JUST-IN-TIME SYSTEMS

In the never-ending drive to improve productivity, few concepts have had such a widespread impact as the Just-In-Time (JIT) philosophy. Beginning with Japan, JIT thinking has influenced not only inventory systems but the entire culture of corporations worldwide.

Question: What is Just-In-Time?

Just-In-Time is a managerial philosophy that fosters continuous improvement by reducing in-plant inventories and developing the supplier and system capabilities to produce quality goods in relatively small lots when needed, i.e., just in time.

Some authors illustrate the JIT with a boat crossing a body of water that has dangerous rocks below the surface. Lowering the water (inventory) level reveals the large boulders (problems) that, once removed (solved), allow the boat (system) to function more effectively. Profits stem not only from the lower inventory cost but also from the numerous other benefits of enhanced coordination.

With JIT, work is "pulled" through the system in response to control from the following (downstream) work center. It, in turn, is responding to the next work center, which is ultimately responding to the master schedule and timely, but perhaps fragmented, customer demand. This means that lot sizes are typically smaller, variety is greater (i.e., requiring mixed-model assembly), and more set-ups are required (to produce different models). It also necessitates that the work force be more highly trained (i.e., and flexible) to function in a cooperative way as a team, taking more responsibility for the quality level of their own work, production methods, preventive maintenance of equipment, etc. With low inventories, there is little or no cushion of buffer stock to keep production going if a machine breaks down or if deliveries from a supplier are late. Defect-free supplies must arrive exactly when needed, in the correct quantities. And production problems must be solved as they occur—not hidden under the protection of inventory.

Question: What are some of the key elements of JIT systems?

Key Elements of JIT Systems

1. Close ties with *few reliable suppliers*
2. *Low inventories* of raw materials, work in process, and finished goods
3. *Pull-type* movement of work through the system
4. *Small lot sizes* with shorter lead times
5. Short, *low-cost set-up times*
6. *Product layout* tendency in smaller, more focused facilities
7. Smoothed (*mixed-model*) master schedule
8. Multiskilled, flexible, *responsible work force*
9. Supportive, team-oriented, *problem-solving environment*
10. *Preventive maintenance* system to minimize breakdowns
11. Strong commitment of everyone to *continuous improvement*

KANBAN SYSTEMS

Many firms have adopted a form of the Japanese kanban system to control inventory in a series of workstations.

Question: What are kanbans?

changes in its culture. JIT also encompasses the Japanese managerial characteristics we have discussed in this chapter. Finally, JIT applies to all the functions of a company, not just operations.

Just-in-time (JIT) A manufacturing system whose goal it is to optimize processes and procedures by continuously pursuing waste reduction.

The definition of JIT that we adopt for our discussion is as follows: *JIT is a manufacturing system whose goal is to optimize processes and procedures by continuously pursuing waste reduction.*

The Seven Wastes. Shigeo Shingo, a recognized JIT authority and engineer at the Toyota Motor Company identifies *seven wastes* (see Table 15.2) as being the targets of continuous improvement in production processes. By attending to these wastes, improvement is achieved.

Shingo's seven wastes Seven sources of manufacturing wastes identified by Shigeo Shingo as targets for reduction through continuous improvements in the production process.

TABLE 15.2 The Seven Wastes

1. *Waste of overproduction.* Eliminate by reducing setup times, synchronizing quantities and timing between processes, compacting layout, visibility, and so forth. Make only what is needed now.
2. *Waste of waiting.* Eliminate through synchronizing work flow as much as possible, and balance uneven loads by flexible workers and equipment.
3. *Waste of transportation.* Establish layouts and locations to make transport and handling unnecessary if possible. Then rationalize transport and material handling that cannot be eliminated.
4. *Waste of processing itself.* First question why this part or product should be made at all, then why each process is necessary. Extend thinking beyond economy of scale or speed.
5. *Waste of stocks.* Reduce by shortening setup times and reducing lead times, by synchronizing work flows and improving work skills, and even by smoothing fluctuations in demand for the product. Reducing all the other wastes reduces the waste of stocks.
6. *Waste of motion.* Study motion for economy and consistency. Economy improves productivity, and consistency improves quality. First improve the motions, then mechanize or automate. Otherwise there is danger of automating waste.
7. *Waste of making defective products.* Develop the production process to prevent defects from being made so as to eliminate inspection. At each process, accept no defects and make no defects. Make processes failsafe to do this. From a quality process comes a quality product—automatically.

Source: Hall, R, *Attaining Manufacturing Excellence.* Homewood, Ill.: Dow-Jones-Irwin, 1987. p. 26.