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Interpretive Structural Modelling for Understanding the Inhibitors of a Telecom Service Supply Chain

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Abstract

ISM is a well-proven strategy for analyzing the synergic influences of various attributes to the overall system under study. The unique feature of ISM is that it analyzes the attributes based on their driving power and dependence. In the current study, the ISM has been developed for a leading telecom service provider operating in various global regions having their head quarters in India. The hierarchy of various inhibitors was established based on the outcomes of the final reachability metrics. Finally MICMAC analysis was carried out categorize the inhibitors in to four clusters.

Keywords
ISM, telecom service, SCM, Inhibitors, MICMAC

1. Introduction
The intent of this ongoing research is to have an insight on the inhibitors, affecting a telecom service supply chain in the Indian context and to investigate their driving power and dependence. In continuation to the ever-vibrant waves of globalization and the rapid proliferation of information technology, a well-designed and reliable supply chain management (SCM) system is now regarded as an essential feature of an organization to intensify the triumphant competitive advantage. The quip that 'servetization of business leads to greater profit and customer satisfaction' brought the attention of current researchers and practitioners to focus there. It has observed that service supply chain management practices are subjected to various inhibitors in multifarious directions. These inhibitors are the outcomes of various industry specific variables. Generally there exists direct correlation between various inhibitors of a service supply chain. They not only affect the service supply chain but also influence one another. In order to have a smooth and seamless telecom service supply chain, these inhibitors have to be mitigated intelligently. This has motivated to understand the inter relation ship between them. In this milieu, an endeavour to identify those inhibitors that are the root of some more inhibitors (Driving Inhibitors) and those inhibitors which are most influenced by others (Driven Inhibitors) is of extreme relevant. This helps management to concentrate on their future strategies in those directions.

2. About the Company
The company ABC has a place of honour among the leading telecom consultancies in the international level. ABC is purely a service sector. It was incorporated in 1978. It is headed by the Government of India. The approximate turnover of ABC is Rs 840 crores. The current employee strength is 837. Backed by the vast network of well-trained and experienced manpower, research & development and training facilities, ABC has made rapid strides in the international level. Today ABC offers total telecom solutions for projects. At present ABC is functioning in almost 45 countries mainly in Middle East Africa, South-East Africa, South-East Asia and Europe. ABC is practicing three types of services. They are (i). Consultancy (ii). Project Execution and (iii).Training and quality control.

3. Service Supply Chain Management Concept
Supply Chain Management (SCM) concerns with an effective approach to coordinate the various links in the entire chain by both improving the customer services and lowering the cost [2]. In this contemporary scenario, servetization of business has become a well- proven strategy in the industrial world. This gave rise to the adoption of SCM principles in service sectors [3]. A service supply chain involves the series of activities from the analysis of customer need, service design to service delivery. It is the conglomeration of various SC aspects in service sector. A road map of a general service supply chain is shown in Figure 1.

