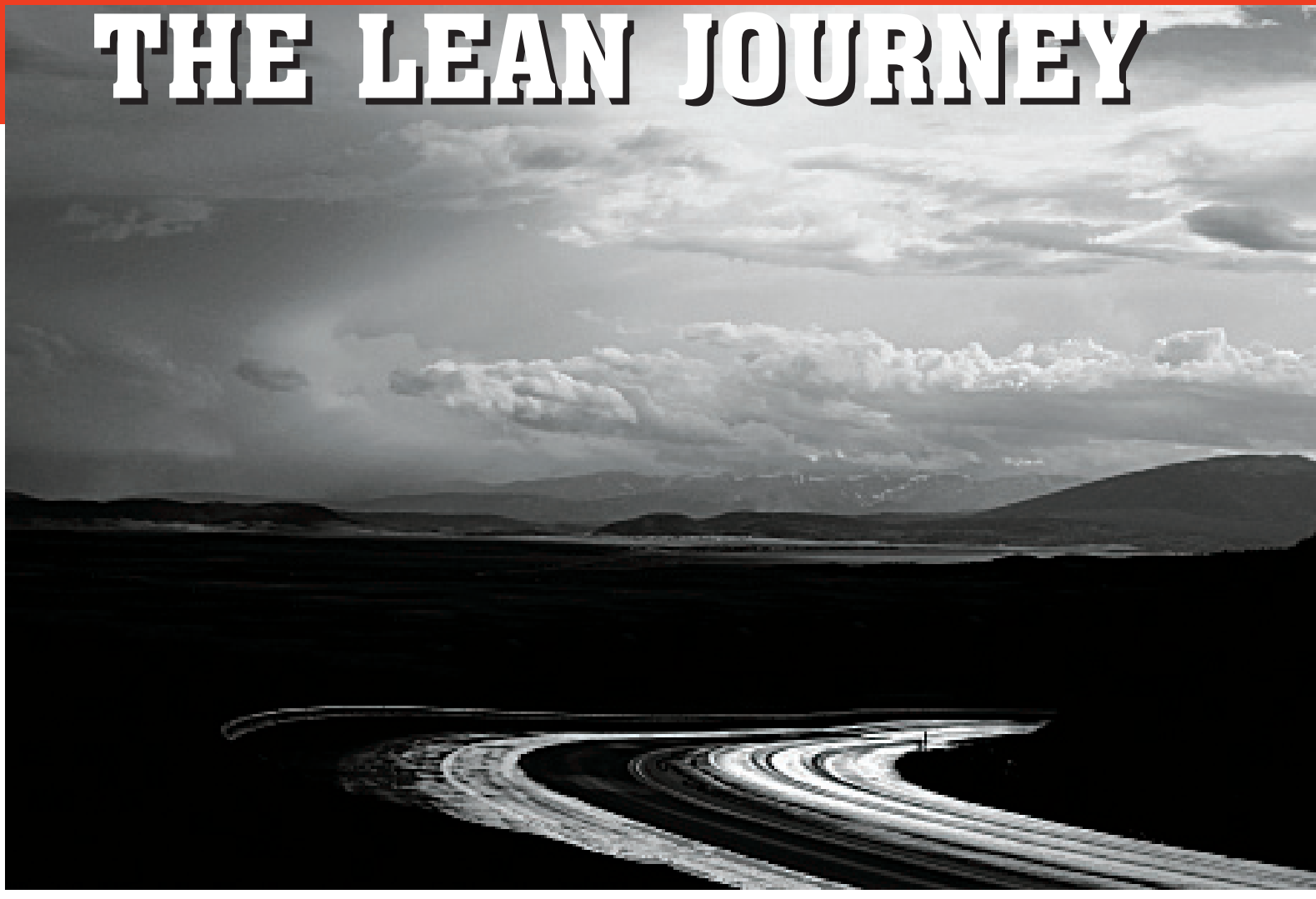
