

Application of Lean Six Sigma to Service Industries... Health and Finance

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9.1 Introduction

The application of *Lean Systems* into the Service Industries is exactly the same as that for the manufacturing industry. In both cases, the information flow systems are the same in principle and only differ in content. The tangible product in manufacturing is replaced by the tangible service element in the service industry. For example: in hospitals, the tangible outcome is patient care. In the Service Industry, generally it is customer service, which has all the product characteristics of the tangible product, quality, cost and delivery.

All manufacturing industries have a service component while many service industries have a manufacturing component. A restaurant manufactures a meal in the kitchen. A surgeon uses tools and techniques analogous to an operator in a manufacturing plant, or a builder or a carpenter... saws, drills, or says a sail-maker... needles and thread. The similarities are endless. Therefore, it is not surprising that already the serviced industry is starting to embrace the methodologies of *Lean Systems*. It is perhaps a little more difficult to see the analogies for the finance industry, but this is because the key system issues are information flow and communication.

9.2 Lean Six Sigma in the Health Industry

We are all living longer healthier lives despite increasing obesity and perhaps greater stress. The negative placebo effect can give rise to premature death, but overall superior diagnostic medical and surgical treatments have added many years of high quality life to all of us. Health and wellbeing can be improved even further if the individual takes control of their own health with good lifestyle choices the correct diet and the correct amount of exercise.

All this places new demands on all the participants in the healthcare industry. Healthcare professionals can learn a lot from the very high degree of precision and accuracy of process control developed in the manufacturing industry, and in particular as first developed by Dr. Ohno, Dr., Deming and the outstanding process control practiced in Japan when these concepts are integrated with the skill and training of the Samurai. All the rules of statistical

process control leading to Six Sigma and the quality rules practised by extending Dr. Deming’s 14 points and assist us to redefine the 26 Rules for Lean Six Sigma systems from Table 2.1 as follows.

Table 9.1 26 Rules for Lean Six Sigma for the Health Industry

People	
1.	Continuously Improve the Culture.....improved customer focus and care
2.	Team Up ...Doctors, Nurses and specialist and scientists working together
3.	Focus on the patient with care speed and accuracy
	Integration
4.	Ensure the correct number of professionals are available
5.	Once treatment begins ensure that it is seamless and continuous
6.	Apply all rules to the whole of the health system from cradle to grave
7.	Ensure the treatment and precision is adhered to and medication is not missed and supplied at the correct intervals with minimum variation
8.	Improve cash flow in the providers enterprise
9.	Apply 6S
Planning	
10.	Flexible resources to the bottleneck (cooperation between say hospitals sharing resources)
11.	Even the flow on say hospitals by digital integration
12.	First in first out if of equal priority
13.	Optimise the availability of all professionals
14.	Level the load between providers if possible
15.	Batch size of one (the patient)
16.	Optimise the sequencing on instrumentation

Operations	
17.	Minimise waste
18.	Aim for continuous flow of patients in the system with the elimination of queuing
19.	Maximise adding value to the patients experience
20.	Link processes where possible
21.	Match Processes
22.	Minimise hold points
23.	Aim for illness prevention
24.	Use Statistical Process control on all processes and systems
25.	Maximise professional value by preparing patients
26.	Use checking and quality systems at all times

9.2 The Status of Healthcare (USA data)

A priority listing of the major costs associated with healthcare in the USA are given in Table 9.2 below:

1. Alcoholism
2. Arthritis
3. Cancer
4. Cardiovascular disease
5. Dental disease
6. Depression
7. Diabetes
8. Digestive disease
9. Drug abuse
10. Homicide or suicide
11. Infant mortality
12. Infectious disease
13. Respiratory disease
14. Accidents

The major gaps in healthcare are:

