

Implementation Aspects of Just in Time in Indian Industries

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Abstract— The objective of this paper is to analyze the barriers for implementing JIT in Indian industries. The aim of this study is to significantly find out the factors affecting the implementation of JIT practices in Indian manufacturing firm .the study shows that implementation of JIT not an easy task, it is burdened by financial, cultural, departmental, behavioral, organizational, & technological barriers, a set of questionnaires have been sent to few industries & the study has been carried out on those factors.

Keywords— just in time, organizational performance, manufacturing organizations barriers.

I. INTRODUCTION

JIT system was originally developed at Toyota Motors Company in Japan in mid of 1970 by taiichi ohno. The objective of just in time is to encourage employee for participating the programs which is relevant to improvement of work, so that profiles increases through quality improvement, reduction of cost & reducing inventory. The implementation of JIT in industries is lead to marked improvement in competitiveness & ability to respond to rapid changes in market demand. JIT having concept of provide raw material when required & producing products when there is a requirement. The focus of JIT is to minimize the all kind of inventories like work in process ,raw material & finished goods, the main aim of just in time is to eliminate all type of manufacturing wastes from the entire supply chain through continues improvement.

It is now well known that just in time is not a collection of techniques but it is a philosophy. The main idea behind the JIT is to solve the hidden problem & involve all employees to remove the problems, so that the requirement of high stock level will not arise.

JIT technique help the Indian manufacturing firm to become more competitive by enhancing their products in world market, but it is observed that some barriers like political, cultural & social matters have a significant role on JIT in different parts of world.

II. OBJECTIVES OF THE STUDY

The objectives of this study have follows:-

1. To find out those element which are important for implementation of JIT in Indian industries.
2. To find out those elements which create a hurdle for implementation of JIT.
3. How to reduce barriers for implementing just in time in Indian industries.

III. METHODOLOGY

A six step procedure was adopted in the study. The step were as follows-

1. Objectives of the study.
2. Literature reviews.
3. Design of questionnaire.
4. Data collection.
5. Results & analysis..
6. Conclusions.

IV. LITERATURE REVIEW

If Indian industries implemented just in time technique, they benefited with wide range of benefits obtained from it, but implementation of just in time in India is slightly difficult due to cultural differences & low literacy level. Many authors highlighted such the difficulty through case studies.

Singhvi (11) shows the experience of an automobile industry, for implementing just in time some important changes were made for improvement in quality level, reducing WIP, material handling reduction & space reduction. The study shows that employee involvement is a very important element for implementing JIT. Without employee involvement it is impossible to implement JIT & persistent focus on quality. Garg et al.(9) presented a case study of a tractor assembly

plant which is located at new delhi.the company started implementing just in time in 1980. The important steps for implementing JIT are, identification of important performance parameters, training of employees on pull system concepts, U shaped layout, proper maintenance for each machinery, standardization of operations, multi functional training, housekeeping & visual control, initially the company not received great results in almost all areas for few years but after few years everything was stream lined & management achieving significant results. Deshmukh (7) shows the effects of JIT implementation in automobile company namely sona steering company which is located at gurgoan.this production company use lean manufacturing rather than mass manufacturing. In company the machines are set in u shaped cell formation & one operator is incharge of multiple jobs. All machines are set closer without in process stock & only the stock of finished product & raw material is managed in every cell. Employee is empowered to stop the line moment a defect take place. Various devices provided on the production line help the worker take such decision. The company also uses the kanban card for their production line.

V. DESIGN OF QUESTIONNAIRE

The questionnaire is designed on the basis of literature available & various study carried on JIT.

First part of questionnaire is targeted to know about profile of the organization & level of JIT implementation. Second part of the questionnaire is design to know presence & importance of the various elements of JIT manufacturing.

Last part of the questionnaire is design to know the relevance for the various reasons for barriers for implementing JIT in Indian industries.

5.1 First part-According to our questionnaire the first part of the questionnaire is to target to know about profile of organization & level of JIT implementation in organization.

