# Analyzing the barriers of OHSAS 18001 implementation in manufacturing organization

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**Abstract**

The current paper give the detail knowledge of barriers for the implementation of OHSAS 18001 in manufacturing organization. How these barriers are connected to each other and how they affect the system. In this paper barriers are connected to each other by using the ISM Approach and make the Digraph of these barriers and with the help of digraph make the ISM model and do the MICMAC Analysis and decide which factor is lies in which quadrant of MICMAC Analysis

**Keywords:** OHSAS 18001, MICMAC, ISM, Diagraph, Modal

## Introduction

As we realize that each industry has numerous works which contain high rate of hazard, because of this many mischance are happened and lot of worker got harmed (Hamid et al; 2003). Due to these hazard and mishap we ought to need to make a security culture in the organization. Occupational Health and Safety Management System (OHSMS) is one of the feasible approaches to remove these dangers and make a security culture in the organization. Beriah (2012), suggested that risk evaluation in particular zones and representative perspectives were utilized to decide the viability of current wellbeing projects and obstructions that keep the usage Of OHSAS 18001.

### Barriers for implementation of OHSAS 18001

OHSAS 18001 having many barriers but this research contain only 14 barriers like as after reading literature review

1. Lack of management involvement ( Reinhold et al;2015).

2. Ignorance of continuous process improvement ( Reinhold et al;2015).
3. Lack of employee involvement (Zeng, et al 2007).
4. Insufficient government regulation (Sui et al; 2018).
5. Lack of government audit. (Beriah, 2012).
6. Ignorance of the psychological issue (Kukhar et al; 2018).
7. Poor organization culture (Rajaprasad & Chalapathi, 2015).
8. Inappropriate audit tools (Pagell et al; 2018),
9. Limited resource (Subhani, 2004).
10. Perfunctory application of the management (Beriah, 2012).
11. Excessive working hour (Alenkov et al; 2018).
12. Multi employee in the workplace (Ismail et al; (2013).
13. Misunderstanding between employee (Ismail et al;2013).
14. Poor literacy and language skills. (Hamid et al; 2003, Pheng et al; 2003).

## Methodology

The main objective of using ISM approach is to develop a structural model in order to identify the critical/ significant barriers in OHSAS implementation. Interpretive structural modeling (ISM) is a well-established methodology for identifying relationships among the specific elements related to a specific problem or an issue (Attri & Grover 2015). For any complex problem under consideration, a number of elements may be related to an issue or problem.

Cai & Xia (2018), in ISM, variables related to an issue are identified through literature analysis. Then, contextual relationship between variables are established. Afterwards structural self – interaction matrix (SSIM) is created on the basis of contextual relationship. Then SSIM is convert into reachability matrix and transitivity concept is introduce in reachability matrix. At last reachability matrix is portioned into different levels in order to form digraph and ISM Model (Attri et al, 2013).

ISM is defined as a process aimed at assisting the human being to better understand what he/she believes and to recognize clearly what he/she does not know. Its most essential function is

organizational. The information added (by the process) is zero. The value added is structural. The ISM process transforms unclear, poorly articulated mental models of systems into visible and well-defined models (Attri et al., 2013).

ISM is an interactive learning process. In this technique, a set of different directly and indirectly related elements are structured into a comprehensive systematic model. The model so formed portrays the structure of a complex issue or problem in a carefully designed pattern implying graphics as well as words (Cia & Xia, 2018).

**Steps involved in ISM methodology**

The various steps involved in ISM modeling are as follows, (Chao et al 2008; Attri et al;2013; Dandage et al; 2017; Cai & Xia, 2018;).

i. Identify the elements which are relevant to the problem. This could be done by a survey or group problem solving technique.
ii. Establish a contextual relationship between the identified elements of the issue.
iii. Develop a structural self-interaction matrix (SSIM) of elements. This matrix indicates the pair-wise relationship among elements of the system.
iv. Develop a reachability matrix from SSIM. This matrix is checked for transitivity.
v. Partition the reachability matrix into different levels.
vi. Convert the reachability matrix into conical form.
vii. Draw digraph based on the relationship given in reachability matrix removal of transitive links.
viii. Convert the resultant digraph into an ISM-based model by replacing element nodes with the statements.

