

Lean Six Sigma Mindset Course



Robert Potter



HELLO!

I am **Robert Potter**

I am a trainer since 1990.

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The History





Walter A. Shewhart



W. Edwards Deming

The History

- W. Edwards Deming in the early to mid 1900's proposed that business processes should be analyzed and measured to identify sources of variations that cause products to deviate from customer requirements.
- He recommended that business processes be placed in a continuous feedback loop so that managers can identify and change the parts of the process that need improvements.



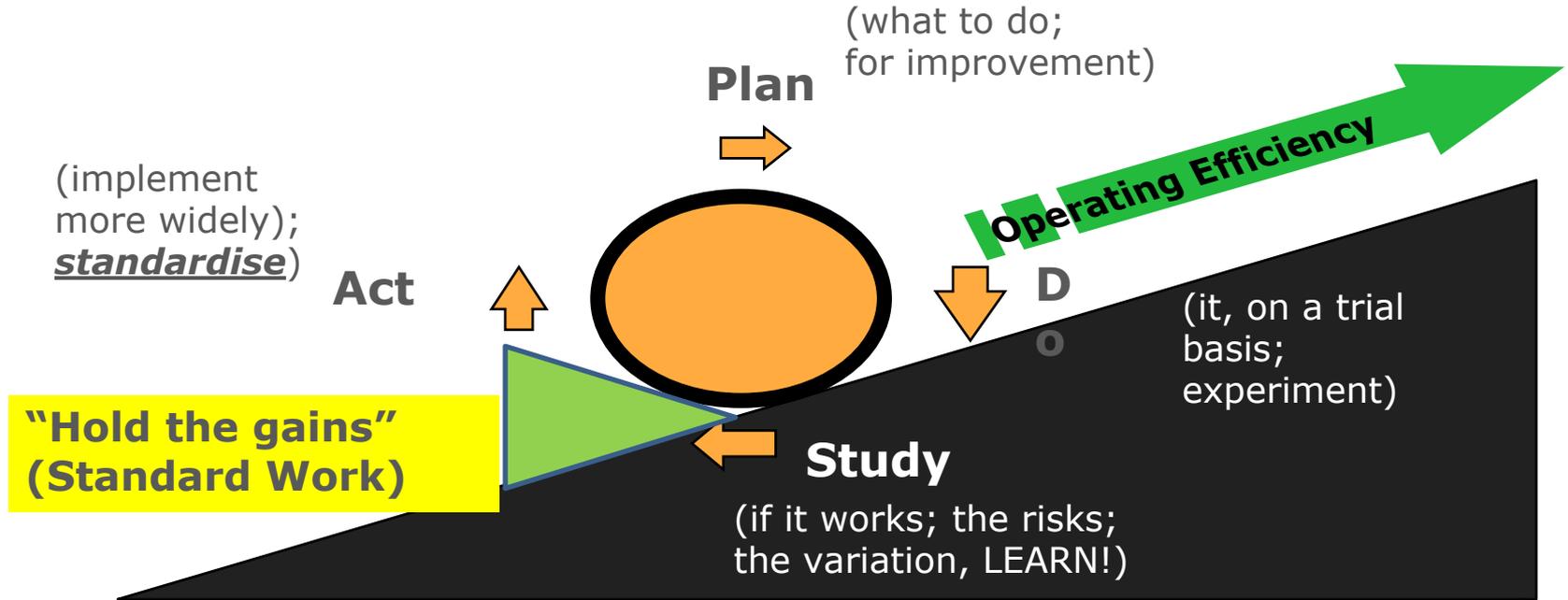
The History

As a teacher, Deming created a rather simple diagram to illustrate this continuous process, commonly known as the **PDCA cycle for Plan, Do, Check, Act***:

- **PLAN:** Design or revise business process components to improve results
- **DO:** Implement the plan and measure its performance
- **CHECK:** Assess the measurements and report the results to decision makers
- **ACT:** Decide on changes needed to improve the process



Perfection: The Deming Cycle



The History of Lean Six Sigma

- Six sigma was developed in between 1983 and 1992 by Dr Mikel Harry who was then with Motorola.
- It was refined some what in the following two years by ABB
- In 1994 Allied signal and General Electric took the system on board with great results
- From 1996 to 2004 most of the fortune 500 companies adopted the system.
- 2004 a redesign took place and Lean Six sigma was born.





