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Lean Manufacturing

Demystified

Line of attack:
Begin at the end
A Good Lean Strategy Starts with Defining Your Ultimate Goal

ExoLytic
Outsourced Solutions
www.exolytic.com

Exolytic, Inc.
Jim
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THE LEAN PARADOX

You already know the statistics - lean can;

- allow you to become very profitable and competitive
- will shorten your lead-times,
- reduce inventories,
- cut operating costs,
- free up resources, and more.

Surveys and our experience indicate that most lean initiatives are abandoned outright or fail to deliver expected and needed results. Studies estimate that the failure rate is 98% (as measured by impact to the bottom line), and we have almost no reason to doubt these findings.

This begs some questions;

What do the 2% of companies know that the others do not?

Are these successes confined to specific industry sectors, or even company types?

Are only "lean experts" capable of leading an organization through a successful implementation?

Experience suggests that lean applies to

- any business
- any manufacturer,
- service companies,
- educational institutions, etc.

We find no data to indicate that employing lean principles cannot be a very effective business model for any organization. Furthermore, we find the failures disturbing the benefits of lean are too important to allow poorly defined lean strategies or ineffective execution to continue to be the norm.

TRADITIONAL APPROACHES TO LEAN

Upon review of some of the more disappointing experiences with lean, we identified several "generic" complaints, excuses, and issues. Following is the typical list given as pitfalls or reasons for lean failure:

- Lack of management support
- Poor metrics
- Not enough training
- Resistance to change
- Ineffective communications
- Not able to sustain initial efforts
- No buy-in from supervision
- Not expanding improvement from the initial efforts to other departments
- No buy-in from workforce

There are interesting observations with the above list.

First,

it could apply to any strategic initiative;

from a business merger, to putting in place a new information system, and anything in between.

Second,

these aren't very specific;

they tend to be symptoms of more deep-seated issues.

Experience suggests that many of these are the result of an inadequate lean strategic plan.

In order to help put these into context, a review on some of the more traditional approaches to starting a lean implementation can demystify lean manufacturing.

5S

Many companies begin lean by employing a technique called 5S, or Workplace Organization.

The "5" and "S" come from the five Japanese words;

1. seiri,
2. seiton,
3. seiso,
4. seiketsu, and
5. shitsuke.

The English equivalents (keeping the "5S" theme in mind) are:

1. sort,
2. set,
3. shine,
4. standardize, and
5. sustain.

Essentially, this is a process to organize a work area, focused on improving;

- efficiency,
- safety,
- layout, and
- flow.

5S produces some immediate and obvious results such as but not limited to;

- Workplaces are indeed better organized
- Tools and materials are maintained in well-defined locations
- Operators notice that their jobs become somewhat easier
- Supervisors find that it's simpler to visually identify problems / inefficiencies, excess inventory, misplaced equipment, etc.
- And, there may even be a marginal increase in productivity.

But, the benefits are difficult to sustain, improvements tend to be isolated, and impacts are difficult to quantify.

KANBANS

The word kanban means visible record in Japanese.

In lean lexicon, it is essentially a signal to produce or move product.

A kanban may be

- an electronic signal,
- an empty bin,
- a card,
- a pallet, or
- a defined area to hold inventory.

Kanbans are used to manage inventory quantify and flow.

In the ideal lean world, product is "pulled" towards the customer, through the factory, from the supplier in quantities of ONE - hence the term one-piece-flow.

However, in many circumstances, it's impractical to produce and move product one piece at a time. So, kanbans become a compromise; allowing the company to move small, controlled batches of material in a pull environment.

The use of kanbans can dramatically reduce total inventory. And, since lead-time is almost directly proportional to work-in-process inventory (WIP), well-defined kanbans can provide a significant improvement in lead-time.

But, there can be problems.

Using kanbans without other coordinated improvements (such as reducing equipment changeover times) can back-fire, resulting in degradation in equipment utilization and even problems with on-time delivery.

Also note that since kanbans are a compromise to true one-piece-flow, companies that have effective kanban systems sometimes become complacent and do not address the root causes that created the need to;

- maintain inventory,
- long changeover times,
- imbalanced processes,
- long distances between work centers,
- quality problems,
- lack of operator cross-training, etc.

KAIZENS

Also known as kaizen blitz.

This may be the most common starting point for a lean initiative in US manufacturing companies. Kaizen is the Japanese word for continuous improvement.

This approach involves empowering work teams too rapidly (hence, the word blitz) improve specific problems within their areas of responsibility. On the surface, this seems like a very good idea, and it can generate immediate and measurable benefits.

The use of kaizens, especially if championed by management, finally proves to the workforce that the company is interested in listening to and supporting their improvement suggestions.

Some of the more common targets for kaizens include;

- solving an equipment downtime problem,
- combining two or more machines into a work cell,
- setting up a kanban,
- reducing equipment changeover time,
- implementing point of use storage for supplies (maintaining storage where the supplies are actually used), etc.