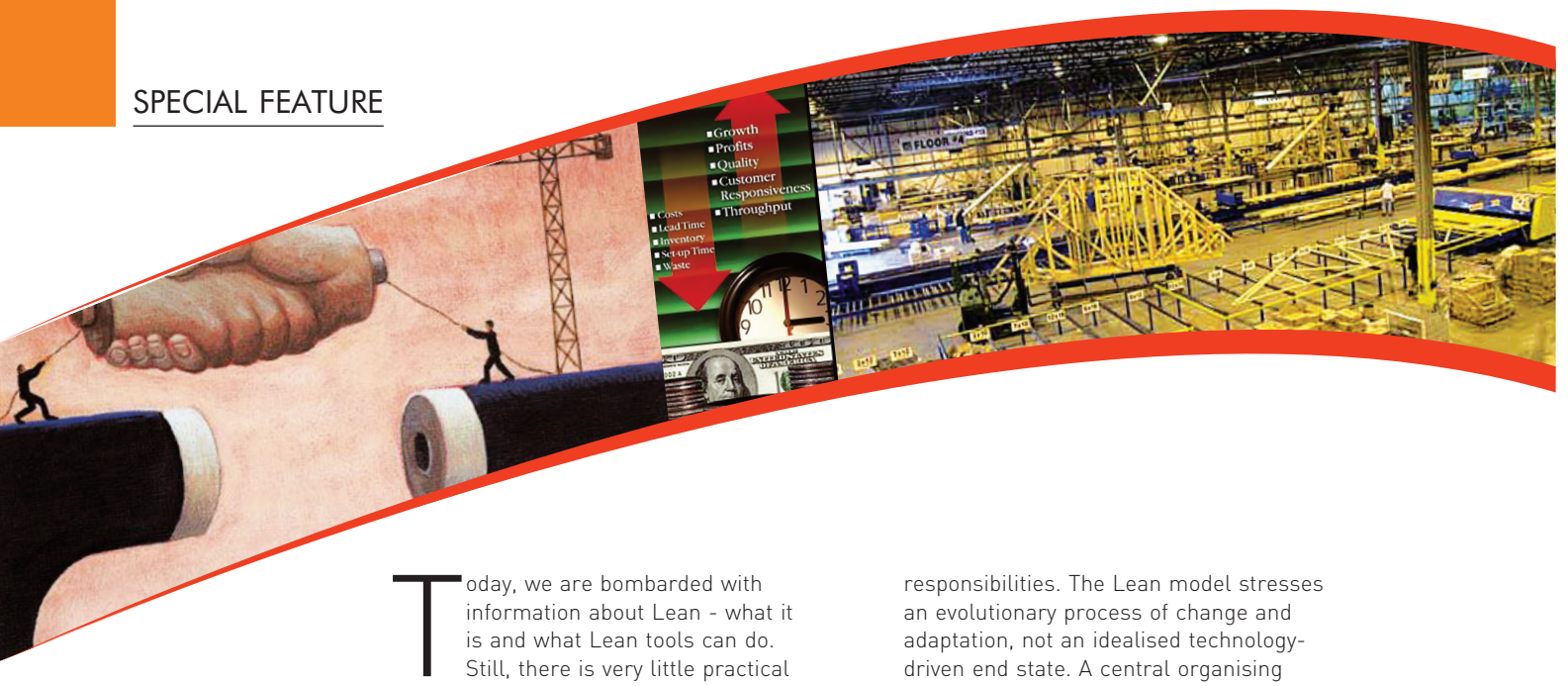
# THE LEAN JOURNEY