Six Sigma Overview

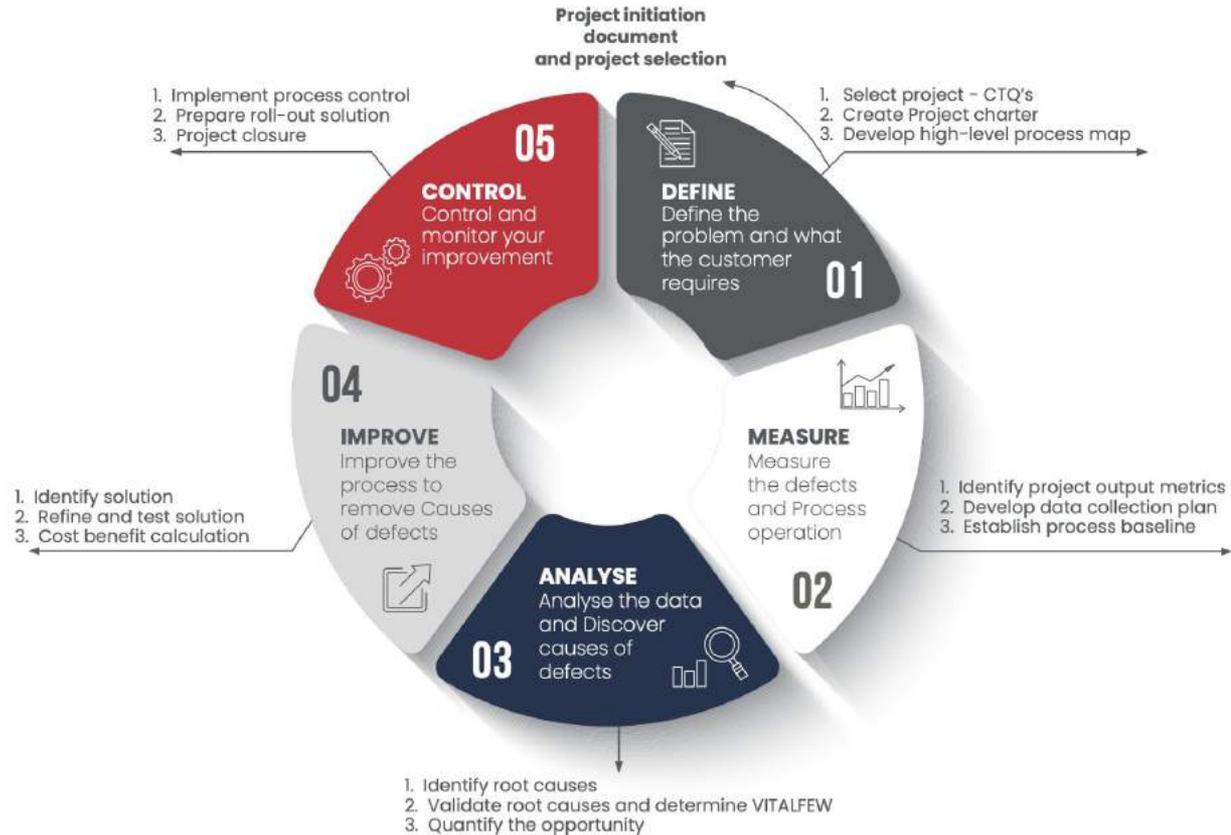


What is Six Sigma?

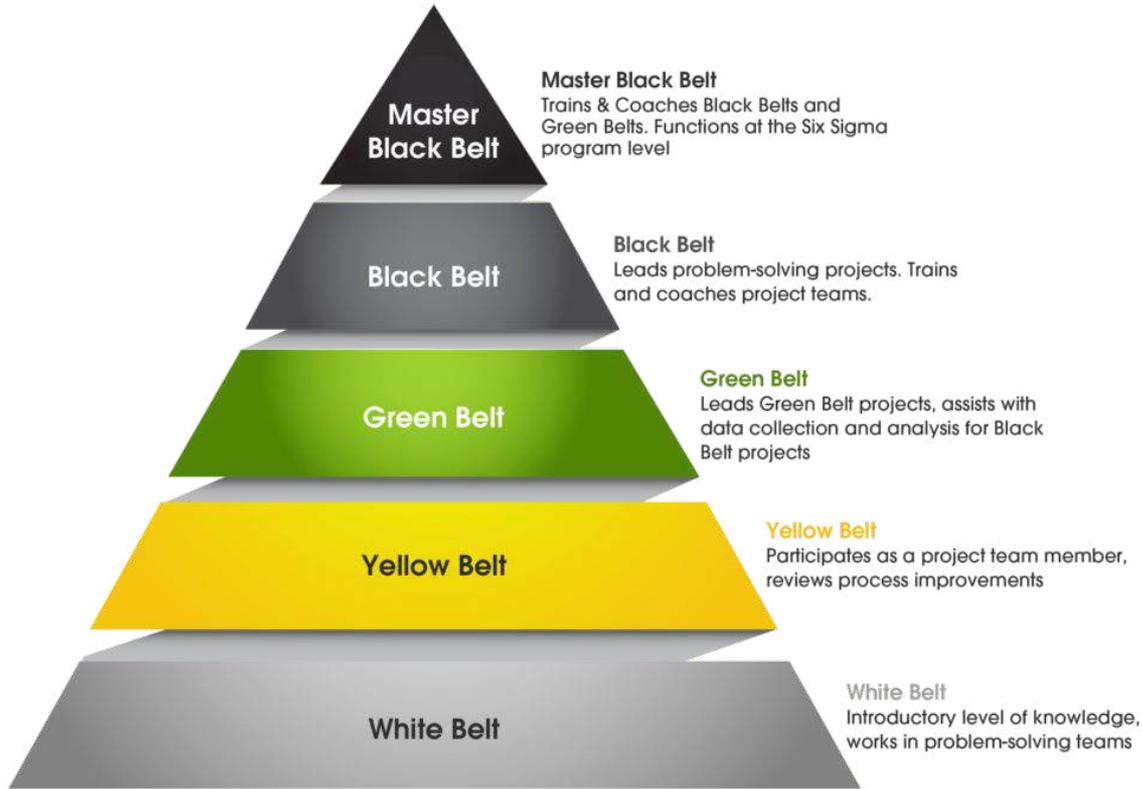
- **Philosophy:** the pursuit of variation, reduction
- Statistical approach to continuous improvement.
- Focuses on preventing defects.
- 5 step methodology for problem solving: DMAIC
- A measurement of performance compared to customer requirements.