According to this we send some questionnaire to organization like

1. Do you have any knowledge of JIT production system if yes, then what is JIT according to you?
2. Do you think your company is implementing or planning to implement some aspects of JIT?
3. According to you, what are the essential requirements for JIT implementation?
4. How do you rate the JIT efforts in your company?
5. In JIT environment the following aspects of JIT are critical successful factors for implementing JIT in any industries, therefore rate them according to the level of their practice in your company.

For, not at all use 1, for low use 2, for medium use 3 & for high use 4.

S.No	Aspects	Rank
1	Top management commitment & culture of an organization	
2	Employee involvement & commitment	
3	Supplier coordination & relationship	
4	Inventory level	
5	Product Variety & flexibility	
6	Setup time.	
7	Production.	
8	Maintenance of equipment	
9	Delivery compliance	
10	Quality	

5.2 Second part-According to our questionnaire which is send to different organizations the relevance of the reasons of JIT implementations, these reasons are-

S No.	Reasons	Results in %
1	Increase links to customers	94
2	Increase links to suppliers	67
3	Increase links to other department	56
4	Quality of parts number reduction	52
5	Decrease in number of suppliers	63
6	Inventory reduction	68
7	Setup time reduction	73
8	Lot size reduction	23
9	Increase flexibility of process & personnel	46
10	Paper work reduction	71
11	Material handling reduction	69
12	Movement distance reduction	36
13	Transport cost reduction	85
14	Increased quality of product& process	92
15	Increased preventive maintenance	74

5.3 Third part-Now in this table shows the different barriers for implementing just in time in Indian industries.

S.No	Reasons	Results in %
1	High cost of implementation	95
2	Barriers related to quality of an organization	47
3	Lack of communication at various level	68
4	Lack of customer awareness about product quality	79
5	Employee's involvement & commitment barriers related to an organization	65
6	Lack of team work	73
7	Lack of understanding of JIT techniques	86
8	Shortage of multifunctional workforce	90
9	Inventory management related barriers	46
10	Barriers related to process/production system	77
11	Plant & equipment layout related barriers	54
12	Cultural barriers of an organization	69

VI. RESULTS & ANALYSIS

The key points & successes factors for implementation of JIT have been listed below. It is strongly believed that after adopting this key points & success factors we can reduce or eliminate the all effects of barriers to JIT implementation in any organization.

Critical Success factors for successful implementation of JIT in any organization is listed below-

6.1 Top management commitment & culture of an organization.

- Responsibility and authority are clearly defined for each employee in organization.
- Kaizen & teamwork
- Formal means for listening to employee suggestion.

6.2 Employee involvement & commitment.

- Enhances skill & competencies of employee.
- Self motivated project teams & problem solving groups.
- Enhanced employee participation in organizational development..

6.3 Supplier coordination & relationship.

- Reduction in delivery time.
- Lot size reduction.

- Reduction in paper work.
- Reduction in incoming inspections.
- Consistency in quality of material received.

6.4 Inventory level.

- Raw material inventory reduction.
- Work in process inventory reduction.
- Reduction in inventory of finished goods.

6.5 Product Variety & flexibility.

- Reduction in cycle time to produce new product.
- Manufacturing system can handle different delivery sequences.
- Gain in product categories.
- Flexibility to change in product design.

6.6 Setup time.

- Reduction in production leads time.
- Reduction in changeover setup time.
- Reduction in total demand satisfaction leads time.

6.7 Production.

- Improvement in productivity.
- utilization of capacity of plant
- .Improvement of process capability.
- Reduction in space requirement

6.8 Maintenance of equipment.

- Improving equipment availability, reliability, maintainability.
- Reduction in unplanned downtime.
- Reduction in numbers of stoppages.
- Enhancement in equipment utilization.

6.9 Delivery compliance.

- Improved customer order compliance.
- Reduction in number of customer warranty problems.
- Achieving dependable & faster deliveries.
- Reduction in inspection of material by customers.

6.10 Quality.

- Improvement in product quality.
- Reduction in total process defects & rejections.
- Reduction of waste & rework scrap.
- Reduction in inspection of outbound materials.

