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KNOWLEDGE SHARING IN ORGANIZATION: MODELLING THE BARRIERS

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Abstract - Knowledge sharing means the exchange of knowledge and share of experience among different organizational units. Knowledge sharing is about stimulating the exchange of experiences, ideas, and thoughts between people. The barriers which resist in the KS are known as knowledge Sharing Barriers (KSBs). The main aim of this paper is to understand mutual influence of KSBs using interpretive structural modeling (ISM) and to identify driving KSBs (KSBs that support other KSBs) and dependent KSBs (KSBs that are most influenced by others KSBs). It has been observed that KSBs 'Lack of top management support and KM is not well understood' has high driving power and low dependency.

Keywords - Interpretive structural modeling, Knowledge sharing, Knowledge sharing barriers.

I. INTRODUCTION

Due to global competition in recent years, KS has been identified as basic facilitator for the effective KM which can assist in optimizing business goals [1]. These business goals can't be achieved until understand if about Knowledge Sharing barriers (KSBs), their mutual relationship so that those barriers which support other barriers (called "driving barriers") and those which are most influenced by others (called "driven barriers") are identified. Hence, effective KS is only possible with the understanding KS barriers.

ISM is a well established methodology for identifying relationships among specific items which define a problem or an issue [2, 3]. Therefore, in this paper, KSBs have been analyzed using the ISM approach, which provides the interrelationships of the barriers, their driving power, and dependencies. In this study, ten KSBs have been short-listed for analysis (see Table I). These KSBs are derived theoretically on the basis of various literature sources and experts opinions from both industry and academia.

The aim of this paper is to develop the relationships among the identified KSBs using interpretive structural modeling (ISM) and classify these KSBs depending upon their driving and dependence power. The ten KSBs (Table I) under consideration in this study were identified from the literature review and the opinion of the experts, both from industry and the academia. The main objectives of this paper are to identify and rank the KSBs in organization, to establish relationships among these identified KSBs using ISM, to discuss the organizational implications of this research and to suggest directions for future research.

II. KS BARRIERS

Many researchers have discussed KS Barriers in details [4, 5, 6]. Ref. [5] Discussed the mutual effect of these KS barriers over each other. These barriers are as follows.

A. Lack of top management's commitment

The top management of the organization is directly responsible for shaping the organization culture, vision, policies, financial resources, training, infrastructure, information technology, transparent rewards and recognition systems and adoption of new management technologies such as KM [7, 16, 22].

B. Concept of KM is not well understood

KS may be hindered if concept of KM is not well understood by the all stakeholders of the organization [6, 8, 9].

C. Lack of strategic planning

Strategic planning helps in successful KS. It involves the deployment of an organization's capabilities and resources to achieve KS goals [16, 17, 21].

D. Lack of methods and processes

Even though top management commitment, better organizational structure and good technological infrastructure support, KS activities may be unsuccessful due to lack of methods and processes. Successful KS implementation requires a set of methods and processes [10, 18].

E. Lack of financial resources

Financial resources are one of the key variables that support the infrastructure and manpower requirements for KS. KS needs huge support from infrastructure, which requires huge funds [10, 11, 19, 21].

F. Lack of organizational culture

Organizational culture defines the core beliefs, values norms and social customs that govern the way

individuals act and behave in an organization [12, 17].

G. *Lack of motivation, rewards and recognition*

The effectiveness of both reward and recognition systems will motivate people to share their knowledge. Absence of any transparent rewards and recognition systems will hamper the KS [13, 17].

H. *Lack of trust*

KS is impossible without mentioning the word trust. Most people are unlikely to share their knowledge without a feeling of trust [14].

I. *Resistance to change*

KM implementation depends on the three pillars of any organization, top management involvement and commitment, then employee attitude and support and lastly the type of infrastructure requirements such as IT [17].