Review the model for conceptual inconsistency and make the necessary modifications

**Development of ism based streuctural model**

The various steps, which lead to the development of an ISM model, are illustrated below:

**Step 1 SSIM (Structural self –interaction matrix)**

After the identification of variable related to an issue SSIM matrix is developed by using the following symbols (Attri & Grover, 2015).

- If barrier 'i' is influenced by barrier 'j' then place 'V'.
- If barrier 'i' isn't influenced by barrier 'j' and barrier 'j' is influenced by barrier 'i' then place 'A'.
- If barrier 'i' is influenced by barrier 'j' and barrier 'j' is influenced by barrier 'i' then place 'X'.
- If barrier 'i' isn't influenced by barrier 'j' and barrier 'j' isn't influenced by barrier 'i' then place 'O'.

On the basis of contextual relationship between the barriers of OHSAS implementation along with its associated direction of relationship, SSIM is finalized. For the development of ISM, Four experts were refereed. Two experts were from the academic background and two experts were from the industrial background. Table 3.1 shows the SSIM of OHSAS barriers.

Table 1 Structural self interaction matrix (SSIM)

| i/j | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | A | O | O | O | X | A | V | A | V | A | A | V | V | |
| 2 | A | A | A | A | A | A | A | A | O | A | A | A | | |
| 3 | A | A | O | A | A | A | A | A | A | A | A | | | |
| 4 | O | O | O | V | V | O | V | O | V | V | | | | |
| 5 | O | O | O | V | V | O | V | O | V | | | | | |
| 6 | A | V | O | A | A | A | O | A | | | | | | |
| 7 | A | O | O | O | A | O | O | | | | | | | |
| 8 | O | O | O | O | A | A | | | | | | | | |
| 9 | O | O | O | O | O | | | | | | | | | |
| 10 | A | O | O | A | | | | | | | | | | |
| 11 | O | O | O | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | O | O | | | | | | | | | | | | |
| 13 | A | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | |

**Step 2: Reachability Matrix**

Attri & Grover (2015), illustrated that SSIM is converted into Reachability by placing binary digit in place of V, A, X, O symbols. For this purpose, Following guidelines is used.

- If i-j element of SSIM is connected by 'V' then place 1 in i-j and place 0 in j-i element of reachability matrix.
- If i-j element of SSIM is connected by 'A' then place 0 in i-j and place 1 in j-i element of reachability matrix.
- If i-j element of SSIM is connected by X then place 1 in i-j and place 1 in j-i element of reachability matrix.
- If i-j element of SSIM is connected by O the place in i-j as 0 and j-i place by 0 element of reachability matrix.

Table 2 Initial reachability matrix

| **Barriers** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| **2** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **3** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| **5** | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| **6** | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| **7** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **8** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| **9** | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| **10** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **11** | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| **12** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| **13** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| **14** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |

The final reachability matrix is shown in Table 3.3

Table 3 Final reachability matrix

| **Barriers** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **Drive power** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 8 |
| **2** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| **3** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| **4** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 11 |
| **5** | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 10 |
| **6** | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 |
| **7** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 8 |
| **8** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| **9** | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 8 |
| **10** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 8 |
| **11** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 9 |
| **12** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| **13** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 |
| **14** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 9 |
| **Dependence power** | 8 | 14 | 12 | 1 | 2 | 9 | 7 | 9 | 1 | 8 | 3 | 1 | 10 | 1 | |

**Step 3: Level partitions:**

Pagell et al; (2018), In this step of ISM approach, final reachability set and antecedent set for each barrier is determined from the final reachability matrix. Later on, intersection set of those sets is derived for all barriers. Reachability set of a particular barrier contain all those barriers (including itself) which are influenced by that barrier while antecedent set contain all those barriers (including itself) which are being influenced by that barrier. Afterward, intersection sets are derived for all the barriers. This set contain all those barriers which lies in both reachability and antecedent set. The barrier for which reachability intersection sets are identical, occupies the top level in the ISM model. Afterward, this/these barrier(s) are removed from the iteration process. This level identification process is continued till are the barriers have their certain level. These known levels helps to make the digraph and afterward ISM model. Table 3.4 to 3.10 shows the different iterations for the identification of level of barriers related to OHSAS implementation.

