

Effectiveness of Just In Time Manufacturing Practices

Dr.Uma Bhushan , Dr.Rajiv Aserkar , Dr. Karippur Nanda Kumar, Dr.A.Seetharaman*

*S P Jain School of Global Management
Dubai-Mumbai-Singapore-Sydney*

Abstract

In competitive world markets most manufacturing companies have learned that survival rests on a commitment to continual process and product improvement compete with high quality of product and low price. In today's rapidly changing marketplace a company must deliver low cost together with high quality and reliability of product to ensure retaining an adequate market share. The necessary improvements can be achieved, as has a company implement JIT in its systems. Thus the themes of this paper are to reveal the critical elements and method of assessing JIT effectiveness and the outcomes of JIT implementation towards the inventory system, organization, financial effect and employee's attitudes. Then, this paper extended to the benefits and costs of JIT sourcing.

1. INTRODUCTION

The evolution of Just in Time can be traced back about a century ago when Henry Ford tried combine all elements of manufacturing system - men, machines, materials, methods and products. Ford arranged them in a continuous system of manufacturing the Model T automobile. Though this was not met with success, at a later years, Toyota recognized the contradictions and short comings of Ford system with considerable emphasis on employees. The method was such a success that Taiichi Ohno was named father of JIT (Cheng, 1996. & García-Alcaraz, J. L., & Maldonado-Macías, A. A. 2016). This is the reason in which the Japanese were forced to create and adopt this new method (Cheng, 1996). Moreover, Schonberger states that "the just-in-time concept can simply be described as the production of one unit of a product to be incorporated just in time into a subsequent process". Schonberger and Ansari describes the JIT ideas as a system to produce and deliver finished goods, fabricate parts just in time to go into subassemblies, and purchase materials just in time to transform into fabricated parts. Monden explains JIT as a process that produces necessary units in necessary quantities at the necessary time. The purpose of JIT is to produce a unit in such a way that there is only one unit of work in process and a minimum stock of finished goods in inventories. Therefore, unnecessary inventories will be eliminated JIT employs a combination of several elements.

2. RESEARCH PROBLEMS

The often overlook problems in implementation of JIT system are seem to be as follows:

- (a) Employees and supervisors not ready for changing in new working environment. JIT represents a revolutionary change in the workplace. For instances, in term of working performance, a worker cannot produce another unit until the worker at the next station signals that another unit is needed. At the end of a shift, each worker in the group will have produced the same output. Performance, then, must be evaluated on the output of the entire group rather than of the individual.
- (b) The importance of worker and management commitment.

3. OBJECTIVES OF THE RESEARCH.

The objectives of the research are:

- To study and explore on the vulnerable threats that possibly face by firms in applying JIT method.
- To shed the lights on the undermining threats that could be prevented and the mitigation plans that could reduce the risk.

4. SCOPE OF STUDY.

There have been numerous articles and books written about JIT. The typical topics covered in this scope of study include the system's operating procedures and characteristics, implementation strategies, and benefits (theoretical and actual) such as efficiency improvements, cost savings, quality improvements, and modifications of the supplier/producer relationship.

5. SURVEY OF LITERATURE.

Just-in-time (JIT) manufacturing is one of the latest Japanese management techniques to be adopted and implemented by many companies. The companies have to take an action to meet in today's rapidly changing

marketplace where a company must deliver low cost together with high quality and reliability of product to ensure retaining an adequate market share. 5 major issues of concern are drawn from these articles:

- 5.1. Critical elements in JIT implementation.
- 5.2. Method for assessing JIT effectiveness.
- 5.3. Total system JIT outcomes: inventory, organization and financial effects.
- 5.4. Impact of implementation JIT on employee's attitudes.
- 5.5. Benefits and cost of JIT sourcing.

5.1. Critical elements in JIT implementation.

Singh, G.& Singh Ahuja, I. (2014) narrated the following critical success factors of JIT

- a. Easy to understand the concept of JIT but difficult to implement due to requirement fundamental change in the organization structure.
- b. Switching over from traditional manufacturing system to JIT manufacturing system
- c. Time reduction in term of machine set-up time to accomplish the ideal lot size of one unit.
- d. Implementation of group technology to perform different tasks together into one work cell.
- e. Cross-training of workers to operate multiple machines.
- f. Need for preventive maintenance to overcome very little work-in-process inventory and disruptive machine breakdowns.