Here we perform AHP Analysis to give relative ranking for critical successful factors which is collected by sending questionnaire in different industries.

The following steps are used in AHP analysis.

1. Make a set of pairwise comparison matrices between each of the critical successful factors by using the relative scale measurement which is shown in table no. 1.
2. Calculating the priority vector on the basis of experience.
3. Calculating the consistency ratio.
4. Calculating λ_{max} .
5. Calculate consistency index(CI).
6. Selecting appropriate value of the random consistency ratio(RI).

Check the consistency of pair wise comparison matrix .

Table 1

S.No	Aspects	Indications
1	Top management commitment & culture of an organization	TO
2	Employee involvement & commitment	EC
3	Supplier coordination & relationship	SR
4	Inventory level	IL
5	Product Variety & flexibility	PF
6	Setup time.	ST
7	Production.	PR
8	Maintenance of equipment	ME
9	Delivery compliance	DC
10	Quality	QU

Table 2

Scale for AHP analysis by pair wise comparison.

Judgments of preferences	Numerical rating
Extremely preferred	9
Very strongly to extremely	8
Very strongly preferred	7
Strongly to very strongly	6
Strongly preferred	5
Moderately to strongly	4
Moderately preferred	3
Equally to moderately	2
Equally preferred	1

Table 3

Average random consistency (RI)

Matrix size	1	2	3	4	5
RI	0	0	0.580	0.90	1.120

6	7	8	9	10
1.240	1.320	1.410	1.450	1.490

Table 4 -Pair wise comparisons matrix for successful factors for implementing JIT

S.F	TO	EC	SR	PF	IL
TO	1.00	3.00	3.00	3.00	2.00
EC	1/3	1.00	2.00	2.00	3.00
SR	1/3	1/2	1.00	2.00	2.00
PF	1/3	1/2	1/2	1.00	2.00
IL	1/2	1/3	1/2	1/2	1.00
PR	1/2	1/2	1/3	1/2	1/2
DC	1/3	1/3	1/3	1/2	1/3
QU	1/2	1/3	1/2	1/3	1/2
ME	1/2	1/3	1/2	1/3	1/2
ST	1/3	1/3	1/2	1/2	1/3
SUM	4.665	7.165	9.16	10.66	12.16

S.F	PR	DC	QU	ME	ST
TO	2.00	3.00	2.00	2.00	3.00
EC	2.00	3.00	3.00	3.00	3.00
SR	3.00	3.00	2.00	2.00	2.00
PF	2.00	2.00	3.00	3.00	2.00
IL	2.00	3.00	2.00	2.00	3.00
PR	1.00	2.00	2.00	2.00	2.00
DC	1/2	1.00	3.00	3.00	3.00
QU	1/2	1/3	1.00	2.00	2.00
ME	1/2	1/3	1/2	1.00	2.00
ST	1/2	1/3	1/2	1/2	1.00
SUM	14.00	18.00	19.00	20.05	23.00

Now calculating consistency ratio(CI) as follows:
For the value of λ max the weighted sum matrix for customer focus is calculated as follows

