Lean Six Sigma:
Tackling seven areas of waste

A BSI whitepaper for business

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For over two hundred years, since the industrial revolution, managers have tried to find ways to make their organizations more productive and more customer friendly.

What is Lean Six Sigma?

In the last 50 years or so, two approaches to operational improvement have been pre-eminent:

- **Lean Thinking**, or just 'Lean', grew out of the car manufacturing industry and spawned the 'just in time' technique that continues to dominate that industry all over the world.

- **Six Sigma** was originally developed by Motorola with the aim of removing virtually all variation in its processes and producing "perfect work".

These approaches have gained a lot of attention over the years due to a number of high-profile implementations. Benefits in the hundreds of millions of dollars have been attributed to companies like Toyota and General Electric (GE), though these companies have also invested very large amounts to achieve those ends.

Unfortunately, these prominent examples have tended to overshadow the potential of Lean and Six Sigma as tools for improving the work and output of organizations of all sizes and types. **The reality is that many of the benefits of Lean and Six Sigma are readily accessible and don't require significant expense**.

At their cores, Lean and Six Sigma share one very straightforward goal: the removal of waste in all its forms. Removing waste reduces cost and increases customer satisfaction. It is because of this common aim that, today, the best aspects of the two techniques are often combined into one: **Lean Six Sigma**.

Today, you will find Lean Six Sigma being applied in almost every industry, from banking to logistics, from manufacturing to health care.

In this paper we will introduce you to one of the central ideas in Lean Six Sigma: the 'seven wastes'. With an understanding of this concept alone you will have the potential to make immediate and ongoing improvements to the efficiency of your organization.

Seven wastes, seven opportunities

While we intuitively think of waste as 'things we throw away', there are actually many different kinds of waste. Most or all of them can be found – and reduced or removed – in every organization. However, to find them you need to know where to look.

One way to think about waste is from the point of view of your customers. Ask the question: "Would my customers be happy to be paying for this activity?" For instance, if you were in the business of food production, your customers would probably be content to pay for the ingredients that end up in their products, and for the cost of cleaning equipment. They may not be so willing to pay for the storage of excess stock or for moving product from one warehouse to another. Similarly, if you were in banking, your customers would be happy paying for the processing of a mortgage application, but less so about paying for reports that get printed but never read.

There are seven main categories of waste. They can be remembered by asking the question: "Who is TIM WOOD?"

Seven areas of waste

- **T**ransport
- **I**nventory
- **M**otion
- **W**aiting
- **O**verproduction
- **O**ver-processing
- **D**efects

The waste of **T**ransport

The waste of transport is the waste of unnecessarily moving things around – commonly called 'double handling'. This waste tends to be obvious in a factory or warehouse, when pallets of product are shifted from one location to another, but it is just as prevalent in service industries. The movement of paper from one desk to another or from one office to another is also a form of transport waste.

Even electronic movement of information can be regarded as transport waste. Every time an electronic document needs circulating for approval, extra time is added to the process. This movement also creates the possibility that the document will go missing in someone's email inbox.

Transport waste can be reduced in two main ways. **First, by creating a robust process and 'a place for everything', transport variation (and therefore excess) can be minimized**. Second, transport waste can be curtailed by moving the steps in the process closer together. In Lean Six Sigma this often means, counterintuitively, smaller offices or factories rather than bigger ones. Cramped is good – provided it is well organized.

While it is almost impossible to remove all transport from a process, any successful attempt to reduce transport will lead to greater efficiency and a reduced chance of error or loss.

The waste of unnecessary **I**nventory

Inventory, or stock, exists in three forms: raw materials, work-in-progress (WIP) and finished goods. Your business may not have all of these but it likely has at least one type. Either way, excessive inventory is bad for business because it takes up space, creates inefficiency and, most importantly, absorbs working capital.

An example of unnecessary inventory would be a supermarket holding a month's supply of breakfast cereal when they are able to order fresh stock with only a few days notice. This excess stock risks going out of date or being damaged – as well as taking up space and getting in the way. In an office environment, unnecessary inventory is often found in the stationery store, where the more you have the more you tend to use. It can also be seen in excessively long print runs of, say, business cards or letterheads.

