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An Overview of a Lean

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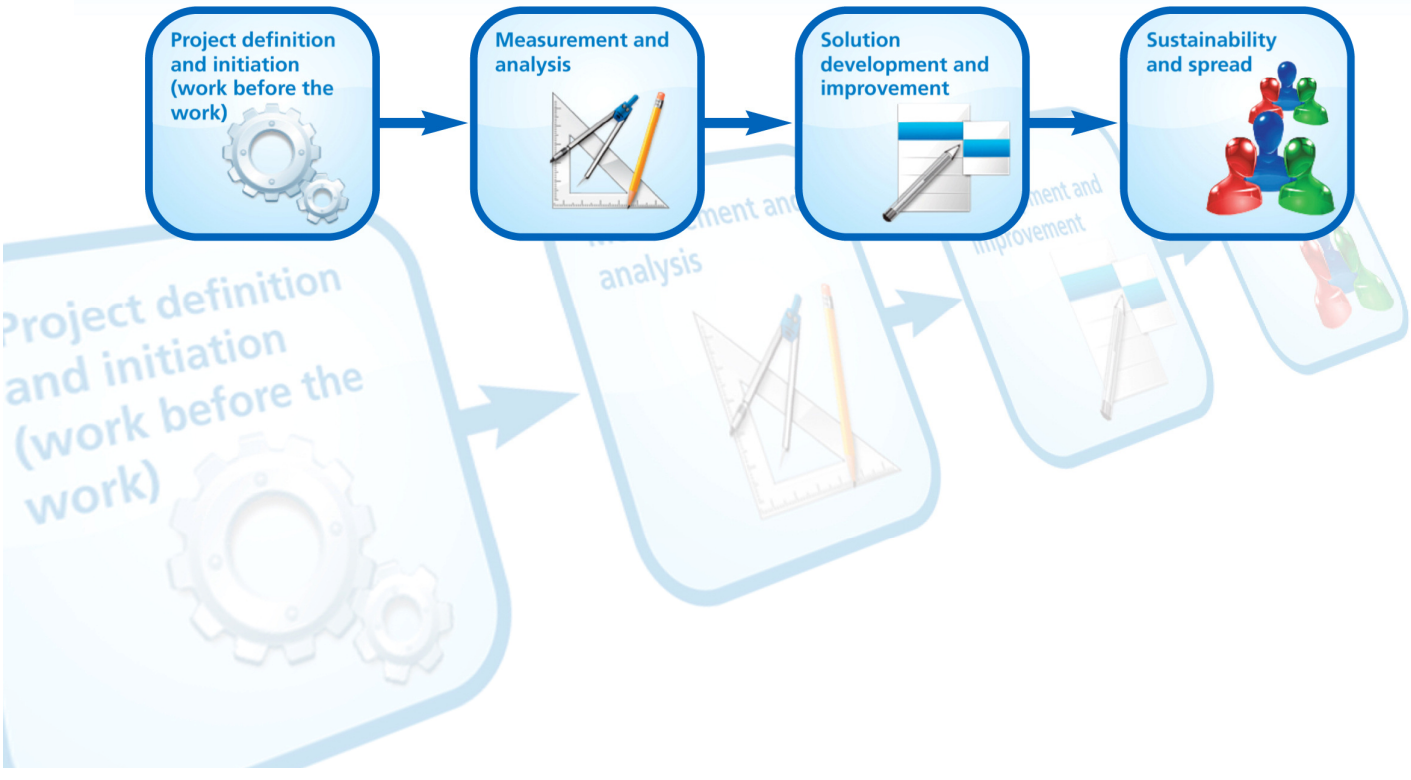

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Lean

Lean is an improvement approach to improve flow and eliminate waste. Lean is basically about getting the right things to the right place, at the right time, in the right quantities, while minimising waste and being flexible and open to change.

Lean is a whole management system which brings into many industries, including healthcare, new concepts, tools and methods that have been effectively utilised to improve process flow. Tools that address workplace organisation, standardisation, visual control and elimination of non-value added steps are applied to improve flow, eliminate waste and exceed customer expectations.

