

# JUST-IN-TIME Technology: A Technique for Achieving Excellence in Operations and Logistics Management

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## Abstract

*Indian companies are continuously facing challenges in the manufacturing sector regarding quality, cost and timely delivery. The entry of international firms in every sector has led them to a persistent struggle to survive in a highly competitive environment. Most of the smaller companies have shut down their business and production, whereas larger companies have found it inevitable to implement production planning and cost reduction in their operations. Just-in-time (JIT) can help them face competition successfully. JIT helps in better efficiency and cost minimization focusing on an uninterrupted flow of work for timely delivery. The question is whether Indian companies are ready for the implementation of JIT in their operations. The present study seeks to highlight the nuances of practising JIT and focuses on the descriptive analytical and conceptual framework of JIT, along with analyzing a few case studies.*

**Keywords:** *Quality, Production, Just-In-Time, Strategy*

## Introduction

‘JIT is viewed as more of a philosophy than a series of manufacturing techniques. It also is viewed as a set of management technologies in the global world. Because of that, JIT has been famous to the world. United States has become one of the first countries that implemented JIT in year 1982.’

India is emerging as a force to reckon with in the world economy. The world's focus is shifting towards emerging economies, mainly on India, China, Russia and Brazil. These economies have to compete with one another for resources. The emphasis, less on the developed world as most European economies are crumbling down, and America struggles with internal issues and trade depression due to COVID-19. With market economies opened up for multinational companies, it has become highly competitive for the local companies to survive. Customer loyalty and the creation of brand equity is a major challenge in a scenario where alternate

brands compete for attention. Cost reduction, quality improvement, better terms of trade, lower pricing, heavy advertising and innovation are the focus areas of improvement for modern firms.

Quality has become a quintessential part of long-term planning, and many techniques have evolved over time. Total Quality Management (TQM), Statistical Quality Control (SQC), and Six Sigma (SS) are some techniques for continuous quality improvement. Just-in-time (JIT) is a tool for achieving TQM. Just-in-time (JIT) manufacturing, also known as ‘lean manufacturing’, refers to a system of production where goods are produced only when an order is placed by a customer. Many large manufacturing companies such as Dell, Toyota, and Harley Davidson have implemented JIT.

JIT requires a complex change in organization. The main reasons for implementing JIT are to reduce or eliminate wastages in terms of raw materials, inventory, components, time and resources. With JIT, zero inventory is achieved because as and when

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a customer needs a product, it is manufactured and therefore excess stock is not maintained. The customers do not have to wait for their products and the manufacturer does not need to keep a large inventory of stock.

‘As JIT is viewed as an organizational philosophy, an organization needs to modify its operating procedures, production system and its organizational culture. Besides that, in order JIT to be effective, JIT has to be viewed as an organization wide practice. So, to enjoy the fruit of JIT, it requires an organization to change their organizational culture. Employee involvement also has been considered a major factor of JIT implementation elements. To support employee involvement, quality circle and total quality controls are being practiced as significant tools.’

‘JIT is a system of manufacturing logistics in which materials or parts are ordered and delivered just before they are needed in the production process. As a result, JIT manufacturers gain flexibility in their ordering decisions, reduce the stocks of inventory held on-site, and eliminate inventory carrying costs. The flexibility of JIT allows manufacturers to meet all fluctuations in the demand for their products, which allows them to sell more. It facilitates improve competitiveness in a highly fluctuating trade cycle.’ the savings generated by reducing inventory carrying costs allow JIT manufacturers to charge lower prices for their products, which lead consumers to increase demand.

JIT is a ‘pull’ tool of Operations Management: after a product is ordered, it is produced. This facilitates a firm to produce only when required and not before at the opportune time. It leads to keeping a smaller stock of raw materials, components and goods in the inventory. It can be achieved with a careful implementation of scientific scheduling and product processing/assembly for the manufacturing

function. Modern production firms use advanced zcomputerized tools for each production cycle based on statistical techniques such as Economic Order Quantity (EOQ). EOQ is a standardized technique of operations management and costing. It comprises finding optimum order size with almost zero lead time, based on statistical theory, through computer software that sends auto-generated text messages to ensure timely delivery.