Table 4: Iteration 1

| Barrier | Reachability set | Antecedent set | Intersection set | Level |
|---|---|---|---|---|
| 1 | 1,2,3,6,7,8,10,13 | 1, 4,5,7,9,10,11,14, | 1,7,10 | |
| 2 | 2, | 1,2,3,4,5,6,7,8,9,10,11,12,13,14 | 2 | 1 |
| 3 | 3,4 | 1,3,4,5,6,7,8,9,10,11,12,13,14 | 3,4 | |
| 4 | 1,2,3,4,5,6,7,8,10,11,13 | 4 | 4 | |
| 5 | 1,2,3,5,6,7,8,10,11,13, | 4, 5, | 5 | |
| 6 | 2,3,6,7 | 1,4,5,6,7,9,10,11,14 | 6,7 | |
| 7 | 1,2,3,6,7,8,10,13 | 1,4,5,7,10,11,14 | 1,7,10 | |
| 8 | 2,3,8, | 1,4,5,7,8,9,10,11,14 | 8 | |
| 9 | 1,2,3,6,8,9,10,13 | 9 | 9 | |
| 10 | 1,2,3,6,7,8,10,13, | 1,4,5,7,9,10,11,14, | 1,7,10 | |
| 11 | 1,2,3,6,7,8,10,11,13 | 4,5,11, | 11 | |
| 12 | 2,12, | 12 | 12 | |
| 13 | 2,3,13, | 1,4,5,6,7,9,10,11,13,14, | 13 | |
| 14 | 1,2,3,6,7,8,10,13,14, | 14 | 14 | |

Table 5: Iteration 2

| Barrier | Reachability set | Antecedent set | Intersection set | Level |
|---|---|---|---|---|
| 1 | 1,3,6,7,8,10,13 | 1,4,5,7,9,10,11,14 | 1,7,10 | |
| 3 | 3,4 | 1,3,4,5,6,7,8,9,10,11,12,13,14 | 3,4 | II |
| 4 | 1,3,4,5,6,7,8,10,11,13 | 4 | 4 | |
| 5 | 4,5 | 5 | | |
| 6 | 3,6,7 | 1,4,5,6,7,9,10,11,14 | 6,7 | |
| 7 | 1,3,6,7,8,10,13 | 1,4,5,7,10,11,14 | 1,7,10 | |
| 8 | 3,8 | 1,4,5,7,8,9,10,11,14 | 8 | |
| 9 | 1,3,6,8,9,10,13 | 9 | 9 | |
| 10 | 1,3,6,7,8,10,13 | 1,4,5,7,9,10,11,14 | 1,7,10 | |
| 11 | 1,3,6,7,8,10,11,13 | 4,5,11 | 11 | |
| 12 | 12 | 12 | 12 | II |
| 13 | 3,13 | 1,4,5,6,7,9,10,11,13,14, | 13 | |
| 14 | 1,3,6,7,8,10,13,14 | 14 | 14 | |

Table 6: Iteration 3

| Barrier | Reachability set | Antecedent set | Intersection set | Level |
|---|---|---|---|---|
| 1 | 1,6,7,8,10,13 | 1,4,5,7,9,10,11,14 | 1,7,10 | |
| 4 | 1,4,5,6,7,8,10,11,13 | 4 | 4 | |
| 5 | 1,5,6,7,8,10,11,13 | 4,5 | 5 | |
| 6 | 6,7 | 1,4,5,6,7,9,10,11,14 | 6,7 | III |
| 7 | 1,6,7,8,10,13 | 1,4,5,7,10,11,14 | 1,7,10 | |
| 8 | 8 | 1,4,5,7,8,9,10,11,14 | 8 | III |
| 9 | 1,6,8,9,10,13 | 9 | 9 | |
| 10 | 1,6,7,8,10,13 | 1,4,5,7,9,10,11,14 | 1,7,10 | |
| 11 | 1,6,7,8,10,11,13 | 4,5,11 | 11 | |
| 13 | 13 | 1,4,5,6,7,9,10,11,13,14 | 13 | III |
| 14 | 1,6,7,8,10,13,14 | 14 | 14 | |