A Brief History of Lean

Although there are instances of rigorous process thinking in manufacturing all the way back to the Arsenal in Venice in the 1450s, the first person to truly integrate an entire production process was Henry Ford. At Highland Park, MI, in 1913 he married consistently interchangeable parts with standard work and moving conveyance to create what he called flow production. The public grasped this in the dramatic form of the moving assembly line, but from the standpoint of the manufacturing engineer the breakthroughs actually went much further.

Ford lined up fabrication steps in process sequence wherever possible using special-purpose machines and go/no-go gauges to fabricate and assemble the components going into the vehicle within a few minutes, and deliver perfectly fitting components directly to line-side. This was a truly revolutionary break from the shop practices of the American System that consisted of general-purpose machines grouped by process, which made parts that eventually found their way into finished products after a good bit of tinkering (fitting) in subassembly and final assembly.

The problem with Ford's system was not the flow: He was able to turn the inventories of the entire company every few days. Rather it was his inability to provide variety. The Model T was not just limited to one colour. It was also limited to one specification so that all Model T chassis were essentially identical up through the end of production in 1926. (The customer did have a choice of four or five body styles, a drop-on feature from outside suppliers added at the very end of the production line.) Indeed, it appears that practically every machine in the Ford Motor Company worked on a single part number, and there were essentially no changeovers.

When the world wanted variety, including model cycles shorter than the 19 years for the Model T, Ford seemed to lose his way. Other automakers responded to the need for many models, each with many options, but with production systems whose design and fabrication steps regressed toward process areas with much longer throughput times. Over time they populated their fabrication shops with larger and larger machines that ran faster and faster, apparently lowering costs per process step, but continually increasing throughput times and inventories except in the rare case—like engine machining lines—where all of the process steps could be linked and automated. Even worse, the time lags between process steps and the complex part routings required ever more sophisticated information management systems culminating in computerized Materials Requirements Planning (MRP) systems.

As Kiichiro Toyoda, Taiichi Ohno, and others at Toyota looked at this situation in the 1930s, and more intensely just after World War II, it occurred to them that a series of simple innovations might make it more possible to provide both continuity in process flow and a wide variety in

product offerings. They therefore revisited Ford's original thinking, and invented the Toyota Production System.

This system in essence shifted the focus of the manufacturing engineer from individual machines and their utilization, to the flow of the product through the total process. Toyota concluded that by right-sizing machines for the actual volume needed, introducing self-monitoring machines to ensure quality, lining the machines up in process sequence, pioneering quick setups so each machine could make small volumes of many part numbers, and having each process step notify the previous step of its current needs for materials, it would be possible to obtain low cost, high variety, high quality, and very rapid throughput times to respond to changing customer desires. Also, information management could be made much simpler and more accurate.

The thought process of lean was thoroughly described in the book *The Machine That Changed the World* (1990) by James P. Womack, Daniel Roos, and Daniel T. Jones. In a subsequent volume, *Lean Thinking* (1996), James P. Womack and Daniel T. Jones distilled these lean principles even further to five:

- Specify the value desired by the customer
- Identify the value stream for each product providing that value and challenge all of the wasted steps currently necessary to provide it
- Make the product flow continuously through the remaining, value-added steps
- Introduce pull between all steps where continuous flow is currently impossible
- Manage toward perfection so that the number of steps and the amount of time and information needed to serve the customer continually falls

Lean Today

Toyota is the leading lean exemplar in the world and stands poised to become the largest automaker in the world in terms of overall sales. Its dominant success in everything from rising sales and market shares in every global market, not to mention a clear lead in hybrid technology, stands as the strongest proof of the power of lean enterprise.

This continued success has over the past two decades created an enormous demand for greater knowledge about lean thinking. There are literally hundreds of books and papers, not to mention thousands of media articles exploring the subject, and numerous other resources available to this growing audience.

As lean thinking continues to spread to every country in the world, leaders are also adapting the tools and principles beyond manufacturing, to logistics and distribution, services, retail, healthcare, construction, maintenance, and even government. Indeed, lean consciousness and methods are only beginning to take root among senior managers and leaders in all sectors today.

Principles of Lean:

1 Specify Value

As Womack and Jones note in *Lean Thinking*, "The critical starting point for lean thinking is value. Value can only be defined by the ultimate customer. And it's only meaningful when expressed in terms of a specific product (a good or a service, and often both at once), which meets the customer's needs at a specific price at a specific time."