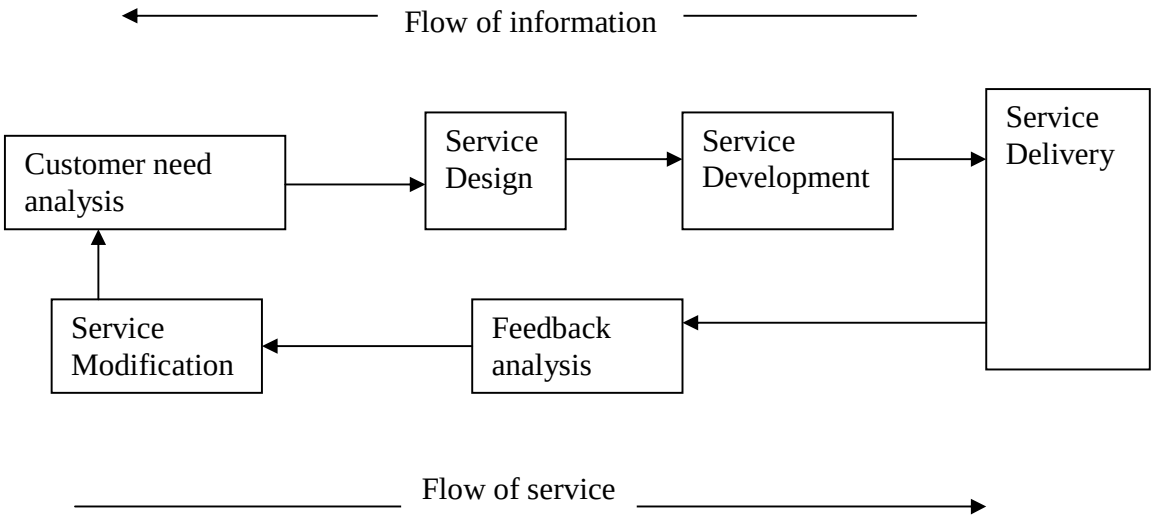

Figure 1: A road map of a general service supply chain

4. Research Methodology

The major focus of this research is to identify the driver-dependent relationships among various inhibitors of telecom service supply chain and categorize them into four clusters based on their driving powers and dependence powers. For the study purpose, the interaction transcribed during the case research has been conducted to gain a systematic understanding on the issues discussed with senior managers of case organization. Initially the inhibitors relevant to the service sectors were identified based on the evidences available in the present literature. Later two General Managers, Manager HRD and seven senior managers were consulted. Their inputs were explored through systematic brainstorming sessions. This led to the shortlisting of 13 variables relevant to the study. The relevance of shortlisted factors based on the opinions of industry experts were further verified by three academicians. Thus the variables have been finalized.

5. ISM Model Development

An eight-step procedure has been adopted for the ISM analysis.

5.1. Identification of Supply Chain Inhibitors

Thirteen inhibitors identified are shown in the first column of Table1.

5.2. Development of Structural self-interaction metrics (SSIM)

Structural self-interaction matrix shows the direction of contextual relationships among the elements. They were finalized by brainstorming the two general managers and manager HRD of that organization. They spared their valuable time and helped to finalize the relationships by incorporating the views of executives holding various functions. In order to represent them in the table, four symbols were used.

V- Inhibitor i ameliorate to achieve inhibitor j
A- Inhibitor j ameliorate to achieve inhibitor i
X- Inhibitors i and j ameliorate to achieve each other
O- Inhibitors i and j are unrelated
where i represent the number of rows and j represents the number of columns
In order to have a better understanding an example is also shown here.

1. Inhibitor 1 helps to achieve 13. It is represented as V
2. Inhibitor 4 will be achieved by 2. It is represented as A
3. Inhibitor 2 and 3 will help to achieve each other. It is represented as X
4. Inhibitor 2 and 9 are unrelated. It is represented as O.

Similarly, based on these relationships, among the inhibitors the SSIM is developed. It is shown in Table 1.

Table 1: Structural self-interaction metrics for inhibitors of ABC

	13	12	11	10	9	8	7	6	5	4	3	2	1
1.Negligence at the strategic level	**V**	**O**	**V**	**V**	**O**	**V**	**O**	**V**	**V**	**V**	**V**	**V**	1
2.Resistance to change	**X**	**O**	**O**	**V**	**O**	**V**	**O**	**V**	**V**	**A**	**X**	**1**	
3.Union problems	**V**	**A**	**O**	**X**	**O**	**V**	**O**	**O**	**V**	**X**	**1**		
4.Lack of funds	**V**	**O**	**O**	**V**	**O**	**V**	**V**	**V**	**V**	**1**			
5.Lack of trust in supply chain linkage	**X**	**O**	**O**	**V**	**O**	**V**	**V**	**V**	**1**				
6.Fear of supply chain breakdown	**X**	**O**	**V**	**V**	**O**	**V**	**X**	**1**					
7.Fear of information system breakdown	**X**	**O**	**V**	**V**	**O**	**V**	**1**						
8.Low level of supply chain integration	**X**	**A**	**V**	**O**	**O**	**1**							
9.Fear of imitation of service	**O**	**O**	**O**	**O**	**1**								
10.Administration problem	**V**	**O**	**V**	**1**									
11.Forecasting uncertainties	**V**	**A**	**1**										
12.Demographical aspects	**V**	**1**											
13.Disparity among supply chain partners	**1**												

5.3. Development of Initial Reachability Matrix

This is a metrics of only binary elements. The SSIM has been converted into a metrics of binary elements by appropriately assigning V, A, X and O by 1 and 0. The initial reachability metrics developed is shown in Table 2.

