

Lean thinking for Competitive Advantage

by Mr. Charles Standard and Ms. Dale Davis

Productivity in the manufacturing sector is rising steadily and has increased by 35% since 1995. This implies that manufacturers must improve continually just to keep pace with the competition. However, today's factory can do better than "stay with the pack." Today's factory can increase productivity, increase business performance in real dollars, and build sustainable strategic advantage over its competitors simply by integrating lean thinking into its operations.

"Does lean thinking actually improve business performance?" This is a question many business leaders are asking. Often the benefits of lean thinking are considered intangible and difficult to quantify. All of us agree that faster setup, shorter cycle time, and better visual management improve the operation of a factory. We also recognize that it is impossible to track, dollar for dollar, the financial benefits associated with these improvements. Nevertheless, we cannot dismiss the very real question of quantifiable returns from our lean manufacturing investment.

Most managers evaluate business performance by reviewing objective reports, spreadsheets, and financial statements. Analysts are often interested in trends, ratios, and formulae. On the other hand, the financial benefits associated with lean manufacturing are difficult to predict if we rely solely on case studies and personal experience. Those who are responsible to stockholders and boards of directors have every right to ask, "Is there any scientific proof that lean thinking improves business performance?"

Before we answer, let us discuss two related questions that were posed to the operations management community in 1992: (1) Are there laws of manufacturing and (2) what other forms of knowledge can help us analyze, manage, and improve manufacturing systems.

The answer to the first question is "yes." There are *laws of manufacturing* based on scientific reasoning and rigorous mathematics. These laws can be discovered empirically, and they hold true for a remarkably wide range of manufacturing situations. These laws constitute the emerging *science of factory physics*. They help clarify why production systems behave the way they do. Real production problems can be solved deductively using these general laws. Furthermore, the solutions are more robust and can be applied more confidently than solutions developed inductively from case studies or individual experience. Factory physics reduces guesswork and provides analytical tools to help us make difficult manufacturing decisions.

The answer to the second question is also, "yes." There is a *philosophy of manufacturing* that describes a comprehensive model of factory operations and production processes. This philosophy is known as lean manufacturing. Although factory physics and lean manufacturing originated independently, they lead us to the same conclusions when they are applied to manufacturing situations. Their corroboration is reassuring and helps clarify why lean philosophy is such a powerful approach to manufacturing improvement.

Lean philosophy emphasizes total system efficiency, continual improvement, value-added activity, and respect for people. *Lean principles* focus on streamlining the flow of production material throughout the entire enterprise. *Lean practices* support this by reducing production variability. Perhaps the single best measure for tracking lean progress is total product cycle time (total time that material spends in the production system).

Why is cycle time important and how does it affect profitability? Many factors influence production cost, and it is impossible to predict the precise dollar effect of each factor. It is possible, however, to develop a model that shows us, in general, how various factors affect production cost. Paul Zipkin developed such a model in 1995. He concluded that the very same manufacturing parameters that cause long cycle time also cause high production cost! The converse is also true; factors that cause short cycle time also cause low production cost!

Will reduction of cycle time improve business performance? Increase profitability? Yes! Operations improvements that shorten cycle time also reduce production cost. Other benefits of shorter cycle time are shorter lead-time, greater flexibility, lower inventory, better customer service, and higher revenues.

Streamlining the flow of production material throughout the value stream is a very practical strategy. We can streamline by (1) reducing cycle time and (2) minimizing the variability of cycle time wherever possible. Variability is anything that disrupts the smooth flow of material. Variability is minimized by reliable equipment, standardized procedures, excellent quality, controlled environment, short setups, small production lots, on-time suppliers, sound management decisions, and other factors. Reduced variability has immediate and measurable benefits reflected in cycle time, lead-time, WIP levels, response time, production cost, production flexibility, quality, customer service, throughput, revenue, and . . . profit!

Lean thinking apply to any industry from agriculture to aerospace and any process from repetitive manufacturing to customized assembly. It also provides us with excellent guidelines for decision making. Measurable improvements in operations and profit are promised with one caveat: lean manufacturing is a *philosophy* and achieving the promised benefits requires that we think about manufacturing in a totally new way.