Above all, lean practitioners must be relentlessly focused on the customer when specifying and creating value. Neither shareholder needs, nor senior management's financial mind-set, nor political exigencies, nor any other consideration should distract from this critical first step in lean thinking. Once more, here's another passage from Womack and Jones on how managers can start off on the wrong path:

Why is it so hard to start at the right place, to correctly define value?

"Partly because most producers want to make what they are already making and partly because many customers only know how to ask for some variant of what they are already getting. They simply start in the wrong place and end up at the wrong destination. Then, when providers or customers do decide to rethink value, they often fall back on formulas: lower cost, increased product variety through customization, instant delivery rather than jointly analyzing value and challenging old definitions to see what is really needed."

2 Identify the Value Stream

The value stream is the set of all the specific actions required to bring a specific product through the critical management tasks of any business: the problem-solving task running from concept through detailed design and engineering to production launch, the information management task running from order-taking through detailed scheduling to delivery, and the physical transformation task proceeding from raw materials to a finished product in the hands of the customer. Identifying the entire value stream for each product is the next step in lean thinking, a step which firms have rarely attempted but which almost always exposes enormous, indeed staggering, amounts of waste.

A great resource and guide to Value Stream mapping is *Learning to See* by Mike Rother and John Shook.

3 Flow

Only after specifying value and mapping the stream can lean thinkers implement the third principle of making the remaining, value-creating steps flow. Such a shift often requires a fundamental shift in thinking for everyone involved, as functions and departments that once served as the categories for organizing work must give way to specific products; and a "batch and queue" production mentality must get used to small lots produced in continuous flow. Interestingly, "flow" production was an even more valuable innovation of Henry Ford's than his better-known "mass" production model.

Lean managers eager to implement flow in their organizations can learn more about the topic in the book *Creating Continuous Flow* by Mike Rother and Rick Harris.

4 Customer Pull

As a result of the first three principles, lean enterprises can now make a revolutionary shift: instead of scheduling production to operate by a sales forecast, they can now simply make what the customer tells them to make. As Womack and Jones state, "You can let the customer pull the product from you as needed rather than pushing products, often unwanted, onto the customer." In other words, no one upstream function or department should produce a good or service until the customer downstream asks for it.

5 Pursue Perfection

After having implemented the prior lean principles, it "dawns on those involved that there is no end to the process of reducing effort, time, space, cost, and mistakes while offering a product which is ever more nearly what the customer actually wants," write Womack and Jones. "Suddenly perfection, the fifth and final principle, doesn¹t seem like a crazy idea."

Getting Started

Welcome to lean. As you begin your lean journey, it is important to recognize two critical points: the road ahead is daunting—yet the potential payoff from your effort is enormous.

Jim Womack and Dan Jones define the promise of lean thinking as

> *"a way to specify value, line up value-creating actions in the best sequence, conduct those activities without interruption whenever someone requests them, and perform them more and more effectively. In short, lean thinking is lean because it provides a way to do more and more with less and less—less human effort, less human equipment, less time, and less space—while coming closer and closer to providing customers with exactly what they want."*

And yet, in his foreword to Jeff Liker's book *Becoming Lean*, Jim Womack also acknowledges the tough job of putting lean into practice.

> *"Why is lean thinking and lean manufacturing so challenging to implement? It is not—as many early commentators believed—a set of isolated techniques, but a complete business system, a way of designing, selling, and manufacturing complex products that requires the cooperation of thousands of people and hundreds of independent organizations. A successful 'lean leap' requires 'change agent' leadership, a sensei (teacher) to demonstrate the techniques, a long-term commitment to the work force to inspire their best efforts, proactive development of the supply base, aggressive management of the distribution and sales system (accounting methods plus individual compensation) that motivates managers to do the right thing every time."*

Common Lean Questions

- How do I get started?
- Is there an essential implementation sequence and if so, what is it?
- Does lean apply to non-manufacturing settings?
- What are the most common mistakes in implementing lean?
- How does lean compare to other improvement processes such as Six Sigma?

- How does lean compare with the Theory of Constraints, or TOC?
- How do I convince my leaders and associates to practice lean?
- What are the best books about lean practice?

