Does enterprise resource
planning software support lean?

ERP goes

BY HARRY F. LANDSBURG AND SHELDON NEEDLE

lean

Many articles have been written about how lean manufacturing practices and enterprise resource planning (ERP) software do not work together. Some articles propose that lean and ERP have a positive effect, but on separate aspects of the business. The premise is that lean is reserved for the factory while ERP is for the front office (CRM, quoting, order entry, purchasing and inventory management) and the back office (accounting, financial reporting, dashboards and business intelligence).

ERP vendors claim that their solutions are supportive of lean manufacturing practices. This article will examine the claims of widely recognized small- and mid-market ERP vendors to understand what their functionality offers in support of lean manufacturing.

The terms manufacturing resource planning (MRP) and ERP are often used interchangeably as though the capability of each is equivalent. Vendors changed the description of what they were selling from MRP and accounting to ERP in the mid-1990s while presenting basically the same functionality in their solutions.

At first, ERP was an umbrella term for all of the components that were sold together previously — MRP, accounting, quoting and sales order entry, bill of materials and routings, and shop floor data collection. Twenty years ago, Customer Response Management (CRM) and business intelligence as we know it today didn't exist. Typically, there was a field in the customer master file that differentiated companies as leads, prospects, customers and inactive customers. MRP was presented by vendors as having the greatest value of all the applications offered, especially because most believed that "accounting is accounting."

The Toyota Production System (TPS) was not familiar to small- and medium-size manufacturers in the mid-1990s. Since software to support this lean foundation system was not in high demand, software developers did not create software for new solutions unless there was a measurable demand from their existing customers.

Twenty years later, many of these small- and mid-size manufacturers have considered adopting or have adopted lean manufacturing practices. Many have applied the principles of the Toyota Production System to their businesses successfully. They are continuously improving their lean factory practices and are now considering opportunities to use lean in the "office." ERP vendors have responded with software modules to support lean practices in the factory.

Definitions

To better understand how far ERP software vendors have come in support of lean manufacturing practices, here's a list of easily recognized lean manufacturing/TPS attributes.

Takt time

Takt time is the number of minutes/seconds that a part is finished to meet customer demand. In an eight-hour day with an hour for a combination of lunch and breaks, there are seven productive hours or 420 productive minutes. If demand for a part is 84 parts per day, then the takt time for a part is five minutes. A part must be finished every five minutes to meet takt time calculations. The part could take hundreds of minutes to produce but the completion interval must be five minutes.

Most ERP systems do not support the correct calculation of takt time. They are not programmed to relate overall demand for a finished part to the frequency it needs to be completed to meet takt time. Most view takt time in relation to production time but use of times defined in routings is not supportive of this concept.

Kanban

Kanbans are containers of parts that are used to produce the finished products sold by a manufacturer. Kanban quantities are determined based on how many parts are needed for a defined period of production. Part quantities are determined by a combination of part demand and the capability of the producer to replenish the part kanbans as required.

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Companies that use a kanban system often have two kanbans at each workstation. When one kanban is empty, the second is used while the first is a visual signal that the kanban quantity needs to be replenished. Replenishment can be from the stockroom or a signal can go to the supplier to deliver the quantity required to replenish the kanban.

ERP systems have been programmed to support the replenishment activity either by reporting parts consumed by a bill of materials (as a signal to the stockroom to deliver a replenished kanban) or by issuing a purchase order (signal) to an outside supplier for the agreed-upon kanban quantity. Manufacturers who do not use technology to support the replenishment activity simply have a stockroom employee who is responsible for walking the plant a pre-determined number of times during the day to retrieve empty kanbans and deliver replenished kanban containers.

