

THE APPLICATION OF JUST-IN-TIME APPROACH TO INVENTORY CONTROL IN MANUFACTURING COMPANIES

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Abstract

There have been tremendous changes in the business environment. Competition in many industries has become worldwide in scope, and the pace of innovation in products and service has accelerated. However, it is necessary to have an appreciation of the ways in which organizations are transforming themselves to become more competitive. Just-in-time is one of the tools used by managers to achieve this goal. With the use of this tool, problems created as a result of inventory maintenance are overcome, the concept of Just-In-Time, as a means to improve organization performance, producing goods and rendering service only when the customer requires it. When Just-In-Time is properly implemented, it enhances quality, reduce cost, increase output, and eliminate delays in responding to customers. It is recommended that the production process must be redesigned so that it is not prohibitively expensive to process one or a small number of items at a time. This usually means reducing the distance over which work-in-progress has to travel and using very flexible employees and equipment that can handle all type of jobs. The employees must be trained so that they carried out their activities without mistakes.

Introduction

Manufacturing companies maintain three classes of inventories - raw materials, work in progress and finished goods. Traditionally, companies have maintained large amount of all three kinds of inventories to act as buffers so that operations can proceed smoothly even if there are unanticipated disruptions.

In the view of Goldratt and Fox (1986) In spite of buffer provided by inventories against unforeseen events, they have a cost. Just in time approach helps in various ways to minimize cost. Under ideal conditions, a company operating a just-in-time system would purchase only enough materials each day to meet that day's needs.

Moreover, the company would have no goods still in process at the end of the day, and all goods completed during the day would be shipped immediately to customers. As the sequences suggest, just-in-time means that raw materials are received just in time to go into production, manufactured parts are completed just-in-time to be assembled into products, and product are completed just-in-time to be shipped to customers.

Problems That Gave Rise to Just- in-Time Approach to Inventory Control

The maintenance of inventories created the following problems: Tied up money in inventory High cost of maintaining inventories Rate of defect is high

Large amounts of land required for warehouse

Procuring materials that are not worthwhile to buy, for other than immediate needs. Drastic increase in the amount of time required to complete a product.

In the view of Garrison and Noreen (1997), Managers at Toyota are credited with the insight that large inventories often create more problems than they solve and Toyota pioneered the just in time approach. The just-in-time approach to inventory control helped Toyota lower its overall costs of production. Those savings could then be passed on to consumers via lower price, resulting in increase sales.

The Process of Just -in -Time Approach to Inventory Control

Just-in-time (JIT) is a production system in which materials are purchased and units are produced only as needed to meet actual customer demand. In a JIT system inventories are reduced to the minimum and in some cases to zero.

Under ideal conditions, a company operating a just in time system would purchase only enough materials each day to meet that day's needs.

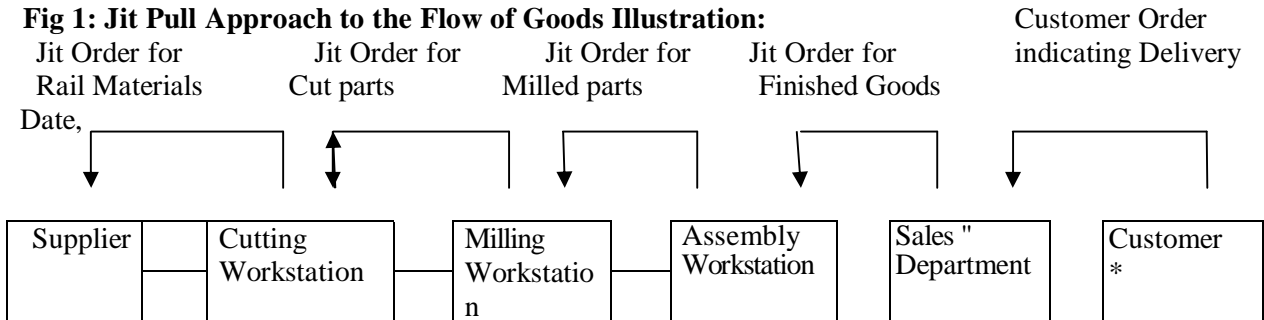
Although few companies have been able to reach this ideal, according to Wadell and Cantor (2005) just-in-time has made it possible for many companies to reduce inventories to only a fraction of their previous levels. The result has been a substantial reduction in ordering and warehousing cost, and much more effective operations.