How do I get started?

While every individual or company embarking on a lean journey will have different challenges based on their particular set of circumstances, there are several crucial steps that can help reduce resistance, spread the right learning, and engender the type of commitment necessary for lean enterprise. One of the best overall guides to getting started on your lean journey can be found in Chapter 11 of the book *Lean Thinking*, appropriately titled, An Action Plan. Here are the key steps as they are elaborated:

- ***Find a change agent.*** This could be you—or anyone of the organization: the key is that this must be a leader who will take personal responsibility for the lean transformation.
- ***Get the lean knowledge***. It's important to draw from a true and thorough source of lean, whether from an ex-Toyota sensei or some other reputable source, so your internal change agents master lean thinking to the point where it becomes second nature. And always implement lean techniques as part of a system, not as isolated programs.
- ***Find or create a crisis***. Unfortunately, few if any firms will take the necessary steps to adopt lean thinking across the board unless they are facing a crisis.
- ***Forget grand strategy for the moment***. Start by simply eliminating waste everywhere possible.
- ***Map the value streams***, beginning with the current state of how material and information flow now, then drawing a leaner future state of how they should flow and creating an implementation plan with timetable.
- ***Begin as soon as possible*** with an important and visible activity.
- ***Demand immediate results***.
- ***As soon as you've got momentum, expand your scope***. Link improvements in the value streams and move beyond the shop floor to office processes. Practice kaizen, or constant improvement, relentlessly!
- For beginners seeking an overview of the entire lean system, as well as a sense of the types of human challenges which lean leaders encounter, The Gold Mine: A Novel of Lean Transformation represents an excellent starting point.

Is there an essential implementation sequence and if so, what is it?

Yes, there is. The five steps of lean implementation are as follows: specify value, map the value stream, make the remaining steps flow, let the customer pull, and then pursue perfection relentlessly.

When it comes down to the actual nitty-gritty of lean implementation, veterans may use these principles as mere guidelines for proceeding, as opposed to a fixed sequence. For example, as illustrated in the novel *The Gold Mine*, the first step that the sensei takes is a simple walk along the factory floor, paying close attention to the facts of how people work. Moreover, some lean experts differ over when to start creating value-stream maps. Do not underestimate the power of a sensei asking pertinent questions about the process they observe. The simplest questions are often the most challenging – however painful this is to the manger, the learning is enormous. One of the key aims of establishing lean as a whole management system of the organisation is

to develop the problem solving skills in each employee – this starts with asking he right questions!

Does lean apply to non-manufacturing settings?

Absolutely. Every core lean principle applies just as strongly, if not more so, beyond the shop/clinical floor. In fact, many of the most exciting breakthroughs are taking place in areas such as services, health care and government.

“Lean thinking gives you a broad perspective on providing goods and services that goes beyond the bottom line, beyond the stodgy principles of mass-producing capitalism. It is a human system, customer focused, customer driven; wherein employees within and outside the workplace are also customers."

What are the most common mistakes in implementing lean?

First of all, if you are taking on the challenge on lean practice, you are to be congratulated for getting started. That said, there are some of the most common pitfalls to be aware of.

To start with, lean must never be seen as a tool for headcount reduction or mindless cost-cutting in the short term. This fundamentally misses the purpose of lean, which is to create value through eliminating waste. It is a long term philosophy. As companies improve their processes they should be able to reallocate their productive resources to new value-creating work.

Another important attitude to avoid from the beginning is the impulse to implement individual lean tools without seeking to understand the system in which they fit. This is hard to avoid, since many tools, like 5S, deliver immediate payoffs. But ultimately all lean workers must understand the ‘why’ behind the tools, or their value will be lost.

Lean beginners should also limit the scope of their initial project so as to better ensure success, be sure that they have a leader with deep knowledge and a gemba attitude i.e. always base one's thinking on a close observation of the work itself, and never relax in their efforts. Indeed, one of the hardest challenges they will face is the degree to which individual lean successes will invariably uncover new problems and greater challenges. So in this regard, simply be aware of how difficult this work will be.

How does lean compare to other improvement processes such as Six Sigma?

