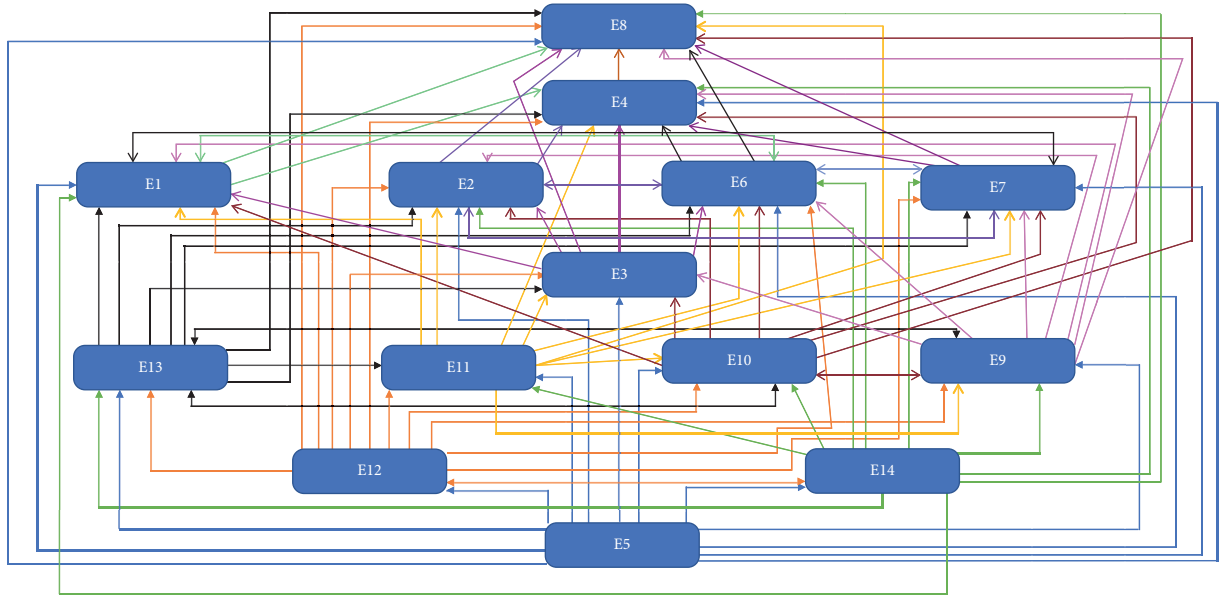


FIGURE 5: Digraph.