There are many ways to reduce inventory but a common starting point is implementation of a robust storage and retrieval process. 'Out of sight, out of mind' leads to out-of-control stock levels.

Every workplace will hold some inventory, but any stock that can be removed will free up cash, free up space and reduce double handling.

The waste of unnecessary **M**otions

Where transport is the movement of materials or information from one place to another, motion is a more 'macro' form of movement: the movements you make at your desk or workstation. Common motions include reaching, bending, walking back-and-forth and even moving your hands from the computer keyboard to the mouse and back. This is the domain of 'ergonomics'.

Unnecessary motions are any movements that could be reduced or avoided by redesign of a routine or process, or by rearrangement of the work space. Often we have become so accustomed to performing certain motions that we are completely oblivious to the idea that they may not be needed and could be removed with minimal effort. For instance, repeatedly getting up and taking three steps to the printer and back could be resolved in a few minutes by moving the printer. Learning common keyboard shortcuts for your most-used software could save tens or hundreds of hand movements every day.

Having proven and documented processes for performing tasks is important here. Repetition is good; variation (a.k.a. reinventing the wheel every time) is not.

The reduction of unnecessary motions can have a significant human benefit in minimizing repetitive strain injuries. But it has further business benefits in the improvement of individual and team productivity. These advantages should not be underestimated: though movements can appear minor in isolation, when they are made over and over they can add up to a significant amount of motion over a day, month or year.

The waste of **W**aiting

We are all familiar with the waste of waiting. All that time we spend in supermarket queues or doctors' waiting rooms – it is all waiting. In the workplace we find paperwork that is waiting for approval or other processing, customers waiting in line in a bank branch or on the phone, and parts waiting for a machine to free up so they can be processed.

A common form of waiting is the staff member who cannot do their work because they are waiting for input (in the form of information or material) from somewhere or someone else. This is more often seen in workplaces where staff are insufficiently multi-skilled, and/or the environment and processes have not been designed in a way that allows flexible transition between multiple tasks.

Waiting can be quite easy to identify: materials backed up behind a machine or people standing (or sitting) around doing nothing are the most obvious indicators.

Any effort to reduce waiting will not only save time but will also improve the overall flow of the processes inside your organization. This is a principle goal of Lean Six Sigma because flow creates efficiency.

The waste of **O**verproduction

Overproduction is one of the most important forms of waste … and also one of the least recognized. It refers to making too much, preparing too early or producing 'just in case'.

Fast-food restaurants are often good examples of overproduction.

When burgers or sandwiches are pre-prepared in batches and placed under hot lights, there is always the potential for the food to spoil before it is sold or, if it is sold, to be of substandard quality. More modern outlets have devised ways of avoiding overproduction by quickly preparing food to order, one at a time.

The book publishing industry is another example of overproduction: high printing costs have traditionally led to longer-than-optimal print runs and, often, large quantities of unsold books. Today, the industry is moving more and more towards 'print-on-demand', in which books are printed as needed – even one at a time – using proven, **streamlined and efficient processes.**

Overproduction tends to lead to many of the other forms of waste, so minimization of overproduction can contribute to widespread improvement including decreases in inventory, transport, motion and defects.

The waste of **O**ver-processing

Over-processing broadly refers to using a resource that is too large or complex for the task at hand, thereby resulting in wasted capacity.

Sometimes over-processing can't be readily avoided. For instance, most large cities still depend on electricity grids fed by a small number of large coal-fired or nuclear power stations. These grids need to be built to provide sufficient power in times of peak demand, such as during periods of extreme weather. At times of average demand, these grids have significant excess capacity, which means some very expensive infrastructure sits idle.

At the other end of the scale, we see over-processing on the typical personal computer. Today's word processing and spreadsheet applications have significantly more features than are needed by the average user; these extra features make the user interface more cluttered than it needs to be and can make doing even minor tasks a challenging exercise.

Over-processing is best avoided when it comes time to buy a new piece of equipment. 'Small is beautiful' should be the mantra. Wherever possible, it is better to have more smaller machines than one large one. This may require a greater upfront expense, but the benefits will include higher flexibility, reduced vulnerability to failure and, over time, the potential for staged upgrades with lower demands on cash flow.