Table 7: Iteration 4

| Barrier | Reachability set | Antecedent set | Intersection set | Level |
|---|---|---|---|---|
| 1 | 1,7,10 | 1,4,5,7,9,10,11,14 | 1,7,10 | IV |
| 4 | 1,4,5,7,10,11 | 4 | 4 | |
| 5 | 1,5,7,10,11 | 4,5 | 5 | |
| 7 | 1,7,10 | 1,4,5,7,10,11,14 | 1,7,10 | IV |
| 9 | 1,9,10 | 9 | 9 | |
| 10 | 1,7,10 | 1,4,5,7,9,10,11,14 | 1,7,10 | IV |
| 11 | 1,7,10,11 | 4,5,11 | 11 | |
| 14 | 1,7,10,14 | 14 | 14 | |

Table 8: Iteration 5

| Barrier | Reachability set | Antecedent set | Intersection set | Level |
|---|---|---|---|---|
| 4 | 4,5,11 | 4 | 4 | |
| 5 | 5,11 | 4,5 | 5 | |
| 9 | 9 | 9 | 9 | V |
| 11 | 11 | 4,5,11 | 11 | V |
| 14 | 14 | 14 | 14 | V |

Table 9: Iteration 6

| Barrier | Reachability set | Antecedent set | Intersection set | Level |
|---|---|---|---|---|
| 4 | 4,5 | 4 | 4 | |
| 5 | 5 | 4,5 | 5 | VI |

Table 10: Iteration 7

| Barrier | Reachability set | Antecedent set | Intersection set | Level |
|---|---|---|---|---|
| 4 | 4 | 4 | 4 | VII |

**Step 4: Conical matrix**

Thakkar et al; (2007), In this step of ISM approach, conical matrix is developed from the final reachability matrix. In this matrix, barriers are arranged on the basis of their levels identified in level partitioning/final reachability matrix. Table 3.11 shows the conical matrix.

Table 11 Conical matrix

| **Barriers** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **Drive power** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| **3** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| **1** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| **6** | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 4 |
| **8** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| **13** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 |
| **1** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 8 |
| **7** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 8 |
| **10** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 8 |
| **9** | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 8 |
| **11** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 9 |
| **14** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 9 |
| **5** | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 10 |
| **4** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 11 |
| **Dependence power** | 8 | 14 | 12 | 1 | 2 | 9 | 7 | 9 | 1 | 8 | 3 | 1 | 10 | 1 | |

**Step 5: Digraph**

After the partitioning of all barriers into different levels, a model in form of digraph is created by using node and line of edges, In the digraph, the top level barriers are placed at top position

and bottom level barriers placed in lowest position (Attri et al;2013).