1. Inoculation

2. Education
3. Screening
4. Personal health habits (diet, exercise, alcohol, smoking, drugs, etc.)

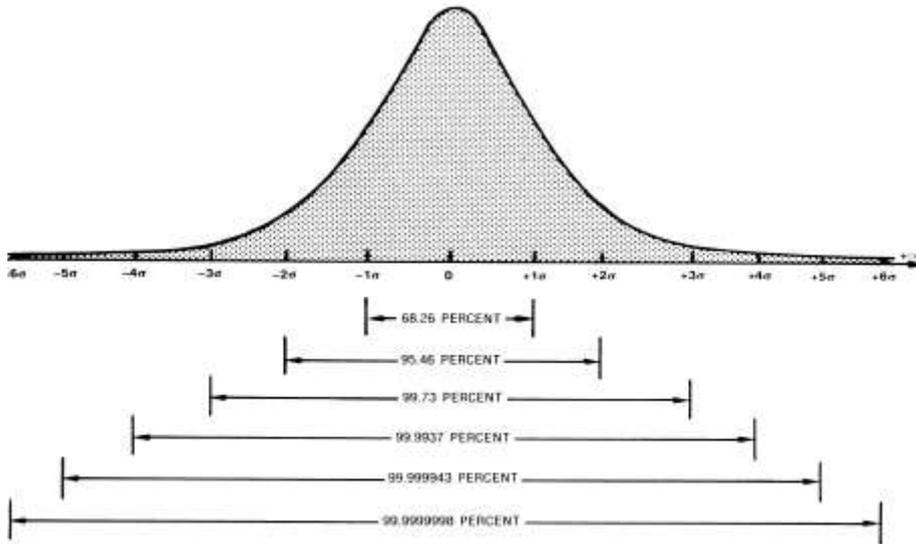
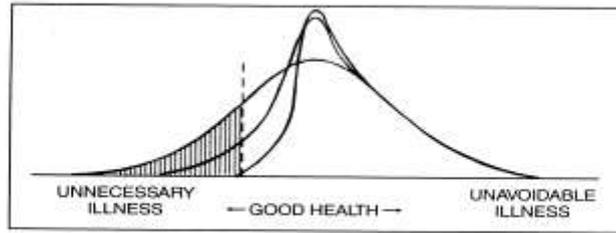
9.3 Process Variability in Healthcare

The variability of all processes can be illustrated using the following familiar frequency distribution. The top diagram below illustrates that most people have good health, but some have unnecessary illness and some unavoidable illness. The challenge for a world class healthcare system is how do we sharpen the bell curve and make all systems more capable of delivering superior health benefits.

The six sigma system aims for the system capability to have a range which includes 4.5 Sigma of variation of the process or a defect rate of 3 parts per billion.

The need to achieve Six Sigma quality in the manufacturing industry was driven by the interdependence of processes and components in complicated systems like computers or motor vehicle components since if there is a relationship between the performance of one component and the next then the failure rate is determined by multiplying the performances of the individual parts. This was not understood in the financial industry when good quality mortgages were bundled with poor quality ones and this will be discussed in more detail later. Of course if it was understood then the drivers were greed and dishonesty in the finance industry which led to the Global Financial Crisis (GFC).

