10 Value-Adds
Manufacturing Systems Give to a Lean Program at the Plant Level and in the Supplier Network

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MESA knows the role of information technologies in manufacturing operations. Do you know what MESA knows?

Extract Introduction

This document is an extract of MESA International’s Lean Manufacturing Strategic Initiative Guidebook. It includes the table of contents from the original guidebook, as well as the contributing authors and organizations. Note that page numbering is consistent with the original guidebook. This extract discusses the role of technology within an organization’s lean initiative – a topic that commonly arises as manufacturers implement lean techniques.

The full guidebook is available from MESA International; please visit www.mesa.org for details.

As with all MESA guidebooks, this work is periodically updated to ensure the guidance provided is consistent with current technology and thought leadership. The Lean Manufacturing Strategic Initiative Guidebook is currently being reviewed for the forthcoming revision; if you would like to contribute to this guidebook update, please contact Brandy Richardson (brandy@mesa.org).

MESA International has also developed guidebooks on additional topics; here is a listing of guidebook titles.

- Quality and Regulatory Compliance – Strategic Initiative Guidebook
- SOA in Manufacturing Guidebook
- Product Lifecycle Management (PLM) Strategic Initiative Guidebook
- Asset Performance Management Strategic Initiative Guidebook

In addition to these, the MESA resource library contains numerous white papers, articles, podcasts, presentations, studies & surveys, and webcast recordings which are available to MESA members.
The Role of Technology in the Lean Journey

Today’s manufacturers operate in an increasingly demanding environment that includes global competition, increasing pressures for cost reductions and new products, quality-driven compliance, and improvements in on-time and in-full orders. Each of a company’s core business functions is affected, including product design, manufacturing, supply chain operations, sales and customer service. It is within this context that many manufacturers are initiating corporate-wide Lean cultures and programs in order to compete in the 21st century.

Though the concept of Lean has been around for many years, it is only recently, with the advent of modern information technologies, that an enterprise can realize the true vision of Lean. With state-of-the-art manufacturing execution systems (MES) or manufacturing operations management (MOM) systems—which combine technologies such as the Internet, Web services, XML, radio-frequency identification (RFID) and other real-time shop floor technologies—manufacturers now can gain visibility into their entire supply chain, from source through consumption. Manufacturers leveraging these technologies and driving towards a fully Lean system will see additional incremental business benefits.

Unfortunately, the results have sometimes been so successful that many beneficiaries have called into question the need for using information technology in Lean deployments. The truth is that manual Lean techniques will deliver some early benefits, but a Lean deployment absent of technology is unlikely to sustain and will not scale to achieve a Lean enterprise.

Referring back to the importance of linking change to business challenges, consider the Lean solution map in Figure 1. This map proposes that the business benefits tracked against a Lean deployment program extending from the plant through suppliers to customers are significantly greater when technology-enabled than without technology.

Figure 1: Lean Solution Map:
Benefit versus Scope of Initiatives

Information Technology—MES/MOM in particular—

1 HighJump Software. “Four Vital Reasons Manufacturing Execution Systems are Essential to Lean Enterprise Initiatives.” Eden Prairie, MN.
MESA knows the role of information technologies in manufacturing operations. 

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is vital to the success of any enterprise-wide Lean initiative. Typically, a program of Lean initiatives begins in the plant, moves upstream into the supplier community, and finally moves to distributors and customers.

The plant is the most logical starting place for a Lean initiative. The approach for implementing Lean in the plant has been proven across many industries and manufacturing styles. Books, industry groups and Lean consultants provide an abundance of information related to deploying manual Lean techniques within the plant.

Many Lean practitioners promote the use of 100 percent manual Lean techniques. Plants suffering from poor quality, excess work in process and long cycle times often see dramatic improvements based on these manual techniques. However, over time these plants find that manual methods are labor intensive and do not scale across the factory.

In order to reduce the number of manual steps, factory schedulers typically develop spreadsheet tools specific to their production lines or product families. Rarely is there any standardization among these scheduler-specific tools. The drawbacks to these tools include limited reuse of best practices, inability to scale across the factory, and heavy reliance on “tribal knowledge” within the plant. Additionally, these spreadsheet tools often cannot deal with complexities such as modeling flexible work cells and smoothing complex demand patterns.

Paper-based Kanban systems are also pervasive in Lean plant environments. These systems require the passing back and forth of paper cards from operators to material handlers several times per day. In many cases, these cards represent the only source of inventory information on the plant floor. Paper-based systems result in labor-intensive processes for transporting and managing cards when demand patterns change, requiring, for example, recalculation of Kanban quantities, collection of old cards and creation of new cards.

Although improved quality, lower work-in-process (WIP) inventory and reduced cycle times may be achieved using manual methods, deploying information technologies elevates Lean initiatives to a new level for many manufacturers. At the plant level and in the supplier network, manufacturing systems can add the following value to a Lean program:

1. **Eliminate Non Value-Added Steps**

   Technology can be used to automate certain steps utilizing plant floor data collection in order to keep personnel focused on direct value-added activities. Integrating systems across the engineering, operations and quality departments can greatly streamline processes, eliminating manual steps and time wasted in activities like waiting for paperwork to travel through approval processes.

