

LEANing Forward



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“One thing you cannot recycle is time wasted.” – Taiichi Ohno (who invented the Toyota Production System which later became Lean Manufacturing). The lean philosophy is founded on three key principles: Respect for people, eliminate non-value-adding activities (remove wastages) and maximise the efficiency of value-adding activities.

WHY LEAN?

The Malaysian oil & gas industry faced a difficult 2015. In February 2015, Petronas posted a RM2 billion loss for the final quarter of 2014. This was followed by an announcement that it would be cutting capital expenditure by 10% and operational expenditure by 30% that year. Across the world, international oil giants slashed exploration and production budgets and scaled back projects.

To add to this, productivity in the oil and gas services industry had a negative development of 55% over the last few years while manufacturing improved by 61%. The situation is clear. Customers have cut spending and are expecting engineering companies to respond to their needs for lower costs and more efficient work.

Lean is the best way to provide revolutionary improvements with changes to the process of product and service delivery. This differs from Value Engineering which provides changes to the actual product/service. While Value Engineering is described as delivering “less for less”, Lean is delivering “more for less”. During this challenging period, Lean is capable of providing the much-needed paradigm shift.

LEAN BASICS

The concept of Lean can be summarised into what I would address as **P(3p)**. The alphabet **P** stands for **Perfection**. **Perfection** can be described as the effort of continuous improvements.

The **3p** in **parentheses** stands for **Product, Process & People**. **Product** is what we want to achieve or produce at the end of each process. **Process** refers to the series of activities involved in order to achieve a particular end and **People** refers to the person involved in the process, either directly or indirectly.

Lean is the collective effort to improve the quality of the product, the efficiency of the process and the involvement of the employee. In Lean thinking, it should be noted that cost is targeted at reduction, not profit. Lean is not

about trimming to the bone and squeezing more from the remains. Applying lean also doesn't mean the restructuring of the company.

LEAN ENGINEERING

Applying the Lean Manufacturing philosophy to engineering may appear to be a little tricky and even discouraging at first. In Lean Manufacturing, the value is visible at each step and the goal can be defined. In Lean Engineering however, the value is not as easily visible while the goal is emergent as we move along the lean transformation process.

In Lean Manufacturing, value stream is formed by parts and material flow while in Lean Engineering, it is the flow of information and knowledge. As far as the flow is concerned, in Lean Manufacturing, iterations in a process are considered as waste. However planned iterations are accepted in Lean Engineering as long as efficiency remains. Another distinguishing difference will be in the definition of perfection, **P**. In Lean Manufacturing, perfection happens when a process is repeatable without errors while in Lean Engineering, it is achieved when process enables enterprise movements.

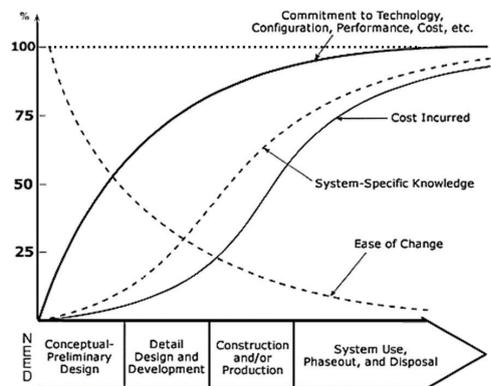


Figure 1: Commitment, system-specific knowledge, and cost (source: B.S. Blanchard & W.J. Fabrycky, *Systems Engineering and Analysis*, 3rd Ed., Prentice Hall, 1998, Figure 2.11).

Engineering companies need to adopt a strategy to focus on differences from competitors and to be the preferred partner to

work with. The key enabler will be focus on performance improvement and improved efficiency. Lean thinking should start as early as the Front End stage, when critical decisions are made. At this stage, management control and ease of change are high while the costs incurred, costs committed and knowledge applied, are low. Engineers must make the right choices early in the process, to ensure customer satisfaction and low lifecycle costs.

ELIMINATING WASTE AND CREATING VALUE

To eliminate waste and to create value from the customer’s perspective, requires close collaboration with the internal and external customer in order to truly understand what creates the value.

In delivering engineering service, it is important to know what it is that we can deliver which will create customer value? Time, Cost and Quality are the 3 aspects which form customer value. Apart from knowing what to deliver, when to deliver and the cost, it is also necessary to understand the needs of the customer and to make the overall process comfortable for the customer, in order to create true value.

The objective of Lean is to increase customer value with less effort by removing the “waste” that the customer is not willing to pay for. In Lean, the goal is **not to run faster, but to run shorter**. Eliminating wastage along the process will make product delivery shorter.

There are 8 categories of waste: **Defects, Over-production, Waiting, Non-Utilised Skill, Transport, Inventory, Movement** and **Extra-processing**.

