

EVALUATION OF JUST IN TIME (JIT) ELEMENTS IN BANKING SECTOR USING ANOVA TECHNIQUE

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Abstract— Recently number of Indian banks has increased enormously. The effective management of banks is fast becoming of prime importance to the general welfare and prosperity of the society. Moreover with international competition some researchers attempt to improve the management techniques to increase productivity of service sector. JIT is a system designed to make an organization operate efficiently and with a minimum number of human and mechanical resources. JIT also improves quality, reduces inventory levels and provides maximum motivation to solve problems as soon as they occur. This study work finds various Just In Time (JIT) elements which are important to both the customer and the employers in Indian context. This paper presents the relative importance and difficulties in implementation of JIT elements in the banking sector and verification of data with the help of Analysis Of Variance (ANOVA) Technique and also identifies the JIT elements which are most important and easy to implement in the manufacturing Industries.

Keywords— JIT, JIT elements, survey, Banking sector, Anova technique

I. INTRODUCTION

Just-In-time (JIT) is defined in the APICS (American Production and Inventory Control Society) dictionary as “a philosophy of manufacturing based on planned elimination of all waste and on continuous improvement of productivity”. It also has been described as an approach with the objective of producing the right part in the right place at the right time (in other words, “just in time”). Waste results from any activity that adds cost without adding value, such as the unnecessary moving of materials, the accumulation of excess inventory, or the use of faulty production methods that create products requiring subsequent rework. JIT (also known as lean production or stockless production) should improve profits and return on investment by reducing inventory levels (increasing the inventory turnover rate), reducing variability, improving product quality, reducing production and delivery lead times, and reducing other costs (such as those associated with machine setup and equipment breakdown). In a JIT system, underutilized (excess) capacity is used instead of buffer inventories to hedge against problems that may arise.

JIT is just not a technique or set of techniques of manufacturing, but is an advanced approach or philosophy which embraces both new and old techniques and provides a wide range of benefits by renovation of existing manufacturing systems. A simple definition of JIT is to produce and deliver finished goods just in time to be sold, subassemblies just in time to be assembled into finished goods, fabricate parts just in time to go into subassemblies, and purchase parts just in time to be transferred in to fabricated parts.

The first basic principle involved in JIT production approach is the elimination of waste. In a JIT system, waste is defined as anything associated with the production process that does not add value to the product. Thus, waste includes quality defects, inventories of all kinds, time spent to move material and time spent in setting up the machines. If the implications of managing the reduction in waste for the categories mentioned above are analyzed, it becomes obvious why JIT is involved in all aspects of the management of production Process. The second principle of JIT involves the management of people. JIT philosophy

assumes that people are capable and willing to take on more responsibility. If defective parts are being produced, an individual can stop the production line. Once stopped, everyone working on the line has the responsibility to solve the problem.

II. METHODOLOGY

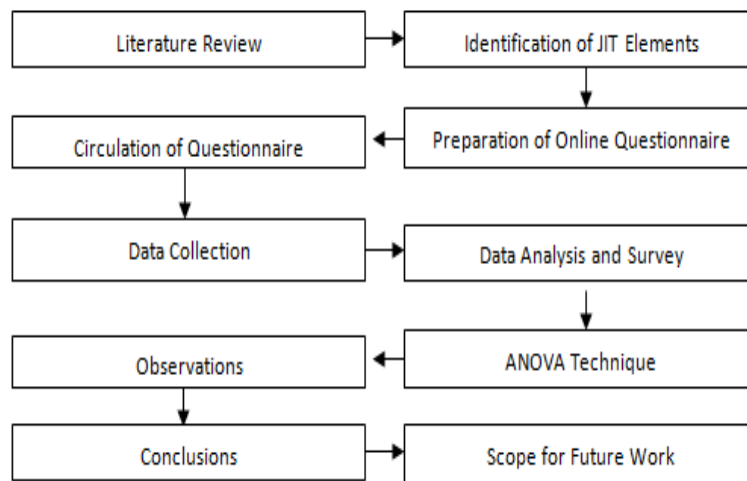
Every essential element of JIT may not be easily implemented and some elements are difficult to implement. These problems may be related to in appropriate understanding of JIT methodology or may be related to technical, operational and human problems.

There are some questions related to JIT system:

- i) Which are the essential elements of JIT?
- ii) Which elements are important and difficult to implement?
- iii) Which elements can be easily implemented?
- iv) Which elements are highly beneficial in banking sectors?

Firstly, various elements are identified from the available literature, experts from the field of academics and industrial professionals for the purpose of comparison. The procedure for the study is:

- Research design,
- Instrument,
- Survey Participants and
- Data collection.