Table 2: Initial reachability metrics for inhibitors of ABC

Inhibitors ⟶	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1.Negligence at the strategic level	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**0**	**1**
2.Resistance to change	**0**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**1**
3.Union problems	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**1**
4.Lack of funds	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**1**
5.Lack of trust in supply chain linkage	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**1**
6.Fear of supply chain breakdown	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**1**
7.Fear of information system breakdown	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**1**
8.Low level of supply chain integration	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**1**
9.Fear of imitation of service	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
10.Administration problem	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**
11.Forecasting uncertainties	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**
12.Demographical aspects	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**1**
13.Disparity among supply chain partners	**0**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**1**

5.4. Development of Final Reachability Metrics

In this step the transitivities were also taken into account and established the relationship between various inhibitors. The transitivity is based on the way that if the inhibitor A leads to the inhibitor B and the inhibitor B leads to C, then the inhibitor A leads to the inhibitor C. The Final Reachability Metrics is shown in Table 3. These driving power and dependence helps to classify the inhibitors into four clusters namely (i) autonomous, (ii) dependent, (ii) linkage and (iv) independent.

5.5. Level partitions

From the final reachability metrics, the reachability and antecedent set of each inhibitor are located. Reachability set consists of a set of the element itself and other elements, which it may help to achieve it where as, the antecedent set consists of a set of the element itself and the other elements, which are achieved by it. The variables, which are common in reachabilty set and antecedent set, are allocated at the intersection set. Thus antecedent set and intersection set are located. This leads to locate the top-level element. The top-level element for each hierarchy is the elements in which antecedent set and intersection set are same in the ISM hierarchy. For the formation of the next table, the top-level elements will be removed from the set. After the top-level elements are separated from the hierarchy, the process is repeated to find the next level of element. This process will be continued till all levels of

each element are found. Reachability set, Antecedent set and Intersection set of level I are shown in Table. 4. Similarly two more iterations are done to locate the elements of level II and level III.

Table 3: Final Reachability Metrics for inhibitors of ABC

Inhibitors ⟶	1	2	3	4	5	6	7	8	9	10	11	12	13	DP
1.Negligence at the strategic level	1	1	1	1	1	1	1	1	0	1	1	0	1	11
2.Resistance to change	0	1	1	1	1	1	1	1	0	1	1	0	1	10
3.Union problems	0	1	1	1	1	1	1	1	0	1	1	0	1	10
4.Lack of funds	0	1	1	1	1	1	1	1	0	1	1	0	1	10
5.Lack of trust in supply chain linkage	0	1	1	0	1	1	1	1	0	1	1	0	1	9
6.Fear of supply chain breakdown	0	1	1	0	1	1	1	1	0	1	1	0	1	9
7.Fear of information system breakdown	0	1	1	0	1	1	1	1	0	1	1	0	1	9
8.Low level of supply chain integration	0	1	0	0	1	1	1	1	0	0	1	0	1	7
9.Fear of imitation of service	0	0	0	0	0	0	0	0	1	0	0	0	0	1
10.Administration problem	0	1	1	1	1	1	1	1	0	1	1	0	1	10
11.Forecasting uncertainties	0	1	0	0	1	1	1	1	0	0	1	0	1	7
12.Demographical aspects	0	1	1	1	1	1	1	1	0	1	1	1	1	11
13.Disparity among supply chain partners	0	1	1	0	1	1	1	1	0	1	1	0	1	9
Dependence	1	12	11	6	12	12	12	12	1	10	12	1	12	

Table 4: Iteration 1

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

5.6. Formation of ISM based model

From the final reachability metrics, ISM has been developed by means of vertices or nodes, and lines of edges. It is shown in Figure 2.

