The **TRUCE** between LEAN and **I.T.**

Eliminating wasteful operations doesn't mean trashing your technology system

BY DAVE DIXON

THERE IS A STORY ABOUT THE OWNER OF A MANUFACturing firm who went to Japan to learn about lean. He was shown lean techniques in action and was duly impressed with the results: extraordinary productivity levels, scant inventories, very visible control of quality, throughput at light speed, and great customer service.

"This is for me," he said. "But tell me how this ties in with my MRP system."

"It doesn't," his host replied. "Go home and turn it off."

It is doubtful that the owner actually scrapped his manufacturing system, but the story illustrates the dilemma faced by companies with legacy manufacturing resources or enterprise resources planning systems that are also in the throes of a lean journey. Is there a role for overarching systems in the lean environment? If so, what is that role? Are there full-blown systems designed for lean adopters? What about bolt-on applications designed to support lean techniques? Are there lean-friendly, standalone applications with links to a backroom ERP?

It's time for a rational approach to combining the performance improvement potential inherent in lean with contemporary information technology.

Different directions

Differences between lean and MRP/ERP include:

Lean	MRP/ERP
Local solutions	Enterprise solutions
Physical process visibility	Green-bar reports
Helps with execution	Helps with planning and reporting
Executes with visual kanban	Executes with work orders
Reduces or eliminates complexity	Manages complexity with IT
Limits transactions	Promotes transactions
Minimizes data needs	Needs lots of data
People measure themselves	Management measures people

Given these divergent thrusts and a sprinkling of professional jealousy, it is no surprise that lean has evolved under a cloud of anticomputer bias. This bias has been further fueled by the fact that many of the promised benefits of ERP turned out to be smoke and mirrors. Thousands of companies have spent many millions of dollars on MRP/ERP implementations. Too often these efforts have actually added cost while doing little to improve inventory turns or customer service (the main reasons for buying the system).

Lean techniques, on the other hand, have a demonstrated ability to deliver improved performance, and one's first impulse might be to follow the Japanese host's suggestion to turn off the computer. Just do the lean thing, right?

A foundation for reconciliation

To understand why abandonment of your computer-based manufacturing system is a very bad idea, we need to examine the underlying objectives of both IT and lean techniques.

Figure 1 is the profile of a world-class company. This model represents the business state to which both IT and lean proponents would move us. This is the goal of all improvement activity. Each faction might suggest that their solution could best close the gap between our reality and this perfect profile. In fact, neither IT nor lean alone will drive the improvement necessary to reach the lofty intent that the model implies.

Companies that assume this profile will learn and apply a wide range of improvement strategies and techniques. Figure 2 offers a model that captures an array of these tools, which in combination have a time-tested ability to enable world-class performance. Each quadrant represents a set of techniques and strategies that, when properly applied, contribute to major operating improvements:

Customer-focused people are developed through human resource initiatives that foster the skills, attitudes, and behaviors necessary to deploy technical aspects of world-class operations effectively. The ultimate objective is to have a work force with an abiding commitment to doing a first-rate job for their customer, where the customer is both the end user and the internal recipient of work done by another person or group. This commitment, coupled with technical know-how, is the foundation for a successful improvement process.

Systems and resource management provides a set of techniques for positioning capacity or inventory in a manner that ensures 100 percent on-time delivery at the lowest possible cost. Being chronically late is definitely not world-class. First, systems and resource management tools provide for realistic delivery commitments based on capacity or inventory available to promise; second, they provide the means by which production schedules can be effectively executed.

| World's preferred supplier	Financial capital magnet	Sought-after employer	Community business of choice
Quality	Management	Safety	Environment
Delivery	ROI	Education	Stability
Innovation	EBITDA	Compensation	Suppliers
Value priced	Simplification	Involvement	Investment
Hassle free	Cost/value	Accountability	Partnerships
Values, performance, and feedback			

Figure 1. What is world-class?
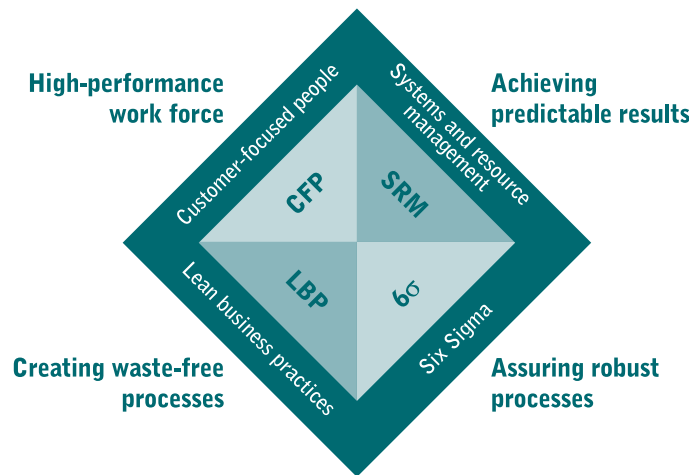
Figure 2. The competition quad

Six Sigma quality techniques are used to drive out errors and defects from business processes throughout the enterprise. These are high-powered diagnostic and statistical tools with the potential for reducing defects to less than 10 occurrences per million opportunities. A reduction in defects to the Six Sigma level is, of course, accompanied by major reductions in the cost of quality and near perfect end-item quality.