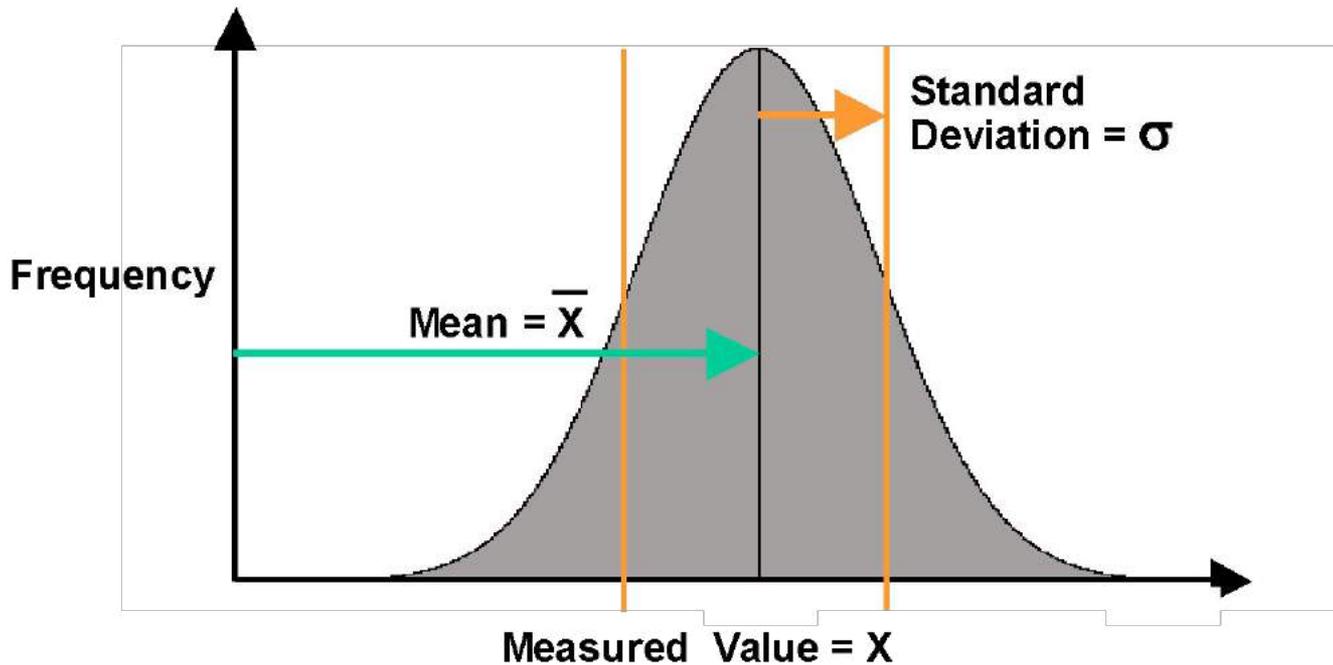
DMAIC



Belts



Normal Distribution/ Curve



Why 99% is not good enough . . .

Good 99% ?

- ❑ 20,000 lost articles of mail per hour in the US.
- ❑ Unsafe drinking water for 14 minutes each day.
- ❑ 225 incorrect surgical operations per week.
- ❑ Two long/short landings at most major airports every day.
- ❑ No electricity for 1.7 hours per week.
- ❑ 4,500 new-born babies dropped by doctors/nurses each year.

Six Sigma 99.9997%

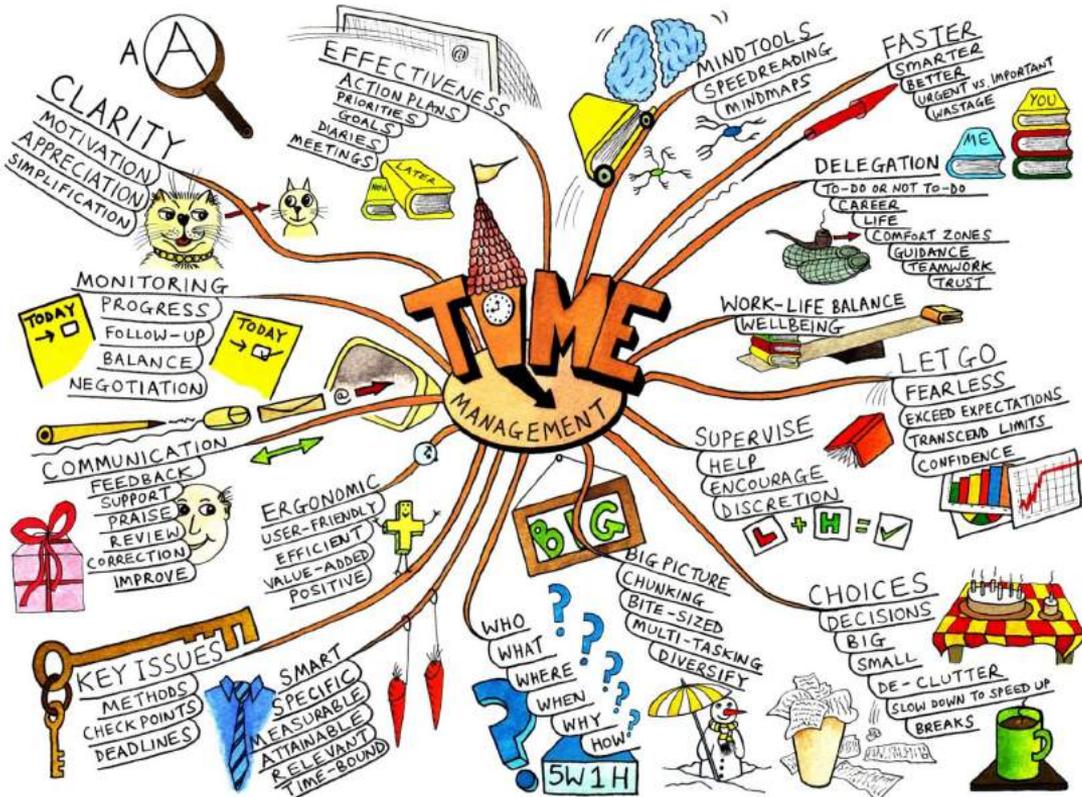
- ❑ 6 lost articles of mail per hour in the US.
- ❑ 5 minutes of unsafe drinking water in 1000 days.
- ❑ 7 incorrect surgical operations every 2 years.
- ❑ One long/short landings at most major airports in 10000 days.
- ❑ No electricity for 6 minutes every 3.6 years.
- ❑ One new-born baby dropped by doctors/nurses each year.