2. **Provide Real-time Performance Visibility**

   Real-time performance visibility is required to support effective program metrics and decision making. An improvement program such as Lean is highly dependent upon the accuracy and timeliness of the data produced and collected during the production processes, including machine uptime, process cycle time or days of WIP inventory. This data is critical for continuously improving the process. Technology provides a visual window into plant floor status and issues, as well as a method for making real-time decisions to optimize flow and resolve constraints.

3. **Enhance Visual Controls**

   The goal of visual controls is to make the job more intuitive. Well-designed manufacturing systems can enhance the display of important information to plant floor personnel. Information like out-of-control
alerts can be displayed in real time and only when necessary. Monitors on department aisles can continuously display machine and production status and highlight issues for quick visual oversight by any supervisor walking through the plant. Online standard procedures and graphical work instructions also are used as visual controls for the shop floor. More examples of visual controls can be found in the MESA International Lean Manufacturing Strategic Initiative Guidebook Appendix.

4. Standardize Work Processes

Manufacturing systems can enforce standard disciplines and work practices, including production sequences, production methods, work instructions, and quality and safety checks. These standard processes provide consistency and reliability while minimizing opportunities for error.

5. Track One-piece Flow Efficiently

Thanks to modern information systems, following one unit through the plant floor is just as easy as following a big lot of units through the plant floor—and when considering activities like splitting work orders to work around production issues, following one unit actually might be easier now. Information technology systems alleviate the need for combining multiple units into a single work order to reduce the overhead of paperwork and scheduling.

6. Facilitate Just-in-Time Pull Processes

Technology provides the backbone for the ability to collaborate effectively with trading partners and suppliers worldwide. Not all manufacturers have suppliers next door to their plants, ready to fill new orders immediately. Electronic Kanban signals can be sent by manufacturing systems automatically via the Internet. Demand-driven production scheduling, which should take into account manufacturing and transportation lead times as well as product availability, becomes another critical element in the execution process. Fortunately, today’s information technologies can leverage web-based capabilities to enable collaboration with suppliers.

7. Identify and Resolve Constraints

Manufacturing systems can be configured to raise alerts based on rules and immediately flag issues in real-time. Specialized scheduling software is also useful in high-mix environments where constraints are always changing, depending on the jobs in process at the moment.

8. Enable Quick Product Line Changes

Changing business needs and processes require flexible software as processes designed and deployed today inevitably will require changes in the future. Business process changes can dramatically affect those doing the work, as well as the materials, equipment and services provided. Relying on manual processes and tools to provide the flexibility necessary to meet these demands can introduce error and

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2 For information on how to obtain a copy of the Lean Manufacturing Strategic Initiative Guidebook, please visit www.mesa.org/ResourceLibrary.
waste, both in time and materials. Manufacturing systems designed to embrace business process change can provide a robust platform upon which to base both today's initiative and future improvements.

9. Improve Product Quality by Reducing Variability

Quality management is so important to achieving Lean manufacturing that Toyota has a philosophy of stopping production to fix quality problems right away. A major reason for this is that quality issues historically have been identified as a major source of time and material waste. Examples of how manufacturing systems help quality improvement efforts include:

- Automation of inspection and data collection
- Real time alerts for out-of-control situations based on statistical analysis
- Systematic enforcement of sampling and auditing rules
- Tracking of corrective action efforts

Further discussion on the relation of Lean and quality management initiatives like Six Sigma can be found in the MESA International Lean Manufacturing Strategic Initiative Guidebook Appendix.

10. Track Process Improvements

Information systems also are required to track the progress of ongoing process improvement initiatives. These systems provide a shared knowledge base with visibility of prior achievements, which is essential in creating a culture that promotes continuous improvement. More information about managing continuous improvement for Lean and Six Sigma initiatives can be found in the MESA International Lean Manufacturing Strategic Initiative Guidebook Appendix.

Many Lean programs focus solely on improving the manufacturing process, but Lean techniques also can be applied to other areas of the enterprise. For instance, the output of the manufacturing process (finished goods) could naturally be defined as the input (inventory receipt) of the distribution process. Only the appropriate use of technology can build the cross-functional bridges required to bring multiple processes together.
In summary, many examples of how information technology enables further achievements in Lean initiatives have been provided. The following sections of this guidebook will delve further into project justifications and implementation considerations to achieve success in different types of industries. Some of these considerations for a successful Lean manufacturing journey include:

- Engage senior management early and align the program with corporate initiatives
- Address the key business challenges
- Jointly develop a roadmap with the principal stakeholders
- Address short, medium and long-term plans
- Run formal value stream mapping / Leaning of selected processes
- Run an initial pilot project to indicate potential savings and gain program support

More information on some Lean manufacturing and Six Sigma techniques and how they relate to information technology can be found in the MESA International Lean Manufacturing Strategic Initiative Guidebook Appendix. For a complete guidebook, visit: https://services.mesa.org/ResourceLibrary/ShowResource/26fe02d8-aef2-4529-bc38-9c799ceac2ab Downloads are free for Premium Members.
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achieve manufacturing leadership by deploying practical solutions that combine information, business, manufacturing and supply chain processes and technologies.

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