Lean business practices reduce or eliminate non-value-added work (waste) as a means of increasing productivity, reducing inventory and other buffers, speeding throughput, and making quality issues more visible. In addition, lean techniques allow production and delivery of small lots of material at frequent intervals — a growing demand in most industries.

Note that the tools of the competition quad include computer-based solutions, particularly in the systems and resource management quadrant. The information provided by a fully integrated, functionally complete business system is absolutely necessary for managing resources in a complex manufacturing environment. It is unimaginable that a manufacturing busi-

ness could run without order entry and management capabilities, item masters, bills-of-materials files, inventory and routing files, and integrated financial modules. You may never use the MRP function to explode a bill of materials, but you must maintain certain data in order to run the business. The real question is not whether or not to use MRP/ERP software. The correct question is how to set it up and augment it to support the lean initiative.

The computer is here to stay. The challenge yet to be met is to develop systems tools that support the objectives of lean.

Overcoming ERP/MRP shortfalls

A very basic issue for aggressive lean adopters is finding a way to adapt off-the-shelf software to support a shop floor execution environment that is driven by visual pull systems and rate-based planning. Software suppliers have not been able to provide the functions required to support lean easily.

Figure 3 lays out a way to run the lean factory using information provided by the ERP system. But here, we also use concepts and report formats that are linked to a shop configuration and organization designed around lean principles.

To understand the approach, it is useful to consider the capabilities of a lean production management system:

- Maintain the best possible data on sales-driven production requirements.
- Express production requirements as a takt time or rate associated with the cells, lines, and shared resource departments defined by a lean enterprise model.
- Produce schedules by cell, line, or department based on absolutely valid due dates.
- Measure performance to rate and schedule on a daily basis.
- Have accurate, real-time visibility of load vs. capacity to enable delivery promising based on available capacity (i.e., the ability to quote variable lead-times based on how sold out the capacity is).

An ERP environment that is adapted or augmented to accomplish the following functions supports this capability:

- Sales, production, and inventory planning using tailored spreadsheets with embedded algorithms and data capture for performance measurement.
- Scheduling and daily production monitoring with flawless date management and rate-based, due-date driven schedules.
- Standalone order promising model with real-time updating.
- Daily performance measurement with an electronic performance board and supporting data capture capability.
- Automatic ERP updates, including completions, shipments, backflushing, inventory files, and other updates as required.

There is no ERP software that includes an effective sales, production, and inventory planning module, so this capability will need to be bolted on. The importance of a first-rate sales, production, and inventory planning process cannot be overstated: All other planning, execution, and performance measurement depends on it.

Other adaptations of the ERP system involve the definition of routings, item mapping to cells and lines, capturing completions, measures of output, back scheduling from delivery due dates, defining transaction points, and collection of cost data. The trick is to satisfy the ERP system's need for transaction-based data in a lean environment where transactions are properly defined as non-value-added or waste. We visualize the business as a set of value streams through which work flows. The system then becomes a tool of value stream managers to help measure progress, performance, and cost with an absolute minimum number of systems transactions. And at the same time, we enjoy the vital support of the ERP system in managing non-manufacturing functions of the business.
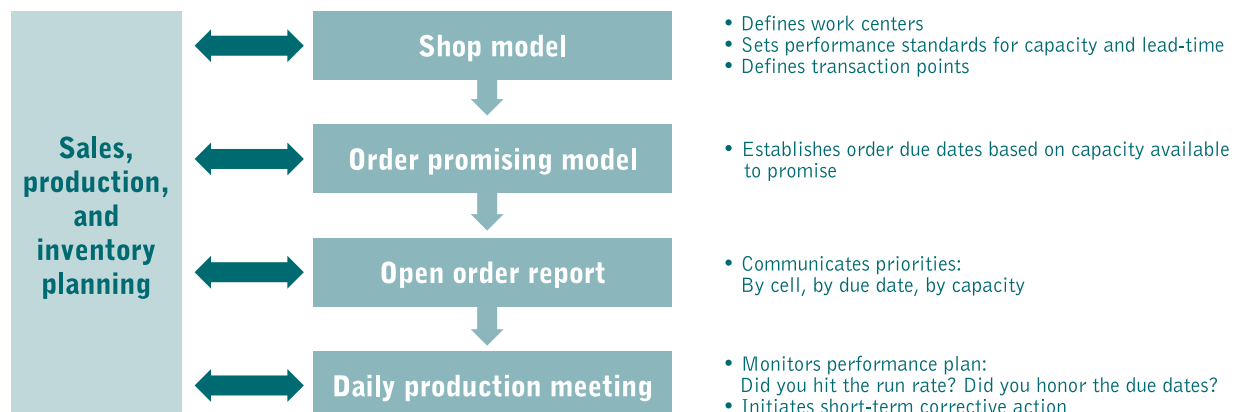