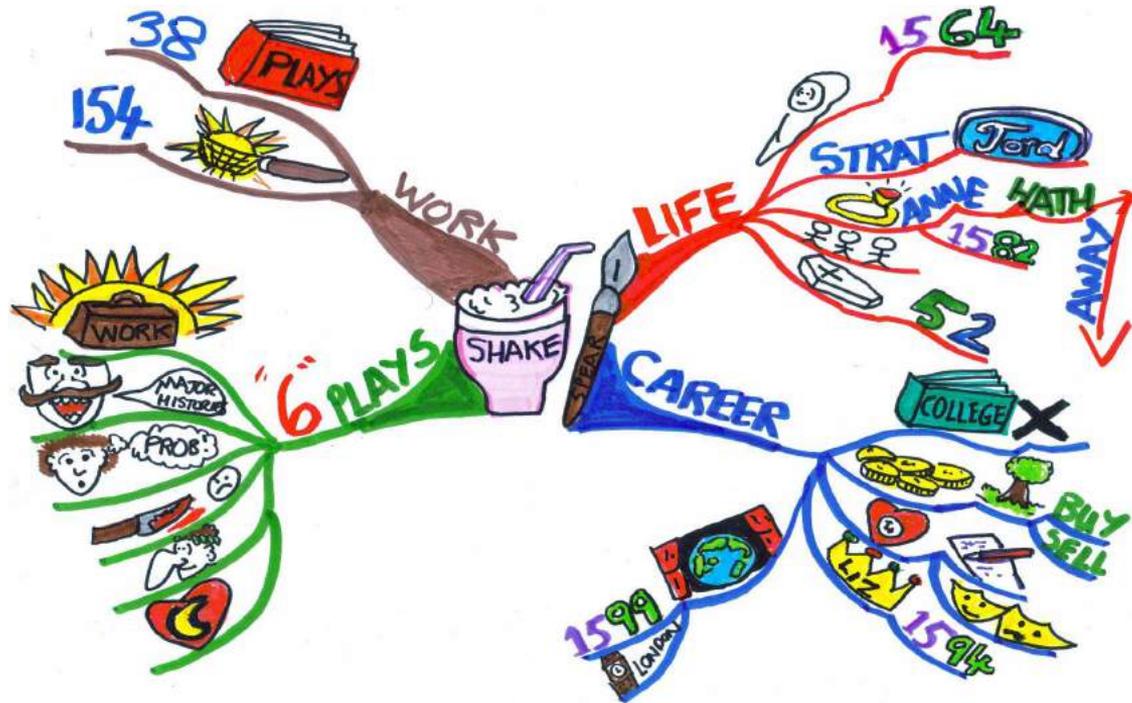
Brainstorming / Mind Mapping



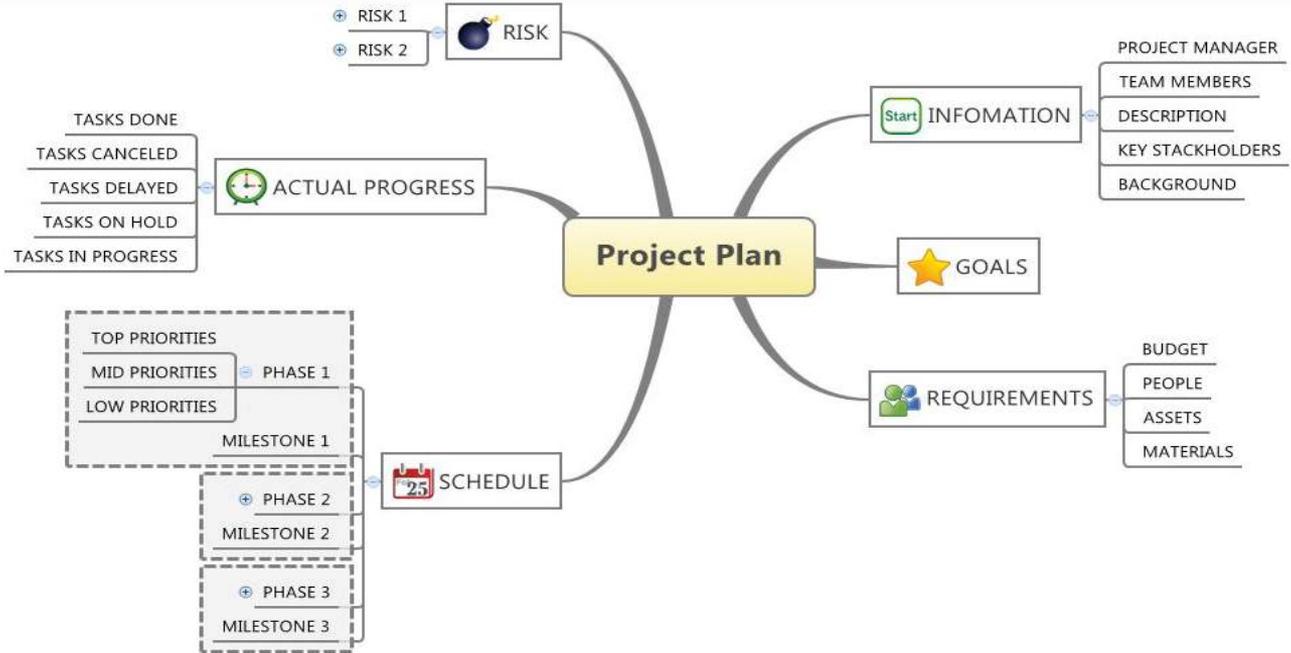
Mind Map



Name the Famous Writer



Project Plan Mind Map





Lean Thinking



The Lean Philosophy

The foundation of a Lean is based on the realisation that there is far more capability/capacity in our organisations people and equipment than is actually being harnessed.