The concept of Lean manufacturing was developed as a result of research work carried out in the automotive sector, heavily influenced by Japanese practice. It is a systematic approach to eliminate waste and focus the attention of the entire company on the value creating processes. The objective of the Lean approach is to provide techniques that enable companies to define value in their products, identify where and how this value is added, and arrange these activities so that minimum waste is incurred and to produce products only when they are needed.

In today's competitive global world this practice gains all the more importance. This section tries to take a wholesome approach to this practice along with expert interviews.

But in this lean journey, as the first article talks about, through the road to Lean is tough, but is sure to lead you to success…




Today, we are bombarded with information about Lean - what it is and what Lean tools can do. Still, there is very little practical information on how to implement Lean transformation and lead the change. Every company's Lean journey starts under different circumstances, so there can be no one recipe, no 'right way.' But, to ensure success, there are many factors to consider before embarking on your Lean journey.

So, why is it that such a low percentage of companies that know about Lean turn it into a success? It's not because they haven't heard about continuous flow, or they don't know how to do 5S, or they've never seen a kaizen workshop. It is because the leadership, cultural, organisational and implementation challenges are much greater than they anticipate.

Someone said wisely, 'Experience is not what you've been through; it's what you take from it.' The fundamental message is that every success and failure should yield as much learning as you can wring from it.

Research on manufacturing technology, operations and performance reflects the wider context of growing industrial competition in a global economic environment. The basic objective is to create a systematic knowledge base, through the application of systems thinking and quantitative analysis, leading to an improved understanding of the fundamental determinants of industrial growth and decline.

Systemic Lean principles, encompassing all industrial operations and covering the entire enterprise, represent a fundamentally new and dynamic production paradigm. The adoption of Lean principles is beginning to transform an increasing number of industries, by fostering continuous technological innovation, the building of new organisational relationships, the creation of new cooperative arrangements, and the establishment of new roles and responsibilities. The Lean model stresses an evolutionary process of change and adaptation, not an idealised technology-driven end state. A central organising concept is the sustainable enterprise, where the corporation builds mutual gain processes and relationships with its multiple stakeholders.

## What exactly is Lean?

'A systematic approach to identifying and eliminating waste (non-value-added activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection.'

The term 'Lean' is used because Lean manufacturing uses less:

- Human effort in the factory
- Manufacturing space
- Capital investment
- Materials
- Time between the customer order and the product shipment.

## Why Lean manufacturing should be implemented?

To be strategically competitive by providing:

- Quality products: Standard expectation of global customer
- Cost-competitive products and processes
- Flexibility: Processes are responsive to rapidly changing conditions
- Speed
- Dependable, capable, repeatable and simple processes.

## Evolution of Lean manufacturing

Lean manufacturing refers to an evolving dynamic process of production covering the total enterprise, embracing all aspects of industrial operations (product development, manufacturing, organisation and human resources, customer support) and including customer-supplier networks, which is governed by a systemic set of principles, methods and practices.

Nilesh Pendharkar, chief consultant, Vrunda consultancy service

| Program | Six Sigma | Lean thinking | Theory of Constraints |
|---|---|---|---|
| Theory | Reduce variation | Remove waste | Manage constraints |
| Applications Guidelines | 1. Define<br>2. Measure<br>3. Analyse<br>4. Improve<br>5. Control | 1.Identify value<br>2. Identify value stream<br>3. Flow<br>4. Pull<br>5. Perfection | 1. Identify constraint<br>2. Exploit constraint<br>3. Subordinate processes<br>4. Elevate constraint<br>5. Repeat cycle |
| Focus | Problem focussed | Flow focussed | Systems constraints |
| Assumptions | A problem exists<br>Figures and numbers are valued<br>System control improves if variation in all processes is reduced | Waste removal will improve business performance<br>Many small improvements are better than systems analysis | Emphasis on speed and volume<br>Uses existing systems<br>Process interdependence |
| Primary effects | Uniform process output | Reduced flow time | Fast throughput |
| Secondary effects | Less waste<br>Fast throughput<br>Less inventory<br>Fluctuation-performance measures for managers<br>Improved quality | Less variation<br>Uniform output<br>Less inventory<br>New accounting system<br>Flow-performance measure for managers<br>Improved quality | Less inventory/waste<br>Throughput cost accounting<br>Throughput-performance measure for managers<br>Improved quality |

The link between leading world-class manufacturing concepts

The best way to describe Lean production is to contrast it to its predecessors: craft production and mass production. Craft production uses highly skilled workers and simple but flexible tools to make exactly what the consumer asks for, one item at a time. The result is that consumers get exactly what they want but at a prohibitively high cost.

