

## LEAN IN THE JOB SHOP

### Think “Lean” doesn’t apply if you don’t have a product line? Think again.

### PRESIDENT’S CORNER



*Dave Dixon is President of TCA. He has over 39 years’ experience with process improvements and Extreme Lean™.*

There is a persistent myth in the job shop community. It suggests that the strategies and tools that have “Leaned out” countless manufacturing operations around the world are simply not applicable in low volume, high mix environment. This article, aims to debunk the myth, factually and logically, once and for all.

There are, to be sure, certain problems with the application of Lean tools in a job shop that we will have to address. We want to offer ideas and suggestions on how to implement Lean, and we will ultimately have to demonstrate to the shop owner that embracing Lean will provide a true competitive advantage and economic benefits, that provide a decent return on the investment in the implementation effort. This done, our “Lean won’t

work in the job shop” myth goes up in smoke and we can get on with the application of Lean’s powerful set of process improvement tools.

#### THE PROBLEM

The markets we serve drive us to a given manufacturing strategy. Figure 1. illustrates the spectrum of alternatives from a Make to Stock (MTS) approach on one end to an Engineer to Order (ETO) environment on the other. Assemble to Order (ATO) and Make to Order (MTO) are “in between” strategies that cater to different customer needs. Most MTS and ATO manufactures are original equipment manufactures (OEMs) with marketing and design capabilities. MTO and ETO companies are often (not always) suppliers to OEMs.

And herein lies the definition of a job shop: a company with many OEM customers who buy a wide variety of component parts in relatively small lot sizes. The degree of repetition is low for any one part number, and the aggregate demand is “lumpy.” Failures in customers’ order planning processes create crisis conditions in the job shop, and the measure of success is how well we respond to those conditions.

Now consider that the “grand daddy” of all Lean applications is the Toyota Production System. Toyota is clearly a MTS, OEM company—a far cry from the somewhat chaotic MTO/ETO environment of the small job shop. Is it any wonder, then, that shop owners and managers question the applicability of a “Toyota” type system in their world? Add to that the fact that there

MTS	ATO	MTO	ETO
End item is stocked in finished goods	“Pinch point” subassemblies are stocked in process	No finished goods or subassemblies are stocked	No finished goods or subassemblies are stocked
All raw material and components are stocked	All raw material and components are stocked	Possibly some raw material or components are not stocked	One or more raw material or components are not stocked
Engineering is complete	Engineering is complete, configuration may need specification	Minor one-off engineering may be required	Significant engineering is required

Figure 1

have been too many failed attempts to force fit the repetitive Lean model in the job shop, and you have the basis for widespread rejection of the whole idea.

The myth has evolved from the notion that there is a rigid template for implementing Lean, often set forth by consultants and others who do not understand the job shop. Fortunately, there are some who have used a more flexible approach to achieve tremendous improvements in job shop performance.

**JOB SHOP LEAN**

Every manufacturer has the same market driven objectives:

- Deliver smaller lots, more frequently
- Deliver on time
- Cut lead time
- Improve quality
- Reduce total cost

Figure 2 depicts the basic Lean tool kit (upper part of the diagram) and the desired outcomes across the bottom. Clearly, these outcomes support directly the common set of objectives listed above.