Research Methodology

III. RESULT

We identified a detailed list of 33 elements of JIT system which are suitable for banking sectors. But all elements of JIT may not be easy to implement. Therefore, there is a necessity to find out those elements of JIT system which are easy and which are difficult to implement in Indian context. Hence a survey of banking sectors is carried out to give useful insights on the basis of listed elements and benefits to achieve the above mentioned objectives. Indian banking sectors can become competitive by successful implementation of JIT.

The questionnaire was mailed in 50 banks taking single employee from each bank. The responses were collected from all the industries successfully. Then all the responses were analyzed. The mean score for each element was calculated. There are two tables giving the mean score of JIT elements for importance and difficulties in context of Indian Banks.

The first table provides the mean score of Degree of Importance of JIT elements in various Banks.
 Table 1: Degree of Importance of JIT Elements in Banks

Sr. NO.	JIT ELEMENTS	RESPONSE					Mean Score (0-250)
		5	4	3	2	1	
1	Organization Policies	15	9	3	6	17	149
2	Communication and Information Sharing	33	11	4	3	2	227
3	People Strategy	10	12	8	6	14	148
4	Team Work	25	8	9	2	6	194
5	Employee Training	19	14	10	5	2	193
6	Expert Lectures	6	16	8	8	12	146
7	House Keeping (orderliness, cleanliness, discipline, safety)	18	11	9	7	5	180
8	Infrastructure (Aesthetic Value)	8	10	4	4	24	124
9	Job satisfaction	23	14	5	3	5	197
10	Employee Feedback and Suggestions	08	8	2	2	30	112
11	Judoka (use of modern/automatic age)	15	13	10	6	6	175
12	Quality Circles	3	8	9	3	27	104
13	Schedule Stability	4	10	10	4	22	120
14	Sole Sourcing	6	10	4	6	24	118
15	Group Incentive Scheme	12	12	6	10	10	156
16	Frequent and Reliable Service	27	16	5	2	0	218
17	Error Prevention (Poka Yoke)	8	11	10	8	13	143
18	Top Management Support	18	12	8	6	6	180

19	Value Addition Services (SDP)	2	10	8	2	28	106
20	Standardization	14	14	12	2	8	174
21	Degree of Complexity	4	10	10	6	20	122
22	Employee Empowerment	11	12	5	5	17	145
23	Customer Awareness	23	9	10	4	4	193
24	Ergonomics Design (Working Conditions)	16	13	12	4	5	181
25	Customer Satisfaction	22	13	4	5	6	188
26	Commitment	13	13	12	4	8	169
27	Flexible and multifunction workforce	13	12	12	8	7	172
28	Process flexibility	24	13	10	2	1	207
29	Lead time/ Response time reduction	02	10	3	17	18	111
30	Technical support	10	10	15	5	10	155
31	Waste Reduction	25	15	6	3	1	210
32	Storage space reduction	5	10	6	6	25	110
33	Administrative Efficiency	18	12	8	6	6	180

From Table 1, other most important elements are Group Incentive Scheme, Top Management Support, Customer Awareness, Ergonomics Design (Working Conditions), Employee Training, House Keeping (orderliness, cleanliness, discipline, and safety), Judoka (use of modern/automatic age), Flexible and multifunction workforce, Technical support, Ergonomics Design (Working Conditions) etc.

From the table 2 the most difficult elements are Organization Policies, Standardization, Group Incentive Scheme, Judoka (use of modern/automatic age), Job satisfaction, Expert Lectures, Employee Training, House Keeping (orderliness, cleanliness, discipline, safety), Employee Empowerment, Ergonomics Design (Working Conditions) and People strategy .

The least difficult elements from Table2 are Quality Circles, Sole Sourcing, Storage space reduction Degree of Complexity, Schedule Stability, Employee Feedback and Suggestions, Infrastructure (Aesthetic Value), Lead time/ Response time reduction, Value Addition Services (SDP).