5.2. Method for Assessing JIT effectiveness

As a result of progressive implementations of just-in-time (JIT) management practices, researchers have attempted to identify method for assessing JIT effectiveness. The success of the JIT implementation is influenced by the support from the organization that promotes use of the JIT practices (Hallihan et al., 1997). Moreover, the first proposed model of JIT components was developed by Giunipero, but focused on managerial support for JIT implementation issues rather than operational components. In 1992, Mehra and Inman[14] proposed a model based on their review of existing literature that identified 19 elements they found to be critical to JIT success, and grouped them into four key factors: management commitment, JIT production strategy, JIT vendor strategy, and JIT education strategy. Mehra and Inman then tested hypotheses based on their classification by conducting a survey of 550 manufacturers. Based on the 114 usable responses Mehra and Inman concluded that:

- (1) No significant relationship was found between management commitment and JIT educational strategy and the level of successful JIT implementation;
- (2) There was a significant relationship between JIT production strategy and JIT vendor strategy and JIT success.

Other than that, based on a case study conducted by Mehra and Inman (2000) in service industry for Ajax's company, there are four critical factors appears to be significant when implementing the JIT system. The four critical factors are;

- (a) quality
- (b) teamwork
- (c) education
- (d) communication

Quality is absolutely essential if JIT to be successful. The Ajax Company utilized quality assurance representatives to work directly with the suppliers to assure "zero defect" and promote and emphasis on quality. (Gmeiner, J et al. 2015) The next critical factor is teamwork. The spirit of teamwork was always presents in Ajax's efforts to adopt JIT concept. Working together was heavily emphasized by top management and followed by the JIT team. For example, after JIT was operationalised, team members from purchasing and other departments frequently missed meetings which led management to persuade the employee to attend. The team members were asked to decide whether or not they were truly team players. If they were not, they were replaced by someone who was identified as being a team player. To further enhance the team spirits, all team members rotated in the position of chairperson of the team meetings. This way everyone will participate in co-ordinating meeting agenda and problems solving. Furthermore, proper education in the basics of the JIT concept including the benefits of successfully adapting it played a key role in Ajax's effort to implement JIT. Through education, employee and vendor entry into the system was facilitated. The process of the education itself helped created team spirit and it proved to be a vital factor for successful JIT implementation. The fourth factor was good communication proved to be a vital factor in JIT implementation at Ajax. Right from the beginning, there was emphasis an open and timely communication between all parties involved in the JIT implementation. Faster communication between the vendor and Ajax's buyer substantially reduced defect and enhance incoming materials.

5.3. Total system JIT outcomes: inventory, organization and financial effects.

The basic aim of JIT is to produce and deliver a planned product by processing exact quantity of materials with exact time required. Though this is simple and straight step, achievement of this aim is difficult and complex (Zipkin, 1991).

In terms of eliminating waste, the following are considered.

- (a) Waste from inventory
- (b) Waste of transportation
- (c) Motion waste
- (d) Overproduction waste

JIT improves financial performance (Zipkin 1991 & Dean and Snell, 1991), enhances long term marketing performance (Davy et al., 1992; Jackson, 1983), reduces cost to improve profitability (Courtis, 1995; Stamm and Golhar, 1991), quickly fills new orders (Courtis, 1995) and reduces repair and warranty cost.

5.4. Impact of implementation JIT on employee's attitudes.

Implementation JIT will also give significant impact to the employee's attitudes from the operators till managers. As for the operators, JIT implementation causes other changes in the operators' work environment (Michael H.Peter and M.Jill Austin 1995).

Moreover, based on case study conducted by David F. Groebner and C. Mike Merz (1993) from Boise State University, Boise, Idaho, USA the impact of implementation on JIT towards employee's attitudes are more on general impact towards the implementation JIT. Meaning that, the employees are including managers and operators. The case study based on Hewlett Packard decided to implement JIT on one electronic assembly line. While implementing JIT was generally done within the context of business as usual, certain specific actions were taken:

- (a) The supervisor of the assembly line was given the additional title of "JIT Champion". While the terminology was different, asking one person to spearhead a change effort is a common technique at Hewlett-Packard.
- (b) Since Hewlett-Packard competes in a very dynamic market, Hewlett-Packard employees are well aware of the need continually to improve the operation of their company to remain competitive. While previous changes had always been made within the context of a batch-processing environment, the move to JIT was largely seen as just one more in a long series of changes.
- (c) Hewlett-Packard remained true to its employment security objective. While improvements in productivity were seen, no one was laid off because of changes due to JIT.

After done some changes regarding the employee's duties and tasks, these changes indirectly give effect towards the working environment in the company. Typically; a company will change to JIT from the traditional batch-processing mode. From a production line worker's standpoint, JIT represents a revolutionary change in the workplace. Some of the most significant changes JIT creates in the work environment include:

- (a) Performance evaluation.