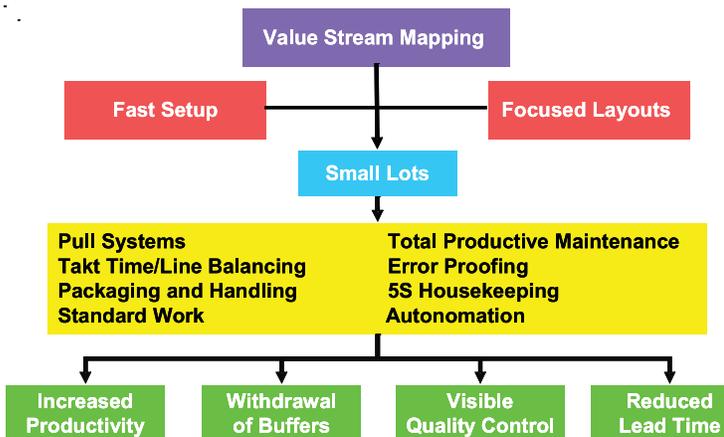


Figure 2

LEAN TOOL	BASIC PURPOSE	JOB SHOP MANUFACTURING APPLICATION
Value Stream Mapping	Identify Part / Product Families and Related Processes, "See Waste"	Critical Focus on Front-end Processes
Fast Setup	Enable Flexibility and Small Lots, Regain Capacity	Constraint Resources are Key
Focused Layouts	Physically Isolate Value Streams, Recreate the "Mom and Pop" Shop	Some Monuments May Remain - Virtual Cells and "Cell-for-a Day"
Small Lots	Reduce Queuing, Provide Flexibility	Coist Effective handling of One-off Quantities
Pull Systems	Flawless Replenishment With Minimum Productivity	Oueue Limiters and Pull to Time Slots
Takt Time / Line Balancing	On-time Delivery With Maximum Productivity	May Use Variations; Earned Hour Run Rates - Load Balancing
Packaging and Handling	Support of Waste Free Processes	May be Less Important
Standard Work	Institute Best Practices / Minimize Variation	Must Include Front-end Processes
Preventive Maintenance	Minimize Queuing and Other Waste Due to Breakdowns	A Dominant Tool, Especially in Capital Intensive Environment
Error Proofing	Minimize Queuing and Other Waste Due to Quality Problems	Major Focus on Front-end Processes
5S Housekeeping	Support of Waste Free Processes	Another Dominant Tool - Office and Shop
Autonomation	Provide Breakthrough Productivity Improvement	Some Opportunities - But Risk the Loss of Flexibility

Figure 3

The trick is to selectively learn and apply the Lean tools that help to achieve the objectives in a given shop while deemphasizing or ignoring those that do not apply.

Figure 3 speaks briefly to the purpose of each tool and, in the right hand column, suggests the role of the technique in the job shop. Note that some tools, e.g.,

autonomation, engineered packaging and handling, are not as important in the job shop as they are in the OEM, repetitive environment. Other tools, such as takt time/line balancing, focused layouts and

pull systems are adapted to the low volume, high variety shop. And others, such as setup reduction, 5S workplace organization, and error proofing are particularly important.

There is another very important point made in Figure 3. Note the references to applying Lean tools to improving "front end" processes. These activities prepare orders for release to the floor, and in many shops every order passes through this process. Delays or errors associated with the front end are passed on to the shop where the cost of correcting problems escalates exponentially. Many shop supervisors would tell you that if we could only fix the problem of late or faulty job packets, the rest would be easy. Thus we have a heavy emphasis on applying Lean tools to enable the **timely delivery of perfectly "clean" orders to the shop.**

Order planning requirements are typical of the many differences between the job shop and the OEM. If orders are repetitive, process documentation is prepared one time, documented as standard work, and fine-tuned over time. In the job shop, the critical standardwork is the preparation of process documentation that may only be used one time!

It is also difficult to dedicate resources in a small shop, so we may employ virtual cells or the “cell for a day” concept. Sometimes we use mobile equipment to set temporary cells. A push-pull variation on true demand pull systems is more common in the job shop, and we may measure performance to a run rate of planned labor hours rather than a takt time based on piece parts. Setup reduction at constraint resources will be pursued relentlessly and preventive maintenance routines will be highly developed. And of course, we will use error proofing, both in the front-end processes and in the shop to “get it right the first time.”

## CONCLUSION

There is one underlying objective that we share with the OEM—we want to enable a flow of work through the shop. Perhaps the OEM flows parts or products one at a time. We may flow small lots or orders, but flow we will. As our selective, appropriate application of Lean tools bears fruit, we will become ever more compliant with the Golden Rules of Flow:

1. If you touch it, finish it!
2. Flow one piece at a time.
3. Flow in one direction.
4. Never pass on a defective piece.
5. Balance each task to takt Time (or a run rate).

There are hundreds of small shops who have discovered the combination of Lean tools that have allowed them to flow their work through a waste free process. They are dominating their local markets and putting extraordinary profits to the bottom line. Isn't it time you did the same?

In one recent example, a client was in desperate need of a Quality Manager. We found them a qualified candidate. They hired him and felt he was a perfect match for their needs. Unfortunately, a week after they hired him, their Quality Supervisor, who had been with the company for several years, gave her notice. She felt she was never going to be anything more than a supervisor with this company.

