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Full Length Research Paper

Analysis of Challenges faced by Indian Logistics Service Providers

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In developing country like India, logistics sector is in booming stage and grabbing opportunities to grow infinitely. Currently, Logistics sector contributes around 14% in GDP in India. Boom in e-commerce industry and initiatives like MAKE in India, will definitely brings substantial growth for LSPs .The LSPs need to redesign their strategies in order to grab all upcoming opportunities. Many challenges are faced by logistics service providers in order to deliver shipments on promised time and in desirable condition. Although, Government has already initiated several mega projects to support LSPs but still it is not synchronized with increased industry requirements. Fragmented and unorganized sector, Infrastructural bottlenecks and Cost implications etc. are the main challenges which come across in delivering high quality services to the end customers. In this study, it has been attempted to identify and analyze the key challenges which impede the effective service quality of logistics service providers. Based on the literature review and experts' opinion, ten key challenges faced by logistics service providers are identified. A structural relationship model is developed by using Interpretive Structural Modeling(ISM) and further challenges are categorized as drivers, dependent, autonomous and linkage variables based on their driving and dependence power with the help of MICMAC Analysis. Based on MICMAC analysis, three challenges have been identified as dependent variables, four as drivers, one as autonomous and two as linkage variables. The study is expected to provide useful inputs to practitioners and service providers itself in terms of crafting better strategies which can overcome the identified challenges and can design better solutions for delivering better service quality to their customers.

Keywords: Logistics Service Providers, Service Quality, Challenges, Interpretive Structural Modeling (ISM), MICMAC Analysis

INTRODUCTION

In the era of globalization and dynamic market requirements, Logistics Service Providers (LSPs) provides all integrated logistics solutions in the form of all shopping at one stop (Kumar et al., 2012). It is very important for LSPs to maintain service quality of all logistics functions in order to survive and grow in the competitive world. LSPs have to meet the challenging role of delivering best quality services to their customers for their business continuity and future business.

In India, LSPs have ample opportunities to grow and

expand their businesses due to increase in e-businesses and recent initiative of "*MAKE IN INDIA*" by Indian Government. Additionally, advancement in technology and rise in globalization can also be considered as responsible reasons for organizations to redesign their strategies and develop products to serve global needs through logistics service provider's capabilities.

The major hurdles which occur in providing the desired level of quality services especially in Indian context are highly fragmented and unorganized sector, lack of government support, infrastructural bottlenecks, lack of efficient technical systems, skill shortages and behavioral complexities etc. These obstacles sometimes become an important cause of failure of desired logistics services. To ensure smooth services from logistics service providers, the challenges need to be identified and removed. Appropriate framework for overcoming these barriers need to be also proposed. Therefore the major objectives of this study are:

- To identify the challenges faced by logistics service providers for improving service quality.
- To develop a structural relationship framework for these challenges by Interpretive Structural Modelling (ISM) approach.
- To find driving power and dependence power and categorisation of these factors into different categories by MICMAC analysis.

The remaining part of paper is organised as follows. In section 2, literature review of identified challenges faced by logistics service providers is discussed. Remaining part of the paper is organised as follows. Section 3 deals with Interpretive Structural Modelling (ISM) of factors. Section 4 classifies the challenges on the basis of driving and dependence power, with the help of MICMAC Analysis and ISM model development in section 5. Section 6 includes discussion and finally conclusion in section 7.

Literature Review

Traditionally, Delfmann et al. (2002) stated LSPs as "Companies which perform logistics activities on behalf of others". Huo et al. (2008) revised the definition by stating LSP as "a relationship between a shipper and a third party which, compared with the basic services, has more customized offerings, encompasses a broad number of service functions and is characterized by a long-term, more mutually beneficial relationship".

The contribution of LSPs has been increased to a big extent due to its direct and indirect benefits throughout the world. Various authors analyzed 3PL businesses, their categorization, structure and services on the basis of different types of industries they served (Marasco, 2008). The role of logistics service providers is very essential in conducting smooth flow of material and information in both upstream and downstream of supply chain (Kumar et al., 2012).