VARIABILITY OF PROCESS

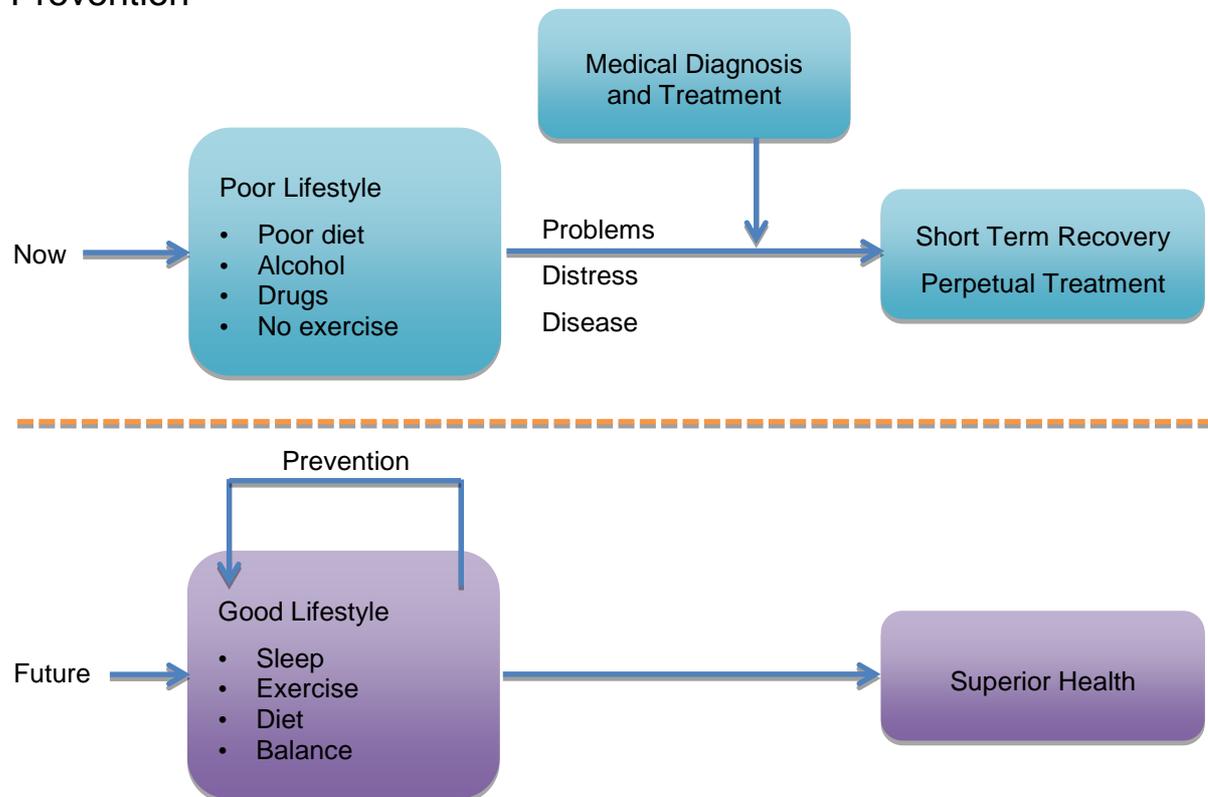


For a manufactured product that contains 200 parts, for example; if every part is made to plus or minus 3 Sigma capability (0.27% outside spec at each process) and each part is dependent on the other, then the failure rate would be 42%. Clearly, 3 Sigma quality at 0.3% defective is not good enough for multicomponent systems. This argument applies more so for the Health Industry: not because of the large number of process steps, but because faults can result in death or serious permanent disabilities of the patient. Six Sigma must become the mantra of the Health Industry.

9.4 Prevention is better than cure

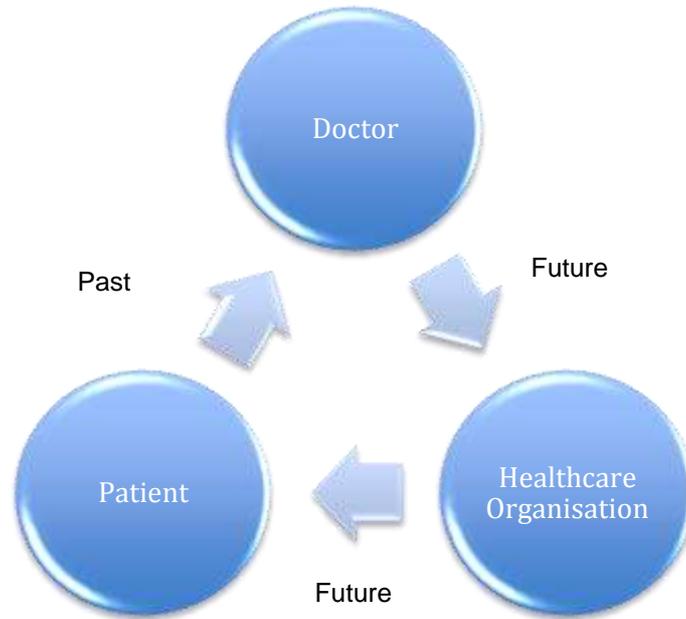
The following schematic is designed to illustrate that the focus of all medical and health processes should be on prevention. Rather than focusing on gastric banding, for example, as a solution to obesity, the focus should be on lifestyle. Avoid cigarettes and drugs; use alcoholic drinks in moderation; exercise moderately continuously; eat a good balanced diet so that weight remains in the healthy range of a Body Mass Index (BMI) of 20 to 25.

