

Welcome to the October edition of our newsletter hopefully with articles that you WILL find interesting. We start with an article from the Manitoba Lean consortiums newsletter on the Principles of Lean. We have Dan Jones' and Jim Womack's monthly newsletters and also Jim's comments on Ford's current situation. Mike Rother has updated his article on the pitfalls of Value Stream Mapping. Another interesting article is on Lean Accounting and I'm sure that you will find 'A Bomber an Hour' interesting.

If you have any experiences, news or information to share please let us have them!

Manitoba Consortium for manufacturing Excellence – A winning team helping each other to achieve success – Don Breakey edits their newsletter and I thank him for the use of their article:-

Principles of Lean

The following is from NWLEAN's Yahoogroups' Lean thread. This site allows readers to ask and respond to other's questions. <http://groups.yahoo.com/group/NWLEAN/>

The NWLEAN group recently spent some time discussing "The Principles of Lean". Mark Warren questioned some of the "pillars" of lean thought in the following.

"I wonder when people will begin to question statements that have been taken for decades as gospel; like the two pillars of TPS are JIT (developed by Kiichiro Toyoda) and Jidoka (concept established by Sakichi Toyoda)?

What would the real principles of lean be worth to a company? I'm not talking about the principles that have been published by Ohno, Shingo, Liker or Womack—real "know-why" to connect to the "know-how". The "know-why" is valuable in terms of people applying the right tools for the right reasons. Do you ever wonder why cells are so popular? Why didn't Toyota just link all of their processes for real JIT? Do you know the real reason for the perceived 'lot size of one' observed on their assembly lines? Do you know why most of the Kanban cards were actually cards and not computerized signals? Do you know the sequence of improvements made by Toyoda and why that worked? It was not like what was done in the US and cultural reasons don't explain the difference. Most of today's crop of 'experts', including the ex-Toyota employees, is no different than the proverb about a third generation cook cutting the end off the roast before placing it in the oven. Why? That's how they were taught. Rote application—cookie cutter copies require no thinking or understanding.

Hint: start with a single objective; then functional principles (each has multiple

dimensions); then add the enablers (most tools are well known).

Much of the insights attributed to Ohno were no more than re-inventing the wheel-items like putting machines in process sequence was done in Ford's Model T plant and widely publicized by about 1915. Or comments that Job Methods was the weakest of the three TWI programs—yes it is the tool that is most likely to NOT be followed as directed, which makes the tool weak. Yet the principles in JM are abundant throughout TPS. As an added point, Shingo also makes the same mistake with JM in his books, rendering the tool worthless with his garbled reinterpretation.

Jidoka (autonomation) is shrouded with mystery and myths—yet, if you evaluate it from an engineering perspective, it is no more than dynamic poke-yoke. The status of Jidoka is raised in deference to the owner of the company and the invention that funded the development of Toyota Motor Company. It is fairly easy to link Kiichiro Toyoda's exposure to JIT in action before he introduced it into his own company".

Michel Baudin of MMTI responds to Mark and attempts to answer some of his questions.

"I agree with you that no statements about lean should be treated as gospel. Lean manufacturing is not a religion but an engineering and management discipline strictly based on rationality and scientific methods. Its implementation requires creativity, observation and experimentation, but not faith. Taiichi Ohno, Shigeo Shingo, Sakichi and Kiichiro Toyoda were human beings, not gods, and nothing they did, said or wrote should be treated as sacred. The proper way to show them respect is to study and review their work critically, but not to revere it.

The pillars and other metaphors were just devices they came up with to organize and communicate what they had done to their growing work force. Our needs are different. Among other things, we need principles to figure out how to implement lean

manufacturing in industries other than cars, such as, for example, frozen lasagna. Many of the specific tools that Toyota developed over the years to solve its car making problems are not applicable to frozen lasagna. To find out what lean manufacturing means for frozen lasagna, you need to abstract underlying principles from car-specific tools, and then redeploys these principles in the form of other tools that apply to frozen lasagna.

With this purpose in mind, I have found the following principles actionable:

1. **People are the main driver of productivity.**
2. **The key to profits is on the shop floor.**
3. **All manufacturing is repetitive.**
4. **The work must flow through the shop.**
5. **Improve, don't optimize.**

This was the short version. Now, for further explanation:

1. **People are the main driver of productivity.**

In some industries, such as semiconductors, many executives refuse to consider that the way operators are used on the shop floor matters. To them, people are cheap compared to equipment, and they are ready to use more than necessary as insurance that the equipment will keep running. The fact is that even expensive equipment is easier to replace than the people who know how to program, run, and troubleshoot it. ***A competitive advantage does not come from the possession of equipment but from excellence in using it, and this requires taking advantage of everything people have to offer, both muscles and brains.*** This requires them to feel trusted, respected, and challenged, which does not happen if they are treated like a disposable commodity and underutilized. The right pace and variety of work, engaging the individual without burning him or her out, impacts both productivity and quality.

2. **The key to profits is on the shop floor.**

Again, many executives will disagree with this statement, on the grounds, for example, that

getting a product to market first is more important than making it cheaply. Their mistake is to assume that it doesn't matter how the shop floor works when your objective is fast time to market for new products. As much care is needed to set up a factory that will whisk through new products effectively as to reduce the production costs of a mature product. Waste does not usually take the form of big lumps that can be trimmed away, but rather is "marbled" through the manufacturing process, and can only be eliminated by paying attention to what happens at every step. Attention to shop floor detail is a strategy.