Tezuka (2011) highlights the three characteristics of service provider as integrated, contract and consulting service providers. The popularity of logistics outsourcing arises from number of reasons. Generally, Indian organizations outsource logistics activities to reduce cost, more focus on core competencies, better service quality and time saving. Currently, transportation is considered to be most crucial logistics activity which almost accounts for 50-60% followed by warehousing which accounts for another 25-30% of the total market, which is further followed by value added services and freight forwarding accounting for rest of the market as shown in figure 1. The organizations always make attempt for improving the quality of their services with the objective of more satisfied customer and as in turn, more satisfied customer can be proven as more loyal customer. The improvement in quality of services helps organizations to reduce cost as well as to increase profits at the same time.

There is need to identify and analyze the challenges faced by logistics service providers in delivering desired quality to the end customers. Based on literature review and experts opinion, various challenges are identified as shown in Figure 2. Earlier, few challenges like "Complex State Documentation" and "Lack of coordination with clients" are considered to be very important but after implementation of Goods and Service Tax (GST) in India, these barriers are automatically vanished to a large extent.

Challenges faced by logistics service providers in providing quality services

In spite of many best practices followed by LSPs, some challenges can hinder their path to success. Some unavoidable issues create bottlenecks in providing quality services to end users.

ISM methodology and Model Development

Interpretive Structural Modeling(ISM), was first proposed by J. Warfield in 1974, a computer assisted methodology that helps in dealing with complex issues by identifying the relations between variables involved in complex issues/problems under study. It helps in better understanding the fundamentals of any complex problem/situation, as well as to put together a course of action for solving it.

ISM can act as a tool for imposing order and direction on the complexity of relationships among elements of a system (Sage, 1977). It is Interpretive as it enables individuals or groups to develop mapping/relationships

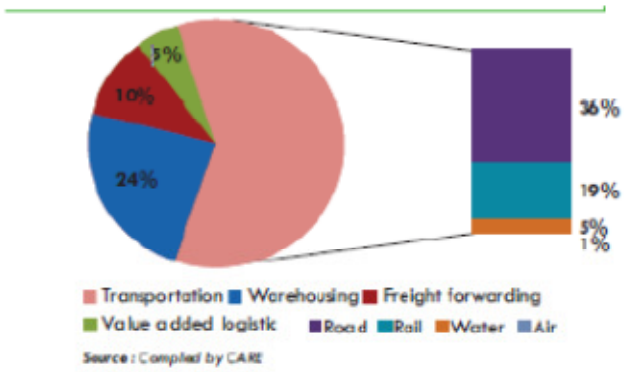

Figure 1: Percentage of logistics services in India

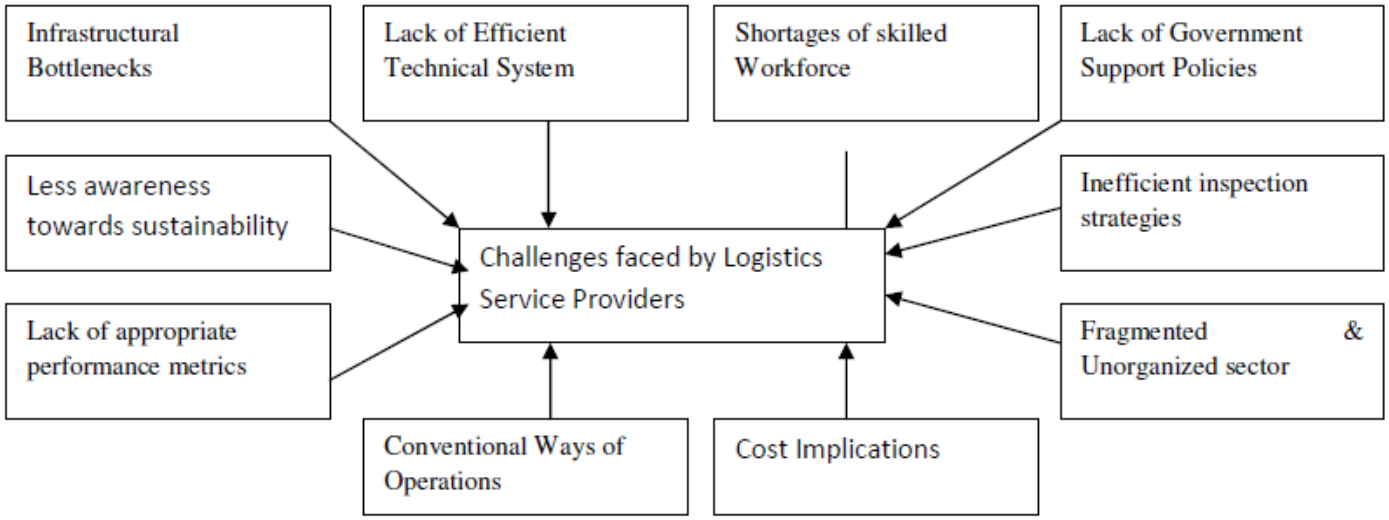

Figure2: Challenges faced by Logistics Service Providers

between variables of the complex system. It is structural as it simplifies the complex structure into simple modules, on the basis of relationship. It is a modeling technique as it portrays overall structure and specific relationships in carefully designed patterns employing graphics as well as words.