Lean Manufacturing: "Been There, Done That"

By Daniel Timco

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"I've seen all this Lean Manufacturing stuff before. Over the last 20 years I've been to classes called Just-In-Time, Flow Manufacturing and Kanban. We've been there, done that and it didn't work. These manufacturing 'movements' are cyclical. Managers come and go and these manufacturing movements come and go with them."

These are some of the comments I've heard from various people at our company when we started our latest Lean Manufacturing efforts.

Take a walk through one of the plants and you may see remnants of past Lean Manufacturing efforts. You may also find a manufacturing cell that has aged somewhat over the years. Much of the Lean Manufacturing that was done in the cell is long gone. Little to no continuous improvement was done over the years.

If you've worked for a large company for any length of time, you've probably been part of a Lean Manufacturing seminar in one form or another. Ranging from a 1-day crash course to a week long Kaizen event. These programs are almost always conducted by an outside consultant who visits your company, does his thing, and leaves as quickly as he came. The concepts are presented at a macro level. The class ends and people file the class binder on their shelf next to the JIT binder from 1982 and the Kanban manual from 1990.

What does all this mean? Is Lean Manufacturing doomed to failure? Have we created a culture of pessimism where people ride the Lean Manufacturing wave hoping it will soon fade away?

How do companies prevent Lean Manufacturing from becoming a passing fad? How can lasting cultural changes take place? How do we cultivate a lasting "Lean" mindset that affects the entire organization?

Here are a few suggestions of strategies being employed at Cutler-Hammer:

Develop experts internal to the company

Instead of hiring a consultant for a few days, develop people internal to the company who are resident "experts". These people can really take Lean Manufacturing to the next level. This demonstrates the company's

commitment to lasting cultural changes. These individuals can be used as valuable on-site resources for consultation on special projects. It helps to have someone people can go to when questions arise to help guide those trying to develop their Lean Manufacturing skills. (Look what has happened when these ideas were implemented in the world of Six Sigma with Black Belts and Green Belts).

Go beyond the basics

Most people have a knowledge of Lean Manufacturing at the macro level. The concepts are clear, now go beyond the basics and get down to details. Teach people how to:

- Develop workcells
- Implement 1-piece flow
- Line balance
- Calculate and setup kanbans
- Implement poka-yoke

Provide consistent management support and reward successes

Managers must lead by example and show everyone that Lean Manufacturing is here to stay. When successes occur, reward them. These actions communicate the company's long-term commitment to becoming "Lean".

Use equipment that facilitates Lean Manufacturing principles

As the popularity of Lean Manufacturing grows, more and more tools become available that help facilitate these concepts. Some equipment naturally encourages "Lean" and prevents wasteful actions and processes. Examples of this are things like:

- Workbenches where product is built on moving carts (or pallets) that limit work-in-process and encourage 1-piece flow.
- Small work surfaces that limit space for unwanted sub-assemblies or clutter which encourages 5 S's.
- Flow racks that enable first in, first out (FIFO).

This is a good way to help perpetuate Lean Manufacturing on the shop floor even with high turnover of employees. There is no substitute for continuous incremental improvements and training, but these tools can help.

Get people involved

The best way to help ingrain these ideas in people is to get them involved. Training is good, but people have a tendency to forget unless the tools are used. Encourage people to find a project and use what they've learned.

Create buy-in

When initiating a Lean Manufacturing project, select a team that includes manufacturing engineers, design engineers, engineering managers,

manufacturing supervisors, operators, purchasing, etc. Not everyone has to be involved in every meeting, but updates on the project's progress should be sent to as many people as possible. In this way everyone is aware of and involved in the changes which are often radically different from what people are used to. Buy-in is created and lasting success is more probable.

Summary:

History has proved that Lean Manufacturing is here to stay. The question is, "Will your company embrace Lean Manufacturing and make it a permanent company strategy and ultimately a way of life?" The answer to this question will determine whether your company will survive in the ever more competitive manufacturing world that we live in.

About the Author:

Daniel Timco is a Manufacturing Engineer who has spent the majority of his career involved in Lean Manufacturing and has taught various courses on the subject. He has also initiated and led several "Lean" projects and Kaizen events that have been highly successful. For answers to questions or to make comments, contact Daniel Timco danieljtimco@eaton.com.