$$\begin{aligned}
 &0.2140 \begin{pmatrix} 1.0 \\ 1/3 \\ 1/3 \\ 1/2 \\ 1/3 \\ 1/2 \\ 1/2 \\ 1/3 \end{pmatrix} + 0.130 \begin{pmatrix} 3.0 \\ 1.0 \\ 1/2 \\ 1/2 \\ 1/3 \\ 1/3 \\ 1/3 \\ 1/3 \end{pmatrix} + 0.109 \begin{pmatrix} 3.0 \\ 2.0 \\ 1.0 \\ 1/2 \\ 1/3 \\ 1/3 \\ 1/2 \\ 1/2 \end{pmatrix} + 0.0930 \begin{pmatrix} 3.0 \\ 2.0 \\ 2.0 \\ 1.0 \\ 1/2 \\ 1/2 \\ 1/3 \\ 1/3 \end{pmatrix} + 0.822 \begin{pmatrix} 2.0 \\ 3.0 \\ 2.0 \\ 2.0 \\ 1.0 \\ 1/2 \\ 1/3 \\ 1/3 \end{pmatrix} \\
 &+ 0.0710 \begin{pmatrix} 2.0 \\ 2.0 \\ 3.0 \\ 2.0 \\ 1.0 \\ 1/2 \\ 1/2 \\ 1/2 \\ 1/2 \end{pmatrix} + 0.056 \begin{pmatrix} 3.0 \\ 3.0 \\ 2.0 \\ 3.0 \\ 2.0 \\ 1.0 \\ 1/3 \\ 1/3 \end{pmatrix} + 0.0521 \begin{pmatrix} 2.0 \\ 3.0 \\ 2.0 \\ 3.0 \\ 2.0 \\ 3.0 \\ 1.0 \\ 1/2 \end{pmatrix} + 0.048 \begin{pmatrix} 2.0 \\ 3.0 \\ 2.0 \\ 3.0 \\ 2.0 \\ 3.0 \\ 2.0 \\ 1.0 \end{pmatrix} + 0.048 \begin{pmatrix} 3.0 \\ 3.0 \\ 2.0 \\ 3.0 \\ 2.0 \\ 3.0 \\ 2.0 \\ 1.0 \end{pmatrix} \\
 &= \begin{pmatrix} 2.30 \\ 1.81 \\ 1.43 \\ 1.21 \\ 1.01 \\ 0.86 \\ 0.72 \\ 0.55 \\ 0.51 \\ 0.45 \end{pmatrix}
 \end{aligned}$$

Now Divide all the elements of the weighted sum matrices by their respective priority vector elements.

1. $2.30 / 0.214 = 10.74$
2. $1.81 / 0.13 = 13.92$
3. $1.43 / 0.109 = 13.11$
4. $1.21 / 0.093 = 13.00$
5. $1.01 / 0.082 = 12.31$
6. $0.86 / 0.071 = 12.11$
7. $0.72 / 0.056 = 12.85$
8. $0.55 / 0.052 = 10.57$
9. $0.51 / 0.048 = 10.62$
10. $0.45 / 0.043 = 10.45$

For the value of λ max calculating the average of the above values

$$\lambda = \frac{(10.74+13.92+13.11+13.00+12.31+12.11+12.85+10.57+10.62+10.45)}{10} = 10.96$$

Now the consistency index, CI is

$$CI = (\lambda m - n) / (n - 1) = (10.96 - 10) / (10 - 1)$$

$$CI = 0.103$$

Selecting appropriate value of random consistency ratio (RI) for a matrix of size 10 using table 3 (RI = 1.490) , then calculating the value of consistency ratio CR as follows.

$$CR = (CI / RI) = (0.103 / 1.49) = 0.069 < 0.100$$

As the value of CR is less than 0.100, which is in the acceptable range

Table 6- ranking of elements according to their priority

Critical elements	priority	Ranks
TO	0.214	1
EC	0.13	2
SR	0.109	3
PF	0.093	4
IL	0.082	5
PR	0.071	6
DC	0.056	7
QU	0.052	8
ME	0.048	9
ST	0.043	10

Now according to AHP analysis the most critical element for implementing JIT in Indian industries is Top management commitment & culture of an organization and according to this analysis least critical element is Setup time.

The detailed observation regarding barriers of JIT implementation in Indian industries are listed below-

I.Cultural barriers of an organization- culture of an organization show that the way one works & get works done under all conditions. In every organization there are some norms, management style, rituals, beliefs, ceremonies, communication, decision making methods & practices that have been come into existence over a period of time. Culture of an organization plays a important role in implementing JIT.

The barriers in implementing JIT due to culture of an organization is shown below-

- Blames are fixed instead of fixing problem.
- Belligerent industrial relations.
- Mistakes are unavoidable & have to be inspected out.
- Profit making for themselves.
- The process of recruitment is rejection rather than selection.
- Organization structure with more grade & levels.
- Social & emotional issues are suppressed, politics & power game dominates.