The applications of ISM methodology are not limited to specific fields. It has been widely used by many researchers in different areas. Singh et al. (2008) applied the ISM methodology to the field of knowledge management to understand the relationship among barriers in implementing knowledge management. Mandal et al. (1994) have employed ISM methodology in vendor selection process and identified the key variables using direct and indirect relationships amongst the variables. Some more instances where ISM methodology applied are: Supply chain sustainability (Faisal, 2010), Supply chain agility (Agarwal et al., 2007), Competitiveness of SMEs (Singh et al., 2007b), IT enablement of supply chain (Jharkharia et al., 2005), Reverse Logistics (Ravi et al., 2005) and many other fields. The various steps for ISM are shown in table 3.

Structural Self Interaction Matrix (SSIM)

For analyzing the challenges in developing SSIM, the following four symbols have been used to denote the direction of relationship between variables (i and j)
V-variable i will lead to variable j; A-Variable j will lead to Variable i; X-Variable i and j will lead to each other; O – Variable i and j are unrelated.

Table 1. Challenges faced by LSPs

S.No.	Challenges to Indian LSPs	Description	References
1.	**Infrastructural bottlenecks**	Pathetic condition of roads, poor connectivity and inadequate air and seaport capacities are the major infrastructural bottleneck (Refer table 1).	Venkatesh et al., 2017; Mitra, 2013; Sahay et al.,2006.
2.	**Lack of Efficient Technical System**	Advanced IT tools are already in process which helps end users to trace and track their shipments but there are around only 2% LSPs which follow these practices.	Luisa et al., 2013; Sauvage, 2003.
3.	**Inefficient Inspection Strategies**	Inspection strategies and policies adopted by customs and border authorities are inefficient. Multiple handling at check-posts leads to delay and damages to goods.	Mitra , 2013; Rajesh et al., 2011
4.	**Lack of Government Support Policies**	Governmental focus is still missing towards policy framework, development and recognition of logistics business as an industry.	Govindan et al., 2014; Luthra et al., 2011.
5.	**Fragmented and Unorganized Sector**	1. More than 90% of LSPs are those who own less than 2 trucks and 95% are those who own less than 5 trucks, impair quality of services.	Outlook Logistics, 2015; Ding et al., 2012; Mitra, 2006.
6.	**Conventional Ways of Operations**	The obsolete way of doing operations-less adoption of automation.	Sharma et al., 2011; Mitra, 2006.
7.	**Cost Implications**	High cost and low-margin business. LSPs always have shortage of adequate working capital due to untimely payments by Indian shippers.	Govindan et al., 2014; Mitra, 2006.
8.	**Lack of appropriate performance metrics**	No appropriate performance metrics are defined for establishment and selection of service providers. Around hundreds of logistics providers are providing services with inadequate resources.	Mitra, 2013; Rajesh et al., 2011
9.	**Shortages of Skilled Workforce**	Lack of specialized training, education and technical knowledge of employees in the field of logistics business.	Govindan et al., 2014; Thai et al. 2011;
10.	**Less awareness towards sustainability measures**	Very few LSPs in India shows concern towards environment and use reusable and recyclable pallets, eco-friendly vehicles and green processes in their operations.	Abbasi and Nilsson, 2016; Colicchia et al., 2013

The inputs for developing SSIM among all identified challenges as shown in figure1 have been taken from four experts from Indian logistics sector. All the experts are from middle and top management working in well known logistics companies of India. They were consulted in identifying the nature of contextual relationships among the challenges to understand the real issues of the industry.