Respect for People

- Frontline staff are the real experts
- Respect for people's talents
- People are the only organisational asset that appreciates over time
- Employee inclusion & involvement

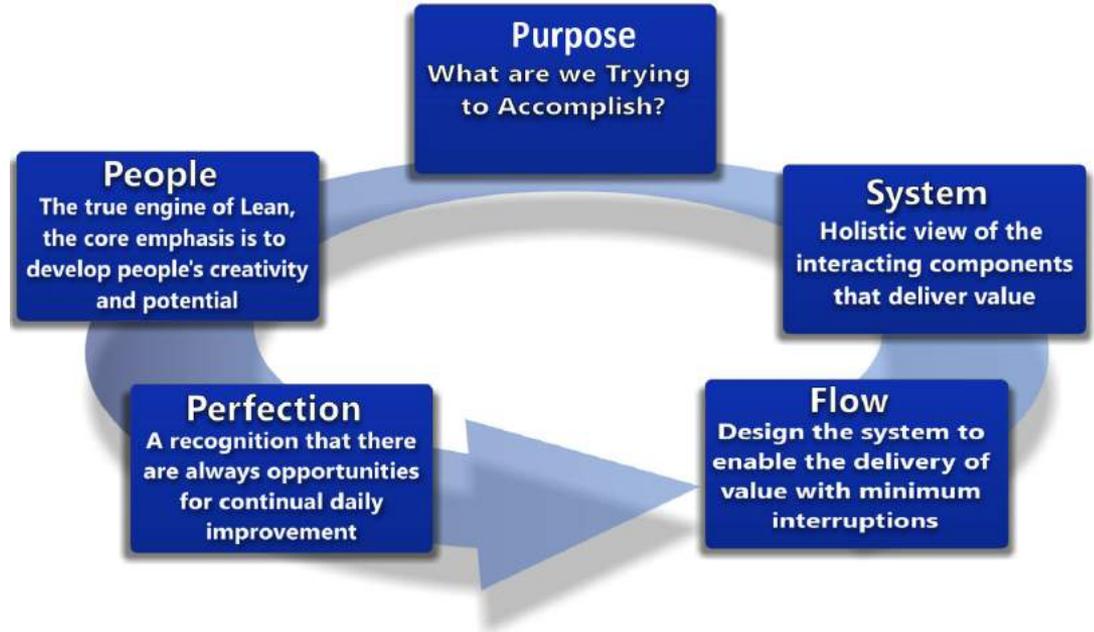
War on Waste

- Everyday Waste Elimination
- Remove Wasted Work Burden from our Staff
- Problem Surfacing & Solving
- Waste Removal to Waste Prevention

Value Creation

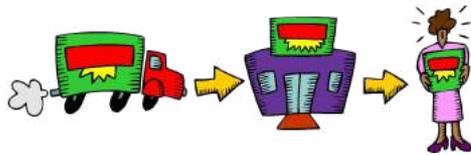
- Understand Customer Value
- Ethnography Study
- Opportunity Awareness
- Creativity Methods
- Innovation Process Excellence

The Lean Principles (a mindset)

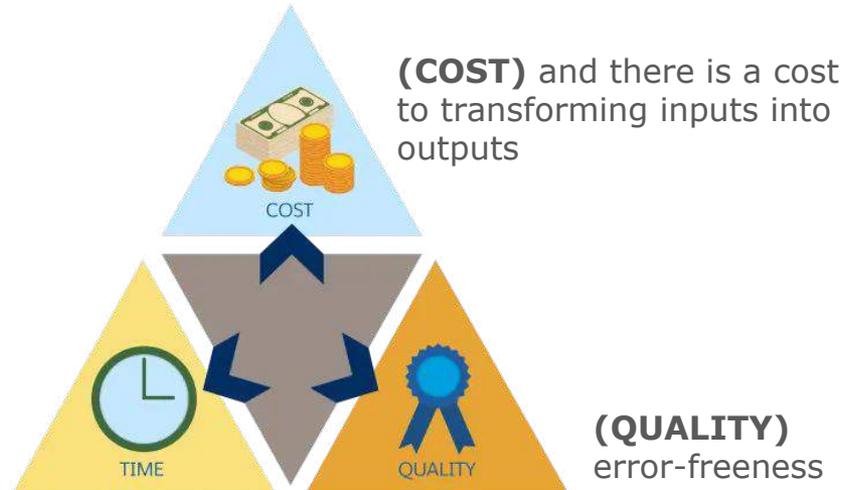


What is an EFFECTIVE process?

Customers will judge your process on...



(TIME) time to deliver



Lean Mindset: A Management System with Methods & Tools

- Policy Deployment
- Lean Leadership and Daily Management
- Lean Assessment
- Lean Culture Development
- Change Management
- **Value Stream & Process Mapping**
- Waste Walks
- **Kaizen Blitz**
- PiT-Stop Accelerated Idea Workshop
- **Visual Management**
- **Standard Work (SOP's & Leader Standard Work)**
- **5S Workplace Organisation**
- **Problem Solving**
- **Quick Changeover**
- Total Productive Maintenance
- **Mistake Proofing**
- **Everyday Lean: Employee Idea Capture System**
- Kanban and Inventory Reduction
- Continuous Flow and Theory of Constraints
- Cellular Design
- Creativity Methods
- Lean Design and Development
- Value Engineering
- Lean Supply Chains
- Lean Scheduling Concepts
- Accounting for Lean



Applications of Lean

- Services
- Manufacturing
- Craft/Job Shop
- Administrative/Office
- Sales
- Financial Services
- Hospitals
- Food
- Banking/Financial Services
- Construction
- Retail
- Software
- Product Development/R & D
- Hotels/Tourism/Hospitality

All Work is a Process

Common Denominator is People Doing Work



Why Lean?



