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Chapter 6: JIT Management

Objectives

- Examine what JIT is and its purpose.
- Understand the conditions necessary for JIT to operate.
- Able to discuss the advantages and disadvantages of JIT.

1. JIT Environment

As manufacturing firms adopt and implement JIT, the supply chain functions will be directly affected. Because JIT stresses reduced inventory levels and more responsive logistics systems, greater demands are placed on warehousing to maximize efficiency and effectiveness.

Providing the right product, right place, right quantity, and at the right time is the heart of JIT manufacturing. To achieve the 4 Rs, a pull system of inventory manufacturing is necessary. The ultimate goals of JIT are:

- Zero inventory
- Zero defects
- Zero setup times

These require efficient movement of materials, predictable and consistent processing of materials. The system characteristics must take into consideration of:

- Machine capacity & bottlenecks
- Shortage costs
- Inventory costs

The efficient flow of material from supplier to warehouse and to production is absolutely critical in JIT. Problems with the delivery of raw materials are often masked by inefficiencies in the manufacturing process.

And even when problems with the delivery process are identified, often very little can be done because many of these problems are caused by the manufacturing process itself.

In JIT, as cycle time and delivery sizes are reduced, the importance of the 4R's become even more critical. All deficiencies are immediately exposed. In the supply chain network, the following must be addressed all the time:

- High cycle times
- Incorrect quantity
- Wrong part delivery
- Poor quality
- On-time delivery

2. **JIT**

The just in time (JIT) concept is simple, but its adoption has widespread implications.

Successful JIT requires a broad management commitment to a distinctive operations policy.

JIT philosophy aims to bring certainty and smoothness to the flow of material through the logistic chain while reducing inventory and thereby reducing lead-time.

The reduction of throughput time can consequently minimize the number of parts waiting.

The concept is introduced here, not only as an illustration of externally oriented scheduling, but also to remind us of the interrelationships of capacity management, scheduling and inventory management.

2.1 **The philosophy**

JIT was developed by companies in Japan - notably Toyota.

It was adopted by manufacturing organizations in the USA and Europe and quickly became one of the most widely advocated, copied and popular manufacturing philosophies, especially in large-volume, repetitive manufacturing environments such as the motor industry.

Virtually all that has been written on the subject is concerned with manufacture.

However, since JIT is essentially a general approach, many of the basic principles are of relevance, and could be implemented for other types of operating systems.

JIT may be defined as involving "*the production of the necessary items in the necessary quantities at the necessary time*".

In other words, with this approach, the materials and items required by a process are made available at that process as and when they are required, and not before.

This seemingly simple idea in fact contrasts markedly with practice in many operating systems which depend upon substantial inventories.

Thus, with the JIT approach, queues awaiting processing at an operation are minimal. Work-in-progress, therefore, is low. Throughput times are reduced, space requirements are reduced, and flow through the system is virtually continuous.

2.2 Elements of the JIT Policy

There are six characteristics of JIT:

a. Demand Call

The entire system is led or pulled by demand. The need to serve or supply a customer triggers activities throughout the operating system.

Thus, where a customer places an order for a manufacturing operation, that order requirement flows back through the system, triggering each stage of the overall process.

This contrasts with the practice in many manufacturing systems where work is begun when materials become available. (This might be regarded as an input 'push' system.)

b. Reduced Set-up Times and Smaller Batch Sizes

Except in systems where only one type of product or service is provided, it will be necessary to 'set up' processes in order that they can deal with a particular type of item. This is a basic characteristic of a batch processing system.

The JIT aim of processing items only as and when required necessitates the processing of small batch sizes.

By reducing the cost of set-ups, which in turn is related to set-up time, reduces the economic batch size. JIT, therefore, is associated with small batch sizes and short, economical set-ups.

c. Efficient Flow

The need for rapid throughput and the avoidance of substantial work-in-progress and thus the need for space necessitates - and enables - efficient flow systems to be established.

The rapid movement of items between processes is an essential prerequisite. Rationalization of flows is therefore a requirement.

These three aspects are the essential characteristics of a JIT system. They are the necessary characteristics. However, in practice, because of the manner in which JIT is normally pursued, there are three additional characteristics:

d. Employee Involvement

The interdependence of operations, the rapid flow and the absence of buffers necessitate smooth and efficient control. In practice this has been found to necessitate the active participation of all employees.

In this way, possible disruptions can be seen and avoided, and operations scheduling and control improved also.

In practice, however, in the introduction of JIT improved communications and participation is also one of the principal aims.

It is pursued because of its intrinsic benefits. JIT in effect provides the opportunity to achieve participation in matters such as quality control, problem-solving work, etc.

e. Kanban

Kanban is a device used in the scheduling of activities in JIT systems. It is a Japanese name for 'card'. The Kanban system, and its derivatives, has become the standard means for achieving production control with JIT.

The definition of kanban is “a signal that gives an instruction to get, move, produce, order, or take some other activity with production materials”. Kanbans tell you when to order, what to order, how much to order, and where to order it from.

A two-bin system is a kanban method used to simplify replenishment on a production line. The process is simple. An operator pulls from one bin until it is empty, and then, depending on how the kanban card is attached, either turns in the *kanban* card (if fastened by hook and pile), or turns in the whole bin (if the card is permanently fixed).