3. **All manufacturing is repetitive.**

This too is controversial. "We make to order and every unit is custom-engineered," we hear. But when we dig into the process we find that all units are identical until the last operation and customized only then. In all manufacturing operations, there is some form of repetitiveness, which may not be obvious but must be sought out in process design. Being flexible, or agile, means being able to make whatever customers want, but it does not require the manufacturer to be actually able to make what anybody might order. It is sufficient to make what customers actually do order. Most of them order from a small range of options, that you produce repetitively on lines dedicated by product or product family, and for the few who actually order specials, you set up a separate, small-scale job-shop. Taking advantage of the structure of the actual demand enables you to appear infinitely flexible without incurring the cost of being so.

4. **The work must flow through the shop.**

The equipment and layout must be designed around the flow of work through the shop and not the other way around, to eliminate the "hurry-and-wait" pattern for materials and the "stop-and-go" pattern for equipment and people. You must match actual production rates at each operation to the Takt time, and move work between operations one piece at a time or in small lots with frequent setups. Transfers of parts from suppliers or between lines within the plant must be on a "pull" and not a "push" basis.



5. Improve, don't optimize.

Engineers are trained in school to seek optimal solutions. The optimum, however, only exists within a mathematical model, and once you have reached it, by definition, no further improvement is possible. On the shop floor, there is no optimum and no limit. You can and should always improve operations, right up until the plant closes. I am curious to know what other lists of principles members of this group have come up with".

Jim Womacks latest newsletter on Ford

I've been reflecting on today's remarkable headlines about the latest retreat by the Ford Motor Company as part of its "Way Forward" campaign. While reflecting, I have found it useful to think about the history of lean thinking at Ford, going back nearly 100 years. I believe it offers many useful lessons for our current-day lean journey and Ford's immediate choices.

The historical record is clear. Henry Ford was the world's first systematic lean thinker. His mind naturally focused on the value creation process rather than assets or organizations. And he was the first to see in his mind's eye the flow of value from start to finish, from concept to launch and from raw material to customer. In addition, Ford was history's most ferocious enemy of waste. (Except, possibly, Taiichi Ohno at Toyota who claimed that he learned what to do from reading Henry Ford's books.)

Ford relentlessly emphasized the need to analyze every step in every process to see if it created value before finding a way to do it better. Otherwise the step should be eliminated. (This was Ford's greatest criticism of Fredrick Taylor and Scientific Management. Why, asked Ford, was Taylor obsessed with getting people to work harder and more efficiently to do things that actually didn't need to be done if the work was organized in the right sequence and location?) Then, when the wasteful steps had been eliminated, it was time to put the rest in continuous flow.

By 1914 at his Highland Park plant Ford had located most of the manufacturing steps for his product – the Model T – in one building and had created very nearly continuous flow in many parts of the operation, using single-piece-flow fabrication cells for components in addition to the moving final assembly line. He had even devised a very primitive pull system by using "shortage chasers" on timed routes along the assembly line to check inventories at every assembly point and convey the information back to the fabrication areas. This speeded up upstream processes that had fallen behind and slowed down those that were getting ahead.

Equally remarkable, Ford had designed his Model T in only three months in one large room with a small group of engineers under his direct oversight. This surely was a high point in lean practice for decades to come.

Then it gradually fell apart. Ford's span of management control at Highland Park had been remarkably broad because he could easily take a walk to see the condition of every process, in design, assembly, and fabrication. And he could train a cohort of managers to see what he was seeing and remove more waste. No abstract measures of performance were needed.

However, as the company grew Ford's personal management method became impractical. But what to replace it with? Ford himself seems not to have had an answer except to link every step by conveyors – as he attempted to do at the massive Rouge complex completed in the late 1920s. By the 1930s the whole Ford Motor Company was in a sense one linked process. (Ohno, of course, realized that lengthy conveyors governed by a central schedule are a push not a pull system, but this was much later.) Did this mean that in the founder's mind that the company needed only one manager -- Ford himself -- even as it became the world's largest industrial enterprise?

In any case, the system came crashing down in the 1930s as Ford tried to produce multiple products with multiple options in wildly gyrating markets. Only the staggering cash reserves from retained profits during the Model T era kept the company going until Henry Ford II was able to take over in 1945.

But what management system should he impose on the chaos? Henry Ford II read Peter Drucker's 1946 classic, *The Concept of the Corporation*, praising the General Motors management system and quickly remade Ford in the image of GM.

What a different system it was! Henry Ford had managed by going to the gemba to inspect the value creation process. General Motors executives managed by analyzing financial abstractions. For example, asset utilization (normalized for sales volume), days of inventory, cost of scrap, etc. in the factory. Available engineering hours utilized in product design. Managers were then rewarded for making numerical targets using methods developed by staff experts that managers rarely understood. A good way to make many of these numbers was to make products in large batches in order to achieve high asset utilization and low cost per individual step. The total value creation process from end to end -- which had been so clear to Henry Ford -- was gradually lost from view.

Soon Ford executives using the financial measures developed by finance czar J. Edward Lundy were even more rigorous in analyzing the performance of their area of control than GM executives. Robert McNamara and the Whiz Kids were the exemplars. And Ford did regain competitiveness as a GM clone, claiming a stable second place in the auto industry.

In addition, by the late 1940s Ford was one of three U.S. auto companies using the same management system in the same town with the same union. With high investment barriers to entry, a remarkable era of stability was put place, lasting nearly forty years until the transplant Japanese factories succeeded in the U.S. in the later 1980s.

When it suddenly became apparent at that point that the leading Japanese companies -- Toyota followed by Honda -- were using a different management system, it was very hard for Ford to respond.

