Introducing JIT Manufacturing: It's Easier Than You Think

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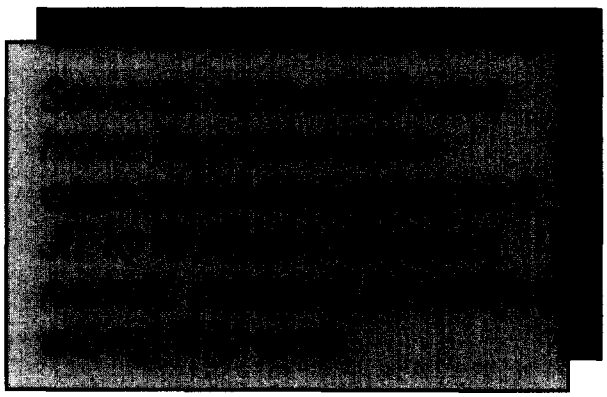
The practical difficulties arising from the implementation of a Just-in-Time (JIT) inventory management approach have caused some managers to dismiss it as a passing fad. When asked to cite the inventory strategies that do and do not work for their companies, purchasing managers identified JIT as the most frequently mentioned failure. Their general sense was that "modified JIT works, pure JIT does not." The success of JIT implementation may also be a function of the size of the company, with smaller firms finding it more difficult.

If JIT is abandoned because it does not appear to work as described in articles and textbooks, the cost savings of an efficient, integrated manufacturing process will be lost. As documented here, the solutions of actual companies in response to the impediments of introducing JIT in its purest form may be instructive for other firms facing similar problems.

The popularity of JIT inventory methods has grown steadily over the last two decades. Officially introduced by Toyota in the 1970s, JIT methods have spread to manufacturing companies all over the world. The appeal lies mostly in an emphasis on simplicity and a cost-saving, "bare-bones" approach. Researchers generally agree about JIT on several points, one being that JIT methods, with some alteration, can be successfully adapted for use in American manufacturing plants of all sizes. Setting up a JIT system, however, involves the entire business, from suppliers to production to customers—even to administrative aspects such as accounting.

There may be significant disadvantages with the system, such as uncooperative suppliers, the distance between suppliers and manufacturers, and overstressed workers. On the other hand, the benefits to be realized include less need for maintaining safety stock, a lower lead time, higher quality, automated communication with customers, and cross-training for workers.



A JIT approach has as its main goal the reduction of the levels of inventory and its associated carrying costs—or to reduce waste altogether. The less time a product is in process, the less inventory there is to finance, store, and manage. The objective is to push to zero the amount of time the product is waiting to be worked on, in transit, and/or being inspected.

Benefits that should result from the implementation of a JIT system include:

- lower inventory carrying costs;
- space and cost savings in the factory and warehouse;
- reduced risk of obsolescence; and
- reduced response time to customers' orders and delivery times.

To the extent that the JIT system can be put into practice without any impediments, a "theoretically correct" demand-pull system will be in place.

JIT in theory often differs greatly from JIT in practice. Not all companies can continuously feed inventory into work-in-process and manufacture their product without interruption. Different industries have different manufacturing processes that, for varying reasons, are not suited to JIT treatment. This does not completely rule out the possibility for the company to practice JIT; it just means it has to find a way to adapt or adjust its processes to incorporate as many JIT principles as possible.

To examine how different manufacturers have adapted JIT to fit the needs of their compa-

nies, we interviewed the production managers of five manufacturing companies. The sample was chosen to represent a variety of industries and manufacturing technologies available in the area, ranging from heavy manufacturing to food processing. We asked the managers to describe their general manufacturing environment, inventory and ordering practices, working arrangements with suppliers, and costs associated with switching to a JIT-type system (see **Figure 1** for a list of the questions). Each company demonstrated a reason peculiar to its industry why it could not employ JIT in its theoretical form.

Electronics Manufacturer

This company had $7.4 billion in sales and $8.9 billion in total assets in 1994. Its lines of production include information systems and electronics, power systems, industrial systems, transportation, and consumer products. The inventory manager stated that the company has a special distributor system developed many years ago that is geared to work with its manufacturing process. Because of the nature of the complex electronic goods it produces, the company is restricted to ordering large quantities of parts from its suppliers, some of whom are located abroad.