Line balancing

Companies can have bottlenecks in their production processes. This typically results from the movement of work-in-process through production where individual tasks do not take the same

Case study: PCB Piezotronics

PCB Piezotronics in Depew, New York, designs and manufactures precision sensors for measuring acceleration, vibration, acoustics, shock, pressure, force, load, strain and torque. The company's products find application in the automotive, aerospace and defense, industrial, energy and test and measurement markets. PCB's customer orders include a mix of stock or catalog products, design/make-to-order special products, and program/blanket orders. PCB Piezotronics uses Infor ERP SyteLine to support its business.

As PCB progressed on its lean journey, it began to use three modules of its ERP solution to enhance factory operations. The SyteLean module supports its electronic kanban functionality while the ShopTrac and DocTrac modules further automate factory transactions and information.

According to John Betzig, PCB's value stream operations manager for components and services, the company's conversion of its manual kanban card system to electronic kanban functionality was of significant value.

"By automating the kanban cards, PCB gained the ability to more easily recalculate kanban quantities and change associated documentation. With the manual card system, collecting old cards and creating new cards was time-consuming since recalculations are completed monthly," Betzig said. "With electronic kanban, there is no delay in having the new information visible and appropriate staff responding to the impact of the change."

Another benefit of electronic kanbans was better visibility in both production planning and purchasing to the updated requirements so that either work orders or purchase orders for kanban replenishment were executed more effectively.

"We are much more responsive to trigger signals of low stock situations with the electronic kanban application," he said.

In combination with the updated kanban functionality, PCB also has benefitted from the forecasting and scheduling capability provided by a SyteLine Channel Partner. Those two functions are more representative of how ERP is used outside the factory floor to help plan longer term for the utilization of available productive capacity.

On the factory floor, PCB also has realized significant benefits from ShopTrac and DocTrac modules in SyteLine. Before implementing these modules, the factory traveler package included not only the work order (bill of materials and routing) but paper copies of drawings, work instructions and sign-off sheets for selected operations.

Although these documents were essential to producing the products ordered by the customer or made to stock on blanket orders, critical information was only on paper. The completion of the work order and the closing of the order in SyteLine provided management with visibility of important data but after all the work was done.

"Visibility of where orders were in the factory and how the order was progressing against anticipated completion dates was limited," Betzig said.

With ShopTrac and DocTrac, the traveler contents are now fully visible on the shop floor. Using barcode data collection, PCB now has full visibility of where orders are at any time and how they are progressing against the schedule. Hard copies of work instructions, prints, in-process testing and manual sign-offs are being eliminated as this data gets collected electronically. There is less paper and more ability to work proactively to know and resolve production challenges.

"Automating this information will make change orders much easier to communicate and track in SyteLine," Betzig said. "We now have far better visibility of the factory, allowing us to communicate more effectively with customers on order status or change order impact."

Another benefit of using ERP in the factory has been PCB's efforts to continuously improve the creation and monitoring of metrics associated with manufacturing.

"We have already experienced better visibility in planned versus actual hours of production both on an individual work order basis and for a functional production area," he said. "We are continuing to use our enhanced information to determine what else we can evaluate so that the direction of our lean journey is based on measured results."

THE ERP BEAST For more information about ERP, consider reading Chapter 10: Tame the ERP Beast in *The Lean CFO: Architect of the Lean Management System*, by Nicholas S. Katko. That book is reviewed in this issue on page 8.

amount of time but have equal staffing assigned to complete each task. The out-of-balance result occurs when work steps with shorter times push up against work steps that take longer.

TPS requires that the production lines be balanced by grouping a number of steps together in a cell so that the combined work activities require a similar amount of time to execute. This facilitates moving the product steadily through the production process to achieve takt time. This also could be achieved by splitting up a longer work step where possible.

Many ERP systems have been programmed to support cellular manufacturing with respect to reporting labor hours as a group of employees with each employee recognized for his or her work hours individually as part of the work cell staffing.

Some ERP systems can help a user visualize the differences in routing operations so that there is a basis for making changes in implementing balanced production lines. Many systems adhere to the belief that eliminating bottlenecks by eliminating planned overuse of capacity is production line balancing. But that is not the same as grouping production times to make sure needed quantities of a product flow through all work centers at nearly the same rate.

