

Just-In-Time

Explanation

Just-in-Time (JIT) is a US term coined to describe the Toyota production system, recognised as one of the most efficient manufacturing operations in the world. In its simplest form JIT requires that only the necessary units be provided in the necessary quantities at the necessary times. JIT is both a philosophy and an integrated system for production management that evolved slowly through a trial and error process spanning more than 15 years.

Principles/ Key Attributes

The JIT production system is the result of a mandate to eliminate waste and is composed of the following elements:

- Flexible Resources
- Cellular layouts
- Pull production system
- Kanban production control
- Small-lot production
- Quick set-ups
- Uniform Production

Waste is anything other than that which adds value to the product or service and defined as “anything other than the minimum amount of equipment, materials, parts, space and time which are absolutely essential to add value to the product”

The Impact on functional Activities

As identified above certain elements of JIT must be incorporated to facilitate the need to eliminate waste. These elements incorporate their own inherent attributes that when combined result in the efficient JIT production system. Each element above incorporates the following:

- **Flexible Resources** – creates multifunctional workers with the ability to perform more than one job (multi-skilled personnel) and general-purpose machines with the ability to perform several basic functions.
- **Cellular Layouts** – creates manufacturing cells that comprise of dissimilar machines brought together to manufacture a family of parts.
- **Pull Production System** – emphasises the supermarket approach and relies on customer requests to pull products/components through the system. Workers take only those parts or materials they need and can process immediately.
- **Kanban Production Control System** – where kanban means card in Japanese. In a pull system, kanban corresponds to a standard quantity of production or size of container and contains such information as part number, description, type of container, unit load, preceding station, and subsequent station. **See Kanban Methodology.**
- **Small-Lot Production** – incorporates the production of small amounts at a time allowing processes to be moved closer together and gives the ability to identify inherent problems within the processes.
- **Quick Set-ups** – incorporates a system called **SMED** (single minute exchange of dies) that focuses on the principles for quick set-ups. The system differentiates between internal and external set-up, where internal set-up can be performed only

when the machine is stopped, and external set-up can be performed while the machine is operating. The emphasis being to convert internal set-up to external set-up.

- **Uniform Production** – is achieved by smoothing the production requirements on the final assembly line. It aims to reduce variability through more accurate forecasts, smoothing of demand and incorporating mixed-model assembly steadying component production.

Environmental Turbulence Indicators

- Intensity of Competition
- Dynamic Customer Requirements
- Supply Chain Turbulence

Agile Capabilities Index

- Product
- Process
- People
- Operational
- Organisational

Risks

- Long implementation, literature and industry state up to seven years implementation with no less than four years.
- Loss of focus due to implementation time-scales, therefore strict discipline must be maintained for continuous improvement.
- Identifies hidden problems that are attributed to JIT implementation but were hidden within the 'old system'.
- High investment for changing systems and costs in personnel time.
- Material Supply issues may restrict and affect production runs especially if dependent on single-sourcing.
- Involves mass culture change that may result in non-full committal of personnel.
- Ensuring that JIT is the right system and suited to the right needs.

Benefits

Although the implementation of JIT requires long-term commitment and dedication there are inherent benefits within the system:

- **Reduced Inventory** - through the utilisation of a pull system processes and workers will use exactly the requirements needed based on customer requests. Further, through supplier relations' onus for stocks are with the supplier, reducing warehousing space.
- **Improved Quality** – smaller lot sizes enable the identification of quality problems usually hidden by mass-produced items. Statistical methods such as **Statistical Process Control (SPC)** and **Six Sigma** enable the control and limiting of defects and variance within the process.
- **Lower Costs** – are achieved through the reduction in inventory and improved quality and achieving right first time.
- **Shorter Lead Times** – through pulling the actual customer requirements through the system, improving quality and maintaining machinery properly (**Total Preventative Maintenance (TPN)**), focusing on product grouping through cellular manufacturing will achieve required customer delivery expectations.

- **Better relations with Suppliers** – through integrating suppliers into the manufacturing process by making productivity and planning information available will enable the JIT supply to processes.
- **Better use of Human Resources** – can be achieved through multi-skilled personnel through balancing the actual needs of processing requirements and the empowerment of personnel giving ownership for the upkeep of the manufacturing function.

References

Alan Harrison, 'Just-in-Time Manufacturing in Perspective', Prentice Hall, ISBN 0-13-514175.

Roberta S. Russell, Bernard W. Taylor III, 'Production and Operations Management – Focusing on Quality and Competitiveness', Prentice Hall, ISBN 0-205-14733-X