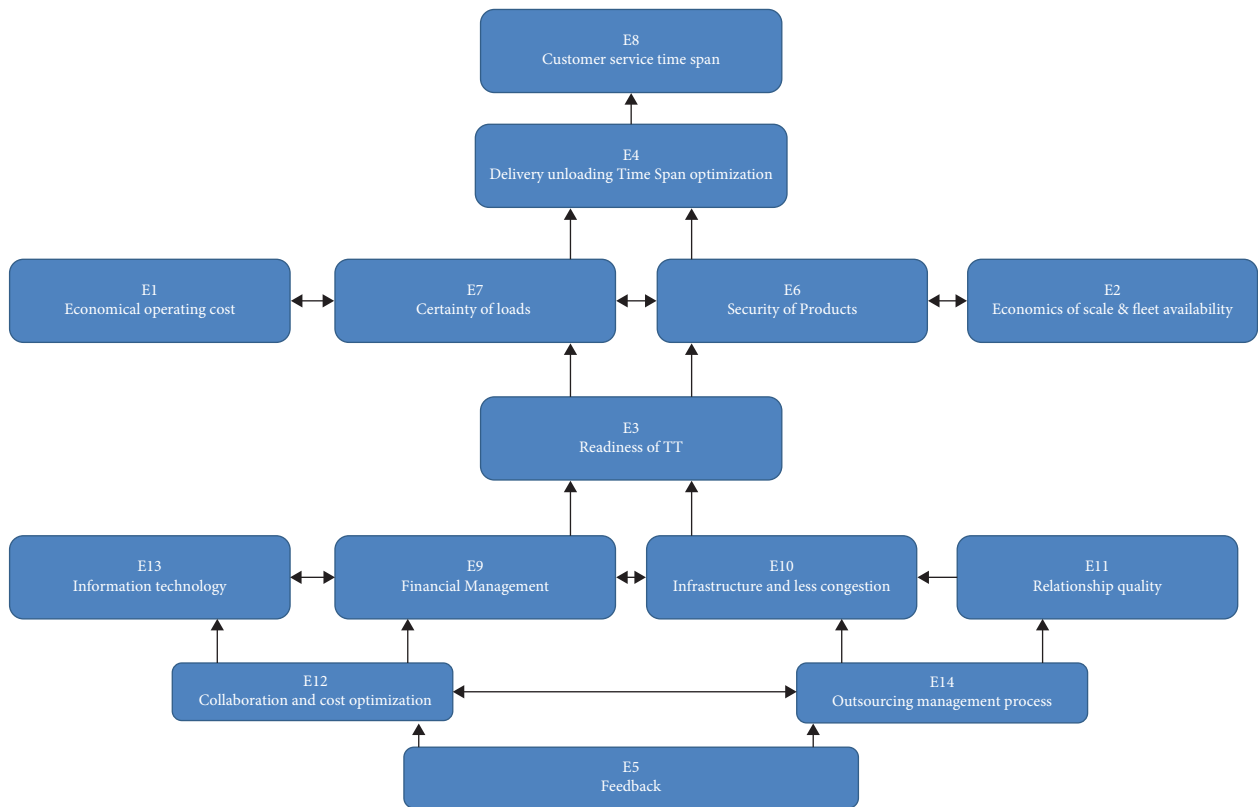


FIGURE 6: Simplified digraph.

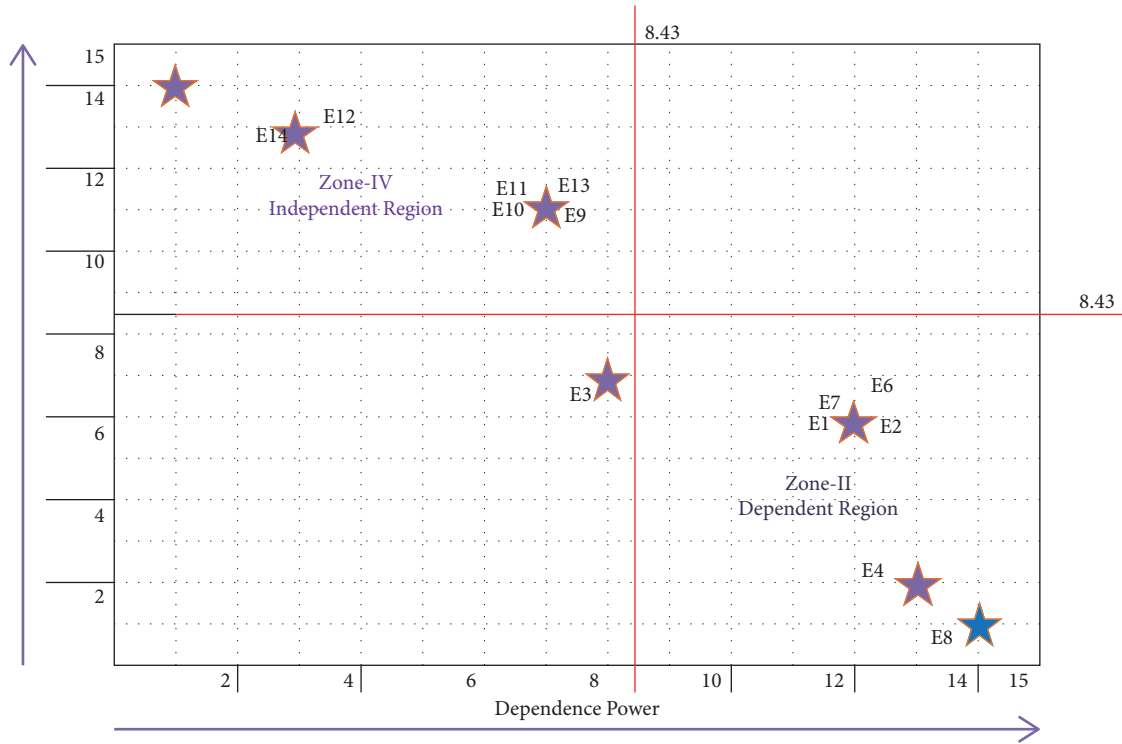


FIGURE 7: MICMAC analysis.