Reachability Matrix

Initial Reachability matrix (B**inary matrix**) can made by converting SSIM Matrix into binary form as shown in Table 5, by substituting V,A,X and O by 1 or 0 as per given case. The substitution of 1s and 0s are as per the following rules:

1. If (i,j) value in SSIM is V then (i,j) value in the reachability matrix will be 1 and (j,i) value will be 0;
2. If (i,j) value in SSIM is A then (i,j) value in the reachability matrix will be 0 and (j,i) value will be 1;
3. If (i,j) value in SSIM is X then (i,j) value in the reachability matrix will be 1 and (j,i) value will be 1;
4. If (i,j) value in SSIM is 0 then (i,j) value in the reachability matrix will be 0 and (j,i) value will be 0;

There is also need to check for transitivity. It is checked for all possible transitive links and all revisions done are mentioned in table 5. The driving power and dependence

Table 2. Core Infrastructural Bottlenecks

Mode of Transport	Infrastructure	Key Constraints
Road	Total road network- over 5,472,144 kilometres (3,400,233 mi) in 2015 National highways include 2% of Indian roads, they handled 40% of the traffic.	Bad condition of roads Low average speed(30-40km/hr) Low Daily average distance travelled(250 km) Issues at check-post and toll-post
Railways	Total Track Length-119,630 Kms (74,330 mi) in 2016	Low service guarantee No dedicated freight corridors Low connectivity to industry No fixed schedule for departure/arrival
Airports	Domestic/International Airport- 125 5 main metros account for over 85% of total freight traffic	Only major airports has infrastructure to handle air cargo High Waiting time Poor warehousing infrastructure
Ports	Ports-212(Major 12 & Minor 200) Capacity-Major ports at 500mm MT and Minor ports at 230mn MT	Heavy congestion at ports Lack of good connectivity with roads Out-dated equipment and technology Low port capacities and number of berths

Table 3. Steps for ISM (Warfield, 1974)

S.No	Steps for Interpretive Structural Modelling (ISM)
1.	Identify barriers from the problem under study.
2.	Develop contextual relationship among barriers by taking inputs from experts.
3.	Build Structural Self-Interaction Matrix (SSIM) for the barriers based on symbols (discussed below).
4.	Develop Reachability matrix from SSIM matrix and check for transitivity of matrix. (Transitivity: A-> B; B-> C then A-> C)
5.	Partition of Reachability matrix into different levels.
6.	Diagraph is developed and transitive links are removed from Reachability matrix.
7.	Convert diagraph into ISM based model by replacing variables nodes with statements.
8.	Review the ISM model and check for any conceptual inconsistency or if required make necessary changes.

power of each challenge is calculated.

Level Partitions

From the final reachability matrix, the reachability and antecedent set for each challenge. The reachability set is a set of variables (including itself) which it may help achieve whereas antecedent set is a set of variables(including itself) which may help achieving it. Thereafter, intersection of these sets is derived for all challenges. The challenges for which the reachability and the intersection sets are same, they occupy the top most level in the hierarchy of ISM model. Once the top most layer is identified, it is separated out from the other variables. Then, the same process will be repeated to

Table 4. Structural self-Interaction matrix (SSIM)

S.No	Challenges	10	9	8	7	6	5	4	3	2	1
1	Infrastructural Bottlenecks	V	V	V	V	V	A	O	O	V	
2	Lack of Efficient Technical Systems	O	V	V	A	V	O	X	V		
3	Inefficient Inspection Strategies	O	O	A	A	X	A	O			
4	Lack of Government support Policies	V	V	V	X	V	X				
5	Fragmented & Unorganized Sector	O	V	V	X	V					
6	Conventional Ways of Operations	O	A	A	X						
7	Cost Implications	O	V	V							
8	Lack of Appropriate Performance Metrics	V	X								
9	Shortages of Skilled Workforce	O									
10	Unawareness towards Sustainable Practices										

Table 5. Final Reachability Matrix

S.No	Challenges	1	2	3	4	5	6	7	8	9	10	Driving Power
1	Infrastructural Bottlenecks	1	1	0	0	0	1	1	1	1	1	7
2	Lack of efficient Technical Systems	0	1	1	1	0	1	0	1	1	0	6
3	Inefficient Inspection Strategies	0	0	1	0	0	1	0	0	0	0	2
4	Lack of Government support Policies	0	1	0	1	1	1	1	1	1	1	8
5	Fragmented & Unorganized Sector	1	0	1	1	1	1	1	1	1	0	8
6	Conventional Ways of Operations	0	0	1	0	0	1	1	0	0	0	3
7	Cost Implications	1*	1	1	1	1	1	1	1	1	0	9
8	Lack of appropriate performance metrics	0	0	1	0	1	1	1	1	1	1	7
9	Shortages of Skilled Workforce	0	0	0	0	1	1	1	1	1	0	5
10	Unawareness towards sustainable practices	0	0	0	0	0	0	0	0	0	1	1
		3	**4**	**6**	**4**	**5**	**9**	**7**	**7**	**7**	**4**	

find out variables in the next level (as shown in table 6-10). The process is continued till the level of each variable is identified (as shown in table 11). These levels help in building the digraph and ISM model.