Sales, production, and inventory planning	Shop model	• Defines work centers • Sets performance standards for capacity and lead-time • Defines transaction points
	Order promising model	• Establishes order due dates based on capacity available to promise
	Open order report	• Communicates priorities: By cell, by due date, by capacity
	Daily production meeting	• Monitors performance plan: Did you hit the run rate? Did you honor the due dates? • Initiates short-term corrective action

Figure 3. Rate-based, due-date-driven production management approach

Other IT applications

There are additional IT solutions that enhance lean techniques (Figure 4). A tour of this diagram shows how contemporary IT tools can support lean objectives:

| Lean concept	IT application support
Value stream mapping	Custom visio applications
	Data capture from ERP (planning) or process execution (actuals)
Fast setup	Continuous measurement and reporting of actual setup time
	Comparisons of actual setup time vs. objectives
Focused layouts	Spreadsheets for line balancing and capacity analysis supported by data from ERP system
	CAD
Small lots	Continuous lot size analysis
	Comparison of actual lot size to objectives (by material class)
Pull systems	Total supply chain capability for data capture at time of visual determination of reorder points; electronic transfer of replenishment signals; printing of kanban signals; electronic posting of kanban signals; and updating of ERP system and required reporting
Takt time/line balancing	Automatic capture of line/cell completions
	Real-time measurement of performance to takt time and linearity goals
	Spreadsheets for calculating line/load balance and total labor requirement
	Labor utilization measurement as an indicator of effective line/load balancing
Packaging and handling	Real-time, incremental measurement of transportation and wait time in plant and over the road
5S housekeeping	Electronic score sheets with embedded formulas to ensure timely updates
Standard work	Electronic work instructions with color coding, digital photos or video, and real-time ECO implementation
Error proofing	Electronic work instructions with color coding and embedded checks
Increased productivity	Output-per-unit-of-input measurements at cell, operations, and corporate levels: completed units per man-hour, completed units per hour, revenue per employee per unit of time
Withdrawal of buffers	Measurement of inventory turnover by line or cell
	Actual turnover vs. objectives
Visible quality control	Integration of quality measurements into comprehensive performance measurement package
	Effective, custom measurement of the cost of quality
Reduced lead-time	Measurement of inventory turnover by line or cell
	Actual turnover vs. objectives
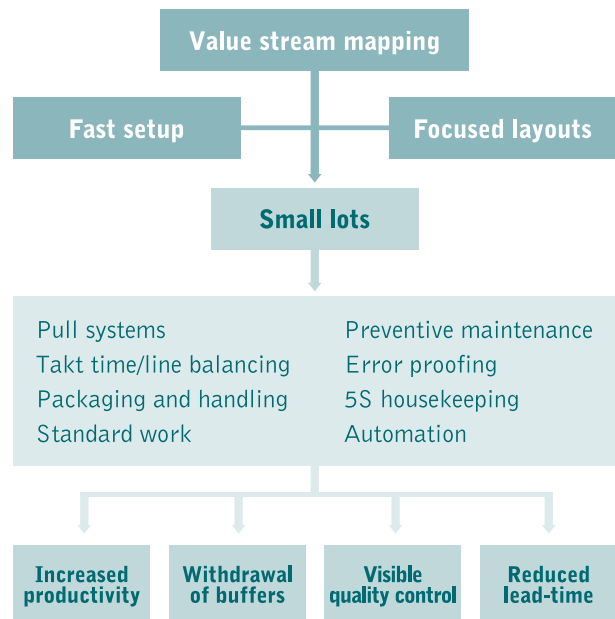
Figure 4. Lean overview

Software suppliers currently do not offer all of these applications, but data capture, manipulation, and reporting capabilities are available. It remains for the manufacturing community to create the demand that will drive development of the software.

In this regard, the software industry should be challenged to get outside its tightly circumscribed world and explore the needs and opportunities outlined in this and other articles. Basic MRP software logic has not changed significantly since its invention more than 30 years ago. An ERP package completely redesigned to support the lean environment is long overdue.

What the future holds

The marriage of lean techniques with IT solutions that helps drive waste out of business processes holds enormous promise. Aggressive practitioners will continue to develop and adopt these tools. Those who cling to the archaic notion that lean and IT are incompatible will eventually be left behind.

In a competitive environment that demands extraordinary performance just to stay in the game, the creative combination of lean and IT might well be the edge you are looking for. ❧

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