TABLE 9: Different enablers in driving power x dependence graph.

Driving enablers	Feedback, collaboration and cost optimization, outsourcing management process, information technology, relationship quality, infrastructure and congestion, and financial management are very influential enablers in this study and are only slightly dependent. These enablers strongly motor the system and are generally not be controlled by the environment
Dependent enablers	Economical operating cost, economies of scale and fleet availability, security of products, certainty of loads, delivery unloading time span optimization, and customer service time span are in the dependent zone of this system. These enablers rarely influence, are highly dependent on other enablers, and are also called output enablers
Autonomous enablers	Readiness of fleet as per statutory requirements is the enabler in the autonomous zone and is near to centre of gravity of the system. It is called as regulating enabler as it can successively act at times as secondary levers
Linkage zone	No enabler is there in the linkage zone

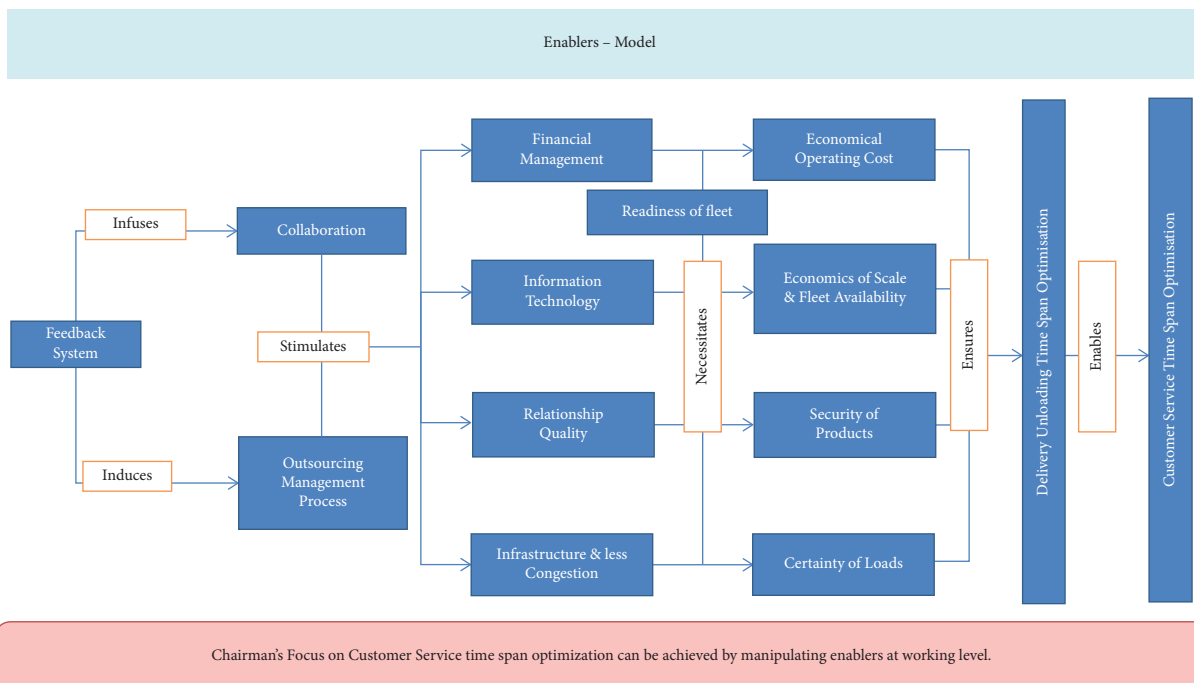


FIGURE 8: Model for enablers to achieve strategic focus of top management.

autonomous, and dependent then the system is stable. The MICMAC of this system shows that the system is stable.