J. *Lack of ownership of KM problem*

Lack of ownership of problem will lead to frustrating situating for any organization. No employees will take the extra responsibilities. So, Lack of ownership of problem act as a serious barrier for KM implementation [6].

TABLE I
KNOWLEDGE SHARING BARRIERS AND REFERENCES

No.	Barrier	Reference
1	Lack of culture	[7, 16, 22]
2	Lack of ownership of the KM Problem	[6, 8, 9]
3	Lack of trust	[16, 17, 21]
4	Lack of strategic Issues	[10, 18]
5	Lack of motivation	[10, 11, 19, 21]
6	Lack of top management support	[12, 17]
7	Lack of methods and processes	[13, 17]
8	Resistance to change	[14]
9	Lack of financial resources	[17, 20]
10	KM is not well understood	[6]

III. ISM METHODOLOGY AND MODEL DEVELOPMENT

ISM is primarily intended as a group learning process, but can also used individually. The ISM process transforms unclear, poorly articulated mental models of systems into visible, well-defined models useful for many purposes [3]. A set of different directly and indirectly related variables are structured into a comprehensive systemic model. The model so formed portrays the structure of a complex issue, a system of a field of study, in a carefully designed pattern implying graphics as well as words. ISM is interpretive because judgment of the group decides how the variables are related. It is structural as on the basis of relationship, an overall structure is extracted

from the complex set of variables. It is a modeling technique as the specific relationships and overall structure are portrayed in a graphical model.

The various steps involved in the ISM technique are:

1. Identification of variables which are relevant to the problem or issues – this could be done by survey.
2. Establishing a contextual relationship between variables with respect to which pairs of variables would be examined.
3. Developing a structural self-interaction matrix (SSIM) of variables which indicates pair-wise relationship between variables of the system.
4. Developing a reachability matrix from the SSIM, and checking the matrix for transitivity of the contextual relation is a basic assumption in ISM which states that if variable A is related to B and B is related to C, then A is related to C.
5. Partitioning of the reachability matrix into different levels.
6. Based on the relationships given above in the reachability matrix, drawing a directed graph (digraph), and removing the transitive links.
7. Converting the resultant digraph into an ISM-based model by replacing variable nodes with the statements.
8. Reviewing the model to check for conceptual inconsistency, and making the necessary modifications.

The various steps, which lead to the development of ISM model, are illustrated as given below.

A. *Structural self-interaction matrix (SSIM)*

Group of experts, from industries and the academics were consulted in identifying the nature of contextual relationships among the KSBs. For analyzing the KSBs in developing SSIM, the following four symbols have been used to denote the direction of relationship between barriers (i and j):

- V - KSB i will help to achieve KSB j;
- A - KSB j will help to achieve KSB i;
- X - KSB i and j will help to achieve each other;
- O - KSB i and j are unrelated.

The following statements explain the use of symbols V, A, X and O in SSIM.

- KSB 1 leads to KSB 8 (V).
- KSB 5 will be achieved by KSB 7 (A).
- KSB 6 and KSB 10 are unrelated (O).
- KSB 7 and KSB 9 strengthen each other (X).

Based on contextual relationships, the SSIM is developed (Table II)

TABLE II
STRUCTURAL SELF-INTERACTION MATRIX (SSIM)

KSB No.	KSB No.								
	10	9	8	7	6	5	4	3	2
1	A	O	V	A	A	A	A	X	V
2	A	A	A	A	A	A	A	A	
3	A	A	X	A	A	A	A		

4	A	V	V	V	A	V	*											
5	A	O	A	A	A		4	1	1	1	1	1	0	1	1	1	0	8
6	O	V	O	V			5	1	1	1	0	1	0	0	1*	0	0	5
7	A	X	V				6	1	1	1	1	1	1	1	1*	1	0	9
8	A	A					7	1	1	1	0	1	0	1	1	1	0	7
9	A						8	0	1	1	0	1	0	0	1	0	1*	5
10							9	1*	1	1	0	1*	0	1	1	1	0	7
							10	1	1*	1	1	1	0	1	1	1	1	9
	DE							9	1	9	3	9	1	5	9	5	1	
	P							0										