The Parable of the Woodcutter

A young man approached the foreman of a logging crew and asked for a job. 'That depends,' replied the foreman. 'Let's see you chop down this tree.' The young man stepped forward and skillfully chopped down a great tree. Impressed, the foreman exclaimed, 'You can start on Monday.' Monday, Tuesday, Wednesday, Thursday rolled by.

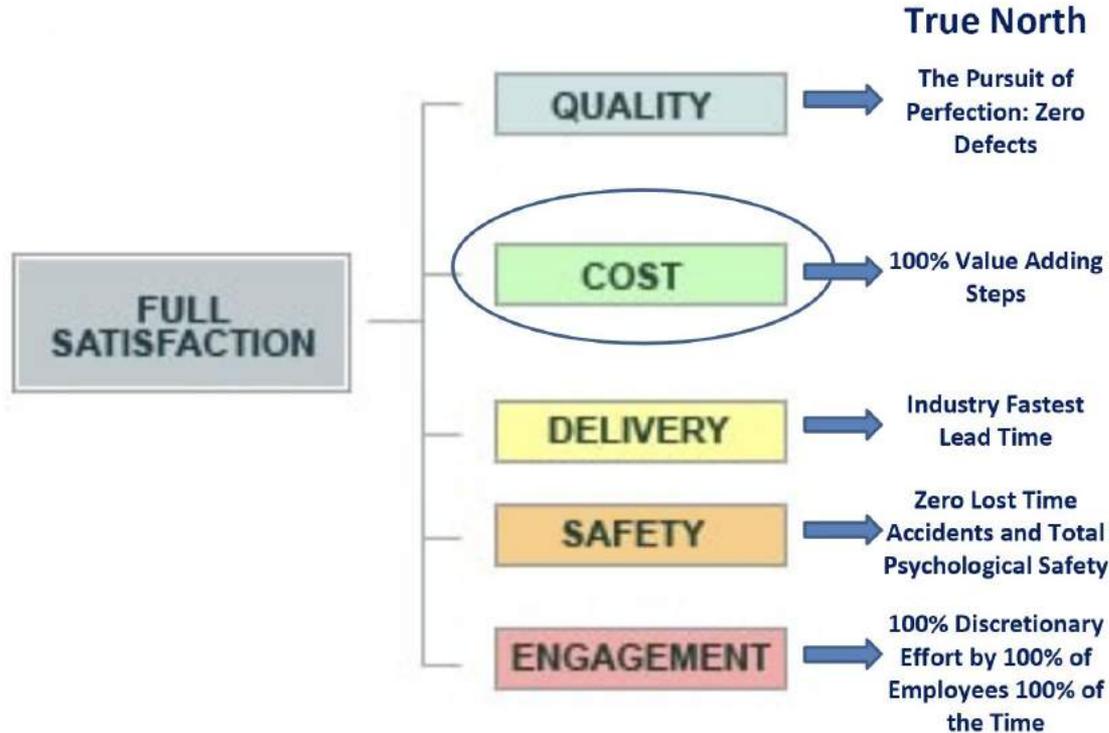
On Thursday afternoon the foreman approached the young man and said, 'You can pick up your paycheck on the way out today.' Startled, the young man replied, 'I thought you paid on Friday.' 'Normally we do,' said the foreman. 'But we're letting you go today because you've fallen behind. Our daily felling charts show that you've dropped from first place on Monday to last place today.' 'But I'm a hard worker,' the young man objected. 'I arrive first, leave last and even have worked through my coffee breaks!'

The foreman, sensing the young man's integrity, thought for a minute and then asked, 'Have you been sharpening your saw?' The young man replied, 'No sir, I've been working too hard to take time for that!'



Entropy

What Are We Trying To Accomplish?





Operational Waste





Waste is Epidemic in Industry; both Public & Private

**In the US, 50 Cents of Every
Healthcare \$ is Wasted.**

(Source: Pricewaterhouse Cooper's
Research Institute 2008)



*"Man's mind stretched to a new
idea never goes back to its
original dimension."*

Oliver Wendell Holmes



Exercise



Lean Six Sigma Project Roadmap: DMAIC



Typical Tools:

- Business Case, Scope, SIPOC/IPO, Problem Statement, Goals, As Is Process Map
- Process Flow, Run Charts, Pareto Charts, FMEA,
- Cause & Effect, VSM, Waste Identification
- Waste Removal, Improve Plan, SOP, Future Process Map
- Monitor to Prevent Repeat Issues, Self-sustaining, Control Plan

Voice of the Customer (VOC)

VOC → CTQ's

- You now convert the VOC data into Critical To Quality (CTQ)
- These are the **key** things that customers want
- This converts vague feedback into concise actionable data



VOC (It is Vital to understand who the customer is)

- Understand what their needs are – what is value
- Particularly when their experiencing a problem
- The ultimate aim of any improvement is to increase customer satisfaction
- So we need to ask them what problems/issues they are experiencing
- **External** people who buy the product or service
- Regulatory bodies you have to report to
- **Internal** within your organisation



Translating customer needs to CTQs

Voice Of The Customer	Key Issue	CTQ	Defect Definition
If I'm not put on hold, I always seem to get the wrong department or person	The customer wants to be put through quickly to the right person	Customer gets to the correct person the first time Customer is answered promptly	<ul style="list-style-type: none">• Customer gets the wrong person• Customer waits too long
You send me an invoice at different times of the month	Consistent monthly billing	Customer bill received on specified day of month, every month.	<ul style="list-style-type: none">• Bill received before specified date• Bill received after specified date

While CTQs should be measurable it is often easier and more enlightening to measure the failure to meet CTQs. These are defects and are a measure of the variation in a process.