6. Conclusions

The ISM model provides the four groups of enablers and provides an understanding of their dynamic behavior to analyze its impact on transporters' performance for downstream logistics excellence in oil industry in India (Table 8). The ultimate strategic aim of reducing customer service time span to give value to customer is achieved through manipulating independent enablers at the operational level and tactic level.

The analysis of various links of digraph is also important to reach the conclusions and recommendations, and the same is as below.

6.1. Feedback to Collaboration and Cost Optimization.

The transporters opined that feedback by the managers of oil marketing companies to them is necessary to achieve collaboration and cost optimization. Velsor et al. ([79]; p.36) defined feedback as "information about a person's performance or behavior, or the impact of performance or behavior, that is intentionally delivered to that person in order to change or improvement." Prior research on the use of feedback in work settings has shown that feedback consistently improves performance [80, 81], although the size of effects is variable. Feedback systems have also been shown to improve safety performance in the workplace [82]. Hutton et al. [83] found that feedback helps drivers improve safety behavior and showed that individual feedback is an effective tool for positive behavior modifications towards collaborations. The feedback system should be implemented with a clear understanding that feedback is not for finding faults but to improve the performance to add value to the customers' experience.

6.2. *Feedback to Outsourcing Management Process.* The transporters and transport managers of OMCs opined that the outsourcing management process is very important and feedback will lead to a proper outsourcing management process. The outsourcing management process (OMP) is defined as a set of processes adopted by outsourcer to manage different types of logistics outsourcing activities [84], and poor outsourcing management process is one of the main reasons for outsourcing failure [85]. The OMP provides scope for feedback and sharing of information to transporters to improve the relationship quality, communication quality, and collaborative participation between the user firm and the transporter [66]. OMCs should responsibly provide feedback to the transporters on their actions.

6.3. *Collaboration and Cost Optimization to Information Technology.* Collaboration and cost optimization will result in the application of information technology in transportation by transporters. The transporters surveyed during research had a feeling that collaboration and cooperation by

OMC with the transporters can certainly increase their efficiency and performance. The empirical research [86] has indicated that LSPs consider horizontal cooperation to be an interesting approach to decrease cost, improve service, or protect market positions. Mentzer et al. [87] report that a focus group of twenty interviewed supply chain executives felt strongly that collaboration entails much more than cooperation, especially in terms of sharing information, risks, knowledge, and profit. Collaboration results in better and cheaper IT solutions as it will motivate the transporters to take cognizance of IT benefits and avoid their fears of being monitored by IT tools. OMCs should motivate for collaboration and cost optimization.

6.4. Collaboration and Cost Optimization to Relationship Quality.

The relationship quality is very important for the business of transportation. While firms within supply chains often collaborate to maximize supply chain performance [88], conflicts may arise when individual supply chain members have inherently different goals [89]. One key factor that impacts a firm's behavior in an interorganizational relationship and, as a result, the relationship dynamics of cooperation and conflict between supply chain members is their relative interdependence [90]. A better relationship shall come with the collaboration and cost optimization. The collaboration and cost optimization shall affect the relationship quality because once there is collaboration and assurance of delivery of proper quality and quantity from the transporter and the transporter listens and acts as per the advice of the customer regarding the behavior and practices of TT crew, the relationship shall automatically improve. The transporters should certainly improve the relationship with the customers by collaboration and cost optimization.

6.5. Outsourcing Management Process to Infrastructure and Congestion.

The transporters feel that the poor infrastructure and congestion on roads are never considered in logistics planning by OMCs as the managers never considered traffic congestion to be the most important source of unreliability in their logistics operations. The solution to this is through the outsourcing management process by proper journey planning. The outsourcing management process should reschedule deliveries to off-peak periods and alter the working practices. Also, the size of fleets can be adjusted as per inventory and congestion. The outsourcing management process should enable the transporters to use proper route planning.