These factors would preclude the company from practicing JIT in its theoretical form. However, some JIT principles have been incorporated into the distributor system. The company feeds the inventory directly into work-in-process, with no initial inspection. A minimum number of suppliers are kept for each category of parts: one for electrical parts and two for prefabricated parts. The distributor handles most of the requirement planning and delivery scheduling. According to the inventory manager, one of the main goals of this system is to decrease costs while increasing quality—a goal that coincides with one of the main principles of JIT.

Figure 1
Survey Questions

General Manufacturing Environment
1. Do you have a repetitive manufacturing environment, where the same product or type of product is manufactured or assembled again and again?
2. Is it a flow or process production, like an assembly line, where the product is manufactured or assembled in stages in different departments or in different parts of the line?
3. Do you have stable production rates so that you try to produce a given number of units of product for a certain time period (hour, day, week)?

Inventory and Ordering Practices
4. Do you have a program in place or are you implementing a program to reduce or eliminate inventories and work-in-process?
5. Do you have a "push" system, where you produce to inventory, or a "pull" system, where you produce to demand? In other words, do you produce as long as you have enough inventory to cover it, or do you feed inventory into production as it is demanded by the processes? What drives the production?
6. Is inventory delivered in frequent small batches, just enough to cover a few hours' or days' production?
7. Do you thoroughly inspect each incoming inventory order, or do you feed it directly into work-in-process?

Suppliers
8. What are the major parts you order from outside suppliers?
9. How many suppliers do you have for each of those parts?
10. Do your suppliers have a just-in-time or similar system, or do you encourage them to do so?
11. Are your suppliers' production and inventory methods similar to yours?
12. Do you have a "partnership" with your suppliers, working closely with them on production methods, quality control, and design specifications?
13. Are your suppliers located nearby?

Other
14. Have you had any problems or do you foresee any problems with your JIT system?
15. What were/are some of the costs the company incurred to switch to a JIT system?
16. If you do not have a JIT system, why not? What kind of inventory system do you have?

Air Filter Manufacturer

This company manufactures air filters for use in air conditioning units, automobiles, and the like. It is a division of a corporation whose total assets in 1994 were $5.1 billion and whose sales were $6.6 billion. The division's main barrier to following theoretical JIT is that it must maintain a three- to four-week surplus of a critical part, one that is common to most of its manufactured products. According to the manufacturing manager, keeping a surplus is necessary because of the setup costs involved in production. It is cheaper overall to maintain this inventory than to manufacture a small number of these parts every time they are needed. Moreover, keeping inventory on hand reduces lead times.

Other than that, the company practices other components of JIT, such as holding little inventory, having a small number of certified suppliers, and reducing inspection of incoming inventory. The company has been using this system for several years. The manager mentioned the idea of driving down costs to remain competitive—again, a central principle of JIT.

Food Processing

No financial information was available for this company, which produces food products and diet supplements from ingredients found all over the world. The manager said the company has been using a form of JIT since its birth in the 1950s. Its inventory system involves keeping only a few carefully screened vendors to supply inventory and working closely with them on quality control

and product development. It also schedules deliveries of certain inventory items so that the materials arrive just when they are needed.

The barrier for this company in implementing theoretical JIT is the law mandating that deliveries of raw material food items such as flour and sugar must be inspected before they are put into production. The process takes about 12 days and the company incurs significant inspection costs. Moreover, because the ingredients required for the products come from many distant places, such events as natural disasters and political upheavals can affect delivery. If, for example, a certain ingredient comes only from Bangladesh and that country has experienced severe floods, production may be delayed. Other than these two difficulties, the company has applied JIT principles to other aspects of its manufacturing process with great success for years.