The ideology of JIT is ‘producing the necessary item in the necessary quantity at the necessary time is an eternal driver of production and operations management’. There are several systems and tools to implement JIT successfully, such as Kanban, SQC, EOQ. A JIT system for, the minimises all sorts of waste and improves operational efficiency through cost reduction by improving the production process, which leads to higher profits.

JIT can be understood to be a variation of production planning and control, which are significant for sustaining customer expectations in a highly competitive market. JIT is a ‘pull’ strategy, whereas old production planning and control systems used a push strategy, in which the planning department decides a schedule and transmits forecasts and targets to all other departments. A proper IT system has become inevitable in communication among departments. Electronic Kanban is a new trend in production control that is a manufacturing philosophy comprising of scientific integration of activities and procedures to attain production in a most efficient manner with minimum stock keeping.

## **History and Development**

The history of using JIT goes back to 1970s, when Toyota started using it in its production units. Taiichi Ohno used the concept through a programme to reduce waste and stock and to attain efficiency to create a competitive edge for the company. He underlined that customers want better quality in a

short time, and it is possible if every employee in the company is involved in quality maintenance or JIT implementation. In other words, company-wide awareness for quality and efficiency was created for the first time in Japan.

Initially, JIT was used as a tool to reduce stocks in shipyards; however, it progressed as a management

philosophy comprising scientific tools and techniques. Gradually, it became a popular strategy of increasing efficiency and reducing the cost of production worldwide. Other manufacturing companies also started following the philosophy of less or zero inventory and Kanban systems to reduce costs and enhance customer satisfaction in minimum time.

**Table 1: Comparison of Traditional with JIT Manufacturing**

<b>Principles</b>	<b>Tradition Manufacturing</b>	<b>JIT manufacturing</b>
<b>Quality</b>	Inspect goods only at critical points.	Workers inspect the goods in the process. Goal is to achieve zero defects.
<b>Planning &amp; Controlling</b>	Focus is on planning. Adopts push system	Focus is on controlling. Adopts pull system.
<b>Capacity</b>	Larger batch sizes. Inflexible capacity. Highly utilized.	Small batch sizes. Flexible capacity to minimize waste. Moderately utilized.
<b>Inventories</b>	Have large WIP buffer inventories	Inventory is seen as an evil, still maintain small WIP buffers
<b>Workforce</b>	Competitive attitude between workers and manager	Workers have cooperative attitude and are broadly skilled to tackle the problems.
<b>Layout</b>	Job shop manufacturing	Cellular manufacturing
<b>Transformation</b>	Longer lead times	Shorter lead times
<b>Maintenance</b>	Corrective measure, repairing a machine when it breaks down	Preventive measure, machines are continuously checked at regular interval of time
<b>Suppliers</b>	Multiple sourcing and suppliers are treated as adversaries	Single sourcing and suppliers become part of the team

## JIT Inventory Management

The technique of JIT is based on the elimination of duplication and reduction in the inventory of supplies, components, etc. As per JIT, the sub-parts should be made available when required in the production stage and not before. It aims at providing the right quantity at the right time. Hence, it is an effective means to control inventory flow, prevent its storage and manage it effectively. Thus, it aims at obtaining a balance in inventory and its holding cost. In order to be more efficient, Toyota adopted the Kanban system.

‘While the prevailing view of JIT is that of an inventory control system, it is much more. JIT is an operational philosophy which incorporates an improved inventory control system in conjunction with other systems, such as: A set-up time improvement system; a maintenance improvement system; and a quality improvement system.’

### **An efficient JIT system will focus on:**

1. Manufacturing products when customers demand them.
2. Manufacturing at a cost the customer is

offering to pay.

3. Offering a quality which is acceptable to the customer or exceeds the expectations.
4. Zero lead time in making it available just on time.
5. Elimination of wastage in labour, materials, or components.