Prevention



Changes to healthcare

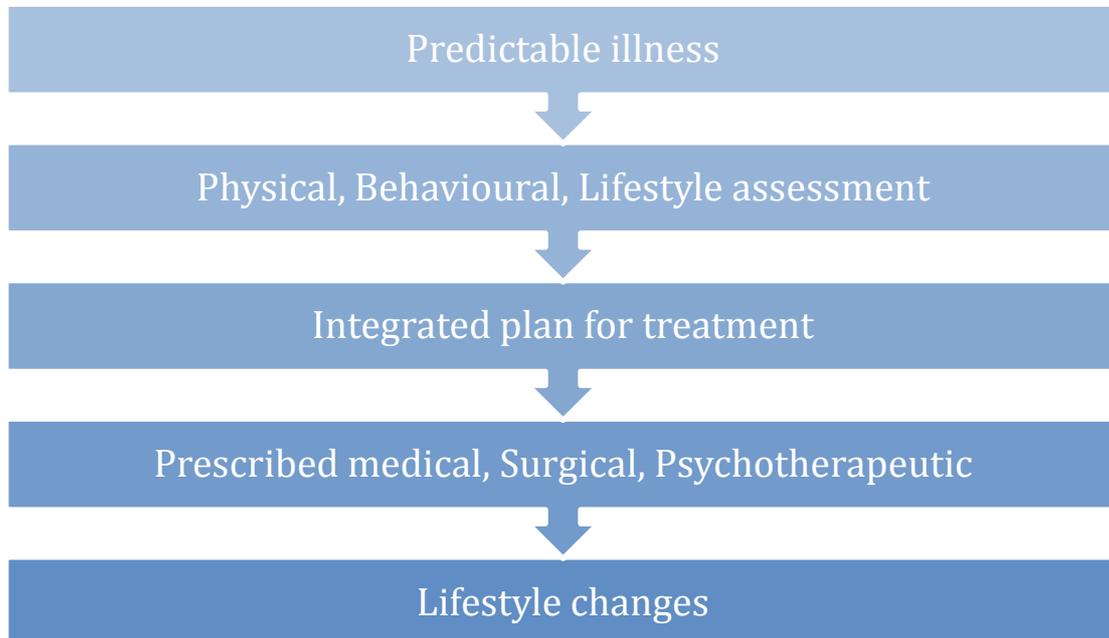
1.



2. Tampering of process has not helped Healthcare Control

3. SPC can add Precision and Accuracy to Therapy

The future of healthcare



STAGES OF HEALTHCARE DEVELOPMENT

	<i>Item</i>	<i>Some Manufact.</i>	<i>Equivalent Healthcare Item</i>	<i>Health Care</i>
1.	Future Unpredictable	✓	Disease Unpredictable	✓
2.	Future Preordained	✓	Disease Preordained	✓
3.	Poor Use Experience	✓	Poor Use Experience	✓
4.	Control Within Limits (3σ)	✓	Control Within Limits (3σ)	-
5.	Tighter Control Within Limits (6σ)	✓	Tighter Control Within Limits (6σ)	-
6.	Maximum Control	✓	Maximum Control	-
7.	Total Control - To Target not Tolerance	Some	Total Control - To Target not Tolerance	-
8.	Knowledge of all Laws - Profound Statistical and Cause and Effect Knowledge	-	Knowledge of all Laws - Profound Statistical and Cause and Effect Knowledge	-

1. *Some Japanese automobile manufacturers at Stage 7*
2. *Japanese computer chip manufacturers at Stage 7*