6.6. Outsourcing Management Process to Financial Management.

The transporters were of the opinion that a proper outsourcing management process can improve their financial management. They were of the opinion that timely and more frequent payment to them shall increase the cash inflow for the transporter. The outsourcing management process should ensure timely and correct payments to the transporters.

6.7. Economical Operating Cost to Delivery Unloading Time Span Optimization. The transporters and tank truck crew said that high operating cost is affecting their delivery unloading time span optimization because high cost demotivates them to unload delivery in time. High cost is due to poor infrastructure and congestion. To avoid the same, they are not unloading deliveries in optimized time. The transporters and OMCs should work in collaboration to bring the economic operating cost down to improve delivery unloading time span optimization.

6.8. Economies of Scale and Fleet Availability to Delivery Unloading Time Span Optimization. The transporters said that the economies of scale and fleet utilization direct the delivery unloading time span. The assurance of utilization of the fleet to its fullest capability and capacity will ensure the delivery unloading time span optimization by them. The OMCs should use fleets fully with economies of scale application while contracting.

6.9. Security of Products to Delivery Unloading Time Span Optimization. The security of product till the time it is unloaded in the tank of the customer with all safety precautions is the responsibility of the transporter. Kevin [91] has pointed out through an interview survey that the transporters expressed the most concern over the risk associated with cargo theft and major collisions in trucking industry as it causes the service disruption. The OMCs should take up with the administration for ensuring security of products while on road.

6.10. Certainty of Loads to Delivery Unloading Time Span Optimization. The transporters raised that certainty of having one more load and trip for delivery after reaching back to the location is necessary for delivery unloading time span optimization. The distribution and transport planning of the shipper can cause uncertainty by having, for example, large and infrequent deliveries to customers [92]. The OMCs should plan in such a way that there is certainty of loads.

6.11. Delivery Unloading Time Span Optimization to Customer Service Time Span. The transporters were of the view that the ultimate aim of the OMC management to reduce the customer service time span with maximum safety and with quality and quantity can be achieved once optimization of delivery unloading time span at the customer end is achieved.

The links explained above are important links in the dependent zone and the independent zone, and it shows how the driving enablers are affecting the dependent enablers. The other links are also important links like link between and driving enablers and autonomous enabler and autonomous enabler to dependent enabler.

6.12. Managerial Implications, Future Research, and Limitations. This study has usefulness for the managers of

supply chain including logistics activities/functions and handling transporters for oil industry and also for the transporters who are on contract with the oil marketing companies. The findings suggest a holistic perspective of the enablers for transporters' performance for downstream logistics excellence in oil industry in India considering the interactions between the enablers that offer a readymade platform on which further studies can be based. Also, the top management of OMCs can obtain useful learning by utilizing this study. The enablers can be focused by the managers of the OMCs to improve the performance of the transporters as well the transporters shall benefit from these enablers and their links to improve their performance by focusing on the same. The digraph also shows the levels at which the enablers should be focused. The dependent enablers always remain the focus of the top management, the driving enablers are to be focused at the working level, and the autonomous enabler should be focused by the middle management to bring it to the driving enabler (Figure 8).

The model as per Figure 8 clearly explains that the proper feedback to transporters, outsourcing management process, collaboration along with financial management use of information technology, improved relationship quality by transporters, and better infrastructure and less congestion by government policies shall enable the transporters to achieve economic operating cost, economies of scale, security of products, and certainty of loads, and it will also help in optimizing the delivery unloading time and customer service time span optimization. The customer service time span optimization is at the top of requirement of top management, and they should design strategies to have feedback, outsourcing management process, and other operating-level enablers implemented at the operating level.

This research can be further extended by factorizing each enabler in further involved/affecting factor, which are constituting the particular enabler, and then ISM can be applied and with all these subfactors of these enablers to have more detailed ISM and for that computer to be used and fuzzy MICMAC can be applied. Further research can be carried out by applying the same in force field analysis and identifying the impact of each enabler to counter various barriers. However, there are certain limitations in this research. Given that the findings of this study are based on oil industry, it has limited generalizability towards other industries.

Data Availability

The data are available in the public domain.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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