DOWNTIME. When we talk about waste, we are not referring to people doing wasteful actions but to the product not being worked on. For example, a document sitting in a box waiting to be worked on, is non-value added. We are not talking about people being idle but the product that we are producing, being “idle”. The waste categories and examples are as below:

Table 1: Waste Categories and Example

CATEGORIES	EXAMPLE
Defects	Something that renders the product, unfit for purpose due to poor quality.
Over-production	Producing more than the customer requires, “just in case”, to make up for poor quality.
Waiting	Waiting for materials, equipment, drawings or for others to complete the tasks.
Non-utilised skill/Knowledge	Under-utilising human skills, talent, and knowledge. Employees are not fully engaged to maximise value creation.
Transportation	Moving material, information around between stages in the production process.
Inventory	Keeping more materials than needed for current process stage.
Movement	Physical movement of personnel or material within a process stage.
Extra-processing	Generating more work products or quality than the customer will pay for. Exceeds “fit for purpose”.

Typically, 40% to 80% of effort is wasted in terms of a significant amount of rework, waiting for information and unnecessary bureaucracy. This results in significant delays in a process (time), wasted time and overruns (cost) and variable quality and significant reworks (quality), resulting in frustrated employees, management and customers.

LEAN TRANSFORMATION

Lean Transformation is not just about using new concepts and tools. It is about changing an organisation's culture, thinking and behaviour. The process requires excellent leadership and a strong vision to be sustainable and successful. It is a difficult journey but one that is well worth the effort. Typically, the Lean Transformation process can be executed in six phases as follows:

1. **Call out.** This phase is a "defining moment" where overall lean strategies must be developed. The call out should be a strong driving message from the topmost level to everyone. The idea is to instill in every employee the driving force or purpose for getting Lean.
2. **Lean Education.** The concept of lean may be new to some. Lean may be simple but it's not easy. Basic education is essential to all. Lean Training sessions have to be rolled out to provide clear and precise information on the lean concept. At this stage, it is very important for managers to play their role well in being the fore-runner in welcoming the initiative.
3. **Value Stream Mapping.** This phase is where the visual representation of workflow and information flow are developed. The current state and the future state are charted. The visualisation will help identify the area of improvements. A Priority List is developed as an action plan.
4. **Initial Lean Projects.** In this phase, small projects are initiated as an improvement initiative. Projects usually involve a small team (process owner) who will benefit the most from the process improvement. This phase also helps to build the comfort level in utilising the lean tools. The results from these small projects are shared and demonstrated across the organisation to gain broader support.
5. **Intermediate Lean Projects.** Small pockets of Lean will begin to appear. This will serve to increase the Lean Appetite and drive the positive momentum. At this phase, an in-depth lean education is rolled out. The driving force in the phase one is re-validated.
6. **Advanced Lean Projects.** After grabbing the "low hanging fruit", it now becomes more difficult to squeeze out simple waste. At this stage, an increase in flow and capacity should be seen. Savings can be projected on a larger scale. Major opportunities still remain as the next action plan. This phase never ends.

ROLE OF AN ENGINEER IN A LEAN TRANSFORMATION PROCESS

- Engineers should play an effective role in a Lean Transformation Process. They need to transform themselves into Lean Thinkers. The optimist – Why is the *glass half full?* The pessimist – Why is the *glass half empty?* The Lean Engineer – *Why is the glass double the size it should be?*
- Engineers must challenge the way they work in order to eliminate waste and increase customer value.
- The only person who can determine the quality of an engineer's work is the internal customer. Engineers should

ask: "What do I need to do so that the next person can do his job? What do I need (i.e. what are my requirements as an internal customer) in order for me to do my job?"

- Engineers should emphasise the usage of visuals rather than plain reports. Visualisation or workflow, progress and performance will allow the team to take immediate corrective action and deliver right the first time as well as on time just as the disruption surfaces.
- All work needs to be performed in accordance to a defined standard. Engineers must measure their performance to identify deviations from the standard way of working. Performance measurement is used to understand how to deliver in accordance with the standard or to improve the standard.
- Identify the root cause of each problem. Instead of jumping to solutions, an engineer should find the root cause of the problem and implement a solution to actually fix the problem.

CONCLUSION

The oil and gas industry will recover from the present challenges but things will not be the same anymore. With this understanding, a culture change is a must in order to remain relevant. The contribution of an engineer is instrumental in determining the success of this change initiative. Together we should LEAN forward for a sustained positive change, and come to grips with a core concept that embraces and promotes change. *"An organisation's ability to learn, and to translate that learning into action rapidly, is the ultimate competitive advantage."* Jack Welch (Chemical Engineer and former CEO of GE). ■

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