Table 2: Degree of Difficulty of JIT Elements in Banks

Sr. NO.	JIT ELEMENTS	RESPONSE					Mean Score (0-250)
		5	4	3	2	1	
1	Organization Policies	6	8	12	5	19	127
2	Communication and Information Sharing	5	7	11	10	18	123
3	People Strategy	10	8	14	8	10	150
4	Team Work	6	2	6	18	16	115
5	Employee Training	9	10	14	12	5	156
6	Expert Lectures	10	10	16	10	4	162
7	House Keeping (orderliness, cleanliness, discipline, safety)	12	12	8	7	11	157
8	Infrastructure (Aesthetic Value)	8	8	11	12	11	140
9	Job satisfaction	12	9	12	15	2	164
10	Employee Feedback and Suggestions	0	10	10	10	20	110
11	Judoka (use of modem/automatic age)	13	11	11	9	6	166
12	Quality Circles	13	9	12	10	6	163
13	Schedule Stability	5	11	15	6	13	139
14	Sole Sourcing	11	12	14	8	5	166
15	Group Incentive Scheme	14	11	11	8	6	169
16	Frequent and Reliable Service	3	6	13	13	15	112
17	Error Prevention (Poka Yoke)	8	9	14	11	8	148
18	Top Management Support	16	12	10	10	2	180
19	Value Addition Services (SDP)	2	10	07	7	24	109

20	Standardization	15	10	12	11	2	175
21	Degree of Complexity	5	10	14	10	11	138
22	Employee Empowerment	13	11	10	8	8	163
23	Customer Awareness	3	7	7	14	19	111
24	Ergonomics Design (Working Conditions)	11	11	12	7	9	158
25	Customer Satisfaction	6	6	8	12	18	120
26	Commitment	3	6	12	13	16	117
27	Flexible and multifunction workforce	13	11	10	8	8	163
28	Process flexibility	5	8	7	12	18	120
29	Lead time/ Response time reduction	6	4	2	22	16	112
30	Technical support	12	11	11	6	10	159
31	Waste Reduction	5	8	10	12	15	126
32	Storage space reduction	11	12	16	6	5	168
33	Administrative Efficiency	16	12	12	10	0	184

3.1 Data Analysis

XY scatter chart is drawn between importance as abscissa and difficulty as ordinate. The axis crosses at their relative value of population mean (μ) i.e. for x axis it is 125 and for y axis its value is 125.

It is advisable that at the initial stage, those elements should be implemented in any organizations, which are highly important and relatively less difficult to implement.

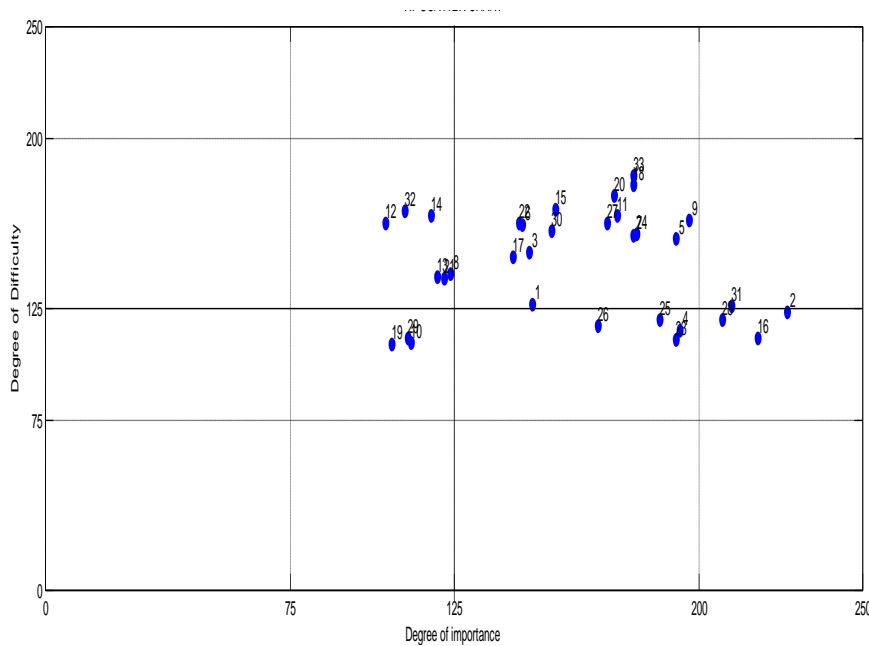


Fig: xy scatter chart

In Figure 3.1, the lower right quarter i.e. Part-1 highlights those elements of JIT which are highly important and very easy to implement. These elements are Communication and Information Sharing, Team Work, Frequent and Reliable Service, Customer Awareness, Customer Satisfaction, Process Flexibility, and Commitment.

The upper right quarter i.e. Part-2 shows those elements which are highly important but are difficult to implement. These elements are Organization Policies, People Strategy, Employee Training, House Keeping (orderliness, cleanliness, discipline, and safety), Job satisfaction, Judoka (use of modern/automatic age), Group Incentive Scheme, Top Management Support, Standardization, Ergonomics Design (Working Conditions) and Administrative Efficiency etc.