VOC for a Pizza

VOC	Needs	CTQ's	Spec	Rank	Benchmark
Good Service	Right Appearance	•Base Height	•1 centimetre	•4	•Dominos •4 Star •Gerry's
		•Diameter	•30 centimetres	•5	
		•Colour	•Light brown	•6	
	Good Taste	•Melted cheese	•Fully melted	•2	•Gerry's •Dominos •Pizza hut
		•Proper combination	•All ingredients	•3	
		•Hot	•Temperature	•1	
	On Time	•Order Time	•5 minutes	•7	•Gerry's •Dominos •dominos
		•Delivery Time	•10 minutes	•8	
		•Payment Time	•5 minutes	•9	
	Easy to deal with	•Smiling	•Greater than once	•12	•Pizza Hut •Pizza Hut •Pizza Hut
		•Thank You	•Always	•11	
				•10	

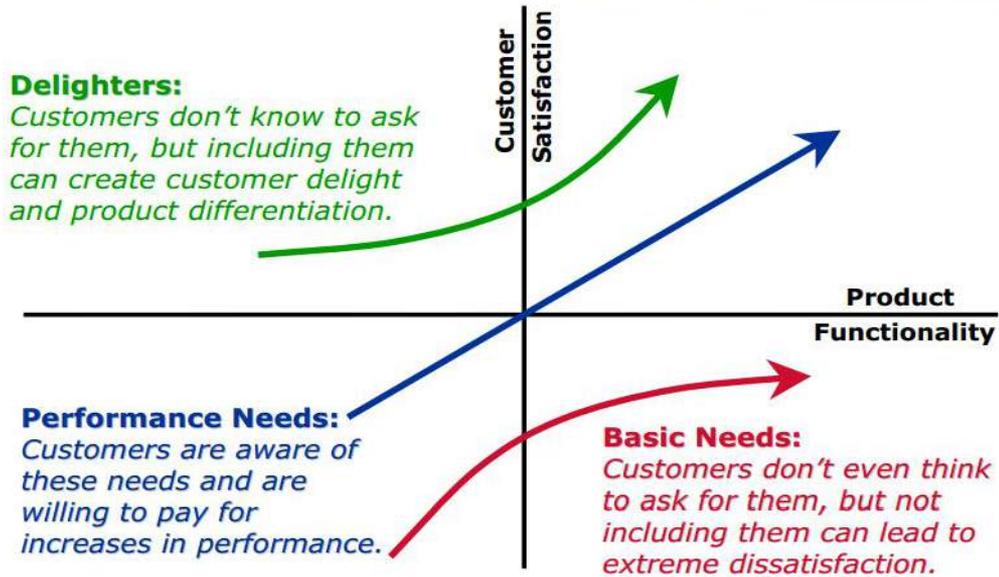




Start with Customer Value: Kano Model



The Customer Needs: Kano Model

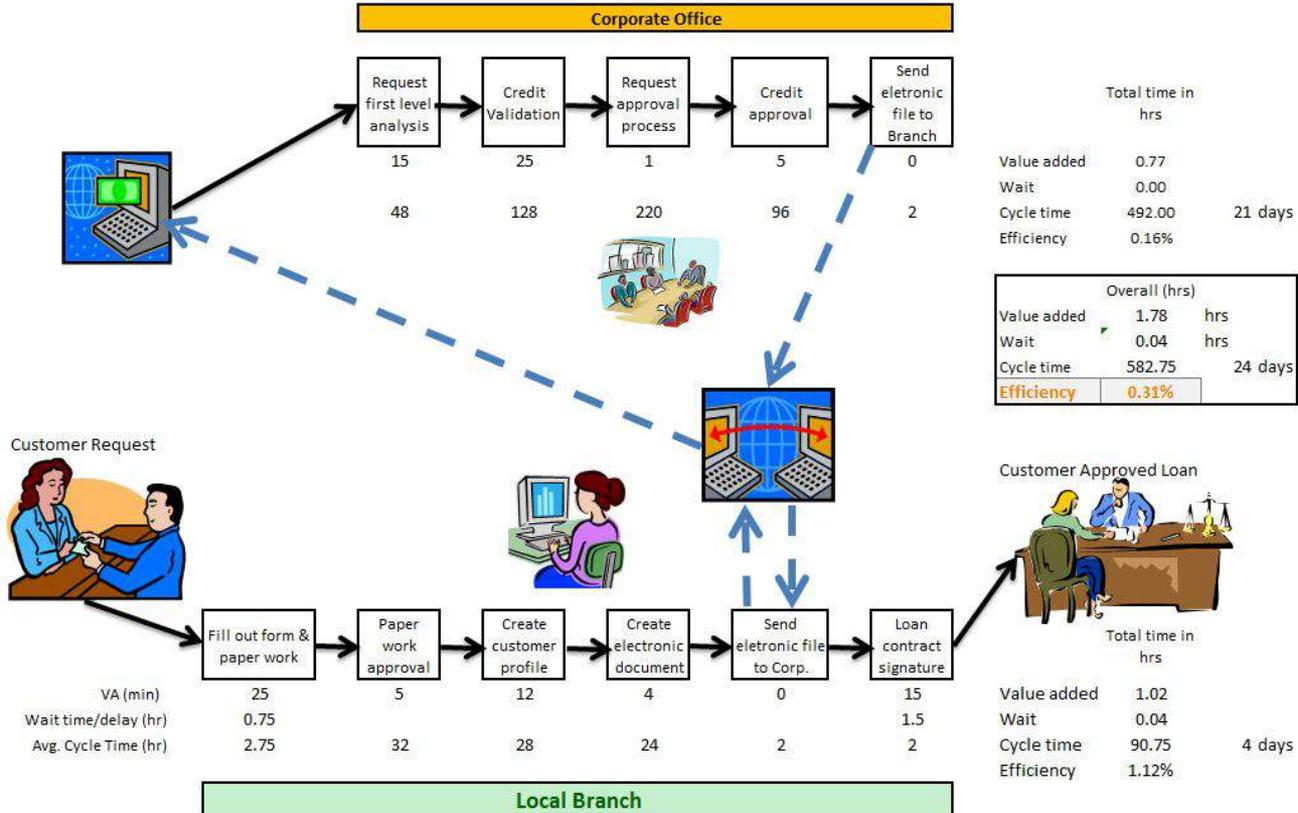




Value Stream Mapping



Business Loan Approval - Value Stream Map



How it looks in practice!





Process Mapping



Tips for Developing Process Maps

Assemble the right people

- Those who work in the process
- Those who supply inputs to you (suppliers)
- Those who you hand off work to (customers)

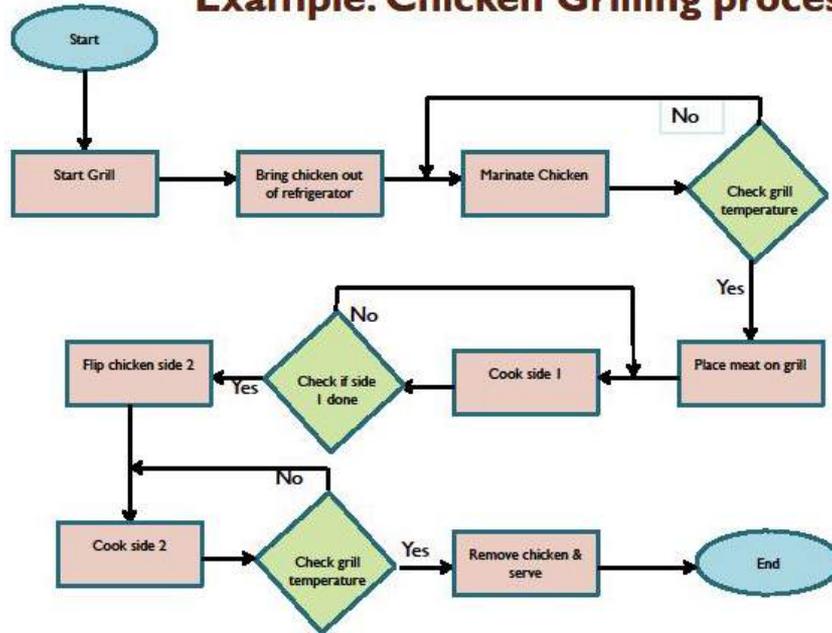
Don't get bogged down in too much detail

- Start with the big picture (macro-level)
- Maintain a consistent level of detail throughout
- GEMBA



Process Mapping or Flow Chart

Example: Chicken Grilling process



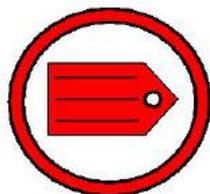


5S Workplace Organisation: **Creating the Physical Environment for Operational Excellence**



5S

Workplace Organization & Standardization



Sort

When in doubt,
move it out –
Red Tag
technique



Set in Order

A place
for
everything
and
everything
in its
place



Shine

Clean and
inspect
or
Inspect
through
cleaning



Standardize

Make up
the rules
and follow
them



Sustain

Part of
daily work
and it
becomes
a habit

5S: Immediate Impact on the Work Environment



The Ladder of Inference

How to exist continuously?

“Must make profit”