With JIT, a worker cannot produce another unit until the worker at the next station signals that another unit is needed. Performance, then, must be evaluated on the output of the entire group rather than of the individual. Workers who excel at meeting individual production goals receive high evaluations in a batch processing system, but may not be evaluated highly in a JIT system which emphasizes contribution to their group's production output.

- (b) Group interaction.

Under JIT, each worker depends on the preceding station for a continuous supply of units to work on, but cannot begin work on a unit until the person at the next station signals that another unit is needed. All workers must act as a team, then, rather than as individuals.

- (c) Job flexibility.

Because the goal of JIT is to produce to demand rather than achieve smooth production runs, each worker must be cross-trained to perform several tasks so that he or she can fill in where needed. Performance evaluations under JIT are based partly on a worker's flexibility to accept a wide range of tasks. On the typical batch method production line, a worker's primary responsibility is to achieve a high output on a single task.

- (d) Mode of supervision.

With JIT, work groups are expected to solve some of their own problems, so more power is bestowed upon workers, Supervisors, therefore, have to give up a certain amount of control. For those supervisors in our study company with an authoritative management style, accepting group decision making was difficult.

- (e) Potential loss of security.

In a batch-processing environment, workers have the security of knowing what their job is each day. In addition, seeing all the work-in-process sitting around indicates there is work to be done. Under JIT, not only is work-in-process greatly reduced but the worker does not know what he or she will be doing each day.

5.5. Benefits and cost of JIT sourcing.

The benefits received by many JIT users as reported in several survey studies. Based on study conducted by Seyed-Mahmoud Aghazadeh (2004), elimination of waste is the indirect benefit between suppliers and are the advantages and disadvantages in implementing of JIT system Abolfazl Kazazi, (1999) opines that production lines can be increased by getting extra space due to abolition of warehouses. Extended advantages from a study done by Niall Waters-Fuller (1996) Department of Management Studies, Napier Business School, Edinburgh, Scotland, UK is the relationships in supply chain both to buyers and suppliers. That is so because, the main characteristics of JIT purchasing are that the delivery frequency increases and selection of suppliers is on the basis of least total cost (made up of delivery reliability, price and quality). The relationship with the supplier has a long term emphasis and suppliers are either single or dual sources. These factors result in a closer relationship between buyer and supplier and a form of mutual dependency. By extending JIT to the supply chain both the buyer and the supplier benefit (a win-win outcome):

- (a) The buyer is able to shift the responsibility for inventory and quality to the supplier, consequently benefiting through reduced inventory costs and reduced inspection, scrap and re-work costs. The buyer may also be able to benefit through value engineering (VE) savings by involving the supplier in the design stages. Further savings can be made by reducing material handling costs through the implementation of standard or reusable packaging.
- (b) Suppliers benefit through obtaining an increase in volume (due to being single sourced) and having a long term relationship with the buyer.

Factors contributing to failure are as follows.

- (a) Lack of cooperation from vendors in a form of inconsistent timing and quantities of deliveries;
- (b) The lack of resources to invest in direct linkages with vendors;
- (c) The unwillingness of workers to perform multi-tasks;
- (d) Management’s resistance to sharing operational power with employees;
- (e) The lack of management confidence in hourly workers’ commitment to the organization; and
- (e) The lack of accurate forecasting system.

6. RESEARCH METHODOLOGY

With the help of using secondary data in the form of large literature to do this qualitative research, the following research methodology is framed.