Classification of Challenges

The MICMAC analysis assists in development of graphs to classify LSPs challenges on the basis of their driving and dependence power. They are classified into four categories as autonomous variables, dependent variables, linkage variables and independent variables. These classifications of variables are similar to classifications used by Mandal and Deshmukh (1994).

In the classification of challenges, the first cluster is autonomous variables that have weak driving power and weak dependence power .The autonomous variables are relatively disconnected from the system. (Challenges like 10 from Figure 3).The second cluster is dependent variables which have weak driving power and high dependence power (Challenges like 3, 6 and 9 from Figure 3).The third cluster consist of linkage variables which has high driving power and high dependence power. These challenges have high links with other challenges and also a feedback effect on themselves (Singh et al., 2008) (Challenges like 7, 8 from Figure 3). The fourth cluster is driver variables which has high driving power and low dependence power (Challenges like 1, 2, 4 and 5 from Figure 3).

Formation of ISM Model

The structural model is generated from final reachability matrix (Table 5).The relationship between the challenges

Table 6. Level partitions: Iteration-I

Challenge Number	Reachability Set	Antecedent Set	Intersection	Level
1	1,2,6,7,8,9,10	1,4,5	1	
2	2,3,4,6,8,9	1,2,4,7	2,4	
3	3,6	2,3,5,6,7,8	3,6	I
4	2,4,5,6,7,8,9,10	2,4,5,7	2,4,5,7	
5	1,3,4,5,6,7,8,9	3,4,5,7,8,9	4,5,7,8,9	
6	3,6,7	1,2,3,4,5,6,7,8,9	3,6,7	I
7	1,2,3,4,5,6,7,8,9	1,4,5,6,7,8,9	1,4,5,6,7,8,9	
8	3,5,6,7,8,9,10	1,2,4,5,7,8,9	5,7,8,9	
9	5,6,7,8,9	1,2,4,5,7,8,9	5,7,8,9	
10	10	1,4,8,10	10	I

Table 7. Level partitions: Iteration-II

Challenge Number	Reachability Set	Antecedent Set	Intersection	Level
1	1,2,8,9	1,4,5	1	
2	2,4,8,9	1,2,4	2,4	
4	2,4,5,8,9	2,4,5	2,4,5	
5	1,3,4,5,8,9	3,4,5,8,9	3,4,5,8,9	
7	1,2,4,5,8,9	1,4,5,8,9	1,4,5,8,9	
8	5,8,9	1,2,4,5,8,9	5,8,9	II
9	5,8,9	1,2,4,5,8,9	5,8,9	II

Table 8. Level Partitions: Iteration-III

Challenge Number	Reachability Set	Antecedent Set	Intersection	Level
1	1,2	1,4	1	
2	2,4	1,2,4	2,4	III
4	2,4	2,4	2,4	III
5	1,3,4	3,4	3,4	
7	1,2,4	1,4	1,4	

Table 9. Level Partitions: Iteration-IV

Challenge Number	Reachability Set	Antecedent Set	Intersection	Level
1	1	1	1	IV
5	1,3	3	3	
7	1	1	1	IV

i & j are presented by an arrow which points from i to j. This graph is called as an initial directed graph or diagraph. After removing the transitivity, the ISM based model is shown in Figure 4.