In the late 1980s, as Dan Jones, Dan Roos, and I wrote *The Machine That Changed the World*, we were able to document that Ford had applied a number of lean techniques in its assembly operations and was making dramatic progress in manufacturing

productivity. We took this to mean that at least one American company was applying lean principles and with good results.

What we couldn't report, because we had no way to measure it, was the status of the management system. And this was largely unchanged. Ford managers were still manipulating abstractions because the gemba consciousness of the early Ford Motor Company had been lost. Even worse, in the product development and supplier management processes, no change had occurred at all.

But Ford could still be successful in its home market for another 20 years by developing large pickups and SUVs. These were essentially America-only vehicles, suited to wide roads and low energy prices. They could only be challenged by Toyota and its Japanese emulators if they were willing to design vehicles specifically for the U.S. market and to locate production in North America.

In 1997 I got a call from Jac Nasser, who had just taken over Ford's North American Automotive Operations on his way to becoming CEO of Ford. He matter-of-factly told me that Ford's Explorer and F100 pickup series were the only Ford products that made serious money and that he calculated that he had four years to become as efficient and effective as Toyota. Otherwise, the large pickups and SUVs would be copied by foreign firms at lower cost with higher quality and Ford would be in terminal decline. "So," he asked, "how can Ford become Toyota in four years?"

We sat down to talk over just what this would mean -- dramatically changing the supplier management system, dramatically changing the product development system, dramatically changing the production management system, dramatically changing what managers do -- and he quickly concluded that it was just too hard. So he changed the management metrics, purged the poorest managers according to the metrics, and experimented with selling cars on the web! I was not asked back and had no desire to go back.

Ford actually survived for five years beyond Nasser's projected meltdown date -- although Nasser didn't as CEO -- to arrive at its

current crisis. But my prescription for new Ford CEO Alan Mulally is the same: Fundamentally rethink the supplier management system. Fundamentally rethink the product development system. And fundamentally rethink the production system from order to raw materials and from raw materials to delivery, with special attention to the information management system. (Much can still be learned from Ford's Mazda subsidiary, which became an able pupil of Toyota after a crisis in 1973.) Above all, fundamentally rethink what managers do and how they do it in order to regain the gemba consciousness that originally took Ford to world dominance. In brief, Ford needs to remake itself once more, this time in the image of the company that copied Ford's original system: Toyota.

In addition, finish rethinking the social contract as Ford becomes a normal company (not an oligopolist) in a normal town (where labour doesn't come from one supplier) that must live in a global market. Finally, rethink brand strategy to get rid of hopeless makes that can never make money – Mercury, Jaguar, Lincoln too? -- while refocusing the remaining brands on what customers really want -- sophisticated, hassle-free transportation in every price range. (A hint: Rethink the vast gap between the company and the customer to provide hassle-free mobility on a continuing basis to user-partners rather than selling cars to strangers in one-time transactions.)

Who knows whether this is doable in the time still available but it is the lean way forward. It will be tragic if the originator of lean thinking is crushed in the end by failing to learn lean lessons from its most earnest pupil.

A Networking Thought

Below is a typical programme of events offered by the Manitoba Consortium. The members of the consortium plan a schedule of events and then each member takes responsibility for arranging their own contribution which is open to all other members of the consortium to attend.

Could we, or should we be doing this for the AME members in the UK?

- **Sep 6 *Workshop* Lean Principles 101** Contact:
- **Sep 11-15 *Course* Shop Floor Leadership** Contact:
- **Sep 14 *ii Tour/TVP* Phillips & Temro Ind.** Contact:
- **Sep 19-Dec 6 *Course* Lean Level I Lean Manufacturing Certificate Program** Contact:
- **Sep 20 *Best Practice Tour* Decor Cabinets** Contact:
- **Sep 25- Dec 8 *Course* Lean Level II Greenbelt Program** Contact:
- **Sep 26 *Workshop* Introduction to Management** Contact:
- **Sep 27 *ii Tour/TVP* Phillips & Temro Ind.** Contact:
- **Oct 4&5 *Workshop* Lean Office** Contact:
- **Oct 10-Jan 17 *Course* Lean Level I Lean Manufacturing Certificate Program** Contact:
- **Oct 11 *Workshop* Problem Solving** Contact:
- **Oct 12-Dec 14 *Course* Performance Management (Leadership)** Contact:
- **Oct 18 *Best Practice Tour* MacDon Ind.** Contact:
- **Oct 24 *Workshop* Managing a Changing Workplace** Contact:
- **Oct 26 *Workshop* Teams and Teambuilding I: Doing work in teams** Contact:

Please let us have your comments thoughts or opinions.

Avoiding Common VSM Pitfalls

I first read Mike's article on the SME website and asked if we could publish it in the AME-UK Newsletter. His answer was a resounding 'No' because he felt the article was out of date. And he offered to update the article for us, so we are the first to publish the updated version. Thanks to Mike, to the Lean Enterprise Institute in the USA and to the SME for allowing us use of the article.

In 1997 I co-authored the book Learning to See with my colleague John Shook. Our goal was to help people on the Lean path widen their perspectives from a then pervasive and limited focus on process-level improvement

to the overall flow, or value stream. After years of improving individual processes it was the right time to also start thinking about tying those processes together and improving the flow from dock to dock.

The value stream perspective represents a shift from traditional vertical thinking to horizontal thinking. This means looking across the silos of individual functions and departments to connect activities in the stream of value flowing from suppliers through the organization, and on to customers. In other words, looking at overall flow means also looking at system efficiency rather than at only the point efficiency of individual elements in your organization.