Mass production uses narrowly skilled professionals to design products made by unskilled or semi-skilled workers tending expensive, single-purpose machines. The machines produce standardised products in a very high volume. Due to the high cost of disruption of the process, the mass producer adds many buffers - extra supplies, workers and space - to assure smooth production. Also due to high cost of changing over to a new product, the mass producer keeps standard designs in production as long as possible. The result is the consumer gets lower costs but at the expense of variety, and workers tend to find their part of the process boring.

Lean production, by contrast, uses teams of multi-skilled workers at all levels of the organisation, and uses highly flexible, increasingly automated machines to produce large volumes of products in enormous variety. The term 'Lean' comes from it using half the human effort in the factory, half the manufacturing space, half the investment in tools, and half the engineering hours to develop a new product in half the time.

The most striking difference between mass and Lean production is that mass producers set a goal for themselves. To do better would cost too much or exceed inherent human capacities. The Lean producer, on the other hand, sets his sights on perfection, thereby delivering ever-increasing benefits. Lean production also pushes responsibility farther down the organisational ladder, to individual workers.

## Origin of Lean production

Henry Ford created the Model T in 1908 - his 20th design over a five-year period. He had, in the Model T, finally met two objectives: a car that was designed for manufacture and was user-friendly (almost anyone could drive and repair the car without a chauffeur or mechanic). The key to mass production wasn't the continuously moving assembly line, as many people believe, but rather the complete and consistent interchangeability of parts and the simplicity of attaching them to each other.

In craft production, each piece was created by an individual craftsman, the majority of