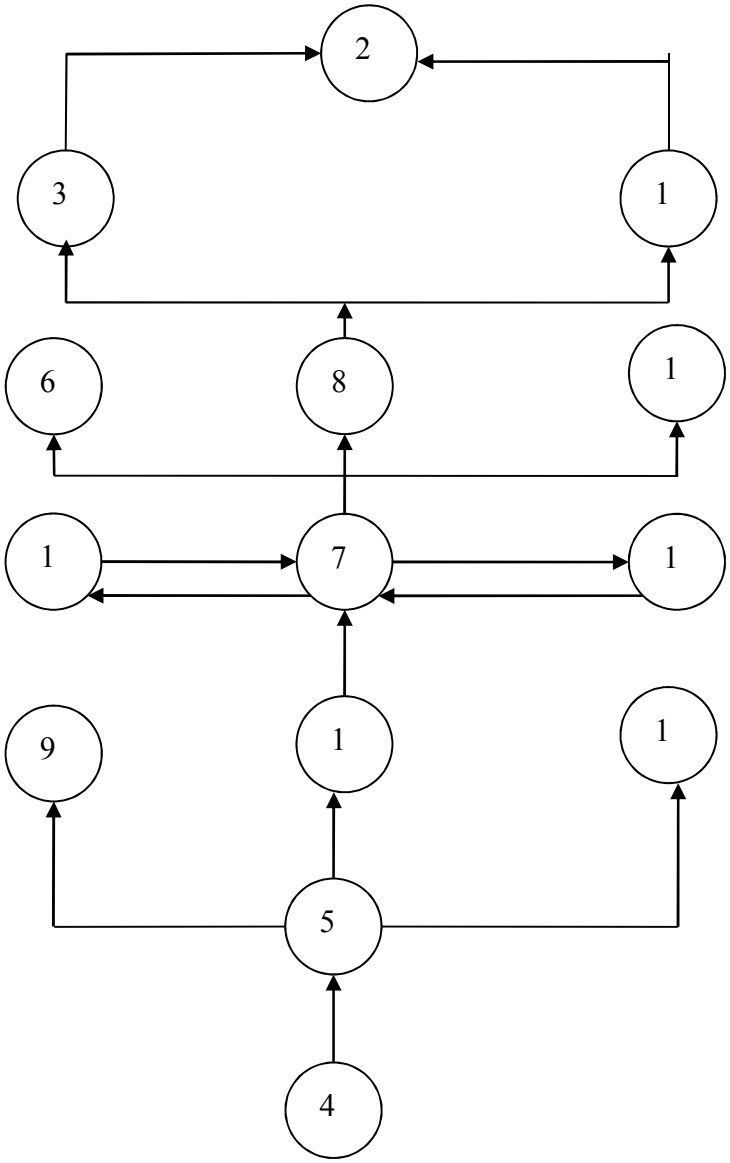


Fig 1 Digraph for barriers in OHSAS implementation

**Step 6: ISM MODEL**

Digraph is converted into ISM model by replacing barriers nodes with statements

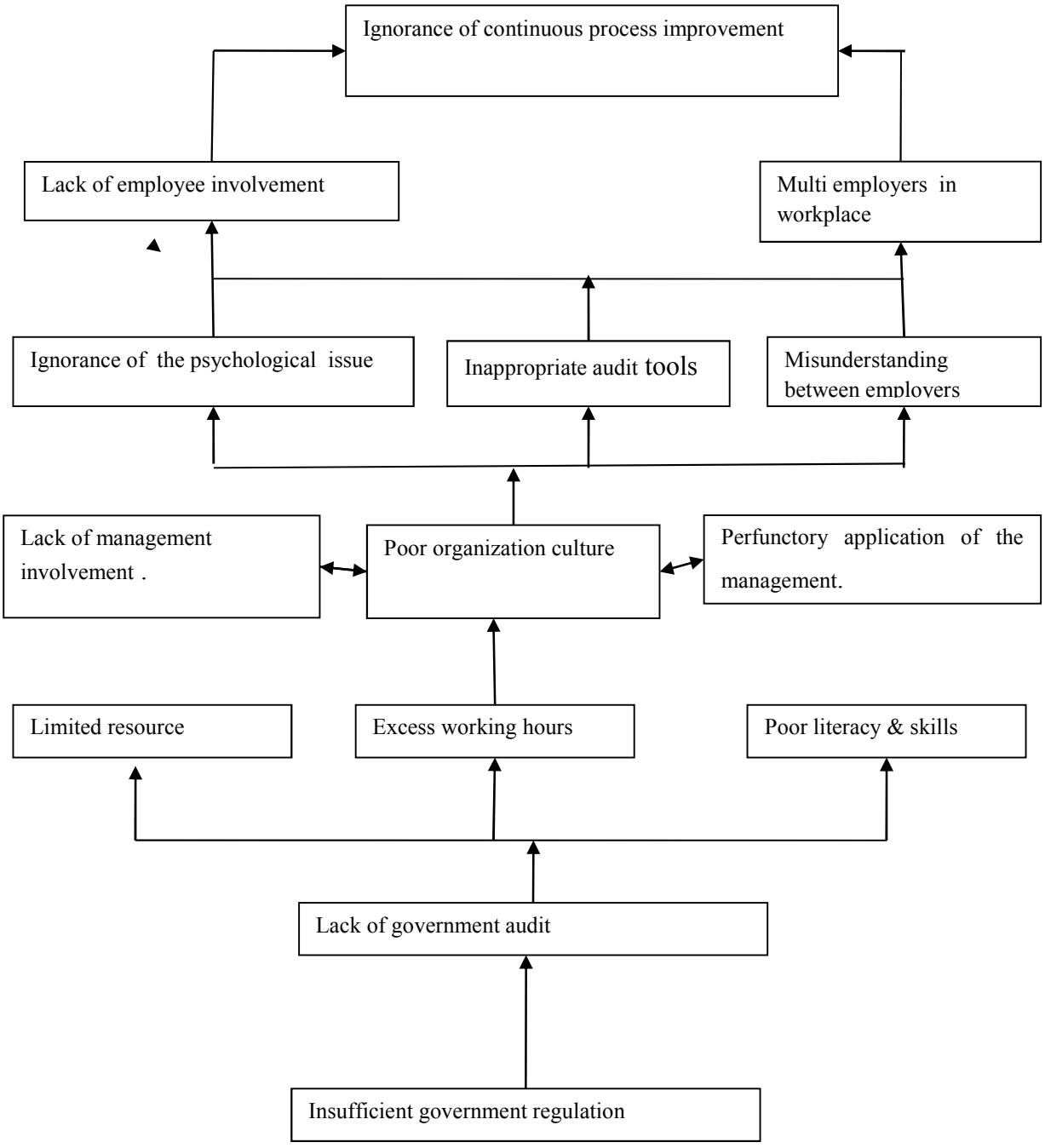


Fig 2 ISM model

From the developed ISM model, it is clear that the most important barrier is insufficient government regulation which exhibit the successful implementation of OHSAS in manufacturing organizations. This barrier is lying at the bottom of the ISM model. Moreover, the barrier is having high driving power, which affect all other barriers in the ISM model (Pheng et al; 2003).

The barrier at the top of the ISM model are having high dependence power and low driving power. These barriers are being influenced by other barriers (Naveh et al; 2007). From the developed ISM model, it is clear that the most important barrier is insufficient government regulation which exhibit the successful implementation of OHSAS in manufacturing organizations. This barrier is lying at the bottom of the ISM model. Moreover, the barrier is having high driving power, which affect all other barriers in the ISM model (Pheng et al; 2003).

The barrier at the top of the ISM model are having high dependence power and low driving power. These barriers are being influenced by other barriers (Naveh et al; 2007).

## Micmac analysis

Matriced' Impacts Croise's Multiplication Appliqué a un Classement. MICMAC analysis is applied to prioritize the barriers based on their driving power and dependence. The MICMAC principle relies on multiplication properties of matrices (Cai & Xia, 2018). It is done to identify the main barriers that drive the system in varied classes. On the basis of drive power and dependence power, the factors, are classified into four classes i.e. autonomous barriers, linkage barriers, dependent and independent barriers (Attri et al; 2015). Higher driving power indicates that the barrier extremely influences other. Higher dependence indicates that the barrier is extremely influenced by other barriers. The horizontal axis represents dependence and also the vertical axis represents the driving power. Every barrier is drawn by its driving power/dependence and placed within the cell of driving power dependence diagram (Sui et al; 2018).

### Barriers classification

In order to classify the barriers, drive power and dependence power of barriers is computed. On the basis of drive power and dependence, barriers are classified into following groups (Sui et al; 2018).