While our book has helped many thousands of people expand their perspectives -- it has even been translated into 15 languages -- any publication is subject to various interpretations by its readers, which can lead to some pitfalls. Here is a look at some we have observed, and how you can avoid them:

Some readers appear to think that value stream mapping is in itself a goal.

They tell us, "We are drawing maps of all our value streams!" This may lead to a better understanding of your flows, but not necessarily to any measurable improvement. Improvement comes from trying to take steps toward a target condition; a condition that goes beyond what is possible today. Value stream mapping can be a useful tool in this pursuit, yet it is still only a tool, not the actual improvement itself.

Instead of mapping everything and expecting good things to happen, it is more effective to start by improving one value-adding process in a value stream -- typically the assembly process -- with rapid PDCA cycles. Then progressively migrate into more of the value stream and support functions as is necessary to be able to further improve that assembly process. This way you will always be working on what you need to be working on.

In this sense there are two general categories of mapping:

1) A rapid walk through, or scan, and sketch of a value stream (say in one day or less) in order to get oriented before you deep dive into one value-adding process as described above.

2) A detailed analysis and future-state design, typically two to three years out, in order to drive several shorter-term improvement projects that will ultimately link together. These sorts of maps take more time to prepare and become increasingly useful as you migrate from assembly into the value stream.

Generally I tend to begin with a scanning map as described in 1) above, because otherwise you easily get into too much information and end up staying at too much of a surface level.

Stay at a 50-ft. altitude the first few times you walk through a dock-to-dock flow.

If you immediately get into to a very detailed level of analysis at every process you encounter you'll lose the overall flow perspective. Instead, begin by walking through at a "high altitude," and then progressively drop down to add detail as necessary on successive walk-throughs. The first walk-through may only take an hour and will result in just a rough sketch of the current-state flow. (Sometimes I tell mappers that during their first walk-through they may walk faster or slower, but they are not allowed to stop moving.)

Avoid an overemphasis on tallying inventory.

Lead time is a great metric, and you should strive to reduce it. (Note that outsourcing lead time does not equal reducing it.) It is fun -- like a scavenger hunt -- to find and tally inventory accumulations and useful to use this data to estimate the lead time from dock to dock. But don't let this become more important than understanding why the inventory is there.

Inventory accumulations tell you where the flow of value has to be interrupted because of process problems. When you find such breaks in the flow a good question to ask is, "What is causing us to hold this much inventory here?"

Inventory is always there for a reason. Go after the reasons.

Don't reach too far out into the future.

If you have drawn more than about six kaizen lightning bursts on a future state map

you are probably getting ahead of yourself. Instead, sketch out where you would like to be in two or three years to give a sense of direction. Then draw up a target condition anywhere from a few weeks to no more than 12 months out; depending on your level of improvement experience and capacity. As you work toward this target condition step-by-step you will gain experience and insights that will influence the next target condition you set for yourself.

Continuous improvement requires the challenge of target conditions.

Mapping helps you see the big picture, but you also always need a specific, measurable and challenging target condition for any process that you want to improve. With that defined you can ask yourself two elegant questions: 1) "What is preventing us from achieving the target condition at this process?", and 2) "What is our next step for moving toward the target condition?"

Roll up your sleeves, observe the process carefully to understand the causes of the problem, get creative and use PDCA (Plan, Do, Check, and Act) to develop solutions, one problem at a time. If you hold fast to your target condition and keep asking those two questions you can find solutions that you once thought impossible. This, in a general sense, is how Toyota moves forward.

And once a target condition at a process is achieved you need a next target condition, or else continuous improvement will stop and performance will tend to slip back.

So I wish you and your team some interesting challenges, at both the process and system levels.

About the author

Mike Rother is the co-author of two groundbreaking LEI workbooks, "Learning to See: value-stream mapping to add value and eliminate muda," which received a Shingo Research Prize in 1999 and "Creating Continuous Flow: an action guide for managers, engineers and production associates," which received a Shingo prize in 2003. He co-developed the accompanying "Training to See" kit that teaches facilitators how to run value-stream mapping workshops. Mike studies Toyota and is affiliated with the University of Michigan Department of Industrial and Operations Engineering and the Lean Management Institute in Aachen, Germany. Mike began his career with the manufacturing division of Thyssen AG in Germany. He lives in Ann Arbor, MI, and Cologne, Germany.

Dan Jones News Letter

Returning from the summer break is the right time to take a fresh look at your lean initiatives. Are they being led by the right people and are they realising the true potential of lean in your organisation, and up and down your value streams? There is still a lot of confusion about what value stream management really involves.

Most organisations have recognised that implementing lean on the shop floor or in a department like finance is the responsibility of the line management in that department. They need support from a lean promotion office, but must do the hard work themselves for it to stick, because it involves changing the thinking about how employees work together as much as moving things around.

But end-to-end value streams almost always cross several departments and several organisations on their way to the end customer. Yet it is still rare to find a value stream manager responsible for creating a value stream that flows out of a set of separately managed activities, or someone responsible for sustaining and improving the flow thereafter. Yet we know that if no one is responsible nothing actually happens.

The one place you may actually find such a person is leading a project to design a next generation product. In Toyota this is the job of the Chief Engineer. They are responsible for the success of their product family through several product generations and report through the Office of Chief Engineers to the top of the company. Interestingly they have few staff reporting directly to them. Most of the staff report to their function or department heads. So the Chief Engineer must articulate a case for the resources necessary to get the next product designed from all these department heads, including marketing, purchasing and production etc.