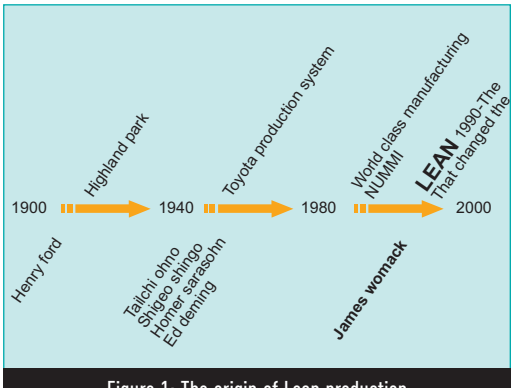



Figure 1: The origin of Lean production

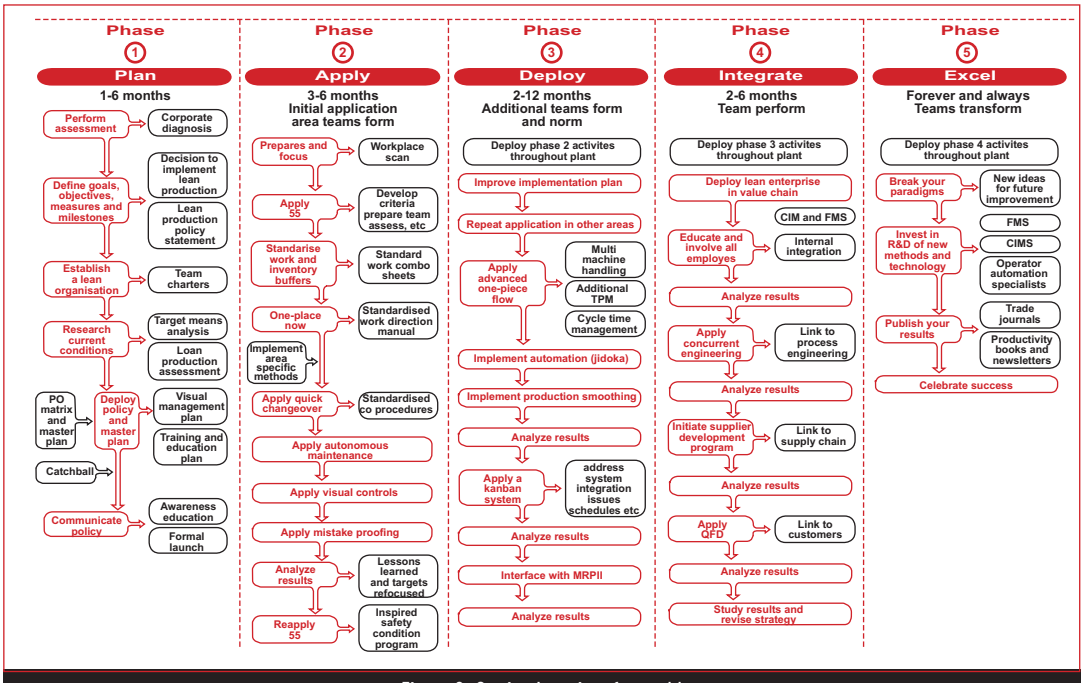



Figure 2: Getting Lean in a fat world

who were independent contractors with a manufacturing organisation. Each craftsman used his own gauging system in manufacturing his part. Once parts were created, the first piece and the second piece were put together with filing and adjustments made until they fit perfectly. Then the third piece was added and adjusted accordingly, and so on, until an entire automobile was assembled. The biggest problem was that each piece was made using a different gauge and then fired for hardness. This usually warped the metal and the piece had to be machined again to regain its original shape. The end result was usually a mere approximation of the original dimensions.

To achieve interchangeability, Ford insisted that the same gauging system be used for every part all the way through the entire manufacturing process. Ford also benefited from the recent development of pre-hardened metals. Taken together - interchangeability, simplicity, and ease of attachment - Ford was able to eliminate the skilled fitters who had always formed the bulk of every assembler's labour force, as just one advantage over competition.

In 1913, Ford introduced the first moving assembly line in the Highland Park plant in Detroit. Rather than individual workers creating one whole automobile before beginning another one, he had honed the concept of the worker remaining in one spot and the product, components and tools would come to the worker. This created the concept of the unskilled worker who no longer needed to understand the whole production process but merely needed to be able to attach two screws to two nuts or put one wheel on every car that came by all day long. He had not only created the interchangeable part, but the interchangeable worker as well.

By 1915, Ford had further streamlined the process to include the vertical integration of supplies. Rather than buying his chassis and engines from the Dodge brothers (as he had been doing) and a host of other products from other firms, he brought all these functions in-house. The decision was made partly because Ford had perfected mass-production techniques before his suppliers and could achieve substantial cost savings by doing everything himself. He also trusted no one but himself. Lastly, he needed parts with closer tolerances and on tighter delivery schedules than anyone had previously imagined. So he decided to replace the mechanism of the market with the 'visible hand' of organisational coordination.

By the early 1920s, General Motors was also in the running as a mass producer of automobiles. Unfortunately, its founder, William Durant, was a classic empire-building man; he had no idea how to manage anything once he bought it. He was ousted from management by his bankers in 1920, and replaced by Alfred Sloan. In order

to manage the five major companies owned by General Motors, Sloan developed the principle of managing objectively 'by the numbers.' Sloan and the other senior executives oversaw each of the company's profit centres by evaluating detailed sales, market share, inventory, and profit and loss reports. Sloan felt it unnecessary for executives to understand the details of operating each division. The numbers would show performance; if performance was down, it was time to change the general manager, if it was good, the manager was a candidate for promotion to the vice-presidential level. Sloan used the same decentralised management theories across the entire company; domestically and internationally, as well as across disciplines. He essentially developed the last part of the division of labour that Ford had begun. Ford had developed the rework specialist and general foreman of the assembly line, to manage the errors of the interchangeable worker, and the engineers to design the product and processes. Sloan added the financial manager and marketing specialist to control the rest of the corporate structure. This was the completion of the entire mass production process.

While mass production was being perfected in the US, it was also beginning to flourish in Western Europe. In the late 1950s, VW, Renault and Fiat were producing at a scale comparable to Detroit's major facilities. A number of the European craft production firms also made the transition to mass production.

By the 1970s, the Europeans were specialising in cars very different from Americans though. They were offering compact, economy cars, such as the VW Beetle, and sporty, fun-to-drive cars, such as the MG. They were also developing new product features including front wheel drive, disc brakes, fuel injection, unitised bodies, five-speed transmissions, and engines with high power-to-weight ratios. Unfortunately, their production systems were nothing more than copies of Detroit's but with less efficiency and accuracy.