B. Reachability Matrix

The SSIM has been converted into a binary matrix, called the initial reachability matrix as shown in (Table III) by substituting V, A, X and O by 1 and 0 as per given case. The substitution of 1s and 0s are as per the following rules:

- If the (i, j) entry in the SSIM is V, the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry becomes 0;
- If the (i, j) entry in the SSIM is A, the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry becomes 1;
- If the (i, j) entry in the SSIM is X, the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry also becomes 1; and
- If the (i, j) entry in the SSIM is O, the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry also becomes 0.

TABLE III
INITIAL REACHABILITY MATRIX

KSB No.	1	2	3	4	5	6	7	8	9	10
1	1	1	1	0	0	0	0	1	0	0
2	0	1	0	0	0	0	0	0	0	0
3	1	1	1	0	0	0	0	1	0	0
4	1	1	1	1	1	0	1	1	1	0
5	1	1	1	0	1	0	0	0	0	0
6	1	1	1	1	1	1	1	0	1	0
7	1	1	1	0	1	0	1	1	1	0
8	0	1	1	0	1	0	0	1	0	0
9	0	1	1	0	0	0	1	1	1	0
10	1	0	1	1	1	0	1	1	1	1

After incorporating the transitivity as mentioned in step (4) of the ISM technique, the final reachability matrix is shown in Table IV. In Table IV, the driving power and the dependence of each KSB are also shown.

TABLE IV
FINAL REACHABILITY MATRIX

KS B No.	1	2	3	4	5	6	7	8	9	10	DR P
1	1	1	1	0	1*	0	0	1	0	0	5
2	0	1	0	0	0	0	0	0	0	0	1
3	1	1	1	0	1	0	0	1	0	0	5

(DEP = Dependence power, DRP = Driving power and 1* entries are included to incorporate transitivity to fill the gap if any in the opinion collected during development of SSIM).

C. Level partitions

From the final reachability matrix, the reachability and antecedent set for each KSBs are found [2]. The reachability set consists of the KSB itself and the other KSBs which it may help achieve, whereas the antecedent set consists of the KSB itself and the other KSBs which may help in achieving it. Thereafter, the intersection of these sets is derived for all the KSBs. The KSBs for whom the reachability and the intersection sets are same, occupy the top level in the ISM hierarchy. The top-level KSB in the hierarchy would not help achieve any other KSB above its own level. Once the top-level KSB is identified, it is separated out from the other KSBs. It is seen from the Table V that lack of ownership of the KM problem is occupied at level I. Hence, this KSB would be positioned at the top of the ISM hierarchy.

TABLE V
PARTITION OF REACHABILITY MATRIX : FIRST ITERATION

KSB No.	Reachability Set	Antecedent Set	Intersection	Level
1	1, 2, 3, 5, 8	1, 3, 4, 5, 6, 7, 8, 9, 10	1, 3, 5, 8	
2	2	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	2	I
3	1, 2, 3, 5, 8	1, 3, 4, 5, 6, 7, 8, 9, 10	1, 3, 5, 8	
4	1, 2, 3, 4, 5, 7, 8, 9	4, 6, 10	4	
5	1, 2, 3, 5, 8	1, 3, 4, 5, 6, 7, 8, 9, 10	1, 3, 5, 8	
6	1, 2, 3, 4, 5, 6, 7, 8, 9	6	6	
7	1, 2, 3, 5, 7, 8, 9	4, 6, 7, 9, 10	7, 9	
8	1, 2, 3, 5, 8	1, 3, 4, 5, 6, 7, 8, 9, 10	1, 3, 5, 8	
9	1, 2, 3, 5, 7, 8, 9	4, 6, 7, 9, 10	7, 9	

10	1, 2, 3, 4, 5, 7, 8, 9, 10	10	10
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This process is continued until the level of each element is found (see Table VI). These levels help in building the digraph and the final model.