II. Employee’s involvement & commitment barriers related to an organization.- the main aim of JIT is to reduce waste & reduction or eliminate inventories. some of the issues which is based on employee involvement & commitment that lead to barrier in JIT implementation in an organization are listed below-

- Fast decision making & slow implementation.
- Specialized & rigid narrowly defined jobs.
- No team work & common values.
- Resistance to change.
- Communication gaps & feedback system hardly exists.

III .Barriers related to quality of an organization- the main aim of QC department is make sure that defect should be detected at source as soon as it arise .this can be achieved by cooperation of employee, management , suppliers & customers.

Barriers related to quality are listed below-

- Reactive approach.
- Quality is not build in but controlled.
- Tolerate some scrap.
- No visual control.
- Inspection at large.
- Only quality personnel responsible for quality problem.

IV. Plant & equipment layout related barriers- barriers related to plant & layout are listed below-

- Reluctant to use cellular manufacturing only automobile industries use this.
- Untidy & disorganized workplace.
- Automation is valued because it drives labour out of the product.

V. Barriers related to process/production system- production or process related barriers are listed below.

- Push system is used instead of pull system.
- WIP is needed to ensure machine utilization stays high.
- Run equipment fast as long as it runs.
- Corrective mentality instead of JIT.
- Less significant material handling system.
- Preventive maintenance is required, but not critical because of queues available.
- Low priority to scrap, maximum output is the usual goal, achieving the quick change over is a rare priority, large batch size.

VI. Inventory management related barriers-barriers related to inventory management are shown below.

- An asset, it protects against forecast errors, machine problems, and late vendor deliveries.
- Lot size is determined using EOQ.

Here we perform ISM Modeling to give relative importance & relations of barriers of implementing JIT which is collected by sending questionnaire in different industries.

A step wise procedure is to be use to develop a model using ISM.

Step 1- variables or elements affected the system under consideration are listed.

Step 2-from the elements identified in step 1 a contextual relationship is established among variables with respect to which pairs of elements examine.

Step 3- a structural self interaction matrix (SSIM) is constructed for elements.

Step 4- reachability matrix is constructed from SSIM & the matrix is checked for transitivity.

Step 5-the reachability matrix formed in step 4 is partitioned into different level.

Step 6- based on relationship given above in matrix, a directed graph is drawn.

Step 7- the resultant diagram is converted in to ISM.

Table 1

Sr no	Barriers or elements	Indications
1	High cost of implementation	A1
2	Barriers related to quality of an organization	B1
3	Lack of communication at various level	C1
4	Lack of customer awareness about product quality	D1
5	Employee's involvement & commitment barriers related to an organization	E1
6	Lack of team work	F1
7	Lack of understanding of JIT techniques	G1
8	Shortage of multifunctional workforce	H1
9	Inventory management related barriers	I1
10	Barriers related to process /production system	J1
11	Plant & equipment layout related barriers	K1
12	Cultural barriers of an organization	L1

Table 2 –structural self interaction matrix

Sr.no.	Challenging issues	L1	K1	J1	I1	H1
1	A1	O	X	X	O	X
2	B1	X	O	V	X	O
3	C1	O	V	V	A	V
4	D1	O	V	O	V	X
5	E1	O	O	V	V	V
6	F1	O	V	A	X	A
7	G1	V	A	V	A	O
8	H1	O	V	O	O	
9	I1	O	O	X		
10	J1	O	X			
11	K1	O				
12	L1					

Sr.no.	Challenging issues	G1	F1	E1	D1	C1	B1	A1	Sr. no.	Challenging issue	F1	E1	D1	C1	B1	A1
1	A1	V	X	A	O	V	O		1	A1	1	0	0	1	0	1
2	B1	V	V	X	X	X			2	B1	1	1	1	1	1	0
3	C1	V	A	O	A				3	C1	0	0	0	1	1	0
4	D1	X	O	O					4	D1	0	0	1	1	1	0
5	E1	A	A						5	E1	0	1	0	0	1	1
6	F1	V							6	F1	1	1	0	1	0	1
7	G1								7	G1	0	1	1	0	0	0
8	H1								8	H1	1	0	1	0	0	1
9	I1								9	I1	1	0	0	1	1	0
10	J1								10	J1	1	0	0	0	0	1
11	K1								11	K1	0	0	0	0	0	1
12	L1								12	L1	0	0	0	0	1	0

Here

V- Challenging issue ‘I’ lead to or influences challenging issue ‘j’.