As noted by Garrison and Noreen (1997), In a Just in time environment, the flow of goods is

controlled by a pull approach. The pull approach can be explained as follows: At the final assembly stage, a signal is sent to the preceding workstation as to the exact amount of parts and materials that will be needed over the next few hours to assemble products to fill customer orders, and only that amount of parts and materials is provided. The same signal is sent back through each preceding workstation so that a smooth flow of parts and materials is maintained with no inventory buildup at any point. Thus, all workstations respond to the pull exerted by the final assembly stage, which in turn responds to customer's orders.

In the view of management Coaching (2006), under a just in time system you do not produce anything, anywhere, for anybody unless they ask for it somewhere. Inventories are an evil that we must avoid.

Fig 1: Jit Pull Approach to the Flow of Goods Illustration:



Source: Culled from Garrison and Noreen (1997:12)

Just-in —Time-Costing

According to Horngren, Datar and Foster (2005), adopting JIT, many companies simplify their cost accounting system. Just-in-time costing is a standard costing system. That start with output completed and then assigns manufacturing cost to units sold and to inventories. There are three major differences between JIT costing and the traditional standard costing system,

- i). JIT system does not track the cost of products from raw materials inventory, to work in process inventory, to finished goods systems unit until the units are completed to record the cost of production,
- ii). Because JIT system does not track cost attached to units in the production process, JIT system does not need a separate work in process inventory account. They combine raw materials and work in process inventories into a single account called raw material and work in progress inventory.
- iii) Under the JIT philosophy, workers perform many tasks, since little labour is directly traceable to individual finished product, most companies using JIT costing does not track direct labour separately. They combine labour and manufacturing overhead cost an account called conversion cost

The Common Characteristics of Companies that Apply Jit System

Companies that adopt the just-in-time system have peculiar characteristics. These are discussed below.

1. Arrangement of production activities: companies following JIT arrange their equipment differently than traditional manufacturers. A traditional drill-bit manufacturer would group all the shaping machines in one area all the grinding machines in another areas, and all the smoothing machines in a third area. Machines performing sequential steps may even be physically joined the goal is continuous production without interruption or work in process inventories.
In the view of Horngren, Harrison and Bamber (2002), arranging machines in sequential production cell slashes production time. For example, within six years after adopting JIT, Harley - Davidson reduced the time to produce a motorcycle by 77%.
2. Setup times. JIT companies reduce set up times on machines used for more than one product. Employee training and technology helped Toyota cut setup time from several hours to a few minutes. This increases flexibility in scheduling production to meet customer orders, which in turn increases customer satisfaction and company profits.
3. Employee roles. Employers on JIT system do more than operate a single machine they also conduct maintenance, perform setups, inspect their own work, and operate other machines.

- This cross training boosts morale and lowers costs.
4. Production scheduling. JIT business schedule production in small batches just in time to satisfy needs. A customer order triggers manufacturing. The final operation in the production sequence. Purchasing and producing only what customers demand reduces inventory. As inventory declines, hidden problems are exposed. Correcting these problems before the company produces a large numbers also, less inventory frees floor space for more production use,
 5. Supply chain management: Because there are no inventory buffers, JIT requires close coordination with suppliers who will guarantee on lime delivery of defect-free materials. According to Horngren, Harrison and Bamber (2002), supply chain management is defined as exchanging information with suppliers and customers to reduce costs, improve quality, and speed delivery of goods and services from the company's suppliers, through the company itself, and on to the company's end customers.

Success Recorded in the Application of Just in Time

According to Garrison and Noreen (1997), many companies, large and small have employed JIT with great success. The following are the main benefits of Just in time:

- (1) It eliminates cost of inventory holding
 - (2) To produce high quality low class product
 - (3) To produce to the quality and taste of customers
 - (4) Working capital is bolstered by the recovery of funds that were tied up in inventories
 - (5) Areas previously used to store inventories are made available for other more productive uses.
 - (6) Defect rates are reduced, resulting in less waste and greater customer satisfaction.
 - (7) It reduces numbers and channel of vendor.
 - (8) Throughput time is reduced, resulting in greater potential output and quicker response to customers
- Variable and absorption costing will show basically (he same net income figure

process

Key: As noted by Ohno (1998), consider a (highly) simplified mathematical model of the Ordering process.