While there are many specific differences among the different schools of thought, Jim Womack cautions against getting lost in the competing schools. For veterans of each practice often get lost in finely detailed arguments over technical or even philosophical differences. In an e-letter outlining the key differences, he nonetheless grounds the discussion by saying, “At the end of the day we are all trying to achieve the same thing: The perfect value stream.”

Quality Progress magazine published an article ‘How To Compare Six Sigma, Lean and the Theory of Constraints’ which offers a very good overview that can help you choose the best framework for your organization.

How does lean compare with the Theory of Constraints, or TOC?

This school of thought is an organizational change method focused on profit improvement, arguing that every organization faces a constraint, or bottleneck, limiting performance. Popularized by Eliyahu Goldratt in his book *The Goal*, this is one of the most well-known systems. The article *What is the Theory of Constraints, and How Does it Compare to Lean Thinking?* is an excellent overview and comparison of the two systems.

How do I convince my leaders and associates to practice lean?

This paramount challenge transcends lean itself. Here's how authors Michael and Freddy Balle respond to this question.

> *"We find it hard to distinguish "technical" issues from "people" issues. Indeed, the two cannot be separated. And so the real question that matters is this: what does it take for lean to become part of the company's culture? The answer is: a critical mass of people who both think lean and act lean. Regardless of how much has been published about the topic, thinking lean is not that obvious. Most people who observe their operations conclude that while they might understand this lean concept very well, it just doesn't apply to their particular circumstance. They need help in seeing the connection."*
>
> *"One of the most powerful insights from Womack and Jones is that lean is not simply a toolbox, but a total perspective. In other words, you must trust people to solve their problems, regardless of the way the problem has been defined. A plant manager, for example, typically defines a problem as, Hit your numbers, keep the factory loaded, and avoid too much union or vendor problems. This effectively forces him to stay in his office, manage by the numbers, run large batches and so on. A lean approach redefines the problem completely. His new goals would be: produce only what has been consumed (or ordered), never by-pass a problem or let an operator face a problem alone and continuously improve all processes. This has dramatic implications for the work of the same plant manager. The only way to solve problems in this lean perspective is to spend most of his or her time on the shop floor trying to understand what goes on, and challenging teams to be more precise and to improve their operations."*
> *"So the first real difficulty with lean deals with both technical and people challenges. The change begins by framing the problem, which one recognizes in the factory from a lean perspective."*

In order to get started, people need to, in essence, develop a lean eye. John Shook and Mike Rother's book, *Learning to See*, refers to the genchi gembutsu, which is translated as "go see for yourself." *The Gold Mine* starts from this perspective. Before being exposed to lean ideas, Phil Jenkinson (a co-founder of the example company) has to learn to see his factory in much greater detail and understand how the different elements affect each other.

Developing this discipline remains an extraordinary challenge for all individuals, regardless of their background or the lean level of the plant. This is what folks call a moving target. Consider a plant that has managed to achieve pull, flow, with a supermarket after the cell, a truck preparation area, kanban, and so on. All's well. Right? Now, imagine that the material handler comes to pick up a container from the supermarket with a kanban card, but the box isn't there. The truck still needs to be prepared, so the system now tells her to get the container from the safety stock. This choice, however, would not be using the principle of pull correctly. The

properly operating pull system would in fact create the right tension that forces the individual to solve the root cause-in this case, to determine what caused the container not to be there in the first place.

However, it takes a sensei level of lean observation to see beyond what appears to be happening in the flow. Most of us would be impressed by the technique of lean, the kanban, the supermarket, the truck preparation, and not see that all of this is failing to do what it's supposed to, which is solve the problems. So learning to see is a pretty big challenge, both on the technical and people front, at whatever lean level you are.

What are the best books about Lean practice?

This is subjective. However, a brilliant starting point would be:

- *The Toyota Way* by Jeff Liker
- *Creating a Lean Culture* by David Mann

For those who would like a lighter hearted feel to their introductory reading you can't go far wrong with *The Gold Mine* by Freddy and Michael Ballé.

Learning to See by Mike Rother and John Shook is an excellent resource for value stream mapping.
It is then worth reading *The Machine That changed the World* by Woamck, Jones and Roos and *Lean Thinking* by Womack and Jones.

Good luck!