The operator then pulls from the second bin while the order is placed for materials to fill the first bin. If all goes well, the first bin is filled and replaced when there are a few items left in the second bin.

The two-bin system is generally designed with a bit of safety stock, hence those extra parts. If things don't go well, the safety stock is used while the delays are resolved. The bigger the potential for problems, the larger the safety stock.

f. Visibility

One of the principal objectives of JIT is simplicity. One means to achieve and sustain a simple system is by ensuring visibility, e.g. one of our objectives is to ensure that stocks are visible.

The ability to see what is happening is an important characteristic of JIT.

2.3 Benefits of JIT

From the above, it will be clear that the benefits of JIT include:

- a. Reduced inventories and work-in-progress
- b. Reduced space requirement
- c. Shorter throughput times
- d. Greater employee involvement, participation and motivation
- e. Smoother work flows
- f. Greater productivity
- g. Improved product/service quality
- h. Improved customer service
- i. More uniform loading of facilities

2.4 Prerequisites for Effective JIT

The necessary conditions to exist before JIT can be successfully implemented are:

- a. Low variety of items being processed
- b. Small, frequent replenishments
- c. Demand stability
- d. Vendor reliability (to ensure reliable supply)
- e. Defect-free materials (to avoid disruptions)
- f. Good communications (to help ensure continuous operation and minimum disruption)
- g. Preventive maintenance (to avoid disruption)
- h. Total quality control
- i. Management commitment
- j. Employee involvement & flexibility

Example:

Cummins Engines (UK) found itself failing behind its Far East competitors. At that time, Japanese competitors had 80% lower inventory levels, more responsiveness to customers, and almost no scrap or rework. Cummins decided to implement JIT manufacturing, which involves reducing non-value-added activities. At its Darlington plant, \$25 million was invested in JIT tools, including automated assembly, automated guided vehicles, and a computerized assembly information-management system. JIT reduced overhead costs by 70%, reduced lead time dramatically, lowered labour cost by 30%, reduced floor space required by 31%, and reduced work-in-progress by 97%. Batch sizes were reduced from 25 to 6, and time spent on large machine tools was reduced by up to 80%. A kanban system helped decrease inventory from a 29-day supply to an 8-day supply and eliminated some material shortages.

Source: Mullins, P. (1989) JIT's competitive edge. *Production*, 101 (7), pp. 62-64.

2.5 Systems in Place Before JIT can be Implemented

- TQM/TQC/ ISO9000.

Total quality management (TQM) consists of organization-wide efforts to install and make permanent a climate in which a firm continuously improves its ability to deliver high-quality products and services to customers.

- Standardization.

Standardization is the process of developing and implementing technical standards allowing a large volume of inter-changeable parts to be developed. The process helps to reduce the number of different parts.

- Reliability and Preventive Maintenance Program.

The structured program allows plant managers and engineers to measure, monitor and implement preventive & corrective maintenance program to ensure the equipment is available when needed.

- Supplier Recruitment & Audit Program.

Organizations ensure that suppliers are systematically selected and periodically audited to provide the products and services as contractually agreed.

- Suppliers and freight system are reliable.

When selected suppliers are audited, the products supplied and services rendered conform to the agreed standards & specifications. They are also required to deliver with a high degree of reliability.

- Stable, reliable operating condition.

Processes, systems and equipment operate optimally when they are used appropriately and correctly. Management needs to ensure that the environment is operating within its designed parameters. JIT requires a very stable environment.

2.6 Major Shortcomings of JIT

JIT is vulnerable to plant shutdowns, demand surges and other uncertainty because of the zero inventory element.

Small and frequent lot deliveries can cause highway congestion and can mean more delays and higher cost in transportation.

Increase in security can result in interruptions for manufacturers as shipments can be delayed at border crossings.

Comment on this:

“When he set-up Toyota’s famous JIT system, Ohno never factored in 7.2 on the Richter scale. Toyota does not have a plant in the Kansai region, yet it was still crippled by the quake. Two suppliers of Toyota – makers of car radios and brake calipers – do have plants near Kobe, and both suffered severe enough to halt production. But JIT means what it says: parts are to be delivered precisely when the customers need them. So critical is this system to Toyota’s operations that the loss of those two suppliers forced the company to shut down all its twelve of its Japanese assembly plants last week, and by Friday, a company spokesman conceded that management was still unsure when production would resume”.

Newsweek, 30th January 1995 p.24-29.

Since the 1980s, many Japanese companies have reduced inventory levels and will continue to do so. These companies include Sony and Sanyo. But when the Kobe earthquake struck in 1995, there was a re-think of inventory levels.

Did companies manage to learn the lesson? If yes, then the impact of September 11th attack would have little impact on JIT global operations?

3. Conclusion

JIT objectives are met by using pull-based production planning and control systems.

There are many advantages to using the JIT philosophy. Among the basic advantages of JIT are reduced finished goods and WIP inventory levels, shorter product flow times, and increased worker productivity allowing for lower production costs, and greater production customer responsiveness.

Assignment

Form a team of four. By using the concept of kanban in an electronic company producing components, design a kanban system.

Use physical devices and tools to test your concept can work.

Present your case in powerpoint slides as well as demonstrate the use of your devices and tools.

Time: 20 minutes.