But, however radical the design leap being attempted, the task is essentially one of managing a new variant through an existing development system. Where you see a more radical leap is when Toyota is designing a completely new product line – like the original Lexus, the first hybrid Prius or the low cost vehicle for developing countries. Here you see a much bigger activity designing the new vehicle and the entire production system to build it (for several

product generations over a couple of decades). This redesign activity reaches back up each supply chain to raw materials, through as many as 26 different operations. It amazes me that many organisations still do not accept the need to take responsibility for designing their supply base in this way.

When it comes to trying to create a value stream that flows through several different departments for the first time then we need a value stream project leader to lead the charge. Like the Chief Engineer they do not need a big staff reporting to them. They have to make the case for the involvement and resources from all the departments involved and they have to report to and get the backing of top management to make the necessary radical changes.

The next question is who leads and improves this value stream once it has been created? What knits together a sequence of activities across a value stream? Not the physical flow – this is an outcome of a previous process – but the information flow coming back from the customer to the pacemaker process. So the answer is that the management of existing value streams is actually the responsibility of a lean planning and scheduling function, like the Production Control and Logistics Department at Toyota. Not surprisingly PC&L is at the heart of making the Toyota Production System work, yet less attention has been paid to how it actually operates than to physical operations.

Value stream management of an existing value stream starts with levelling the flow of orders coming from the customer – acting as a harbour wall to dampen rather than amplify order signals being passed upstream. Then it involves deciding where the pacemaker should be for both the products made to replenishment pull and for the build-to-order products made to sequential pull. Then it is about releasing small quantities of orders frequently to establish a common rhythm across the value stream so products flow quickly and activities come to match the rate and pattern of demand as closely as possible.

Wherever we turn the weak link in our lean activities is the way variability in the information flow is amplified and passed upstream. As long as this is not addressed it will be difficult to create the stability necessary to enable products or patients to flow. Maybe it is time to take a fresh look at the leadership of your value stream redesign

activities and at how your planning and scheduling department will manage your value streams on an ongoing basis.

Lean accounting and accounting for lean

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People often use the phrase “lean manufacturing” when referring to the process of creating a lean organization. This may be one of the biggest impediments to the lean conversion process because it suggests that the rest of the company can adopt a hands-off attitude.

Lean is a process improvement strategy that must be applied universally throughout the organization. If we only apply lean tools in manufacturing, we will have limited success. But when we focus on the lean enterprise, we recognize that success depends on a total commitment across all functional areas, and from the top to the bottom of the organization.

Typically, after significant changes have been made in manufacturing processes, managers discover that traditional reporting conventions don't show the gains made, and may even erroneously indicate things are deteriorating. The accounting department may then be brought into the lean conversion process, but it is behind the learning curve, slowing down the lean journey or derailing it completely.

Accountants can be obstacles to a successful lean conversion because they

- do not understand lean,
- do not know how to support it,
- do not know how to measure improvements,
- do not have time to devote to it, and
- have not been asked to participate in it.

Lean accounting or accounting for lean

It has become common practice to use the terms lean accounting and accounting for lean interchangeably, but there really is a significant difference in the two. The accounting department has to do two things

during the lean conversion -- change how the business keeps score for its internal operations, which is accounting for lean; and apply lean accounting to the accounting department, which consists of using lean tools to eliminate waste in accounting. Accounting for lean is the cost management system for today's world-class operations. Lean accounting is about eliminating waste in a functional area.

Accounting for lean -- 21st century cost management

Cost accounting methods developed in the early 20th century are no longer relevant after the transition from batch processing to pull and flow. Batch and queue with large lot sizes, long setups, massive inventories and a push production system required widespread control points, detailed job tracking and sophisticated cost allocation routines, which were usually incorrect, outdated and next to impossible for most non-accountants to decipher.

With lean manufacturing, the differences are dramatic:

- product is quickly pulled through the plant one or a few pieces at a time,
- inventory levels are minimized as well as standardized,
- skilled workers operate multiple machines simultaneously,
- others rotate into positions as needed,
- generic materials provide greater flexibility and standardization, and
- the overall speed of the operation is much greater.

The traditional standard cost system and absorption accounting has no place in a lean environment and in fact will become a significant barrier to a successful lean conversion.

The goals of accounting for lean are to:

- Provide accurate, timely and easy-to-understand information to motivate the organization's lean transformation and improve decision making, leading to increased growth, profitability, cash flow and customer value.
- Support the lean transformation with relevant and actionable information that

empowers continuous improvement at every level of the organization.

- Develop an accounting system that utilizes value stream costing, "plain English" P & Ls, box scores and other means to simply convey performance activity.
- Provide an accounting system that meets the needs of all of its customers, including tax authorities, the board of directors, creditors and internal customers.

With both lean accounting and accounting for lean, no compromise is made in adhering to all reporting requirements, including the SEC, IRS and GAAP.

Lean accounting

Process improvements in accounting can begin early in the lean conversion process. Early in the lean journey, the accounting staff should participate in the events on the manufacturing floor. Not only will they better understand what has taken place in production, they will also learn about lean tools and how to apply them in the accounting department.

The accounting department's resources will be stretched during an effective lean conversion. Accounting leadership should immediately deploy lean tools in the accounting department to eliminate waste and non-value-added clerical work, thereby freeing up resources that will be needed later on to implement accounting for lean.

Lean accounting is about using lean tools to eliminate waste in the accounting function in the same manner lean manufacturing or lean engineering would apply to those functional areas. Lean accounting is:

- An accounting system that minimizes the consumption of resources that add no value to a product or service in the eyes of the customer.
- A discipline focused on eliminating historical data and reports in favour of providing actionable information.
- A department of financial advisors, with associates involved in the day to day activities of all areas of the company, willing to work in the plant and participate in kaizens.