DISCUSSION

It is important to understand the levels of LSPs challenges for providing effective service quality to their customers. “Unawareness towards sustainable practices”, “Conventional ways of operations” and “Inefficient Inspection strategies” are occurring at the top level of the structural ISM model. “Unawareness towards sustainable practices” is an autonomous variable which has weak driving and dependence power and remains disconnected from the system as shown in figure 3. Due to huge blend of small and large players in logistics sector, the concern towards sustainable practices is not taken as priority (Luthra et al., 2011). In Indian scenario, the logistics sector has not defined any benchmarks for logistical activities which in turn, enhance the

Table 10. Level Partitions: Iteration-V

Challenge Number	Reachability Set	Antecedent Set	Intersection	Level
5	3	3	3	V

Table 11. Levels of all LSPs Challenges

ChallengeNumber	Reachability Set	Antecedent Set	Intersection	Level
1	1	1	1	IV
2	2,4	1,2,4	2,4	III
3	3,6	2,3,5,6,7,8	3,6	I
4	2,4	2,4	2,4	III
5	3	3	3	V
6	3,6,7	1,2,3,4,5,6,7,8,9	3,6,7	I
7	1	1	1	IV
8	5,8,9	1,2,4,5,8,9	5,8,9	II
9	5,8,9	1,2,4,5,8,9	5,8,9	II
10	10	1,4,8,10	10	I

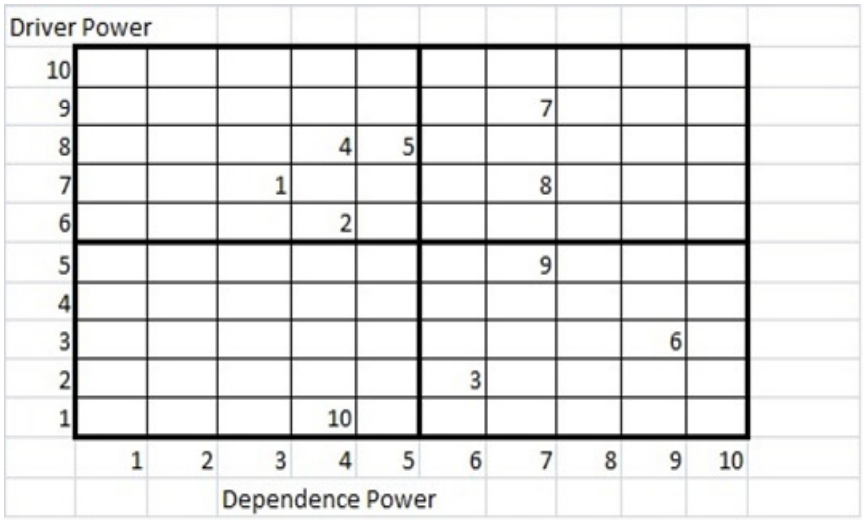

Figure 3. Cluster of LSPs Challenges

conventional ways of operations handling and ineffective planning and implementation of inspection strategies. They are more of dependent variables which will automatically rectify when strict internal and external auditing compliances will be defined. Therefore, the top most challenges are not of too much importance. “Lack of appropriate performance metrics” and “Shortage of skilled workforce” are positioned at the second level in the hierarchy. A shortage of skilled workforce does not create major hurdles due to their high dependency on other challenges like lack of government policies and fragmented and unorganized sector etc. Despite of very high contribution to GDP, unlike engineering or manufacturing sector, there is hardly any focus on training, education and technical knowledge of employees (Mitra, 2013). A challenge like lack of appropriate performance metrics shows the requirement to strengthen the performance measurement processes and improve the level of quality of services delivered. “Lack of Efficient Technical Systems” and “lack of Government support policies” are coming at third level of ISM model. The Government need to emphasis more on these challenges and can enhance the level of logistics service quality. In India, due to high fragmentation, LSPs