The waste of **D**efects

Defects are possibly the most straightforward waste to understand. Quite simply, a defect is a any product or service that fails to deliver what is expected of it. While the worst defect is one that finds its way to a customer – resulting in the need for an exchange or refund along with damage to your company's reputation – defects found internally can still have high costs associated with them.

The cost of defects tends to increase the longer they go undetected. In any form of manufacturing, if a faulty component is identified before it is used, the only cost incurred will be the value of the part itself. On the other hand, if that part is allowed to flow right through the process and is detected in the finished product, you will have wasted the cost of the part, the labour involved in assembly and possibly the cost of all the other components.

The same applies in service environments. An error of arithmetic by a bookkeeper would have little effect if identified and corrected soon after it is made, but could be expensive if allowed to flow through to the finalization of a large contract negotiation.

The best way to prevent defects is to have properly mapped processes which are closely monitored to detect variation. Where a process starts to 'drift' – say by producing out-of-specification components – it should be stopped and corrected as soon as possible.

The benefits of avoiding defects are fairly obvious, though the costs saved by investing in quality are often underestimated.

Eliminating waste: DMAIC

As we said earlier, identifying waste in your organization will not be difficult once you know where to look. However, removing waste in a way that can be sustained requires an ongoing, organized approach.

Lean Six Sigma provides a process for doing this that can be applied in almost any circumstances, called DMAIC ('De-may-ick'), which stands for Define, Measure, Analyse, Improve, Control.

In practice, the process involves:

- **Defining** an area of likely waste

- **Measuring** the extent of the waste

- **Analysis** to hone in on the causes of the waste

- Making **improvements** to remediate the situation

- Putting **controls** in place so that the waste doesn't re-emerge

Note that in defining an area of waste to address, it's a good idea to keep the target small: focus on just one of the seven wastes in one area. This increases the chance of lasting success.

While the DMAIC process may sound somewhat technical, particularly given its acronym, it is actually a relatively uncomplicated process to understand and apply with only a relatively small amount of training.

The benefits of building in-house expertise

The best way to use DMAIC and address the seven wastes is as a cycle: after one area of waste has been identified and reduced or removed, choose another to focus on and follow the five steps again.

The most effective approach to reducing the seven wastes is to have a specific in-house person or team responsible for initiating, guiding and maintaining the DMAIC process. That person or team should work as guide and coach for the people 'at the front line'. They will teach those front line people how to see waste, in all its forms, and how to use the DMAIC process to ameliorate it.
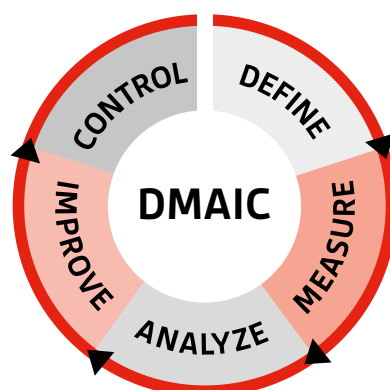
They will ensure the use of the DMAIC cycle and pursuit of waste reduction is not swept away by 'the next big thing'.

It is central to the philosophy of Lean Six Sigma that improvement should be identified and implemented by those who do the work. Also central to Lean Six Sigma is the idea it needs to become part of the culture of a work place – not a one-off or limited-time intervention. You can achieve this in your organization by developing the in-house skills for running Lean Six Sigma initiatives.

Lean Six Sigma training by BSI

We offer a full range of Lean Six Sigma training specifically aimed at building the in-house capability of your people. Introductory courses can give you and your management team an overview of the Lean Six Sigma approach with a view to assessing its appropriateness for your organization and developing a strategy for implemention. More advanced Green and Black Belt courses build the capability needed to run an ongoing Lean Six Sigma initiative.

Our courses can be run off-site, in a classroom environment or at your premises. The latter can be more cost effective and be given extra relevance by drawing on local examples.

All our Lean Six Sigma programs are aligned with ISO 13053 - Quantitive methods in process improvement - Six Sigma.

For more information on Lean Six Sigma training visit **bsigroup.com/lean-six-sigma** or call **0845 086 9000**

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