- A system that fully complies with generally accepted accounting principles (GAAP), and external and internal reporting requirements.

A lean accounting organization will provide simple value-added analysis to its customers so improvement actions can be taken immediately. Furthermore, accountants need to be involved in improvement activities so they can develop a greater understanding of the company's processes. We're giving the accounting folks a promotion from historical reporting and clerical analysis to becoming a mini-CFO for an organization's value streams.

Unfortunately, in North America the accounting profession is at least a decade behind the lean manufacturing movement and has a steep hill to climb. Survival will depend on a company's ability to navigate the treacherous lean journey and accounting leaders must decide if they want to be an ally or an obstacle.

About the author Jerry Solomon is the author of "Who's Counting," a Shingo Award-winning novel. He is VP of Operations - Hunt Valley at MarquipWardUnited, a division of Barry-Wehmiller

Jim Womack's email

Every value stream runs from raw materials all the way to the end customer. And value for the customer is only delivered at the very end.

In many service industries, of course, the "raw material" is information rather than molecules -- like the data in the claim application processed by an insurance company. But the situation is the same. Value is only delivered at the end of the stream.

Today I see a lot of progress in applying lean thinking to isolated segments of the value stream, even across functions within firms. But optimizing the entire stream as it flows *between* firms -- to truly solve the customer's problem while helping all the providing organizations to prosper -- still seems to be elusive.

Take the case of motor vehicles. As customers, we do want to obtain a physical object called a car or a truck. But the real problem we are usually trying to solve is personal mobility: We want to get places cost-effectively with no hassle or wasted time. So the processes of buying the vehicle and then keeping it running through an extended life are critical parts of the complete value stream. This total stream must link the car manufacturer's design and production processes to the car dealer's sales and service processes.

I've just been looking at the data collected by J.D. Power and Associates on customer satisfaction, by brand of vehicle, with the car buying experience and with the car service experience in the U.S. And I've been comparing this information with data on satisfaction with the vehicle itself. Not surprisingly, Toyota continues to capture top scores for satisfaction with the vehicle among brands sold in the U.S. Its Lexus brand was # 1 in 2006 while Toyota was #4 despite some recent problems with recalls. These data are for problems encountered with the vehicle in the first three months of ownership and the results are similar after three years. Lexus buyers report the fewest problems while the Toyota brand is in 5th place among the 37 brands in the market.

But the service experience at Toyota dealers -- as tracked by the Power Customer Service Index -- ranks 27th among thirty-seven brands. (Lexus is number one.) And the buying experience at Toyota dealers -- as shown by the Power Sales Satisfaction Index -- ranks 29th out of 37. (Lexus is number two.)

What's worse, as Dan Jones and I report in our recent book, *Lean Solutions*, (where we provide data collected by the International Car Distribution Programme) all 37 brands are terrible at meeting customer needs *cost effectively!* Thus Toyota dealers are performing poorly in a race where no one is doing well.

In sum, Toyota solves half the customer's problem by delivering high-quality vehicles. But it is still struggling to solve the whole problem by perfecting the entire value stream of the vehicle plus sales and service.

How can this be? And how can Toyota's performance in its largest market -- the U.S. -- be so different from its performance in its home market in Japan where the Toyota buying and service experience is legendary for the customer satisfaction it provides?

The heart of the problem I think is that Toyota dealers in Japan are co-owned by Toyota. So applying process thinking to the selling and service processes is much easier: The dealer really must listen. In the rest of the world car dealers, for all brands including Toyota, are independent businesses. And, in my experience, most car dealers -- certainly not just Toyota dealers -- are "hunters." They focus on making the sale at an advantageous price and moving on to the next sale. What's needed instead are "farmers" who carefully study their selling and service processes to completely solve every customer's problems through the life of the vehicle.

So the simple fact is that because Toyota dealers have had a superior product to sell they could afford to treat the customer poorly. The combination of a high quality vehicle plus inferior sales and service -- which comprise the total customer experience -- was still competitive in the marketplace. What's more the dealers erroneously believe that creating a superior buying and use experience must cost them money.

Lexus dealers, by contrast, do treat their customers well. But they seem to achieve this by spending more on sales and service, not by creating smooth flowing, lower-cost value streams. With a higher-priced product, they can afford to do this despite the waste in their processes.

We now know that the belief that better sales and service costs more is simply wrong. *In fact, better sales and service, like better quality in products, actually costs less.* This is because large amounts of wasted time and effort for dealers *and* customers can be eliminated through careful process analysis. Dan Jones and his colleagues at the Lean Enterprise Academy in the U.K. have clearly demonstrated this through their work with the GFS car dealing system in Portugal where one of third of the cost of providing a given amount of service was removed even as the level of customer service was dramatically improved.

Now that other manufacturers are closing the gap with Toyota brands on delivered defects and product durability -- look, for example, at the recent progress of Hyundai -- Toyota is finally taking steps to perfect its value stream all the way to the customer. It has recently launched experiments at five European dealers with the "Toyota Retailing System" designed to apply the techniques of the Toyota Production System to sales and service. As experience is gained, Toyota hopes to expand this system to dealers all over the world.

I don't doubt that Toyota will make progress with this initiative, although turning hunters into farmers is a major challenge. But what about the rest of us, whatever industry we are in? Almost all firms in today's de-integrated world either reach their end customer through other firms or obtain the items they need to solve their customers' problems from many suppliers. The end customers -- that's you and me in our role as consumers -- are only interested in the value delivered at the very end of the value stream. And we certainly don't want to hear about the difficulties that retailers, distributors, manufacturers, and supplier are having cooperating with each other to solve our problems.