In the spring of 1950, a young Japanese engineer, Eiji Toyoda, set out on a three-month pilgrimage to Ford's Rouge plant in Detroit (Ford invited large numbers of engineers from around the world to visit his plant; he kept no secrets about mass production). The Rouge plant was the largest, and most complex in the Ford family, if not the world. After much study, he went back to Japan and with the help of his production genius, Taiichi Ohno, they soon concluded that mass production would never work in Japan. From this tentative beginning was born what Toyota came to call the Toyota Production System, and ultimately 'Lean production.'

Toyota faced a host of problems in Japan. Their domestic market was tiny and demanded a wide range of vehicles from luxury cars for executives, to large and small trucks for farmers and factories, and small cars for the crowded cities and high-energy prices. The native Japanese workforce also was no longer willing to be treated as a variable cost or as interchangeable parts. Japan also did not have the advantage of 'guest workers' (that is temporary immigrants willing to put up with substandard working conditions in return for high pay) such as had been available in America and in Europe.

The first process that Ohno tackled was stamping of sheet metal. Until now, the standard practice had been to stamp a million or more of a given part in a year. Unfortunately, Toyota's entire production was to be a few thousand vehicles per year. Ohno concluded that rather than dedicating a whole set of presses to a specific part and stamping these parts for months or even years without changing dies, he would develop simple die change techniques, and change dies frequently (every two to three hours, versus two to three months) using rollers to move dies in and out of position. This way he would need only a few presses rather than a large number of them, and he found it was actually cheaper to produce a smaller number of parts and not have to inventory them.

Not only did he save on the cost of inventory, but mistakes were also caught much earlier in the process. He also hit upon the idea of letting the production workers themselves perform the die changes instead of needing specialists to do so.

## Common problems faced in implementation of Lean

There are many reasons. Far too often, Lean teachers give the answer 'because Toyota does it and because it is the best way.' That may be true, but for the manufacturing executive or business owner who faces pricing pressure, workforce turnover, or quality and technology problems, that isn't a compelling reason. We must connect lean transformation to both the long-term and immediate needs of managers today.

First, competitive pressures have been increasing for some time. What might have once been a regional business is now even subject to international competition because of easier access to information and decreasing transportation costs. That means there is pricing pressure, along with delivery and quality pressure, which is beyond anything we've ever seen. And for these reasons it will only get tougher. Price is not tied to cost, but the ability to continually reduce price while remaining profitable is tied to your ability to continually drive waste out of your processes.

Second, consolidation is a growing force

in many markets, including utilities, automotive suppliers and even hospitals. This is eat or be eaten time. The competitive performance and skill base of your organisation will allow you to control your own destiny - stand alone or buy and improve someone else. If you haven't grown your organisation's skill base, you will either sell your business at rock bottom prices or fade into the sunset.

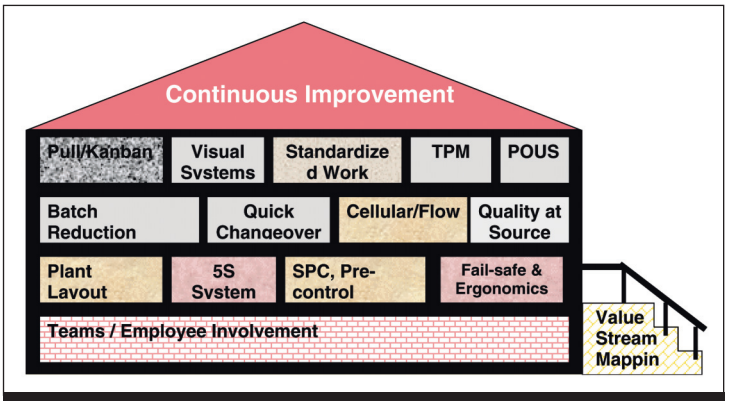



Figure 3: House of Lean

Third, there is good reason to engage in lean transformation efforts not just because of what it does to your performance but what it does for your people. There is a war for talent, and a knowledgeable workforce is critical in even the oldest industries. More and more evidence suggests that people choose their job and employer primarily on what their opportunity and experiences will be, not just on wages. That being said, developing a culture that engages the entire workforce and drives continuous improvement, one of the central principles of lean, will help you recruit and retain the best and brightest. So that is the good side. This may all seem obvious, so why don't more people head down this path? There are many myths out there that prevent people from exploring their opportunities, so before we go any further, we should explore the validity of those myths.

