Just-in-Time Manufacturing

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Agenda

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2. JIT Defined
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5. Relationship of JIT to Total Quality and World-Class Manufacturing
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Time is money.

Greek proverb

What Do We Call It?

The manufacturing system we will be discussing in this chapter was initially developed by Taiichi Ohno in the 1950s as the successor to Henry Ford's mass production system. Ohno named it the Toyota Production System (TPS). Since it involved making products only when needed from materials that were made available by suppliers only as required, just-in-time (JIT) became its generic name. As is so often the case, we find that the same product is being repackaged under other names. This is sometimes done by those searching for clarity of description. Sometimes it is done by those wanting to be seen as having something new and different, when in fact it is not. The term Lean production came on the scene in 1990 in the book The Machine That Changed the World: The Story of Lean Production by James Womack, Daniel T. Jones, and Daniel Roos. It was the name these authors gave to the Toyota Production System, believing, apparently, that it described the Toyota Production System better than JIT. Lean production and Lean manufacturing are synonymous with just-in-time.

JIT Defined

Although not exactly what was originally intended, just-in-time manufacturing, by any of its names, has become a management philosophy that seeks to eliminate all forms of waste in manufacturing processes and their support activities. *JIT permits the production of only what is needed, only when it is needed, and only in the quantity needed*. This must apply not only to the just-in-time manufacturer but also to its suppliers if the system is to eliminate all possible waste. Those companies that have required their suppliers to do their warehousing clearly have not gotten the point. The supplier should not produce the material until the JIT manufacturer needs it. In that mode, there is no warehousing and, therefore, no wasted resources for buildings, maintenance, people to care for the material, spoilage, obsolescence, or other related problems.

JIT Defined

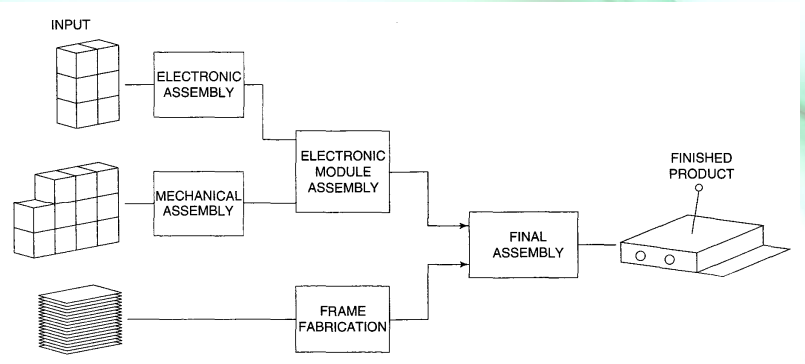

Figure 21–1
The Traditional Production Process

Rationale for JIT

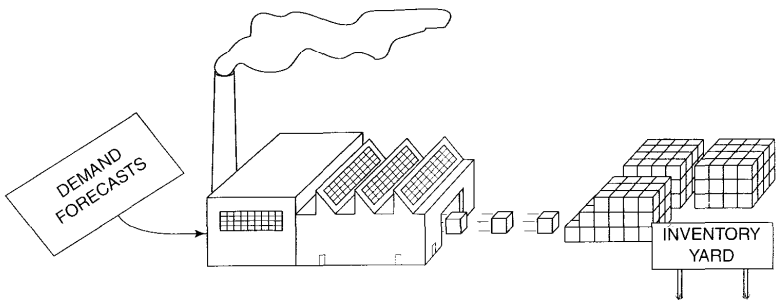

Figure 21–2
Factory Producing to Forecast Demand (Mass Production)

Rationale for JIT

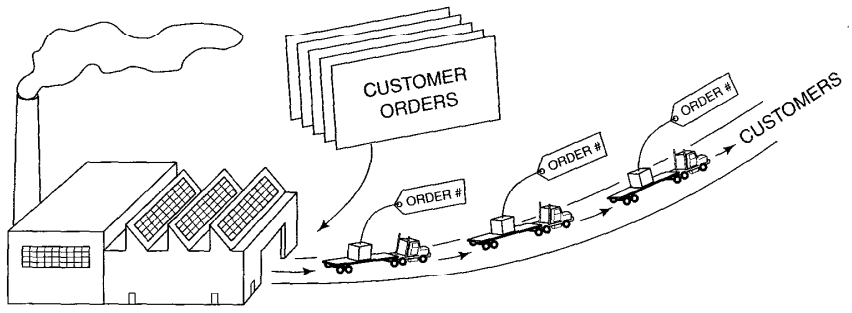

Figure 21–3
Factory Producing to Orders (JIT)