	Item	Some Manufacturers	Equivalent Healthcare Item	Healthcare
1.	Future unpredictable	✓	Disease unpredictable	✓
2.	Future preordained	✓	Disease preordained	✓
3.	Poor use experience	✓	Poor use experience	✓
4.	Control in limits		Control in limits	-
5.	Tighter Control in tighter limits		Tighter Control in tighter limits	-
6.	Maximum control	✓	Maximum control	-

7.	Total control – to target, not tolerance	Some	Total control – to target, not tolerance	-
8.	Knowledge of all laws – profound statistical and cause and effect knowledge	-	Knowledge of all laws – profound statistical and cause and effect knowledge	-

1. Some Japanese automobile manufacturers at Stage 7

2. Japanese computer chip manufacturers at Stage 7

Beyond Quality Awards

1. Statistical Process Control
2. 6 Sigma
3. Input Control
4. Prevention
5. Community
6. Just in Time

9.5 Finance

Failure to use The Deming Philosophy and Lean Six Sigma...The GFC

What caused the Global Financial Crisis (GFC). Was it pure greed? Was it the failure to understand probability theory? Was it the poor quality control of processes and systems? Was it the use of poorly controlled derivative trading or was it the invention of derivatives themselves? Could it have been avoided?

If we apply the *5 Whys* to the GFC, we end up with greed... *animal spirits*. Along the way, however, there were little controls on the systems and even now the controls on bank lending particularly in the USA are still not tight enough. In Australia, the control is tighter, but there is still a lot of pressure applied by banks on borrowers to accept loans beyond what could be expected as reasonable risk. The banks do not have a lot of worry under most circumstances in Australia at present. In the USA, however, many homes were so highly geared that the loan exceeded the value when the property bubble burst that people simply walked out leaving the bank to pick up the tab.

In a free market economy, it is the marketplace that sets value. The Australian Dollar is high because the world sees Australia as a low risk place to invest. Adam Smit would say that it is the invisible hand controlling the system.

Using the correct levels of quality control and removing tampering would have saved the USA from the GFC.

Let us now look at the causes and see how Lean Six Sigma could have helped.

Bundled Mortgages

To understand what happened here, it is necessary to introduce some simple laws of probability.

In a bundled mortgage of ten mortgages, for example, of which nine were of very high quality and one was not, the financiers argued that the probability of failure was very low since the nine good ones would carry the one poor one and the package of ten would have a low probability of failure.

Let us look at this in more detail:

Let the probability of failure of the nine good ones be very low at one in 10,000. I.e the Pr to fail = 0.00001.

Let the probability of failure of the one high risk mortgage be 0.5.

What is the probability of failure of the bundle?

This can be computed as follows:

Pr of failure of Bundle = (proportion of good mortgages) x (Probability of failure of good mortgage) + (proportion of high risk mortgages) x (probability of failure of high risk mortgage)

$$\begin{aligned}\text{Therefore Pr} &= (0.9 \times 0.00001) + (0.1 \times 0.5) \\ &= 0.000009 + 0.05 \\ &= 0.050009\end{aligned}$$

The probability of failure is additive and set by the one high risk mortgage. It has little to do with the low risk mortgages. Was this pure deceit or lack of understanding?

Application of the 26 Lean Rules to the Finance Industry

Referring back to Table 2.1 *26 Rules for Lean Systems in the Service Industry*, we can see many failures in the Financial Industry that led to the GFC. The rules broken are as follows:

1. Continuously Improve the Culture
2. There was no attempt to team up honestly with the lenders to the bundled mortgages
3. There was no attempt to optimise service in terms of quality cost and delivery to the customer
4. There was no attempt to match resource with the honest demand
7. There was no attempt to minimise variation of the probabilities in the bundled mortgages
19. There was no attempt to maximise the value added to the customer
23. There was no prevention at all
24. There was no use of SPC
26. No quality systems were in place

At least ten rules were broken because of *animal spirits*. The problem was people, just like “Moneyball” with Brad Pitt.