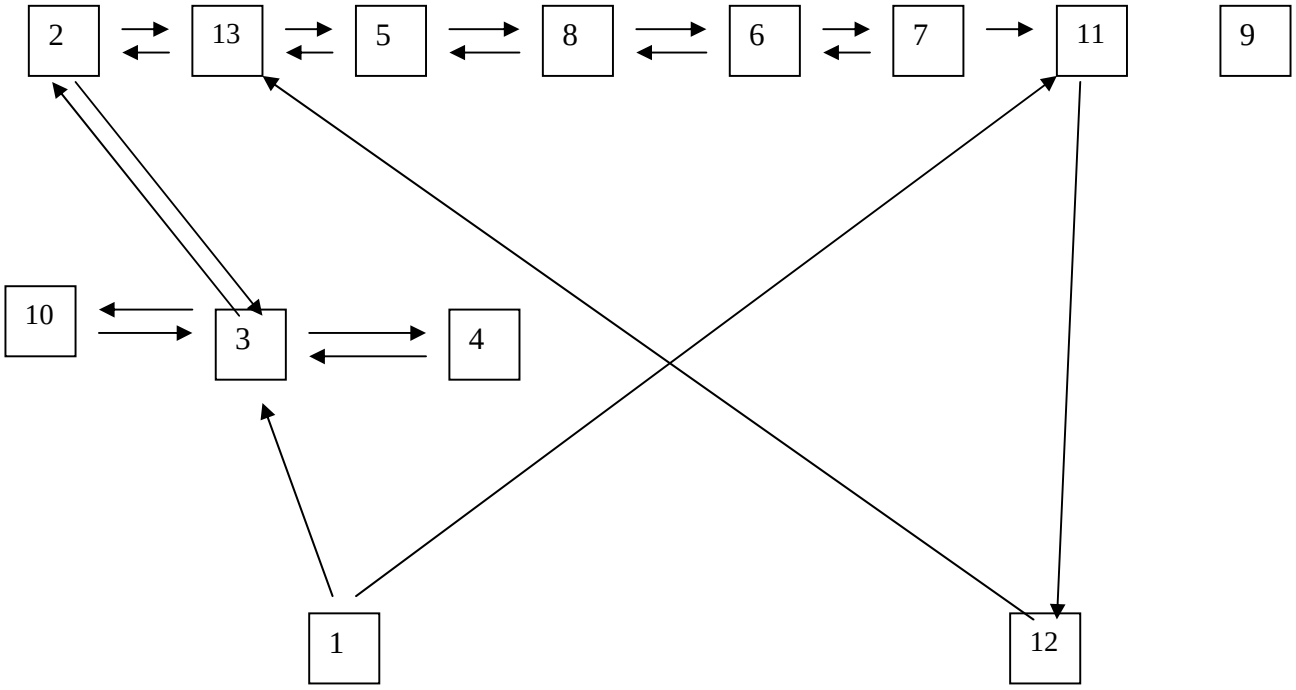

Figure 2: ISM for Inhibitors of telecom service supply Chain

6. Classification of Inhibitors (MICMAC Analysis)

MICMAC analysis is a widely identified and traditionally structured approach to categorize the variables according to their driving power and dependence. In this study their driving power and dependence of inhibitors of the telecom service supply chain was determined from the final reachability matrix. Based on the driving power and dependence, inhibitors have been classified into four clusters. They are (i) autonomous (ii) dependent (iii) linkage and (iv) independent [4]. The driving power and dependence of each of these inhibitors is shown in Table 3. Based on Table 3, a driver power-dependence diagram is constructed. This is shown in Figure 3.

7. Managerial Implications

Identification of the inhibitors hindering SSC success itself is a challenging task as it involves the soft components. It is hoped that the result of this research may be of benefit to service mangers in three ways as sighted below.

(1) The criticality of bottleneck factors could be understood in advance;
(2) Interrelationships exist among the factors can help to rationale the time and resource constraints; and
(3) The effect of some extraneous variables could be trapped when derived benefits varies from expected one.

The driver dependence diagram helps to categorize the inhibitors in to four clusters. From the study the inhibitor 'Fear of Imitation of service' only can be neglected and the management has to pay attention in all other identified barriers. The inhibitors falling in the dependent cluster are having low driving power and high dependence. This means that by their negligence organizational efficiency will not be hampered much. However in order to control them, many other inhibitors have to be controlled as they are the outcome of other elements due to their high dependence. The inhibitors in the linkage cluster have to be given extreme importance due to their high driving power and dependence power. The inhibitors at the Independent cluster are the causes of many variables due to their high driving power. Proper strategies have to be re developed for preventing them to an uncontrollable stage.