Rationale for JIT

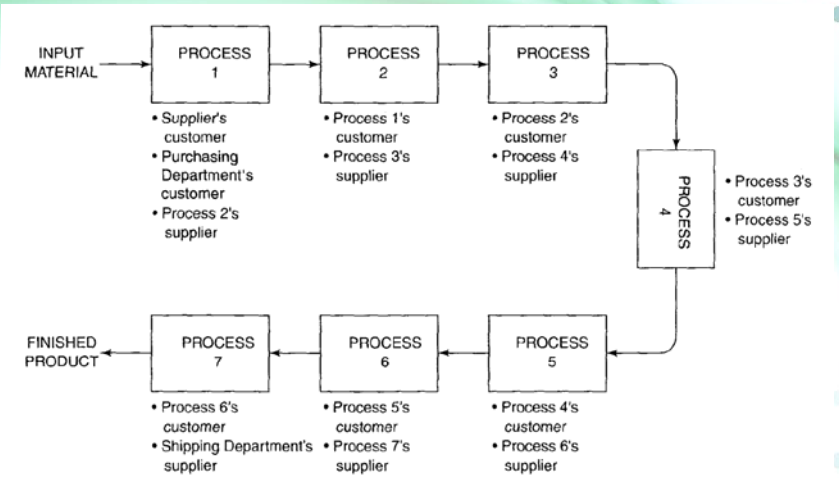

Figure 21–4
Internal Supplier–Customer Relationships

Rationale for JIT

Taiichi Ohno, the creator of the just-in-time system, saw that the mass production system produced waste at every step. He identified seven wastes:

1. Overproducing
2. Waiting (time)
3. Transporting
4. Processing itself
5. Having unnecessary stock on hand
6. Using unnecessary motion
7. Producing defective goods

The elimination of these wastes is at the heart of the rationale for just-in-time: eliminate these wastes, and you will produce better products at lower cost. If the competition gets there first, your rationale for JIT is survival.

Development of JIT

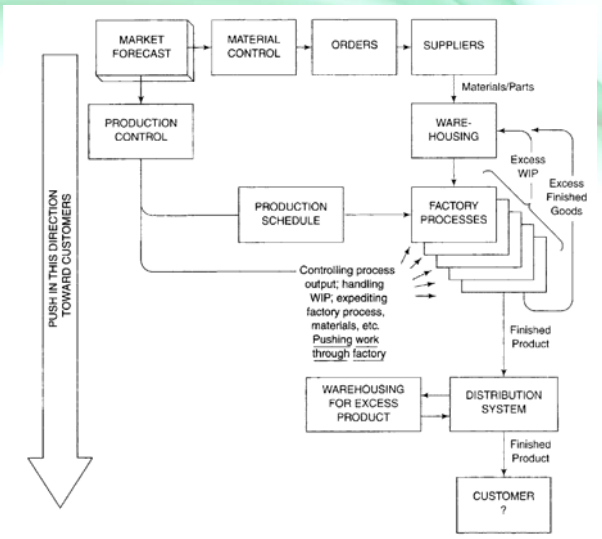

Figure 21–5
Mass Production Push System

Development of JIT

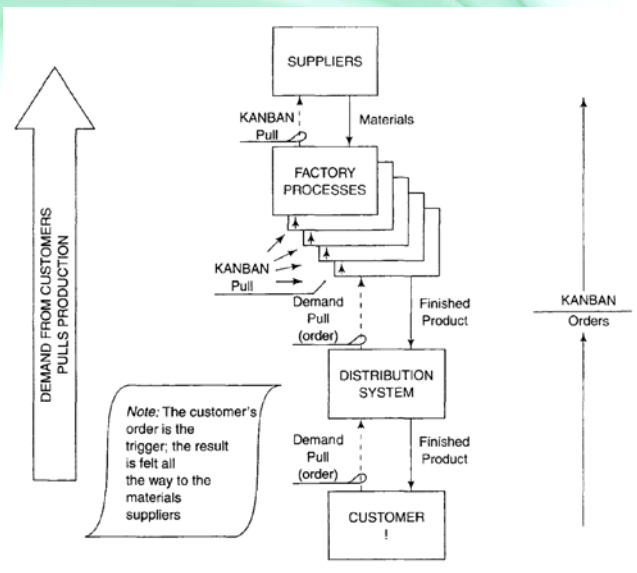

Figure 21–6
Just-in-Time Demand Pull System

Relationship of JIT to Total Quality and World-Class Manufacturing

	Before JIT	*After JIT*
Indirect Expense	$200,000	$188,000
Direct Labor	100,000	67,000
Materials	500,000	500,000
General and Administrative Expense	50,000	50,000
Cost of Goods Sold	$850,000	$805,000