The upper left quarter i.e. Part-3 depicts those elements which are less important and very difficult to implement in banks. These elements are Storage space reduction, Technical support, Quality Circles, Sole Sourcing and Schedule Stability

The lower left quarter i.e. Part-4 demonstrates those elements which are less important but are easy to implement. These elements are Lead time/ Response time reduction, Employee Feedback and Suggestions, Value Addition Services (SDP).

3.2 ANOVA Technique

The ANOVA technique is important in the context of all those situations where we want to compare more than two populations such as in comparing the yield of crop from several varieties of seeds. In such circumstances one generally does not want to consider all possible combinations of two populations at a time for what would require a great number of tests before we would be able to arrive at a decision.

Table3: Averages of Elements for ANOVA

Groups	Count	Sum	Averages	Average of Averages
Communication and Information Sharing	50	355	7.1	6.58
Team Work	50	345	6.9	
Frequent and Reliable Service	50	340	6.8	
Customer Awareness	50	310	6.2	
Customer Satisfaction	50	335	6.7	
Commitment	50	295	5.9	
Process Flexibility	50	325	6.5	

Table 4: Calculation of F-RATIO

Source of Variation	SS	d.f.	MS	F-ratio	1% F limit
Between Groups	52.6	6	8.76	2.52	1.76
Within Groups	1193.6	343	3.47		
Total	1246.2	349			

From the above table, it is clear that F- critical is less than the calculated F value. So we may conclude that the values of elements are significant.

IV. CONCLUSIONS

In this paper, survey of 50 banks is carried out. On the basis of the mean calculated for different elements of JIT on 0-250 scale, all the elements have been analyzed and plotted on a scatter chart, from where most important and less difficult elements are found out. The data has been verified with the help of ANOVA technique.

The most beneficial elements for the surveyed Banks have also been identified. It is further suggested that JIT elements should be implemented in a phased manner and after confirming its success, it should be implemented to the whole process. First of all one should implement the most important and less difficult elements to the critical processes only as a pilot project. The most important and highly difficult elements should be implemented after the successful implementation of the pilot project.

REFERENCES

- [1] Chung, C. J. and Wee, H. M., "Optimizing the economic lot size of a three-stage supply chain with backordering derived without derivatives," European Journal of Operational Research, Vol. 183, pp. 933-943 (2007).
- [2] Zhou Xin, Huo Jiazhen , "Coordinating Ordering and Production Policies for JIT: Bargain Power Analysis" 2010 IEEE.
- [3] M. G. Korgaonker, "Just in Time Manufacturing," New Delhi: McMillan India Limited; pp.42-65, 1992.
- [4] W. S. Demmy, and G. K. Constable, "Major Elements of Just-In-Time Production," Engineering Management Conference, Engineering Leadership in the IEEE, pp. 161-164, 1988.
- [5] J. W. Toomey, "Establishing Inventory Control options for Just-in-Time Applications," Production and Inventory Management Journal, 4th quarter, pp. 13-15, 1989.
- [6] Mandeep Kumar, P.C. Tewari and Amit Gupta, "Relative Importance of JIT Elements in Banking Sector", International Journal of Applied Engineering Research, Volume 6, pp. 2179-2182, November, 2011

- [7] J. Fowler and S. Mason, "A Production-Delivery Inventory System under Continuous Price Decrease and Finite Planning Horizon", Industrial Engineering Research Conference, pp 1580-1585, 2008.
- [8] Aksoy, A., Ozturk, N. (2011), "Supplier selection and performance evaluation in just-in-time production environments", Expert Systems with Applications, Vol.38, Issue 5, pp. 6351-6359.
- [9] Garg, D., Kaul, O.N. and Deshmukh, S.G.(1998), "JIT implementation: a case study", Production and Inventory Management journal, Third quarter, pp. 112-118.
- [10] Gupta Amit, Sindhwani Rahul, Bansal Rajan, Garg R. K., "Identification of JIT Elements for Educational Industry" in national Conference on Emerging Trends in Mechanical Engineering(ETME-10) organized by Haryana College of Technology & management, kaithal.

BIOGRAPHY



Myself Vikas Panchal graduated in 2009 and obtained master degree in 2013 from university of Kurukshetra. Presently I am working as a assistant professor in mech engg. Department in H.C.T.M Technical campus, Kaithal(Haryana).my research interest in Mechanical vibration, Manufacturing system, Industrial engg.I have published two research papers in Mechanical vibration International conference and one paper in Industrial engg. Internationl journal.