Lot size

When possible, lean manufacturers look to reduce lot sizes to a smaller number to accelerate production through the factory. Producing in smaller lot sizes allows product to move more quickly through the factory with less wait time. A production manager reduces lot size gradually from a large quantity to a small quantity, often by halving the lot size and measuring the impact on lead time. Some companies are able to achieve a lot size of one, the ultimate result in accelerating product through production. Producing a lot size of one must be aligned to the takt time based on customer demand and is the goal of a lean pull system. It also

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could provide the basis for a pull system rather than a push system.

ERP systems have provided work orders that can have multiple releases based on desired lot size but little is available to calculate preferred lot sizes. Lot size has nothing to do with lot traceability or serial number traceability. Reducing lot size to accelerate movement of product through multiple production operations is unrelated. "Split Lot Move Ahead" is also not a lot size reduction strategy but often a response to the accelerated need of customers for their product regardless of the promise date.

Supermarkets

Supermarkets are designated work-in-process inventory locations that store semi-finished products that will be consumed in the next production steps. Supermarkets are designed as part of the lean flow when there is a timing difference that can't be addressed by line balancing. The production flow can be maintained if one operation produces at a different pace and stores the extra parts produced in a supermarket area. An example would be where a batch process step is required and the quantity produced in that batch is larger than the lot size determined for that product. The batch process would be run fewer times per week but the yield would support the continuous flow of the desired lot size.

A supermarket is typically not an inventory location since the quantities are often small and consumed continuously throughout the production cycle. Many vendors view supermarkets as an inventory location requiring inventory

transfers rather than understanding that supermarkets are merely stations in the continuous production process where in-process goods are stored temporarily to support production activity needed to meet takt time. The vendors may choose to ignore a supermarket situation as the quantity is consumed quickly enough that tracking does not add value to the system.

Backflushing

Backflushing is a method of closing a work order without reporting actual production hours and actual use of raw materials and subassemblies. Backflushing simply assumes that all finished products were made as specified with the pre-determined amount of parts and labor hours incurred. Factory floor reporting is responsible for reporting scrap quantities so perpetual inventory can be maintained accurately. Otherwise, all other time-consuming factory reporting is eliminated. Backflushing can occur when the work order is released to the factory floor, when the final operation is completed or at pre-determined intervals during the production process.

Backflushing is widely supported by most ERP systems.

Lessons learned

Without specifying which vendors provide support of Toyota Production System features, there are lessons to be learned relative to selecting the right software to support your continuously improving manufacturing processes, including the following:

Definition match

When you ask a vendor about a particular function, the typical response is "we do that." Ask the vendor to tell you what the function is designed to do and then show you an example of how it works. The vendor may offer functionality that it says is what you are seeking but it may not come close to how you want new ERP software to support your active production practices.

Identify supporting information to be used in making lean/TPS calculations

While the vendor may not offer the specific functionality you are seeking to support (e.g., line balancing) the software may give you good visibility of the information you need to complete the necessary calculations to achieve line balancing. Look to make sure you know how the proposed solution could best support decisions that you need to make "off line."

Check references

If you are looking to make final decisions on how proposed ERP software could help your company in its lean journey, talk to users of the software about where they are in their lean journey and how they are using the software to continuously improve. Typically, no two companies are in the same place in their continuous improvement activities so matching your progress and plans to theirs is an important aspect of final decision-making.

Summary

Over the last 15 years, ERP vendors have listened to their customers' needs for continuous improvement support on their lean journeys. In the areas of kanban and backflushing, there is significant software support. Calculations of takt time, line balancing, lot size and supermarket quantities may be indirectly supported by information provided by an ERP system.

With regard to the argument that ERP does not belong in a lean factory, ERP vendors are supporting the lean journey more and more, and there are clear roles for ERP capabilities in support of a lean operation. It is important that your vision of lean matches the vendor's definition to achieve continuous improvement. ◉

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