Relationship of JIT to Total Quality and World-Class Manufacturing

JIT as a Total Quality Concept

JIT was conceived as a total management system, not just for the manufacturing floor. Isolating JIT from the rest of the management system will not allow it to fully develop and mature. JIT needs to be a part of a total quality management system.

Benefits of JIT

A discussion of the benefits of JIT must include four very important topics: inventory and work-in-process, cycle time, continual improvement, and elimination of waste. The discussion could be expanded to include such topics as reduced time-to-market, improved employee work life, flexibility, and employee ownership. All of these are definite benefits of JIT, but the usual targets of a JIT implementation are the critical four.

Benefits of JIT

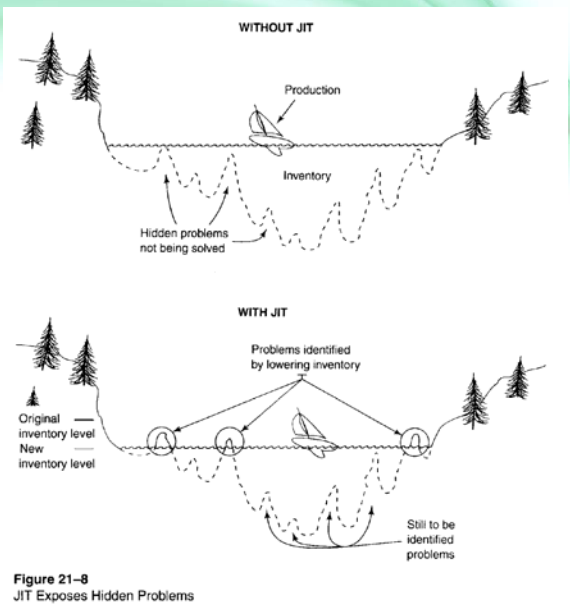

Figure 21–8
JIT Exposes Hidden Problems

Benefits of JIT

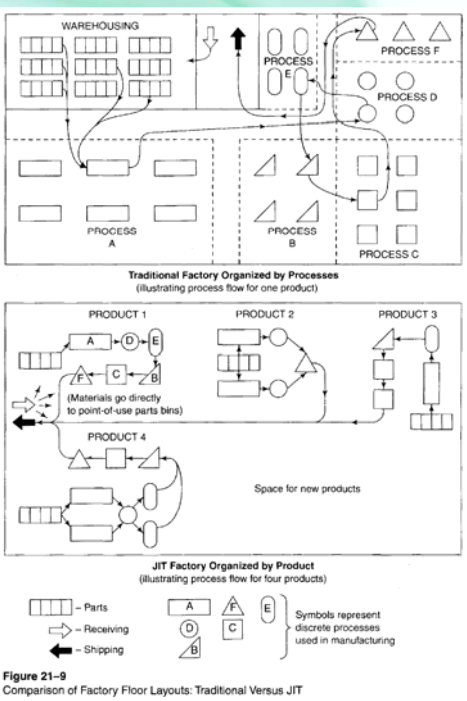

Figure 21–9
Comparison of Factory Floor Layouts: Traditional Versus JIT

Requirements of JIT

For a factory to operate as a just-in-time production facility, a number of steps must be taken. It is very important that JIT implementation be a part of a larger total quality program; otherwise, many interdepartmental roadblocks will crop up as time passes. Like total quality, JIT requires an unwavering commitment from the top because production is more than just the manufacturing department. If these two elements (a total quality program and a commitment from the top) are in place, JIT implementation should be within reach. The following issues must be addressed as the implementation progresses:

- ✓ Factory Organization
- ✓ Training, Teams, and Skills
- ✓ Establishing the Flow and Simplifying

Requirements of JIT

- ✓ Kanban Pull System

PRODUCING PROCESS	LOCATION	PART NO.	WITHDRAWING PROCESS
HARNESS ASSY BHA-15	BHA-15 SQ. F 1	3371-10130	PANEL INTEG BPT-1
	CONTAINER TYPE N/A	PART DESCR BETA HARNESS	
	CONTAINER CAPACITY —	NO. WITHDRAWN 1	RECEIVING LOC BPT-1 WS