A- Challenging issue ‘I’ influenced by challenging issue ‘j’.

X- Challenging issue i & j influence each other.

O- Challenging issue I & j do not influence or affected each other since they are unrelated.

Development of initial & final matrix

Initial matrix

Table 3 -Rules for transformation

If the (i,j) entry in the SSIM is	Entry in the initial reachability matrix	
	(i,j)	(j,i)
V	1	0
A	0	1
X	1	1
O	0	0

Table 4- Initial Reachability Matrix

Sr. no.	Challenging issue	L1	K1	J1	I1	H1	G1
1	A1	0	1	0	0	1	1
2	B1	1	0	1	1	0	1
3	C1	0	1	0	0	1	1
4	D1	0	1	1	1	1	1
5	E1	0	0	1	1	1	0
6	F1	0	1	1	1	0	1
7	G1	1	0	0	0	0	1
8	H1	0	1	0	0	1	0
9	I1	0	0	1	1	0	1
10	J1	0	1	1	1	0	0
11	K1	0	1	0	0	0	1
12	L1	1	0	0	0	0	0

Table 5- final reachability matrix

Sr. no.	Challenging issue	L1	K1	J1	I1	H1	G1
1	A1	0	1	0	0	1	1
2	B1	1	0	1	1	0	1
3	C1	0	1	0	0	1	1
4	D1	0	1	1	1	1	1
5	E1	0	0	1	1	1	0
6	F1	0	1	1	1	0	1
7	G1	1	0	0	0	0	1
8	H1	0	1	0	0	1	0
9	I1	0	0	1	1	0	1
10	J1	0	1	1	1	0	0
11	K1	0	1	0	0	0	1
12	L1	1	0	0	0	0	0
	Dependence	3	7	8	6	5	8
	F1	E1	D1	C1	B1	A1	Drive power
1	0	0	1	0	1	7	
1	1	1	1	1	0	9	
0	0	0	1	1	0	6	
0	0	1	1	1	0	7	
0	1	0	+1	1	1	7	
1	1	0	1	0	1	7	
0	1	1	0	0	0	5	
1	0	1	0	0	1	5	
1	0	0	1	1	0	6	
1	0	0	0	0	1	5	
0	0	0	0	0	1	4	
0	0	0	0	1	0	2	
6	4	4	7	6	6		

Table 6: Level partition – iteration 1

Issue No.	Reachability set	Antecedent set	Intersection set	Level
A1	1 3 6 7 8 10 11	1 5 6 8 10 11	1 6 8 10 11	
B1	2 3 4 5 6 7 9 10 12	2 3 4 5 9 12	2 3 4 5 9 12	
C1	2 3 7 8 10 11	1 2 3 4 5 6 9	2 3	
D1	2 3 4 7 8 9 11	2 4 7 8	2 4 7 8	
E1	1 2 3 5 8 9 10	2 5 6 7	2 5	
F1	1 3 5 6 7 9 11	1 2 6 8 9 10	1 6 9	
G1	4 5 7 10 12	1 2 3 4 6 7 9 11	4 7	I
H1	1 4 6 8 11	1 3 4 5 8	1 4 8	
I1	2 3 6 7 9 10	2 4 5 6 9 10	2 6 9 10	
J1	1 6 9 10 11	1 2 3 5 7 9 10 11	1 9 10 11	I
K1	1 7 10 11	1 3 4 6 8 10 11	1 10 11	I
L1	2 12	2 7 12	2 12	