Since the HR Manager and I had a very good business relationship, we discussed the situation and decided to offer her a training schedule and promotional plan that would lead to an Assistant Quality Manager position. This employee withdrew her resignation, was pleased with the actions taken and is now on a career path that she feels will afford her many growth opportunities. The company retained her valuable contributions and demonstrated their commitment by investing in her development.

Prepare today for tomorrow's human resource requirements. Look now, and begin the process of developing your future leadership and technical skill sets.

2007 marks the third year that TCA has offered recruiting and placement services for our clients. We have experienced tremendous success in matching our clients' needs with qualified candidates who want to be productive and are looking for a place to call home.

# RECRUITING



## MOST EMPLOYEES WANT THE SAME THING EMPLOYERS WANT

Hiring managers sometimes seem to forget that most employees want the same things that employers want—a long term, mutually beneficial relationship. As part of our search process, we ask each potential candidate why he wants to leave his current employer. The overwhelming response is “there is no room for growth and no potential for advancement.”

I often wonder if we are making the investment to develop talent that we already have in house. Employees want to be productive and appreciated. They are most productive when they are given significant challenges and growth opportunities.





*Rick Smith is Vice President*

*and General Manager of TCA. He has over 33 years' experience with implementing Lean principles.*

# LOST... AND FOUND

## FINDING LOST CAPACITY IMPROVES PRODUCTIVITY

By: Rick Smith

The popular ABC series “Lost” depicts the activities of a group of people who are marooned and presumed lost on an island in the Pacific. I say “presumed lost” because they are obviously not lost, only stranded in a place they would rather not be. This can also be the case when looking for lost manufacturing capacity; it is seemingly lost, but in reality it is only temporarily stranded. In the eyes of a “Lean” thinking person, lost capacity is as easily seen as sighting an “SOS” scribed on a beach.

I recently walked the floors of a manufacturing facility with several executives who were considering expanding the facility at a tremendous cost and investment. I probed for the reasons they believed additional space was required. “We are out of capacity,” they said. “We need more space to satisfy growing customer demand.”

The area was cluttered with unused machinery and multiple racks filled with large batches of work in process (WIP) inventory.

The workers were struggling with dangerous material handling methods in a cramped unsafe and dirty work area, littered with electrical cords on the floor and numerous other safety hazards. If any excess capacity existed in this area, it was very well camouflaged. It appeared that indeed they did need more space; or at least better utilization of the existing space.

As is the case in most manufacturing organizations, production areas like this are not planned; they just happen to turn out like this over time. The good news is that lost capacity can be rediscovered. The “Lean” tools of Value Stream Mapping, 5S, setup reduction, layout planning for flow, one piece flow, and standard work can help us rediscover lost capacity.

### A KAIZEN TO RECOVER LOST CAPACITY

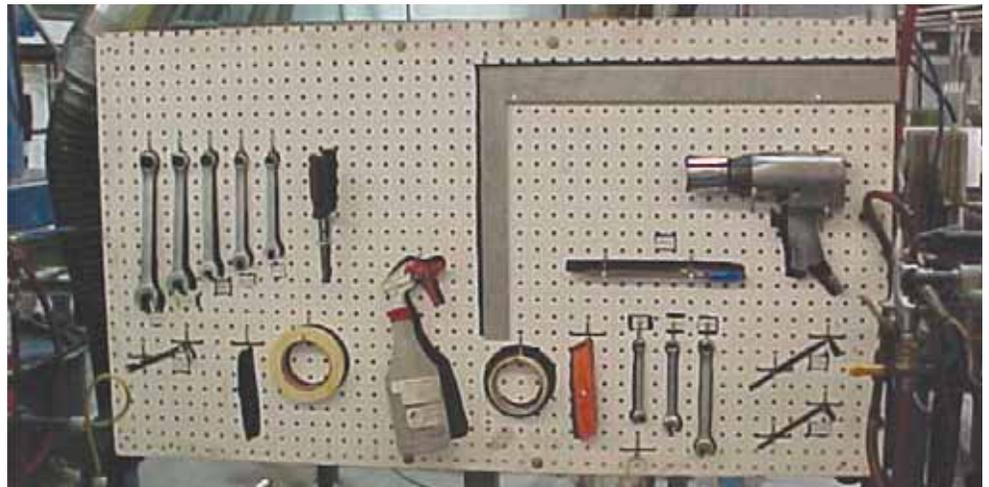
Kaizen is a unique methodology that enables a group of people, working towards a common objective, to make significant improvement in a work center or area. Changes are designed and implemented rapidly, with a minimum of disruption and expense.

