



How Information Technology  
**Helps Drive** and Support  
the Move to Lean Manufacturing

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## Inextricably Linked: How Information Technology Helps Drive and Support the Move to Lean Manufacturing

**AS WE APPROACH THE MIDPOINT OF THE CENTURY'S FIRST DECADE**, information technology (IT) is taking on a broader, more strategic role in the implementation of lean manufacturing practices. For those lean practitioners who looked to marginalize, if not downright eliminate, the significance of IT in the application of their discipline, this development is nothing less than a revelation—underscoring the rapid evolution of IT and lean philosophies in the manufacturing arena.

There are good reasons for this change. A close look at the development of lean practices will show not only that IT can support them in powerful ways, but also that IT has been a driving force in the lean revolution.

Consider the Internet.

The advent of the Internet and broadscale implementation of Web-based technologies has dramatically transformed the landscape of commercial enterprise. The “digital marketplace” has changed requirements for virtually everyone involved in business.

As the processes of this new IT-driven marketplace have become second nature to consumers, individuals and the enterprises they work for have come to rely on the power of the mouse click and everything that comes with it. For businesses, this means responding at light speed, as well as providing 24x7x365 access to place and track orders. Increasingly, customers expect product to be available on demand, and their desire to have that product meet their very specific requirements has led to the rise of mass customization. Tolerance for lead times or partial answers has eroded, and delivery-to-promise is an increasingly critical element in customer satisfaction. Further, the ability to compare information over the Web (e.g., pricing, product specifications, delivery options, etc.) has helped develop more educated and pitch-savvy customers prior to the sale, making it more difficult for manufacturers to differentiate themselves.

This shift in customer expectations has been a giant meteor hit to traditional manufacturing, and while one can't say it gave birth to the idea of lean manufacturing, it definitely has helped to fuel its momentum.

### THE PATH TO LEAN

While the demands of a market with an “Internet mentality” are severe for manufacturers, the technology has opened new channels to market that allow for enhanced customer service and rapid, cost-effective entry into new and extended (that is, more geographically dispersed) markets. The challenge is that these opportunities have significantly different attributes (for example, shipping, logistics, warehousing, international regulation, and documentation) than manufacturers have addressed in the past.

Traditional manufacturing channels afforded narrow or restricted vision into demand, using sales forecasts over a planning period to assess it. While the accuracy of this approach has varied considerably, it has served to provide direction for manufacturers preparing for future production requirements.

In today's emerging channels, the vision into demand is much more precise—the sales pulse is monitored immediately, in real time, with orders often coming into the channel without anticipation. In this environment, manufacturers must be incredibly agile and able to respond to demand as it happens.

Traditional manufacturing methods have lacked the flexibility to achieve such a rapid response and efficiently meet the increasingly short lead times that accompany real-time demand. The result is too

much inventory, which not only means significant holding costs but also, in an age of increasingly narrow windows-to-market timeframes, the risk of inventory loss through product obsolescence. (In the automotive industry alone, AMR Research estimates that excess inventory costs are \$700 billion annually.)

Manufacturers, led by the automotive industry, are meeting the challenges of the new marketplace by moving from traditional manufacturing paradigms to lean manufacturing methods.

### WHAT IS LEAN?

At the core of lean manufacturing is the idea of removing waste—and adding value—to all processes involved in product creation and delivery. Lean environments all share certain critical characteristics:

- Production is done to customer demand
- Material replenishment and work control are driven by signaling devices (for example, kanbans)
- Synchronized production lines
- Continuous improvement ( kaizen) procedures
- Personnel empowered to control the manufacturing process for which they are responsible, and able to shift operations based on current demand

### HOW IT CAN SUPPORT LEAN OPERATIONS

While many original lean practitioners took the position that IT was not necessary for lean operations, the fact is that all would benefit by asking whether and how IT—both applications and infrastructure—can help achieve the goals of the lean manufacturing commitment. Software can condense (that is, reduce the time required for) manufacturing processes, present complex information in easy-to-access and simple forms, and facilitate better communications between business processes across functional and organizational boundaries.

The automotive sector has long been at the leading edge of lean manufacturing implementation. As automotive consumers seek increasingly higher degrees of customization in their vehicles, the ramifications for automotive OEMs and their suppliers are severe. Fueled by the proliferation of features and options, the number of vehicle configurations has grown dramatically. This makes it more difficult for automotive manufacturers and suppliers to maintain effectively low levels of inventory. Complicating the situation further is the ongoing challenge of balancing supply and demand. To meet these daunting challenges, automotive manufacturers have moved universally toward lean production practices. As this movement has gained traction across the sector, so has the realization that IT is an essential tool to make the promise of lean manufacturing real.

A key—and difficult—part of this realization has been the recognition that prior IT investments will not serve to realize lean objectives. The concepts behind MRP, MRPII, and ERP were based on the push model, from which forecasts are made, a plan is produced, and operations are executed. In today's real-time environment, this approach inevitably fails. Forecasts are wrong, plans are too rigid, and often the result has been large batch sizes based on the concept of manufacturing capacity and without the flexibility to change quickly. This leads to excess inventory, unnecessary production, and necessary

expediting—it leads to confusion and waste throughout the supply chain. Time and money is expended in devising new plans, debating proposed changes, and loss of focus on the single most important factor—the customer order requirement. Such experience has shown automotive manufacturers that the traditional push paradigm is counterproductive to achieving lean production. The only way automotive OEMs can work effectively is by pull and flow techniques, two of the main planks of the lean execution foundation. Any automotive company that fails to work this way is doomed to fail.