Much of what we can learn about lean comes from the Toyota Production System. Through over 50 years of learning and experimentation, Toyota has driven deep into the systematic elimination of waste and has created a system that learns and adapts better than anyone else. Its reputation for management and manufacturing excellence extends well beyond the automotive industry and truly is a benchmark for all operations and manufacturing companies.

## How to go ahead?

Figure 4 gives the answer to the question of 'why' one should take the lean way. The following speaks of 'how.'

- Structure every activity
- Clearly connect every customer/supplier
- Specify and simplify every flow
- Improve through experimentation at the lowest level possible towards the ideal state.

It is easy to read these design rules and think, 'We've already done that. We have a book of standards, we've developed process maps for the flows, we know the customer of every process - so what's new?' Of course, the initial reaction will usually prevent someone from really engaging and learning. For example, a process map may define what request is made between a supplier and customer, but how thoroughly do we actually consider how that connection between the customer and supplier is carried out? Is it defined to great detail? Is it so clear that there can be no misinterpretation of the signal? If there is a problem or failure with the signal, does someone know? A process map will just show a box with the activity. The depth to which Toyota applies these rules-in-use to the connection between team leader and team member in comparison to most other companies is well worth exploring.

In your company, what happens when an employee finds a problem or an opportunity? Perhaps you've told you're employees 'feel free to come to me with any problems,' but is that really a good application of rule number 2 which states clearly connect every customer/supplier. If it were a good application, that connection should be direct between you and your employee and it should be binary so that a customer request - such as help in solving a problem - comes only one way and means only one thing. You

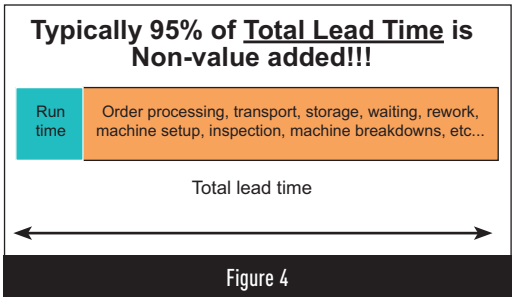



Figure 4

may not see this rigour as important, so we will explore what happens when the answer to that question is even slightly ambiguous.

A new employee comes to you with a problem that he doesn't know how to solve. You, full of good intentions, tell the employee to try again so that he can learn. He solves the problem, but in the process inadvertently learns that he should exhaust every possible opportunity before coming to you with the problem. One time, the problem is so critical in timing that it could cost the company millions of dollars, but following what he learned, the employee tries everything he can first. By the time he comes to you, it is too late. Both you and the employee had good intentions, but despite these intentions a major problem occurred. Because this problem was such a catastrophe, it creates unwanted attention for that particular employee.

As a result, the next time he comes across such a problem, he focusses on sweeping the problem under the rug so that he will not receive all this negative attention. Now, not only does the problem not get attention in a timely manner, but doesn't receive it at all, all because there is significant ambiguity between the employee and supervisor regarding their problem-solving process. It would be a safe bet that every disenfranchised and frustrated employee has a story like this one. It is not enough to have good intentions, you need to drive unbending rules into how your organisation will operate or it will always eventually revert to its most closed and self-protecting form.

## Benefits of lean

Typical results of implementation:

- Travel time reduced by 75 per cent;
- Process time reduced by 82 per cent;
- Inventory turns increased by 40 per cent;
- Production time reduced by 40 per cent;
- Gross margin increased by 105 per cent;
- Product cycle time decreased from 4 weeks to 24 hours;
- Six-fold increase in throughput.

## Additional benefits

- No finished good inventory: All goods pulled by customer and shipped on the day of manufacture;
- On time delivery 96.1 per cent;
- 25 per cent decrease in manufacturing inventory;
- Cultural change from traditional manufacturing to scheduling based upon product pull;
- Staff is involved with the production process and allowed to make necessary changes.