All Kaizen events begin with the end in mind. In order to visualize the outcome, we usually create a map of the value stream. This Value Stream Map allows us to see the entire process in

one glance and helps to focus improvement efforts at specific points along the value stream. The specific goal for this Kaizen was: **“Create a work cell that will enable the production of work in smaller lot sizes, with more frequent turns, with higher quality in less space.”**

A Kaizen event was organized and a team of workers in this facility gathered together for a week-long event. The first day of the Kaizen event was dedicated to teaching and learning the tools of the Lean enterprise. The second day was dedicated to an analysis of the current conditions, customer demand, and discussion of how we could apply the knowledge of the Lean tools to achieve the objectives and the future state.

Midway through the second day, team members were assigned to smaller groups to focus on two initiatives that would free up the lost capacity – establishing 5S in the workplace and reducing key setup times. With new ideas and plans in place, the smaller groups went to work on implementing their ideas. At the end of day 2, 3, and 4, the teams met collectively to discuss their efforts and to coordinate their improvement plans for the work area; creating a synchronized overall improvement plan.

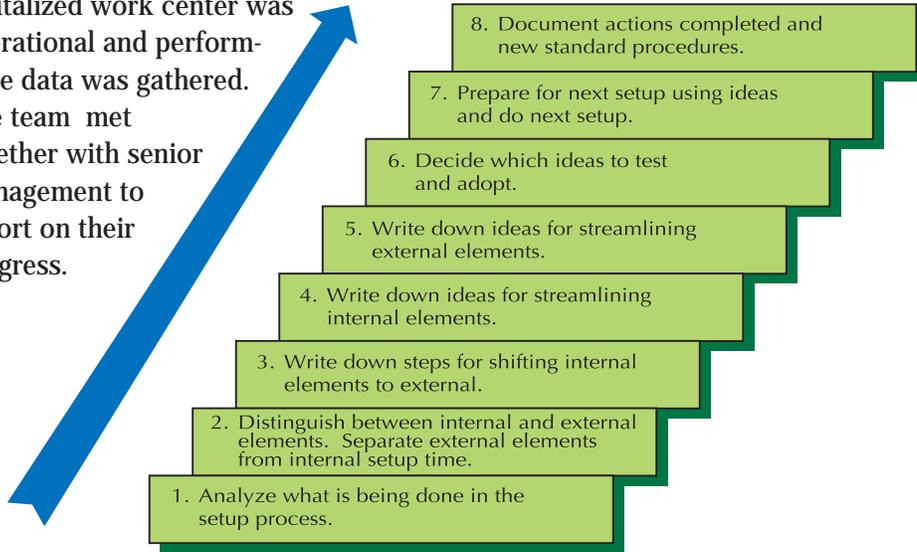


*5S organization removes workplace clutter and frees floor space for other productive activity.*

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On the fifth day, the newly revitalized work center was operational and performance data was gathered. The team met together with senior management to report on their progress.



The results were phenomenal. Having put their new found knowledge to work, the Kaizen team was able to report that 30% of the current floor

space could be freed up to accommodate additional production capacity. In addition, other results of the Kaizen included:

- Productivity - up 50%
- WIP - down 97%
- Throughput time - down 22%
- Overtime (est.) - down 50%
- Setup times (avg.) - down 50%
- 5S score - up 100%

This initial Kaizen event was actually the first of many such events. Later in the program, when several Kaizen events had been completed, I asked about the perceived need for more space. The answer was a resounding "no longer required."

We found the lost capacity. The company was able to increase sales of this product without a building addition. The Kaizen process allowed a team of workers to achieve the objectives and future state without adding cost or labor. In fact, the results of this event enabled the workers to secure their future, reduce cost, increase productivity, and to help grow the business.