But, this program can fall prey to a phenomenon known as

"drive-by kaizens"

improvements are implemented stand-alone, without prioritization, and without understanding how changes in one part of the facility might impact negatively other functions.

Other critical problems with this approach are that;

1. it tends to overlook consensus, and
2. there is little time taken to actually identify and eliminate root causes — there is more focus on speed than there is on planning.

VALUE STREAM MAPPING

The value stream is defined as all activities and events (both value-added and non-value-added) that a product or service passes through on its way from supplier to customer.

In a manufacturing facility, this includes shipping, waiting (in inventory, in a queue to be processed, or even in an oven waiting for adhesives to cure), packaging, inspection, rework, and both manual and automated processing.

When we map the value stream, we map both the product and information flows. The primary purpose of a value-stream map, specifically a "current state map," is to highlight areas where one-piece-flow breaks down — these points suggest opportunities for improvement (i.e., kaizens).

Other purposes of mapping include; measuring the total cycle time, identifying inventory locations, and determining points in the process where signals to produce arise.

Once a current state map is created, one or more "future state maps" are developed from it, showing where various kaizen events might eliminate root causes for stoppages in flow. The two reasons for creating alternative future state maps are;

1. certain improvements might be logistically, technologically, or cost prohibitive, and
2. there is no single correct future state. The VSM approach is significantly more effective than the aforementioned approaches because it prioritizes the improvement efforts.

But, it still has drawbacks.

One issue is that it involves those who will be impacted by the change much later in the improvement cycle than the 5S and Kaizen techniques—this late involvement of stakeholders tends to foster resistance to change.

Perhaps the most important point is that of "competing value streams" and impacted support functions. In most organizations there exists more than one value stream— more than one product line, or one product line that produces two or more different items.

These different value streams frequently compete for resources; equipment, people, materials, etc. Additionally, all organizations have departments that support the operations or production department—accounting, purchasing, quality, maintenance, engineering, etc.

If we change one value stream without understanding how it impacts a competing value stream or a support function, we may negatively impact the overall organization. It's important to note that focusing on the value stream is a relatively recent addition to the slate of lean tools and techniques.

This concept was introduced by Toyota Motor Company in the 1980's. The result is that we now treat individual processes within this value stream as a system. But, until now, we haven't applied this systems approach to the entire organization.

A BETTER APPROACH

Those companies that have been successful with lean have managed to overcome most of the pitfalls noted in the section Traditional Approaches to Lean and resolve those issues listed in each specific approach. Based upon our research and experiences, we tend to consolidate all these into a more focused list, as follows:

- Not involving stakeholders in the planning process (primary cause for resistance to change)
- Not considering the entire organization as a system
- Not treating each company and each lean initiative as unique
- Not understanding the real purposes for the initiative

This new list becomes the founding strategic principles upon which to build your lean implementation. The point is, lean works—it's probably the most effective business model in use today. So, let's do it, but let's find a way to exploit it for maximum advantage, benefit, and sustainability.

Every organization's approach to lean must be different—must be uniquely designed.

It's impractical to believe that two companies will share the same set of conditions—the combination of market, industry, financial health, technology, geography, culture, etc., are very different from company to company.

Therefore, any cookie-cutter approach will not be as effective as a customized approach.

Another important principle to keep in mind is that of "purposes." Those of you familiar with Goldratt's "Theory of Constraints" know that he talks about the GOAL of an organization. You need to know WHY you are implementing lean. And, this purpose will come from the people who benefit from your products and services—your customers—better yet, your competitor's customers.

Specifically, what is it that will make the industry sit up and take notice of you?

Is the driving force in your industry?

- lead-time,
- price,
- quality,
- product features,
- responsiveness,
- on-time delivery,
- time to market, or some specific combination of the above?

Why do you really want a lean enterprise?

What is it you're trying to accomplish?

No department in your organization stands alone. Each single step in your manufacturing process is either dependent upon an upstream step or impacts a downstream step.

Your lean strategy must integrate all the variables within the organization—business functions, suppliers, information, equipment, and people.

A traditional lean value stream comes close, but frequently different value streams share resources (equipment, facilities, and people). Improving one value stream might negatively impact another value stream. Even more, when you envision your overall future business state, some of your current lower level value streams might even disappear.

Text-book examples of value-stream mapping show a single, simple value stream with a single product or with a few very similar products. In the real world, in a real manufacturing environment, there are multiple value streams, all competing with internal (and sometimes external) resources.

If we improve or change one value stream, this will impact other value streams, and maybe in a negative way. So, before we create one simple value stream map, we need to identify ALL the value streams and their interconnectivities.

Everyone resists change at some level. And, this resistance can derail a lean implementation.

Moving from a traditional business to a lean enterprise requires very significant and personal changes by many people in the organization (and, some outside the organization). But, notice in any change effort those individuals who do NOT resist change—it's those on the core strategy and implementation team. Why?