### Advantages of JIT

1. **Reduction in inventory:** Following the philosophy of JIT results in a reduction in the inventory, leading to less cost. It requires less working capital as the turnover is much higher due to less raw materials for the work in progress. The basic tenet is targeting zero inventory, implying no blocking of capital and reduced storage and warehousing costs. However, it should not be done at the cost of the flow of work. It should be planned so that it takes care of the bottlenecks of logistics management without causing interruption in the production process.
2. **Improved quality:** As it results in savings in handling and costs of materials, emphasis is on the quality of products. Vendor selection is based on their certification and commitment to quality. The quality of production depends on the raw materials and supplies. Good quality and prompt delivery is an essential requirement of selecting a vendor. The commitment to quality can be measured in terms of international quality certification in many companies, such as Maruti Suzuki, where vendors have ISO:9000 certification for supplying spares and parts.
3. **Shorter lead times:** The strategy of JIT insists on a shorter lead time so that replenishment is fast with no interruptions in production. This is possible only with shorter lead times and

efficient planning of delivery schedules for each part. Generally, the production line is delayed due to a longer lead time and bottlenecks in transportation and handling of spares and supplies.

4. **Reduced storage:** As the technique is based on smaller inventory, the result is less storage space and cost. There is no idle stock in the production. It is scientifically planned in a flow where no process is delayed due to lack of availability of materials. However, the process should not be compromised in order to reduce storage space and cost.
5. **Increased productivity:** JIT cannot function in isolation; productivity improvement programmes and quality assurance are strategies that make this technique a success. As it reduces wastes and reworks, leading to higher productivity, this technique is worth implementing. Every company needs to streamline its processes so that it can deliver value to its customers on time. It needs a value-added analysis of each processing part of manufacturing/assembling of a product. Each stage needs to be analyzed in order to find repetitions and wasteful movements of goods from the acquiring raw material stage to shipping the finished product. This method highlights the stages through which each product moves and the time is taken at each step can be calculated. The replenishment time would suggest the time to place an order. Overall, productivity can be improved by eliminating wastages and production of or rework on defective items.
6. **Lower production costs:** The improved level of production is an outcome of strategic decision making about delivery of quality goods, lesser wastages, less defective goods produced, enhanced customer satisfaction,

etc. and the cost of production is reduced in the process. The company has to identify its inefficiencies in order to reduce its cost of production. JIT is a part of overall company planning to implement TQM and other quality improvement programmes. The bottom-line result of such exercise is economy, efficiency and profitability. At times, it is part of the counteracting forces of competition as well.

- 7. Enhanced labour and machine utilization:** JIT is based on efficiency and economy in operations at every stage of the production function. Equipment, labour and machines can be utilized more efficiently by value-added analysis of processes.

## Waste Elimination as a Strategy of JIT

One of the authorities on JIT, Taichi Ohno, a leading engineer at Toyota Motors, identified seven types of wastages most prevalent in manufacturing. It was imperative to eliminate these wastages from the production process in order to achieve excellence and economic efficiency. The philosophy of continuous improvement in operations was highlighted for the first time in Japan. The seven areas requiring focus are listed below:

- 1. Waste from overproduction:** The synchronization of quantity produced with the demand would result in less wastage in terms of over production, otherwise the stock that could not be sold piles up. Overproduction should be reduced by monitoring plant capacity utilization as per the market demand for each product category. The timing of sale is also an important determinant of production schedule.
- 2. Waste from processing:** A production function may comprise of activities which are either duplicated or not required. The series of activities to be performed needs to be analyzed with value added analysis to find their relevance. All such acts which do not add value to the product/service should be removed, and wastages emanating from repetitive and costly functions should be controlled. This requires the participation of all workers in the process of identifying such functions.
- 3. Waste from waiting:** If any division has to wait for orders, parts, components or work-in-progress from previous processes, wastages do happen. When machines breakdown, the repair time is wasted. For removing such wastages, regular maintenance of the various equipment is required. There is a need to synchronize work flow to balance out uneven loads due to seasonal and other variations in lead time. If possible, workforce could be made flexible.
- 4. Waste in transportation:** As parts, components and human resources need to move from one point to another for processing, storage or service delivery, it needs to be minimized and coordinated in order to reduce costs. In order to save time, conveyor belts, trolleys, cranes, lifts and trucks should be used. The movement should be kept to a minimum in such a manner that the distance between the plant, warehouse and supply centres is minimum. Layout of the facility should be designed in a scientific manner so that the shop floor flow of work remains uninterrupted and is in a straight line. Backward movement should be avoided in order to reduce wastages.
- 5. Waste from defectives:** Various techniques of quality control and assurance should be adopted to remove wastages arising from items produced defective. An effort should be made to have a defect-free production system. If a defective product is sold, the increase in

grievances, re-work or loss of goodwill results. Inspection of the quality of raw materials plays a major role in ensuring the quality of finished goods. Vendors should have quality processes and documents to support the claims of quality products supplied to the company. This would ensure the quality in the production function.

6. **Waste of movement:** Production is about movement and value addition to the final good. A worker may be in motion the whole day but he may be doing little work or value addition to the final product. Thus, the motion that does not add any value to the product is a waste. Some of the wasteful motions could be searching, selection, loading/unloading and storage processes. We should try to reduce such motions that add waste to the process.
7. **Waste from inventory:** Inventory storage is an expenditure which is considered non-productive, according to some authors. Larger stocks require more storage space, implying more investment. Thus, as per modern techniques of zero inventory, the lead times are reduced. The supply of finished products to customers at the right time is an equally important reason for the inventory. Wastages arise due to poor planning and inaccurate forecasting of demand for products. Firms keep a stock of finished goods as a precaution against fluctuations in future demand.

## **Push versus Pull Systems of Manufacturing**

Manufacturing large volumes of products, especially FMCG, requires repetitive operations. Two types of methods are used for buying sub-components and fabricating finished goods. The push system is described as a western technique of a traditional production system which adheres to a predetermined production schedule based on the expected demand

for the product. This technique tends to work backwards from the time the final product is made or assembled. Thus, estimated demand determines the level of components and materials to be ordered as per the planned output level. Therefore, each production process is carried out in large batches. After completion, work-in-progress is pushed to the next department for processing or used in assembly line operations. At times, push system is designed based on the Economic Order Quantity Model, which replenishes the stock based on market demand trends.

Thus, subsequent batches depend on the completion of earlier processes. Adequate quantities of materials ensure uninterrupted production of fixed goods. The workers perform their specialized jobs repetitively.

The pull system was popularised by Japanese manufacturing, different from the traditional western push production system. This technique works on the principle of simplicity, flexibility and coordination among work centres. The production schedules are planned in such a way that it is adapted as per variations in demand and not on stock. The orientation is towards assemble-to-order rather than assemble as per schedule. The buying of components, parts and materials depends on the final assembly line requirements. The purchases are 'pulled' by the actual end products' demand for the specific model, sizes, colour, etc. Production takes place when the demand arises and not ahead of demand. There is no need for extra staff for managing surplus stock. The flexibility in the production process demands a quick changeover in machine designs and equipment at the shop floor level. In order to understand the concept, some case studies are used below.

## Case Study 1: JIT in Toyota

The company identified seven types of shortcomings in its production process:

1. Lack of estimates in production
2. Lead time is more with lack of productivity and economy
3. Increased transport costs at different points of production
4. Duplication in processes
5. Excess stock
6. Lack of scientific motion study, leading to wasteful movement of goods and parts
7. Number of defective items produced

To overcome these shortcomings, JIT was implemented using Kanban cards in the assembly line. The processes were streamlined in such a way that one process received inputs from the previous one in estimated amounts only; thus, there were zero inventory needs. In this method, a smooth flow of processes is needed. Kanban cards help in indicating all movements of the semi-finished goods in the plant in the production process in a coordinated way. It sends signals to production on what and how much shall be manufactured, eliminating duplication and wastage. This helped the company to reduce the cost of production as the stress is on the economy and efficiency. For instance, reducing inventory eliminates the post of store manager and storage cost. Thus, Toyota was able to save by a smooth flow of production through the assembly line in a scientific way using Kanban cards and JIT. Customers are able to receive an on-time delivery. The company realized the benefits of JIT implementation through the technique of Kanban, which is quite powerful.