So the challenge now for all of us -- no matter which customers we serve -- is to begin conversations across firms about optimizing total value streams. The best approach is to take a walk together, backwards from the end customer (or, even better, *with* the end customer), in order to draw an accurate map of the total value stream with all its shortcomings. Then it's time to talk seriously about how to create a smoother-flowing, higher-quality, lower-cost value stream that can be a win-win-win for providers, their suppliers, and consumers, as

Work lean to control costs

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The number one enemy of good management in American manufacturing is the widespread assumption that management accounting

systems are needed to control and evaluate operations on the shop floor.

In fact, the current wave of interest in "lean" manufacturing has attracted a large following of accountants who are promoting what is called "lean accounting." Not all of what they advocate is bad, but much of it resurrects old ideas about management accounting that, if carried too far, will impair sound operations.

There are a number of ways to identify and judge a truly lean operation. Lean is about viewing operations in the present moment, not with delay, and in a specific, concrete place, not in an abstract context removed from the site of the actual work.

In contrast to this, American managers customarily "see" operations after the fact, through abstract financial or quantitative data in computer reports and quantitative analyses. This propensity may go a long way toward explaining why American businesses have had so little success in adopting and implementing "lean" practices. They deal with the world in abstract terms rather than in the more concrete terms required to conduct lean operations.

"Average unit cost," for example, is an abstraction, far removed from the reality of the operation. American organizations will drive operations managers to pursue average unit costs by evaluating departments with standard cost variances.

Producing more and more output to reduce average unit costs is a time-honoured pathway to excess, delay, and abnormal variation -- prime drivers of higher total cost.

To focus on costs and on the concrete reality at hand, you must look at total cost, not unit cost. This is one of the most distinct differences between a Toyota plant and plants run by American companies.

The difference is that chasing average unit costs invites employees to focus on output, whereas pursuing low total cost, as Toyota does, invites attention to consumption of resources.

Toyota's approach to managing total cost focuses on the unit of output in each workstation at every moment, whereas the American companies' focus on average unit

cost shifts attention to an abstraction far above the local workstation or cell level where the resources that cause cost are consumed.

Viewing total cost as including resources consumed in each and every moment, in each and every step, as Toyota's system does -- one order at a time -- leads to lower total costs, higher quality, lower lead times, and greater flexibility.

On a traditional batch-and-queue shop floor, external systems for production control and management accounting control are standard fare. Managers are using standard-cost budget variances to motivate behaviour they hope will achieve financial targets.

Such external control systems disappear when a company conducts customer-pull, continuous-flow operations as seen in a Toyota plant. In the continuous-flow setting, controls are inherent in the work itself.

For production control, the customer pull sets the schedule in the Toyota plant, and standardized connections and pathways among workers and machines provide all the necessary routing information.

Cost control is maintained by adhering to standardized work and immediately reporting and rectifying abnormalities whenever and wherever they occur. Deviations from expected cost will be visible to people on the Toyota floor long before accounting evidence can signal such a development.

However, American managers seem to feel a need for external cost and financial controls more strongly than they feel the need for production controls.

This difference in attitude between production and financial control systems is perhaps understandable, because the production controls American accountants see in a Toyota plant, achieved by customer-pull scheduling and kanban replenishment, are concrete, immediate, and visible. They understand and accept that a Toyota plant operates without an MRP system to release work to the floor and route it through the relevant processes. They readily see how internal features of the work process itself replace any need for external computer scheduling.

But they find it much more difficult to see the internal features of the work that enable a Toyota plant to control cost without any need for external financial controls. Toyota achieves that cost control, of course, by the way they design work processes so every employee at every moment sees exactly what must be done to complete just one order at a time.

In the traditional American setting, managers strive to achieve the best overall results by running all parts of the system efficiently, without regard to the connections between one part of the system and another. This means the American plant will stress or sacrifice parts of the whole to achieve financial targets.

The lean plant strives to operate every part as a balanced and integrated whole. This holistic approach is the difference between seeing the whole as a mechanistic sum of parts and seeing the whole as an emergent feature of relationships among a living system of parts.

These two approaches to conducting operations differ greatly in how they manage abnormalities, errors, or defects. In traditional operations, an error is the fault of an individual person or machine, which is detected by inspecting work after it is done, and away from where and when it was done.

In lean operations, by contrast, an abnormality is immediately visible as soon as it occurs and where it occurs. Having people see and remedy abnormality promptly is an expected part of work in the lean setting. Moreover, an abnormality is not seen as an individual's fault. Rather, it occurs because of a breakdown in the pattern of relationships inherent in the work. The problem lies in the system, not with the person.

This list of ways to see lean, and know you are seeing it, is not exhaustive, but it shows that a person can identify and judge operations to be truly lean without using quantitative metrics. The attributes of a manufacturing organization's operations identified here provide a more powerful lens than any available table of metrics to see whether they follow the principles of the Toyota system.

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A Bomber an Hour

*Thanks Styrategosfor allowing us to use this extract from their Lean Briefing.
www.strategosinc.com*

*In January of 1940, America was being drawn into the growing war and our military was woefully unprepared. The Roosevelt administration asked Ford Motor Company to manufacture components for the B-24 Liberator bomber. Charles Sorensen, Vice-President of Production for Ford travelled to San Diego to observe Consolidated Aircraft's operations. Here is his description of the visit and how he conceived the **Willow Run bomber plant** that eventually manufactured 8,800 of these aircraft. Willow Run was the physical embodiment of the Ford Production system which was later transformed by Toyota into "[Just In Time](#)" and Lean manufacturing. **This is where it all started.***

Charlie Sorensen's Story

Inside the (Consolidated) plant I watched men putting together wing sections and portions of the fuselage. The work of putting together a four-engine bomber was many times more complicated than assembling a four-cylinder automobile, but what I saw reminded me of nearly thirty-five years previously when we were making Model N Fords at the [Piquette Avenue](#) plant. This was before Walter Flanders rearranged our machines and eight years before we achieved the orderly sequence of the assembly line and mass production.