Information technology—software and the infrastructure upon which it functions—is merely a tool to provide enterprises the penultimate benefit: operating profitably. If not controlled and integrated into a lean manufacturing strategy, IT systems unto themselves do not contribute to the objectives of that strategy and can lead to waste by simply being run. IT must support the way a company chooses to run, and if that means scrapping MRP or other IT systems because they fail to support the waste elimination/value creation objectives of lean manufacturing strategy, companies shouldn't hesitate to pull them.

In today's digital competition, the role of IT is fundamental in supporting any business operation. A lean implementation is no different. While a large percentage of newly introduced lean practices requires a cultural commitment (for example, training and education from the plant floor to the boardroom; beyond manufacturing per se to purchasing and accounting; devising new measures of assessing performance that incorporate value-added parameters), IT itself is a significant component. The fact is that lean manufacturing techniques are more likely to succeed—and more likely to succeed faster—if the appropriate software and software support systems are in place.

*Where can IT make a powerful difference in lean manufacturing?* The areas include:

- Sequence control. For example, providing logic to calculate and recalculate the size and number of kanban bins required on an ongoing basis. Providing alerts to changes in existing kanbans (i.e., where physical kanbans are employed) or automatically changing electronic kanbans.
- Creating direct links between sales, production, and fulfillment.
- Supporting just-in-time procurement, including the provision of parts from suppliers in sequence according to the needs of the OEM production line.
- Product configuration. Providing applications designed to determine specific customer-ordered configurations and component needs to meet real-time capable to promise, demand loading, and line sequencing requirements.
- Implementing schedules or cell working lists wherever possible.
- Providing ways and recommendations to level flow demands.
- Presenting visual information that supports and improves decision making.
- Providing information to the process/production points where and when needed.

- Providing IT capabilities in an easily accessible and understandable way to all those who need them.

These are functional components that IT must provide to lean implementations. IT must be flexible, support change, and allow for rapid introduction of new processes. Therefore, a technology platform that can be changed quickly is fundamental to lean software development.

## A DRIVING EXAMPLE

On top of this foundation, the automotive industry has established an operational structure that can be described as rigid in its attempts to be flexible.

OEMs communicate across the supply chain by means of sales schedules tied to firm, tentative, and forecast planning horizons. Cumulative figures that control the schedule position change on a minute-by-minute basis using call-off requests as the vehicle moves down the production line. The use of EDI and rigid standards (for example, ODETTE, X12) are employed differently by each OEM, creating a challenge for suppliers down the supply chain.

These factors lead invariably to a flow and pull approach consistent with lean objectives. In order to meet the requirements of the OEM, supply chain partners cannot “guess the market,” so the only way to meet these demands without establishing costly and inefficient buffers is to employ pull and flow techniques. OEMs have been the driving force for lean initiatives in the automotive market. They have imposed more pull and flow requirements for their downstream suppliers. In-Line Vehicle Sequencing (ILVS) is perhaps the best example. With ILVS, OEMs pull the exact components needed at the assembly line at specific points and times—a practice designed to optimize production efficiency. All of these tactics fall under Release Management.

Release Management practices integrate EDI releases and JIT delivery instructions, reconciling cumulative shipments against requirements while maintaining a full history of OEM change requirements. The objective is to eliminate manual intervention for routing processing—and highlight exceptions for review and action. Release Management also includes automated scheduling of order picking and shipping, and a requirement that manufacturing account for shipping lead times and customer ship-to calendars. Automatic generation of outbound Advanced Shipping Notes (ASN) is included when needed.

OEMs also require specific documentation processes that facilitate the flow of information throughout all operations. Supply chain participants are required to automatically calculate packaging materials based on fully configurable, multi-level packaging—which can be labeled as a consumable or inventory item. The objective of this practice, commonly called Automatic Packing Creation, is to ensure that precise quantities of packaging are issued from stock when goods are shipped, and that returnable packaging is tracked.

To buffer the spikes in market demand that inevitably occur, automotive OEMs use consignment stock, smoothing the flow transaction by self-billing. This approach not only provides visibility of consigned and self-billed goods, but also eliminates manual invoicing and supports expected service levels.

Naturally, supply chain integration has been key to automotive implementation of lean manufacturing; and one can claim that the automotive industry has integrated their supply chains more extensively and effectively than any other manufacturing sector. The ability to flow demand from the OEM to its

downstream suppliers is essential. It requires the IT-empowered ability to digitally send vendor schedules and call-offs while managing inbound ASNs and payments by electronic invoicing or self-billing. The objective is synchronization of material delivery with actual need, thus streamlining the receiving process.

## MOVING FORWARD

There are multiple techniques, methodologies, and templates available to any organization considering a transition to lean practices. How to make the transition from traditional manufacturing to lean manufacturing has been the subject of much debate, with some arguing for an immediate changeover, while others make the case for a phased implementation. Regardless of which path is selected and which tools are employed to take the organization down that path, the decision needs to be made after collaboration between the CEO, IT manager, and others involved in the lean initiative at the decision-making level.

Yet one must always remember—lean is about “doing,” not planning and discussing; and IT will be a critical tool in empowering the organization to respond to lean imperatives as they arise. For manufacturers, the results of not adopting lean strategies may well be eroding profit margins or closed facilities. To avoid this, management needs to embrace the concept that IT systems are partners with effective lean initiatives because IT enables constant change, anticipates change, and embraces the opportunity to support and facilitate change as a critical part of its reason for being.

“Change alone is unchanging,” said the Greek philosopher Heraclitus. Who knew the roots of lean practice extended so far back?

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