Figure 21–10
Withdrawal Kanban

MATLS REQD	PART NO.	PROCESS
3371-10040 3371-10041	3371-10130	HARNESS ASSY BHA-15
	DESCRIPTION BETA HARNESS	
QTY AUTH 1	QTY COMPLETED 1	STORE COMPLETE SQUARE F1

Figure 21–11
Production Kanban

Requirements of JIT

- ✓ Kanban Pull System

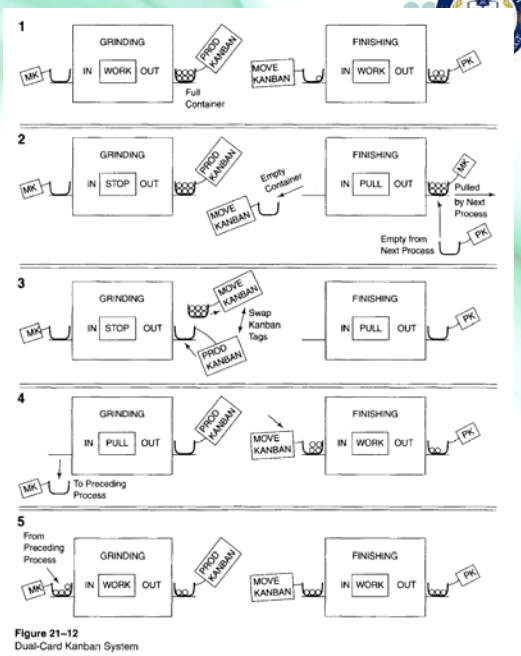

Figure 21–12
Dual-Card Kanban System

Requirements of JIT

- ✓ Visibility and Visual Control

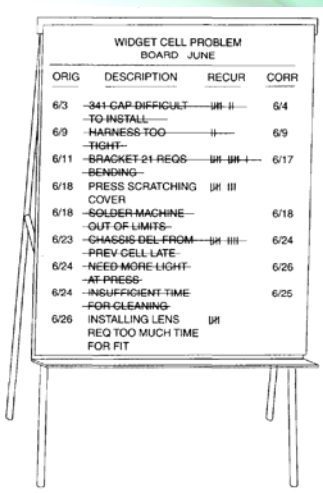

Figure 21–13
Work Cell Problem Status Board

Requirements of JIT

- ✓ Eliminating Bottlenecks
- ✓ Small Lot Sizes and Reduced Setup Times
- ✓ Total Productive Maintenance and Housekeeping
- ✓ Process Capability, Statistical Process Control, and Continual Improvement
- ✓ Suppliers

Automation and JIT

Many companies have made the costly mistake of thinking that automation will solve manufacturing problems. During the 1980s, manufacturers in the United States invested billions of dollars in automation. Cadillac built the most highly automated auto assembly plant in North America and probably the world. It turned into a nightmare of high-tech problems that took years to sort through. The plant that was to produce six cars per hour, after a year of operation, could do only half that and the quality of manufacture was, to put it charitably, questionable. Two years later, Toyota opened a new plant in Kentucky. Visitors to that plant, expecting to see a high- tech automated production line, were disappointed to find very little in the way of robotics. The difference in the philosophies of the two companies becomes obvious. Executive managers at GM believed that by spending enough money, they could buy their way out of the trouble they were in. Toyota knew what it was capable of doing in one of its other low-tech plants that was operating successfully in Japan and simply cloned it down to the last detail in Kentucky. No razzle-dazzle; just good common sense.

Automation and JIT

Automation clearly has its place. There are many examples of very successful highly automated plants, especially for high-volume manufacturing. In such plants, JIT is at least as valuable as it is in the plants with less automation. JIT's pull system prevents overproduction of any manufacturing element and supplies materials at the front end of the processes when needed, and without the massive inventories of the pre-JIT period. Whether the processes are operated by humans or by robots makes no difference in this regard. Automation and JIT are completely compatible. Probably the best example of that is in today's auto industry. Although employing large numbers of workers, the industry is highly automated. All U.S. and Japanese auto plants use JIT successfully. Remember, JIT was originally designed for an auto producer, and as automation has been integrated as needed in the car- building processes, JIT has been there doing its job.

References

Quality Management for Organizational Excellence: Introduction to Total Quality, 6th Edition, David Goetsch and Stanley Davis, copyright 2010, Pearson, ISBN: 978-0-13-501967-2.

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