Figure 2
Comparison of Traditional, "Real World," and JIT Inventory Methods

Company	*Traditional*	*"Real World"*	*Just-in-Time*
Electronics	Batch or job lot processing	Hybrid of JIT and batch processing developed by company	Continuous feed—no batches
Air filter manufacturer	Inventory stockpiled	Only one part stockpiled due to setup costs	Little or no inventory held
Food processing	Raw materials inspected before being fed into work-in-process (WIP)	Raw food materials required by law to be inspected	Raw materials fed directly into WIP without inspection
Tire manufacturer	Inventory held in stock until needed	Certain materials, due to nature of material, must "age" before use	Materials ready for use upon arrival
Climate control equipment manufacturer	Supplier cooperation not necessary	Suppliers may not cooperate due to tax laws or other reasons	Close "partnership" with suppliers is key

Tire Manufacturer

The fourth company, which also has no financial information available, has great variety in its product mix. It may produce 10 to 14 different types of just one size of a tire. The manager said the plant has been using a form of JIT since it opened in the 1970s. Inventory needs are forecast in three-month intervals with the aid of a computer. This three-month "view" is sent to the supplier, who delivers the order in small batches as needed. The manufacturer updates the supplier on changes in the material requirements as necessary. A *kanban* system is used as well, which signals when parts are needed, and incoming inventory is randomly selected for inspection. The plant sends its people to the suppliers' plants to work with them on improving production methods and quality control.

According to the manager, the plant runs its inventory system "as close to JIT as possible." The difficulty in achieving theoretical JIT lies in the nature of the raw materials themselves. Certain chemicals used in the tire-manufacturing process must be allowed to "age" a few days before being used in production. This means that once the chemicals have been delivered, they must be held on the shop floor as inventory for a while. Although traditional JIT theory aims to eliminate the need for holding any inventory at all, the tire manufacturer has benefited greatly from using as many JIT principles as possible.

Air Conditioning and Climate Control Equipment Manufacturer

A $1.6 billion corporation with net sales of $2.4 billion (as of 1994), the final firm in our sample makes large-capacity cooling and heating equipment for commercial and residential use, as well as commercial and industrial refrigeration and gas compression equipment. It implemented a JIT system in the early 1990s. Of all the manufacturers interviewed, this company actually runs its plant closest to JIT in theory. Although it uses all the traditional principles and ideas, there is still some difficulty in getting cooperation from suppliers. The manager said that because of the state tax laws, some suppliers will not participate in the consignment program that is part of the company's JIT system. This makes it hard to find suppliers both willing to participate in such a program and able to meet the quality standards set forth by the manufacturer. Other than the problem of getting cooperation from suppliers, however, the JIT program has more than paid for itself in savings of carrying and freight costs, fewer stockouts, and more turns of inventory.

So far, these five companies have displayed five main practical difficulties in practicing JIT (see **Figure 2**). First, a company may already have its own system in place to handle special ordering requirements and does not see a need to change to JIT. Second, a company must

hold inventory it manufactures itself due to the setup costs involved. Third, food manufacturers are required by law to inspect incoming raw food materials. Fourth, sometimes raw materials are not ready to be used in production immediately, thus requiring them to be held as inventory for a short time. Finally, there may be difficulties in working with suppliers.

There are, of course, other reasons why companies may not be able to practice JIT in its theoretical form, including:

1. Management may be unwilling to switch to JIT because of the initial costs involved.
2. Manufacturers in remote areas may not be able to arrange for frequent deliveries of inventory in small batches, as JIT theory dictates.
3. The manufacturing process itself may not be suited to JIT treatment, such as when some component of the finished product needs to be cured or dried between processes.

Although there are five actual and three speculative reasons mentioned here as to why companies may be unable to practice JIT in its theoretical form, the manufacturers interviewed have shown that it is still possible to work around these barriers and realize some savings by using as many JIT principles as possible. It may feel like a major effort to produce a seemingly insignificant amount of savings, but these savings can add up to provide a big competitive edge.

One final observation about JIT: In conducting this research, we found several articles hailing JIT as a major breakthrough and a new and exciting discovery that is just beginning to catch on in the United States. However, the interviews conducted with these companies seem to suggest just the opposite. Three of the five managers interviewed stated that their firm had been using a JIT-like system for many years, even before Toyota introduced it under the name "Just-in-Time." For these companies, the ideas in JIT are not new and have been saving manufacturers time, effort, and money for quite a while. One manager summed it up perfectly: "When all the hype came out about this new JIT stuff, we said, 'We've been doing that for years!'"

There are any number of techniques for improving quality that are described by "theoretical" conditions. With some careful thought, they can be implemented in practice. ❐

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