The nearer a B-24 came to its final assembly the fewer principles of mass production there were as we at Ford had developed and applied over the years. **Here was a custom-made plane, put together as a tailor would cut and fit a suit of clothes.**

The B-24's final assembly was made out of doors under the bright California sun and on a structural steel fixture. The heat and temperature changes so distorted this fixture that it was impossible to turn out two planes alike without further adjustment. The Consolidated and the Air Force people talked about an order from Ford Motor Company for centre and outer wing sections; but it was obvious that **if the wing sections had uniform measurements, the way we made parts for automobiles, they would not fit** properly under out-of-doors assembly conditions.

All this was pretty discouraging, and I said so. Naturally, and quite properly, the reply was "How would you do it?" I had to put up or shut up.

"I'll have something for you tomorrow morning," I said.

I really did have something in mind. To compare a Ford V-8 with a four-engine Liberator bomber was like matching a garage with a skyscraper, but despite their great differences **I knew the**



same fundamentals applied to high-volume production of both, the same as they would to an electric egg beater or to a wrist watch.

First, break the plane's design into essential units and make a separate production layout for each unit. **Next**, build as many units as are required, **then deliver each unit in its proper sequence** to the assembly line to make one whole unit~ finished plane.

To house all this and provide for efficient operation there should be a new plant specially designed to accommodate the progressive layout. I saw no impossibility in such an idea even though mass production of anything approaching the size and complexity of a B-24 never had been attempted before.

But who would accept such a wild notion? And instead of one bomber a day by the prevailing method I saw the possibility of one B-24 an hour by mass production assembly lines. How could the aviation people take that estimate seriously?

As soon as I returned to my room at the Coronado Hotel, **I began figuring how to adapt Ford assembly methods to airplane construction and turn out one four-engine bomber an hour.**

Throughout the day I had made copious notes. I listed all major units of the plane and the subunits and fractional units required for their assembly, and I had gathered figures on Consolidated's labour force and job performance.

From these I computed each unit operation, its timing, and required floor space as I saw them, and paper began to fly. Figures for each unit I kept together in a separate pile, and soon there were little stacks of paper all over the floor of my room.

I was back at my old game of **sketching a series of manufacturing and**

subassembly operations and their orderly progression toward becoming major units-- a game I had played many times since that morning in 1908 at the Piquette Avenue plant when we first experimented with a moving assembly line.

Again I was practicing my production planning philosophy, which stemmed from my patternmaking days when I fashioned wooden models of Henry Ford's half-thought-out designs: **"Unless you see a thing, you cannot simplify it. And unless you can simplify it, it's a good sign you can't make it."**

As I look back now upon that night, this was the biggest challenge of my production career-bigger than any Model T assembly line sequence for [Highland Park](#), more momentous than the layout and construction of the great [River Rouge](#) plant in which I'd had a part. It took eight years to develop Ford's mass production system, and eight more years before we worked up to a production of 10,000 cars a day.

Now, in one night, **I was applying thirty-five years of production experience** to planning the layout for building not only something I had never put together before, but the largest and most complicated of all air transport and in numbers and at a rate never before thought possible.

Once again I was going on the principle I had enunciated many times at Ford: **"The only thing we can't make is something we can't think about."** Through most of the night I set down figures and revised them. I arranged and rearranged the stacks of paper, as it became plainer to me which unit came after the other in moving to final assembly and how much floor space was involved.

At length the whole picture became clear and simple. I knew I had the solution, and I was elated by the certainty that the Germans had neither the facilities nor the conception for greater bomber mass production.

Towards four o'clock, I was satisfied that my piles of paper were arranged in proper order and represented the most logical progress of units to the main assembly line; and I knew I could prove a construction rate of one big bomber an hour. Now I had something to talk about.

Standing over the papers, I roughed out on Coronado Hotel notepaper a pencil sketch of the floor plan of a bomber plant. **It would be a mile long and a quarter mile wide, the biggest single industrial building ever.** I still have that sketch, initialled by [Edsel Ford](#), his two sons and others, and I still get a kick out of it.

The result of one night's hard work, it is the true outline of Willow Run, which



took two years to build and came through on schedule with one four-engine Liberator an hour, 18 bombers a day, and by the end of the war a total of 8,800 big planes off the assembly lines and into the air.

When I finished my sketch I went to bed, but was so carried away by enthusiasm for the project that I couldn't sleep. I was building planes the rest of the night.

At breakfast with [Edsel \(Ford\)](#) the next morning I was somewhat woozy as I showed him the sketch and outlined the bomber-an-hour proposition.

He was in complete accord and assured me that Ford Motor Company would build such a plant. My high respect for

him went higher than ever. We spent an hour together, getting set for a meeting in Major Fleet's office to shoot the works on a \$200,000,000 proposition backed only by a pencilled sketch.

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Willow Run became a reality. It was the embodiment of American ingenuity, perseverance and productivity. Here are some of the statistics:

488,193 parts
30,000 components
24 Major subassemblies
Peak production- 25 units per day
25,000 initial engineering drawings
Ten model changes in six years
Thousands of running changes
34,533 employees at peak
100% Productivity improvement