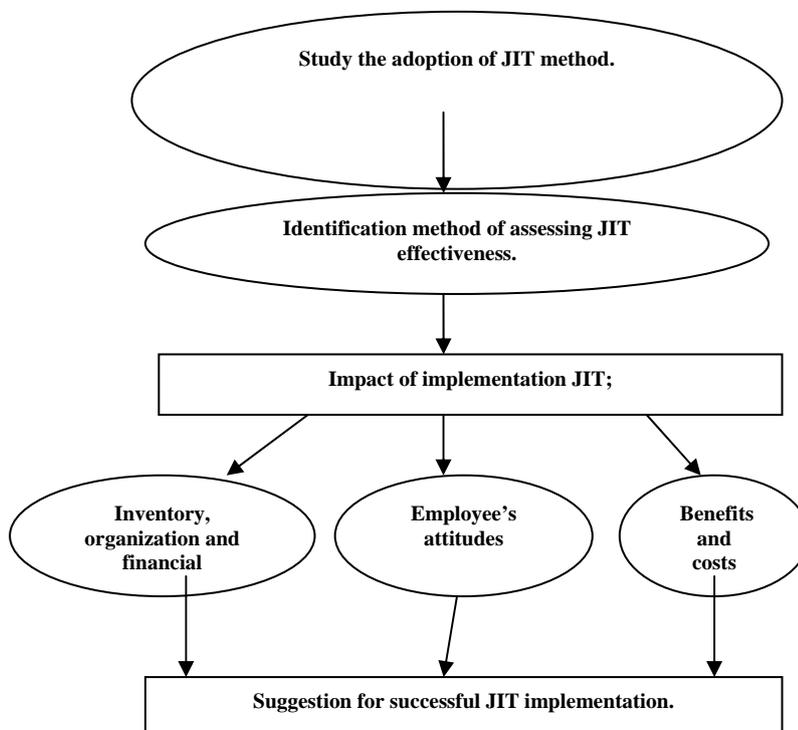


Figure 1: Research framework on the methodology of JIT implementation in an organization.

7. DISCUSSION, ANALYSIS & FINDING.

This paper found that, the integration among employees, management, suppliers and organization is a vital factor for the success in implementing JIT in an organization. Here are the lists of characteristic and supporting factors that were important to JIT implementation. According to these suppliers, the most important characteristics (not in any particular order) were as follows:

- Close relationship between the manufacturers and their suppliers.
- More frequent and precise order of parts and components.
- Manufacturers should have more trust in the suppliers.
- Machine set up and break down time should be short (at the supplier).
- Better machine layout (at the supplier).
- Frequent deliveries.
- Raw materials and work in process are of high quality.
- Good control of raw materials and work in process.

Moreover, this paper found that, JIT not just as an approach to cutting cost, but as a means of gaining competitive advantage. The most important aspects were (Abd.Hamid., 1988) low raw materials and work in process inventory, less inventory space, greater financial benefits as a result of a decrease in inventory investments and lower level of inventory will induce further cuts in labour costs.

8. LIMITATIONS.

As with other research papers, this paper has its limitations which can be classified as follow:

- Information presented in this paper was basically sourced from secondary data. There was no sufficient time to conduct survey from the system users in Malaysia.
- This research paper is limited to emphasize on the significant and foreseen threats of current digital accounting. Therefore, the suggestion of the mitigation plans are bound to the threats as discussed in this paper.

9. CONCLUSION

This study indicates that managers adopting JIT practices have experienced considerable benefits in all of the measured areas: quality improvements, time-based responses, employee flexibility, accounting simplification, firm profitability, and inventory reductions. Moreover, this study also provides convincing evidence that the more comprehensive (both in breadth and depth) is the adoption of JIT, the greater are the overall returns. Both low and high adopters are receiving similar benefits when their focus is restricted to JIT manufacturing practices and quality maintenance leads to greater benefits. The JIT practices most likely found in firms that have more fully committed to the JIT philosophy. The increasing economic importance of service industries reinforces the need for complementary research of this sector to determine which JIT concepts could provide competitive advantage in this environment. JIT is not a panacea for all market challenges. Nonetheless, strong evidence of JITs substantial benefits merits its consideration as part of organizational strategy to enhance long-run performance and competitiveness.

REFERENCES

- Abolfazl Kazazi, (1999), A Method for Assessing JIT Effectiveness, *Industrial Management & Data Systems*, Vol. 94 No. 7, 1994, pp. 14-17, © MCB University Press Limited, 0263-5577
- A. Kazazi and A.Z. Keller, (1994) Benefits Derived from JIT by European Manufacturing Companies, *Industrial Management & Data Systems*, Vol. 94 No. 10, 1994, pp. 12-14 © MCB University Press Limited, 0263-5577.
- Cheng, T. C., & Podolsky, S. (1996). Just-in-time manufacturing: an introduction. *Springer Science & Business Media*.
- Cindy Claycomb, Richard Germain, Cornelia DroÈge, (1999), Total system JIT outcomes: inventory, organization and financial effects, *International Journal of Physical Distribution & Logistics Management*, Vol. 29 No. 10, 1999, pp. 612-630. # MCB University Press, 0960-0035.
- David F. Groebner and C. Mike Merz, (1994), The Impact of Implementing JIT on Employees' Job Attitudes, *International Journal of Operations & Production Management*, Vol. 14 No. 1, 1994, pp. 26-37. © MCB University Press, 0144-3577.
- García-Alcaraz, J. L., & Maldonado-Macías, A. A. (2016). Just-in-time elements and benefits. Springer
- Gmeiner, J., Ramler, R., & Haslinger, J. (2015). Automated testing in the continuous delivery pipeline: A case study of an online company. In *Software Testing, Verification and Validation Workshops (ICSTW), 2015 IEEE Eighth International Conference on* (pp. 1-6). IEEE.
- Injazz J. Chen, Chia-Shin Chung and Atul Gupta, The Integration of JIT and FMS: Issues and Decisions, *Integrated Manufacturing Systems*, Vol. 5 No. 1, 1994, pp. 4-13 © MCB University Press Limited, 0957-6061.