Because we involve them in defining the vision for the new system. And, we involve them in designing the implementation plans. So, before you begin the effort, you need to identify Stakeholders and;

- those who will be involved,
- those who will be needed for support, and
- those who will be impacted by the change.

If it's impractical to involve all stakeholders in planning the change, at least involve representatives of each group of stakeholders.

Where you begin with lean might be some combination of the aforementioned traditional approaches. But, each will be modified or customized using these four principles. Indeed, your overall strategy must be based upon these principles.

Remember the discussion above of value stream mapping. Consider the systems principle and identify if there really are competing value streams. Instead of a basic value stream map, remember that you need to look at ALL values streams simultaneously, showing how the competing value streams interconnect and interact. And, this value system will need to expand outward to your suppliers, transportation partners, service providers, and customers. And, don't forget to consider your information system, cash reserves, and internal support functions—anything that impacts the total system cycle time—the delivery of your product or service from concept to customer.

We've been talking about systems and interconnectivity. To manage a complex lean enterprise, we need a fully integrated ERP system. We need real-time information. Information flow and the management of information must be integrated with your improvement efforts. And, it's not enough that your ERP system NOT conflict with your lean enterprise—your ERP system must fully integrate with and COMPLEMENT your lean initiative.

Another important point is that these interacting value streams we discussed can be quite complex, as you might imagine.

You will need to identify tools to create these models—a traditional pen & paper value stream map probably won't suffice, unless you have only one product line and manufacture two or three very similar products. You will probably need a modeling tool to really understand the subtleties and interconnectivity points of this entire value system.

Put in place a lean scorecard to monitor both your results and progress towards your lean indicators. Lean has a goal of perfection—eliminating all waste, variation, and uncertainty within the entire value system.

Until lead-times are instantaneous, until WIP is 0, until defects are 0, until changeover times are 0, until margins are the best in your industry, there are opportunities for improvement.

SUMMARY

Let's summarize by presenting a recommended lean implementation strategy.

Lean Executive Overview: Send the executive team and core implementation team to a lean executive overview workshop. The workshop should provide attendees with a background in lean and introduce them to basic principles in one-piece-flow, kanbans, and pull systems.

Lean Skills Training: Train the core implementation team in the more common lean tools; value stream mapping, 5S, kaizens, mistake-proofing, kanbans, cellular layout, total productive maintenance, lean metrics, and rapid changeover.

Identify Value Streams: At the point, a traditional implementation would involve the creation of current state maps. In this system-wide approach, identify all value streams and business functions that will impact and be impacted by any value stream. Also, identify where these streams connect AND the nature of these interconnections.

Ideal Future State: To identify your ideal future state, use the purposes principle to envision how you might address your customers' needs three or four years from now.

If you're having difficulty grasping this concept, make the assumption that you've already taken your organization to the next level.

Now, picture the solution that you're most significant competitor used to leap frog what you've just done! This could be your ideal future state. From this ideal state you may note that some of your current value streams, business functions, or interconnection points disappear. Use this map to prioritize your improvement opportunities. As your improvement starting point, select the value stream from the ideal future state that has the most impact on the entire organization.

Current State Map: Map the prioritized value stream.

Future State Map: Convert the current state map to a future state map, per your value stream mapping training. The difference or gap between these two maps will be a list of kaizen events. But, remember to note how and where this specific value stream connects with other value streams and business functions—your kaizens might impact these. Put in place actions plans or risk mitigation plans to address these.

Implement Kaizens: Create an implementation plan—the kaizens (actions) identified on the above map, who will be involved, how will improvements be measured, what resources will be needed, what barriers will need to be overcome, and a timeline. Execute the plan.

Repeat the above for each value stream.

Use 5S, process capability, point-of-use storage, kanbans, mistake-proofing, total productive maintenance, etc. throughout the organization—including the front office, engineering, maintenance, R&D, etc.

Congratulations! By this point, you will have just scratched the surface, but you will have made measurable and sustainable impacts! You will have begun to understand what a lean enterprise really is—and why a comprehensive lean strategy is the key to a successful initiative.

Notes

1. To manage a complex lean enterprise, we need a fully integrated ERP system. It's not enough that your ERP system NOT conflict with your lean enterprise your ERP system must fully integrate with and COMPLEMENT our lean initiative.

2. You need to keep going:
   - Until lead-times are instantaneous,
   - until WIP is 0,
   - until defects are 0,
   - until changeover times are 0,
   - until margins are the best in your industry, **there are opportunities for improvement.**

3. Every organization's approach to lean must be different must be uniquely designed.

4. At your improvement starting point, select the value stream from the ideal future state that has the most impact on the entire organization.

5. You need to know WHY you are implementing lean. What is it you're trying to accomplish?

6. Your lean strategy must integrate all the variables within the organization business functions, supplier's information, equipment, and people.

7. Our experience indicates that many of these are the result of an inadequate lean strategic plan.

8. The benefits of lean are too important to allow poorly defined Lean strategies or ineffective execution to continue to be the norm.