## Case Study 2: Dell

The second study deals with the strategy of Dell Inc. about effective implementation of JIT. They used an altogether different approach to JIT. They expect their suppliers of sub-parts/components to implement JIT and keep the inventory. Dell will then order and receive parts as and when they require in the production process. The lead time is kept short and orders are replenished instantly by the suppliers. Then the company assembles the final product and delivers to the customers. The need for storage is thus reduced to a minimum. The technique has been quite successful, and saving storage and handling costs has shown substantial reduction in wastages and costs.

### Important Factors to Dell's Success:

- The first factor are steady suppliers with the capability to honour their commitments on time fulfilling Dell's lead time deadlines.
- Dell uses a smooth, organized component requirement system through computer software, which communicates the needs just in time.
- Their suppliers cooperate with them by maintaining stock at their level, thus reducing their burden.

### The Indian Experience

However, the Indian experience regarding JIT implementation is quite different from that of the international firms due to the following reasons:

1. Small- and medium-scale firms characterize the Indian corporate sector. The comparison instead is with multinational companies from developed countries and the issues are different. In Indian firms, there is a lack of resources and orientation towards R&D is low.
2. The Indian economy is governed by government

agencies, laws and institutions in many aspects of businesses. The philosophy of management is short-sighted and family-oriented.

3. In recent decades, due to uncertainty in the country's political environment, there has been a lack of stability in government policies. The mindset of Indian managers towards innovative ideas is conservative and are not open to experimentation.
4. As the economy has opened up for foreign investment and foreign technology transfer, a number of multinationals have shown keen interest in investing in the manufacturing sector in India. Since these companies have already adopted these tools and techniques in their production processes, it will be interesting to note if they use them in Indian plants.

The philosophy of total quality is not new to Indian manufacturing sector, but there has been reluctance in implementation due to lack of proper training and increased costs. This has delayed the implementation in most of the companies. It is time to remove the gap between 'thinking' and 'doing'. It is time to realize that no tool can work alone; rather, all quality control techniques have to be systematically adopted to our requirements to get the best results. Hence, training our managers is the need of the hour.

### **How to Improve Effectiveness of JIT Implementation**

1. In order to make the implementation effective, certain systems need to be altered. The tools of TQM such as Kanban, benchmarking, economic lead time, and TPM needs to be implemented in day-to-day operations.
2. The level of implementation will differ from company to company as the production processes vary in complexity and ownership

patterns/attitudes.

3. A company-wide strategy needs to be evolved in order to make the program a success. Top management commitment is the beginning of the adoption of any such technique as it requires a huge investment of resources and time.

A long-term strategy requires clarity in terms of objectives and expected outcomes so that there is no confusion, clarity in objectives and wastages are reduced.

### **Conclusion**

Modern business firms seek to minimize cost by adopting various techniques of inventory control and management to manage their resources. Distribution logistics is another area of focus these days to improve returns. JIT is essentially a waste elimination strategy that selects relevant processes and removes duplicate or non-essential operations reduce cost by scientific planning. JIT is a managerial way of approaching problems of efficiency and economy in a scientific manner so that the company can excel in attaining its targets in a highly competitive market. It aims to rationalise the production system, which can be achieved by eliminating waste, reducing defects, increasing machines' utility, increasing workforce efficiency, and reducing other non-productive works.

The paper discussed the concept, significance, scope, advantages and push vs. pull systems of JIT. It also explained the concept using two case studies. Ways and means to improve the implementation of JIT in Indian companies by learning lessons from their multinational counterparts were also suggested.



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