**1 Autonomous barriers**: - These barriers are comparatively disconnected from the system with only a few weak links. These factors have weak drive power and weak dependence power. (Atrri et al; 2013), these barriers own weak driving power beside the weak dependence. These barrier lies in the first cluster.

**2 Dependent barriers**:- These barriers have weak driving power however strong dependence power. These barrier lies in the second cluster.

**3 Linkage barriers**:- Olaru et al; (2004), these barriers have strong drive power and strong dependence power. These barriers are unstable within the incontrovertible fact that any action on these barriers can have impact an impact on others and additionally a feedback effect on themselves. These barriers square measure unstable. These barriers have strong driving power and strong dependence power. These barrier lies the third cluster.

**4 Independent barriers**: - These barriers are having strong driving power along with the weak dependence power. These barrier lies the fourth cluster. Management should pay most attention to induce fast and good results. Any barriers with a really strong drive power, referred to as the 'key barriers' falls into independent or linkage barriers (Attri and Grover; 2015).

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | |
| 12 | | ***Independent barriers*** | | | | | | | | ***Linkage barriers*** | | | | |
| 11 | 4 | | | | | | | | | | | | | |
| 10 | | 5 | | | | | | | | | | | | |
| 9 | 14 | | 11 | | | | | | | | | | | |
| 8 | 9 | | | | | | 7 | 1,10 | | | | | | |
| 7 | | | | | | | | | | | | | | |
| 6 | | ***Autonomous barriers*** | | | | | | | | ***Dependent barriers*** | | | | |
| 5 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | 6 | | | | | |
| 3 | | | | | | | | | 8 | 13 | | | | |
| 2 | 12 | | | | | | | | | | | 3 | | |
| 1 | | | | | | | | | | | | | | 2 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |

Fig 2: Driving power and Dependence diagram

**Result and conclusion**

ISM approach ahs been utilized for identifying the mutual relationship existing among the barriers of OHSAS implementation. It also defined the level of each barrier of OHSAS. The level identified from the ISM based analysis is as follows:-

Level 1 : ignorance of continuous process improvement.

Level 2 : Lack of employee involvement, multi-employers in workplace.

Level 3: ignorance of psychological issue, inappropriate audit tools, misunderstanding

between employers.

Level 4: lack of management involvement, poor organization culture, perfunctory application of management.

Level 5: limited resources, excess working hours, poor literacy & skills

Level 6: lack of government audit.

Level 7 : insufficient government regulation.

Micmac analysis has been applied in order to analyze the driving power and dependence of OHSAS implementation. For this purpose, driving power and dependence diagram has been constructed. On the basis of driving power and dependence diagram, following observations has been made:-

- Autonomous barrier is multiemployer in the workplace. This particular barrier is having low driving power and low dependence. This barriers does not have significant effect on the OHSAS implementation. But this barrier can not be neglected from the present study.
- Dependent barriers are ignorance of continuous process improvement, lack of employee involvement, ignorance of psychological issue, inappropriate audit tools, misunderstanding between employees. These barriers are having low driving power but high dependence. For effective handling of these barriers, top management should utilize proper strategies/motivational schemes, to motivate the employers to participate in OHSAS implementation and continuous improvement activities of the organization. Moreover top management should use proper strategies in order to reduce/eliminate the misunderstanding between the employees. Moreover, proper audit tools should be utilized for effectively evaluation of OHSAS initiatives. Furthermore, psychological issue should not be ignored by top management.
- Linkage barriers are lack of management involvement, perfunctory application of management. These barriers are having high driving power as well as high dependence. These barriers are considered as unstable barriers. For tackling these barriers, top management should effectively involve in the OHSAS implementation. These effort

should not be limited to words but should be demonstrated by the action in the organization.

Independent barriers are insufficient government regulation, lack of government audit, limited resources, excess working hour, poor literacy and language skills. These barriers are having high driving power but less dependence. These barriers are considered as the significant/critical barriers. For this purpose, top management should reduce the excessive working hours of the employees working in the organization. Moreover, stress should be emphasized on improvement of language and skills

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