# BOOK REVIEW

Reviewed by: *Pietro (Pete) Savo*

## KAIZEN EVENT IMPLEMENTATION MANUAL

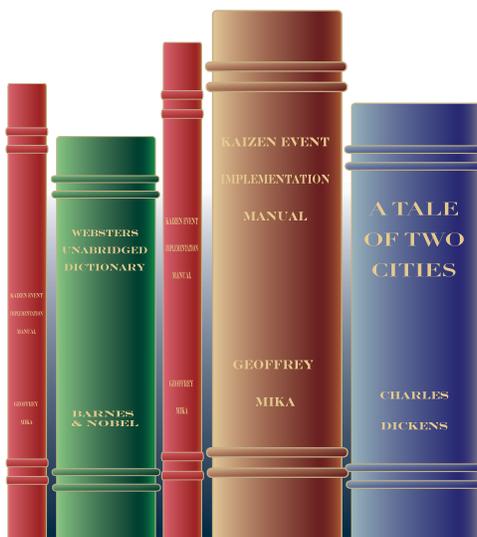
Author: Geoffrey Mika  
Publisher: Society of Manufacturing Engineers

An extraordinary Kaizen journey begins with a common sense road map such as the Kaizen Event Implementation Manual by Geoffrey Mika. Aimed at Lean leaders on the shop floor, in quality or in operations management, this guide explains how to plan for and deliver successful Kaizen events.

The first Kaizen events flourished within Quality Circles. New, responsive cultures began to emerge around the concepts of zero quality control, source inspection and pokayoke systems. The Kaizen Event Implementation Manual describes the early history of the Kaizen event and tracks its emergence as one of the most powerful tools for successfully implementing Lean.

The Kaizen Event Implementation Manual is well organized and easy to follow. It is an invaluable guide for hands-on implementation of Kaizen. Geoffrey Mika, himself, has been a Lean advocate and implementer for over 20 years. He received his formal training on the Toyota Production System in Japan at Toyota Motor Co.

This is a Kaizen manual that you will refer to over and over again – eventually wearing it out from extended use. Buy two, one for everyday use and one to simply read when a refresher or backup is needed. Kaizen Event Implementation Manual by Geoffrey Mika will place in your hands everything you need to know to conduct successful Kaizen events time after time. It offers powerful tools and sustainable Kaizen concepts for a lifetime of Lean Improvement!



# Welcome TO TCA



**Amy Strebel**

Office Administrations Manager

It is our pleasure to take this opportunity to introduce you to Amy Strebel, our new Office Administrations Manager for TCA. Amy's duties will include support of all TCA's administrative, sales, marketing, workshop, and meeting coordination.

Amy comes to us from America Online. Amy has been AOL's Workforce Management Supervisor, Senior Coach, and Staffing, Benefits, and Payroll Specialist. Her expertise in communication, strategic planning and operational responsibilities make her a great fit for our organization.

Amy has attended Weber State University and is currently finishing up her Business Management degree at the University of Phoenix (August 2007). She is also finishing up her PHR certification.

Amy and her husband live in Ogden. They have a 5 year-old daughter. In addition to her family responsibilities she runs a non-profit organization, Dylans friends/fight SMA.

Please join us in welcoming Amy to the TCA family.



**Pietro (Pete) Savo**  
Senior Vice President  
Lean Implementation

Pete comes to TCA from the US Air Force's Small Business Manufacturing Technical Assistance Production Program (MTAPP) where he focused on achieving competitive excellence and devising productivity improvements.

Other successful accomplishments include his 18 year career with Sikorsky Aircraft division of United Technologies where he co-founded the Sikorsky Aircraft Failure Analysis Clinic. He became a certified instructor in quality improvement, 5S, Mistake Proofing, Total Productive Maintenance and other classes for the Sikorsky Aircraft Manufacturing and Flight Operations departments.

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Pete has a Masters of Aeronautical Science in Human Factors from Embry Riddle Aeronautical University and a Bachelor of Science in Business Administration from Sacred Heart University. He holds a certificate from Tuck School of Business at Dartmouth College (Minority Business Executive Program) and from the Supplier Excellence Alliance (Operational Excellence Lean Manufacturing Consultant). He is the author of Root Cause Analysis System for Problem Solving and Problem Avoidance.