Table 7: Level partition – iteration 2

Issue No.	Reachability set	Antecedent set	Intersection set	Level
A1	3 8	1 5 6 8 10 11	1 6 8 10 11	II
B1	2 3	2 3 4 5 9 12	2 3 4 5 9 12	II
C1	2 3 8	1 2 3 4 5 6 9	2 3	II
D1	2 3 8	2 4 7 8	2 4 7 8	II
E1	2 3 8	2 5 6 7	2 5	II
F1	3	1 2 6 8 9 10	1 6 9	II
H1	8	1 3 4 5 8	1 4 8	II
I1	2 3	2 4 5 6 9 10	2 6 9 10	II
L1	2 12	2 7 12	2 12	

Table 8: level partition-Iteration 3

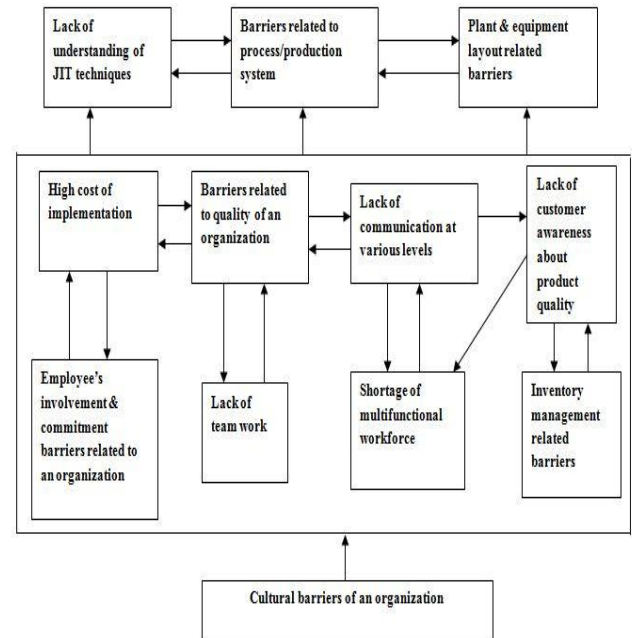
Issue No.	Reachability set	Antecedent set	Intersection set	Level
L1	12	2 7 12	2 12	III

Table 9: Final list of level partitions:-

Level	Issue no.	Issue
I	G1	Lack of understanding of JIT techniques
	J1	Barriers related to process/production system
	K1	Plant & equipment layout related barriers
II	A1	High cost of implementation
	B1	Barriers related to quality of an organization
	C1	Lack of communication at various level
	D1	Lack of customer awareness about product quality
	E1	Employee's involvement & commitment barriers related to an organization
	F1	Lack of team work
	H1	Shortage of multifunctional workforce

	II	Inventory management related barriers
III	L1	Cultural barriers of an organization

Building the ISM based model-The model developed with the barriers for implementing JIT is shown in Figure. It is clear from the ISM model that the most important issues that enables the barriers for implementing JIT are cultural barriers of an organization.



MICMAC' Analysis

		Cluster 4 Independent driving issues						Cluster 3 Linkage issues							
Driving power	12														
	11														
	10														
	9						B1								
	8														
	7				D1,E1		A1,F1								
	6						I1		C1						
	5						H1			G1,J1					
	4								K1						
	3														
	2				L1										
	1														
Cluster 1 Autonomous issues							Cluster 2 Dependent issues								
		1	2	3	4	5	6	7	8	9	10	11	12		
		Dependence													

VII. CONCLUSIONS

Indian manufacturing firm are going through hard competition & have to improve in order to become competitive globally. JIT can be very helpful for improving the performance of Indian manufacturing firm in productivity & quality. This study shows the critical elements & barriers for successful implementation of just in time in Indian manufacturing firm. In this study we categorized the barriers for implementing JIT in organization in various phases like operational, cultural, financial, technological etc. It has also been found in the study that successful implementation of JIT in Indian industries can be achieved by bringing out successful cultural changes & management commitment. Moreover, it can be concluded from the study that successful JIT implementation need to implement initiatives successfully, so as to improve organizations maintenance performance, productivity, reduce costs, unnecessary downtime, and utilization of resources.

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