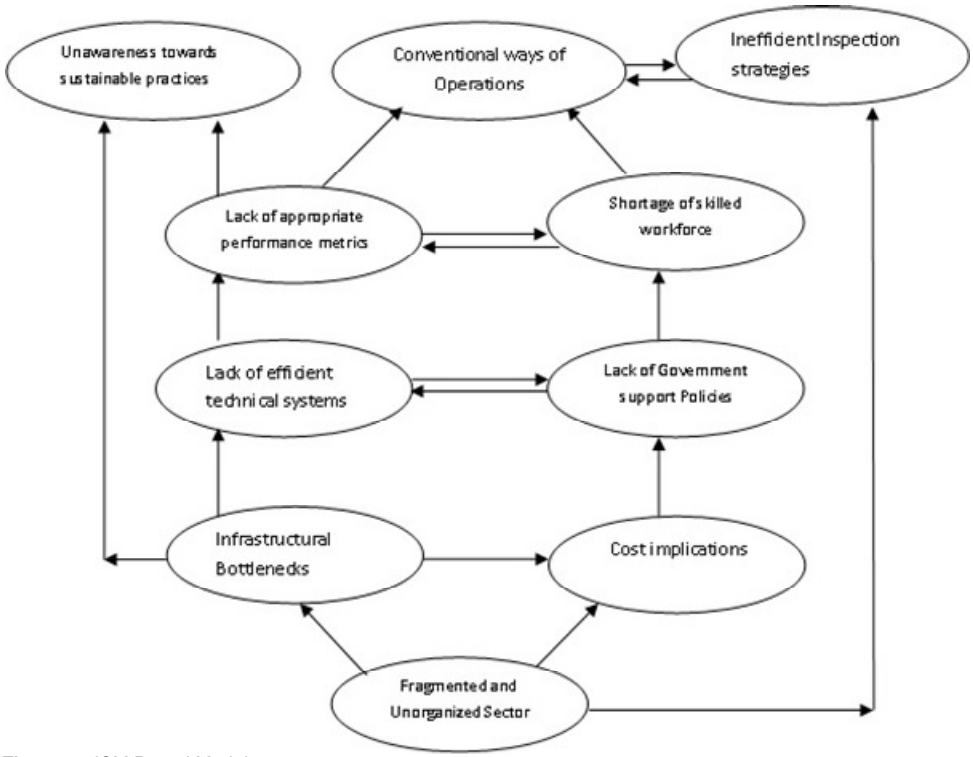

Figure 4. ISM Based Model

are less adopted to digitalization and automation which results in conventional ways of operations and manual process handling.

"Infrastructural Bottlenecks" and "Cost Implications" are coming at the fourth level of hierarchy. Infrastructural issues like pathetic road conditions, slow toll transactions, lack of integration in transport networks etc. are the main critical hurdles in the Indian context. Although, the Government is coming up with many initiatives like *Goods and Service Tax (GST), Make in INDIA*, and increased use of eco-friendly and green products so, we can expect things will be better in near future and these challenges can be rectified."Cost implications" are basically limitations on investments made by LSPs on various resources. "Cost implications" is coming to be as linking variable which have high links with other variables and also a feedback effect on themselves (Singh et al. 2007a). These challenges need to deal with utmost care and rectify them for betterment. "Fragmented and Unorganized Sector "is at the fifth level of ISM model are driver or independent variables. They have high driving power and low dependence power which drives all other challenges and removal of these challenges will help in improving service quality of logistics service providers. Due to high fragmentation, many small and large LSPs catering different customer segments, are just providing solutions to logistics issues but not something, which is appreciable for the growth of the economy. This is the most crucial barriers which have to be removed on the top priority.

CONCLUSION AND FUTURE SCOPE

The ten challenges faced by logistics service providers in delivering effective service quality are identified from literature review and expert opinion. The challenges are clubbed into different clusters by ISM methodology for in-depth understanding about the nature and impact of each challenge on LSPs services. From the study it is observed that the fragmented and unorganized sector, infrastructural bottlenecks and cost implications are the most crucial challenges which are faced by Indian service providers. After the implementation of GST in India, transparency in system has increased due to collaboration among large and small logistics service providers for utilizing common resources. Although the Government has initiated various projects like Dedicated Freight Corridors (DFC), Inland Water Ways (Coastal line shipping) etc. and many infrastructures related mega projects to overcome these hurdles but still logistic service providers are struggling to provide service quality as per dynamic needs of customers. LSPs also face hurdles in making huge investments in procuring and maintaining resources.

Lack of efficient technical system is found to be a driver variable which affects other challenges as well. LSPs prefer to work out in their own conventional way of

operations due to non availability of updated technology. There is need of availability of technical systems and updated technology adoption for smooth coordination and communication among customers and logistics service providers. The Government is also encouraging manpower to learn and upgrade their skills by associated with many programs like *Pradhanmantri Kaushal Vikas Yojna* etc. The Government has started taking steps in the direction of improvement but still a long way to go to meet the exact requirements. Lack of performance metrics is a linking variable which links all the other challenges. So, there is huge requirement of defining and establishing strict performance measures to streamline and improve the quality of services delivered. Unawareness of sustainability practices is found to be disconnected from the system. Currently, logistics service providers are not actively contributing in sustainable practices but it is the need of hour to make optimum utilization of scarce resources. Now, in this research, the relationship between challenges is retrieved using ISM methodology but the results are not checked and validate statistically. To make it statistically valid, a technique, SEM (structured equation modeling), referred as linear structural relationship approach, can be used.

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