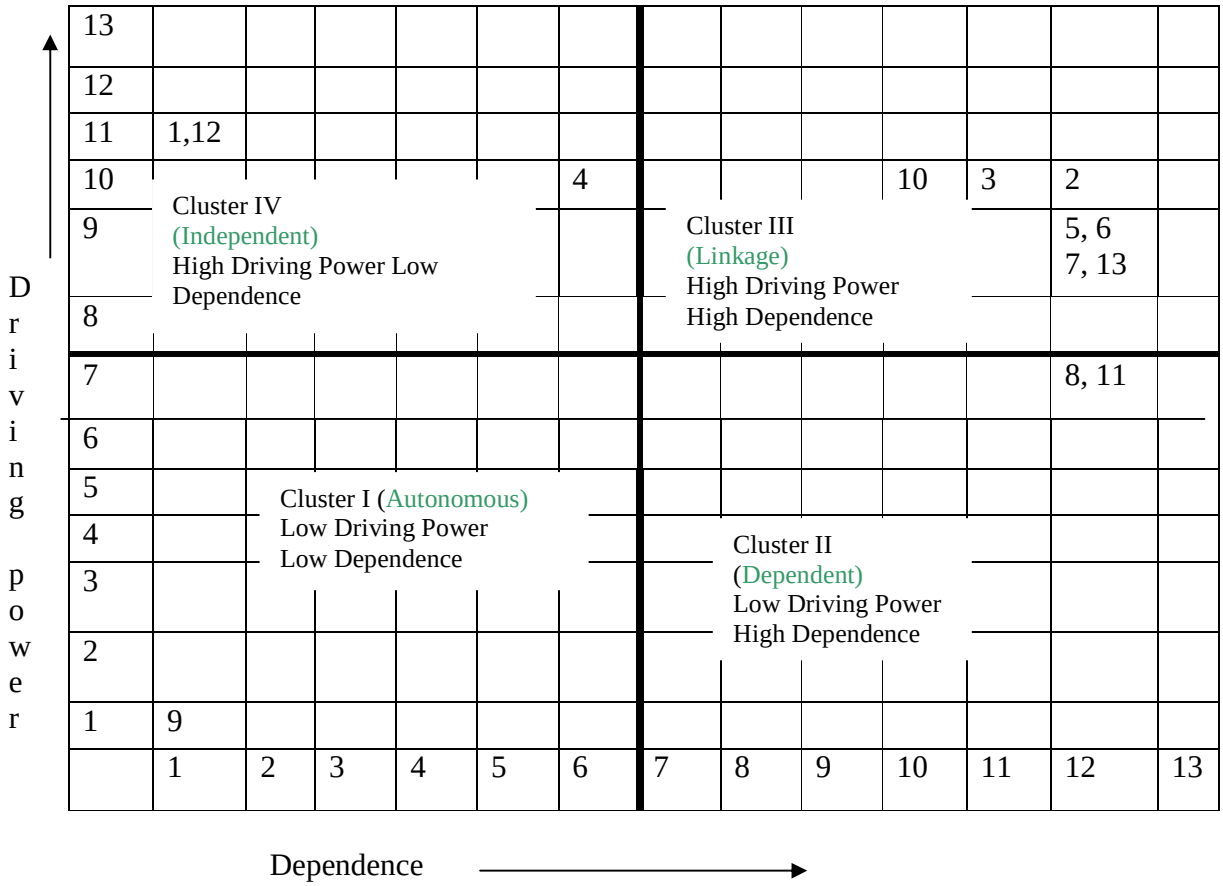

Figure 3: Driving power-dependence diagram for inhibitors of telecom service supply chain

8. Conclusion

Although service managers are aware of various inhibitors, a systematic approach to tackle them is quite absent. The identification of these inhibitors and awareness of their driving power and dependence power helps the managers to focus on them and prioritize them as strategic issues. As a rule, managers consider one or two inhibitors which they feel significant on prior judgement and develop action plan for tackling them. The hierarchy based ISM further delineates those inhibitors which are really critical and need more focus on the root causes of the problem. This has enormous feasibility of strategic decision for policy formulation for the organization considered for study. In addition to that the proposed ISM model acts as good guideline for future investment decision. The results are more generic and can be applied to other service sector supply chains. It can be considered for future study.

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