- Javier Gonzalez Benito, (2002), Effects of the Characteristics of the purchased Products in JIT Purchasing Implementation, *International Journal of Operation & Product Management*, vol 22, No.8, pg 868 -886.
- Katsuhiko Takahashi , Nobuto Nakamura, (2000), Agile control in JIT ordering systems , *International Journal of Agile Management Systems* 2/3 [2000] 242±252.
- Lawrence Christensen, (1996), JIT sensitive distribution – cutting waste and serving the customer, *Logistics Information Management*, Volume 9 · Number 2 · 1996 · pp. 7–9 © MCB University Press · ISSN 0957-6053
- Leslie K. Duclos, Samia M. Siha, Rhonda R. Lummus, (1995), JIT in services: a review of current practices and future directions for research , *International Journal of Service Industry Management*, Vol. 6 No. 5, 1995, pp. 36-52. © MCB University Press, 0956-4233.
- Mahmoud M. Yasin, Marwan Wafa, Michael H. Small, (2004), Benchmarking JIT An analysis of JIT implementations in the manufacturing service and public sectors, *Benchmarking: An International Journal* Vol. 11 No. 1, pp. 74-92, Emerald Group Publishing Limited 1463-5771 DOI 10.1108/14635770410520311.
- Michael H. Peters and M. Jill Austin, (1995), The impact of JIT: a critical analysis, *Industrial Management & Data Systems*, Vol. 95 No. 1, 1995, pp. 12-17 © MCB University Press Limited, 0236-5577.
- Michael S. Spencer, Dale S. Rogers, Patricia J. Daugherty, (1994) JIT Systems and External Logistics Suppliers, *International Journal of Operations & Production Management*, Vol. 14 No. 6, 1994, pp.60-74, © MCB University Press, 0144-3577.
- Mike Simpson, Geoff Sykes and Adini Abdullah, Case study: transitory JIT at Proton Cars, Malaysia, *International Journal of Physical Distribution & Logistics Management*, Vol. 28 No. 2, 1998, pp. 121-142. © MCB University Press, 0960-0035.
- Narender K. Ramarapu, Satish Mehra and Mark N. Frolick, (1995), A comparative analysis and review of JIT “implementation” research, *International Journal of Operations & Production Management*, Vol. 15 No. 1, 1995, pp. 38-49. © MCB, University Press, 0144-3577.
- Niall Waters-Fuller, (1996)The benefits and costs of JIT sourcing: A study of Scottish suppliers, *International Journal of Physical , Distribution & Logistics, Management*, Vol. 26 No. 4, 1996, pp. 35-50. © MCB University Press, 0960-0035.
- R. “Nat” Natarajan, S.K. Goyal, (1994), Safety Stocks in JIT Environments, *International Journal of Operations & Production Management*, Vol. 14 No. 10, 1994, pp. 64-71. © MCB University Press, 0144-3577.
- Rosemary R. Fullerton , Cheryl S. McWatters , Chris Fawson, (2003), An examination of the relationships between JIT and financial performance, *Journal of Operations Management* 21 (2003) 383–404.
- Rosemary R. Fullerton a, Cheryl S. McWatters, (2001), The production performance benefits from JIT implementation, *Journal of Operations Management* 19 (2001) 81–96.
- Seyed-Mahmoud Aghazadeh, (2004) Does Manufacturing Need to Make JIT Delivery Work?, *Management Research News*, Volume 27 Number 1/2 2004.
- Singh, G., & Singh Ahuja, I. (2014). An evaluation of just in time (JIT) implementation on manufacturing performance in Indian industry. *Journal of Asia Business Studies*, 8(3), 278-294.
- Thomas A. Carnes, Jefferson P. Jones, Timothy B. Biggart, Katherine J. Barker, (2003), Just-in-time inventory systems innovation and the predictability of Earnings, *International Journal of Forecasting* 19 (2003) 743–749.
- Yasuhiro Monden, (2002), The relationship between mini profit-center and JIT system, *Int. J. Production Economics* 80 (2002) 145–154.
- Zhiwei Zhu and Paul H. Meredith,(1995), Defining critical elements in JIT implementation: a survey, *Industrial Management and Data Systems*, Vol. 95 No. 8, 1995, pp. 21-28 © MCB University Press Limited, 0263-5577.