TABLE VI

LEVELS OF KS BARRIERS

Barrier No.	Reachability Set	Antecedent Set	Intersection	Level
1	1, 3, 5, 8	1, 3, 4, 5, 6, 7, 8, 9, 10	1, 3, 5, 8	II
2	2	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	2	I
3	1, 3, 5, 8	1, 3, 4, 5, 6, 7, 8, 9, 10	1, 3, 5, 8	II
4	4	4, 6, 10	4	IV
5	1, 3, 5, 8	1, 3, 4, 5, 6, 7, 8, 9, 10	1, 3, 5, 8	II
6	6	6	6	V
7	7,9	4, 6, 7, 9, 10	7, 9	III
8	1, 3, 5, 8	1, 3, 4, 5, 6, 7, 8, 9, 10	1, 3, 5, 8	II
9	7,9	4, 6, 7, 9, 10	7, 9	III
10	6	6	10	V

IV. CATEGORIZATION OF KS BARRIERS

All KSBs have been classified, based on their driving power and dependence power, into four categories as autonomous KSBs, dependent KSBs, linkages KSBs, and independent KSBs. The above classification of barriers is similar to the classification used by [15]. The driving power and dependence power of each KSB are shown in Table 4. The driving power and dependence power diagram for KSBs are shown in Figure 1.

It is observed from Table 4 that lack of top management support (KSB 6) has a dependence power of 1 and a driving power of 9 and therefore, it is positioned at a place which corresponds to a dependence power of 1 and a driving power of 9 in Figure 1.

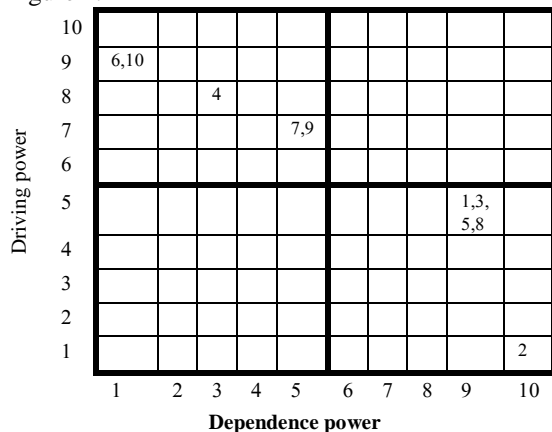


Fig. 1 : Driving power and dependence diagram for barriers

The main aim behind the classification of KSBs is to analyze the driving power and dependence power of the KSBs. In this classification of KSBs, the first cluster is of autonomous KSBs that have a weak driving power and weak dependence power. The autonomous KSBs are relatively disconnected from the system. In the present case, there are no autonomous KSBs. The second cluster consists of dependent KSBs that have weak driving power and strong dependence power. In this case Lack of culture (KSB 1), Lack of trust (KSB 3), Lack of motivation (KSB 5), Resistance to change (KSB 8), Lack of ownership of the KM Problem (KSB 2) are weak drivers but are strongly dependent on the others. The third cluster consists of linkage KSBs that have strong driving and dependence power. Any action on these KSBs will have an effect on the other KSBs and also a feedback effect on themselves. In this case, there are no linkages KSBs. The fourth cluster includes independent KSBs that have strong driving power and weak dependence power. In this case Lack of top management support (KSB 6) KM is not well understood (KSB 10), Lack of strategic Issues (KSB 4), Lack of methods and processes (KSB 7) and Lack of financial resources (KSB 9) are strong driving power and weak dependence power.

V. FORMATION OF ISM DIGRAPH AND MODEL

The structural model is generated from initial reachability matrix. If there is a relationship between the KSBs *i* and *j*, this is presented by an arrow which points from *i* to *j*. This graph is called as an initial directed graph, or initial digraph. If arrow from *j* to *i* than After removing the transitivities-see step (iv) of the ISM methodology, the final digraph is obtained (Fig. 2). This final digraph is converted into the ISM-based model (Fig. 3).