Pete and his wife Pat, live in Mont Vernon, New Hampshire with their six children. He is also a licensed pilot, and is currently restoring a 237 year old home in his spare time.

## CONFERENCE REPORT

### TCA'S 13TH ANNUAL CONFERENCE ON LEAN/SIX SIGMA COMPETING IN A GLOBAL MARKET—YOUR KEYS TO SUCCESS

This year's annual conference was held May 16-18, 2007 at the Marriot Boston Burlington with a tour of the Shingo prize winning facilities Boston Centerless and AccuRounds. The conference was a huge success with interesting and informative ideas for survival in the profitability battle using Lean/Six Sigma strategies and included a powerful Leadership workshop. We at TCA would like to sincerely thank all of those who participated and helped to make this conference one of our best! We especially would like to thank Boston Centerless and AccuRounds for allowing us to tour their World Class Lean facilities.

Please watch for information on next years spring conference by checking our website at [www.technicalchange.com](http://www.technicalchange.com)



## BASELINE FOR FREE ONLINE LEAN ASSESSMENT

Answer these  
questions to assess  
your need for lean  
implementation and  
certification.

You can find our online  
questionnaire on the  
Technical Change Associates  
web site at  
[www.technicalchange.com](http://www.technicalchange.com)



### MATERIAL

1. Kanban replenishment processes visible (Internal & external)?
2. What is the overall inventory turnover, including Finished Goods, WIP and Purchased/Raw material?
3. What portion of the facility's layout minimizes material handling?

### LEADERSHIP & TEAMING

4. What is the organization type?
5. Our front line employees are actively involved in change management, percentage of the time?
6. To what extent do people have job security?
7. What is the annual personnel turnover?
8. What percentage of personnel (ALL Personnel) have received at least eight hours of quality team training?
9. What percentage of personnel are active members of formal work teams, quality teams, or problem-solving teams?

### HUMAN RESOURCES & SOFTWARE

10. Front Line Supervision has been trained in WC "supervision", leadership techniques percentage for your company?
11. Culture indicative of and can support change?
12. Software/system support "lean" operations
13. Company has an aligned recognition and rewards system?

### PROCESSES

14. How many large-scale machines or single-process areas are in the plant through which 50% or more of different products must pass?
15. Company has program in-place to reduce process steps?
16. How easy is it to shift output when the product mix changes?
17. How easy is it to alter the total production rate by +/-15%?
18. What is management's target operating capacity for individual departments or machines?
19. Viable new product introduction process in place?

### MAINTENANCE

20. Equipment is State-of-the-art?
21. Equipment and tooling are well maintained?
22. Does maintenance have and follow a defined preventive schedule?
23. How often does unplanned maintenance happen?
24. What is the overall average availability of plant equipment? Ready for use time?

### LAYOUT & HANDLING

25. What portion of total space is used for storage and material handling?
26. What portion of the plant space is organized by function or process type?
27. 5S Housekeeping process in use?
28. How would you rate overall housekeeping and appearance of the plant?
29. How well could a stranger walking through your plant identify the processes and their sequence?
30. Facility has a cellular/focused factory layout?

### SUPPLIERS

31. What is the average number of suppliers for each raw material or purchased item?
32. Materials management is visible through an effective Sales, Production, Inventory (SPI) Planning process?
33. What portion of raw material & purchased parts comes from qualified suppliers with no need for incoming inspection?
34. What portion of raw material and purchased items is delivered directly to the point of use without incoming inspection or storage?
35. What portion of raw materials and purchased parts is delivered more than once per week?

### SETUPS

36. What is the average overall setup time (in minutes) for major equipment?
37. What portion of machine operators have had formal training in Rapid Setup techniques?
38. To what extent are managers and workers measured and judged on setup performance?

### QUALITY

39. What portion of total employees have had basic SPC training?
40. What portion of operations are controlled with Statistical Process Control (SPC)?
41. Quality is high and not an issue?
42. What is the overall defect rate?

### SCHEDULING

43. What portion of work-in-process flows directly from one operation to the next without intermediate storage?
44. What portion of work-in-process is under Kanban?
45. What is the on-time delivery performance?
46. Shop lead time is monitored and measured?
47. Production is in-sync with demand?