K = The incremental cost of placing an Order
 K_c = The annual cost of carrying one unit of inventory
 D = Annual demand in units

Q = Optimal Order Size in Units
 Tc = Total cost over the year

We want to know Q

We assume that demand is constant and that the company runs the stock to zero and then places an Order, which arrives instantly. Hence the average stock held (the average of zero and Q, assuming constant usage) is Q/2. Also, the annual number of Orders placed D/Q. TC consists of two components, the first is the cost of carrying inventory, which is given by Q* kc/z i.e. the average inventory times the carrying cost per unit. The second cost is the cost of placing Orders, given by D* K/Q. The annual number of orders D/Q times the cost per Order, K.

Thus Total Annual Cost is

$$TC = \frac{Q \times KC}{2} + \frac{D \times K}{Q}$$

We differentiate TC with respect to Q and set it equal to 0 to find the Q for minimum total cost, giving

$$\frac{d(TC)}{dQ} = \frac{KC}{2} - \frac{K \times D}{Q^2} = 0$$

$$Q^2 = \frac{2 \times K \times D}{KC}$$

$$Q = \frac{\sqrt{2 \times K \times D}}{KC}$$

which is known as the Economic Order Quantity EOQ Formula.

The key Japanese breakthrough was to reduce K to a very low level and to re-supply frequently instead of holding excess stocks.

In practice Just-in-time works well for many businesses, but it is not appropriate if K is not small.

The theory above can be fairly easily adapted to take into account realistic features such as delays in delivery times and fluctuations in demand.

Drawback of the Just -in-Time Approach to Inventory Control

1. In Just-in-time, the traditional emphasis on keeping everyone busy is abandoned in favour of producing only what the customer actually wants even if that means some workers are idle. Traditionally, companies have maintained large amount of all three kinds of inventories to act as buffers so that operations can proceed smoothly even if there are unanticipated disruptions. Raw materials inventories provide insurance in case suppliers are late with deliveries. Work in progress inventories are maintained in case workstation is unable to operate due to breakdown or other reasons. Finished goods inventories are maintained to accommodate unanticipated fluctuation in demand. Under this situation employees are busy working and idle time is avoided.
2. Re-order level is determined by historical demand. If demand rises above the historical planning duration demand the firm could deplete inventory and cause service issue. To meet a 95% demand, a firm must carry about two functions of demand in safety stock..
3. It leaves the supplier and downstream consumers open to supply stocks. In the view of Ohno (1988), in part, this was seen as a feature rather than a bug, who used the analogy of lowering the level of a river in order to expose the rocks to explain how removing inventory showed where flow of production was interrupted. Once the barriers were exposed; they could be removed; since one of the main barriers was rework, lowering inventory shop to improve its own quality or cause a holdup in the next downstream area. Just-in-time is a means to improving performance .of the system, not an end.

Future of the Just-in-Time Approach to Inventory Control

With the present progress in the application of Just-in-time, companies will keep on applying the technique as a result of the inherent benefits most companies in the developed nations have employed Just in Time in their Inventory control. But companies in Nigeria are yet to adopt JTT as a result of lack of adequate infrastructure and working environment and habit is not there. In the nearest future, companies in Nigeria will embark in the usage when (here *is* availability of infrastructures).

State of Just-In -Time in Nigeria Business Environment

Though Just-in-time approach to inventory control has been employed by large and small companies in the developed countries, it has not been employed in Nigeria as a result of the following reasons:

1. Adequate infrastructure not available
2. Working environment and habit is not there
3. Cultures of development is not there
4. Lack of technical know-how
5. Corruption

Conclusion

When Just-In-Time is properly implemented, this approach can enhance quality, reduce cost, increase output, and eliminate delays in responding to customers. Just-in-time is Simple in theory but hard to achieve in practice. Many organizations are nervous about JIT because a problem anywhere in the system can stop all production. For this reason, organizations that use JIT must eliminate all the sources of failure in the system. It is recommended that, the production process must be redesigned so that it is not prohibitively expensive to process one or a small number of items at a time.

This usually means reducing the distance over which work in progress has to travel and using very flexible people and equipment that can handle all types of jobs. Production people must be better trained so that they carry out their activities without mistakes. Suppliers must be reliable to provide defect-free materials or component precisely when they are required. Equipment must be maintained so that machine failure is eliminated. This approach is worthy of extended study.

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