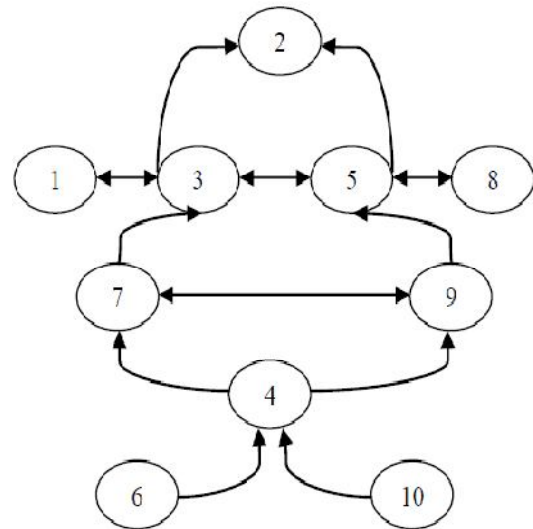


Fig. 2 : Final Digraph depicting the relationship among the KSBs

VI. DISCUSSION

Lack of top management support and KM is not well understood of SCM concepts are the most important KSBs due to its high driving power and low dependence among all the identified KSBs. These KSBs are positioned at the lowest level in the hierarchy of the ISM-based model (Fig. 3). The KSB Lack of ownership of the KM Problem is at the highest level in the ISM-based model due to its high dependence power and low driving power. Lack of strategic issues is positioned at the second level of the ISM hierarchy. Those KSBs which are at the third level in the model with highest driving power are known as ‘strategic KSBs’. These KSBs play a key role in KS disablement of organization through Lack of methods and processes, Lack of financial resources. These KSBs require larger concentration from the top management.

The driving power and dependence power diagram gives some precious insights about the relative importance and interdependencies of the KSBs. The driving power and dependence diagram (Fig. 1) indicates that there is no autonomous and linkage KSB in the process of KS enablement in organization. Autonomous KSBs are weak drivers and weak dependents. These KSBs do not have much influence on the KS disablement in organization. Linkage KSBs have strong driving power and strong dependence which makes the system unstable. The absence of autonomous and linkage KSBs in this study indicates that all identified KSBs influence the process of KS disablement in organization.

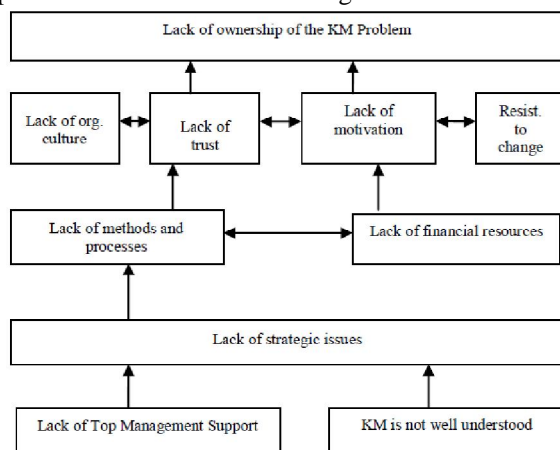


Fig. 3 : ISM Model of KSB

VII. CONCLUSION

Finally it is interesting to examine the scope of future research. The experts’ opinion has been used to analyze driving and dependence power of the barriers. Here, the framework developed depends upon the survey and opinion of experts, which may have some factor of prejudice. Through ISM, a relationship model among KSB has been developed. This model has not been statistically validated. Thus, future research focus should be to test the validity of

this model. ISM is a tool which can be helpful to develop an initial model whereas tools like SEM commonly known as linear structural relationship approach has the capability of statistically testing an already developed theoretical model. LISREL software can also be used to examine the relationships derived from this model.

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