How to make a profit?

“Reduce cost”

How do we reduce cost?

“Eliminate waste”

How do we eliminate waste?

“Make waste visible”

How to make waste visible?

“Visibly managed worksites”



Visual Management Centre



Hospital Kaizen Example

Bubbles for Babies		Franciscan ST. FRANCIS HEALTH	
Before	After		
<p>Our little patients under 5 years old are often screaming and won't lie still or lay down during Ultrasound procedures. The parents are frustrated and many times cannot find a way to calm the infant down.</p> 	<p>We now have tiny bottles of "wedding" bubbles and we ask the parents to gently blow them over the top of the child to calm and entertain them.</p> 		
The Effect			
Happy babies make for happy parents, which make for happy staff, resulting in Joyful Service, and peace of mind.			
Name	Supervisor	Date	Estimated Cost Savings (Optional)
Hope Woodard	Gina Bonner	5-9-07	Priceless



Each year, Toyota's employees implement **1.5 million ideas** that **save the company over \$300 million annually.** Inspired by this a decade ago, the Chairman and CEO of Dana Corporation asked his 80,000 employees to submit two creative ideas per month and implement 80% of them. A cultural transformation began, and for **over ten years Dana's employees implemented about 2 million ideas per year, saving over \$2 billion.** Beginning in 2001 by using the same process, Technicolor in Detroit with 1,800 employees **generated 20,000 ideas, implemented over 12,000 of them, and saved the company over \$10 million within a year.**

(The Idea Generator; Norman Bodek 2001)





Visual Measures





Kaizen



Kaizen Events

- **Kaizen:** Japanese word meaning “continuous improvement”, implying many small improvement steps
- **Kaizen Event:** concentrated effort leading to a major improvement (50% or more)



Kaizen Events

How does it work?

- Management selects area and sets goals
- Selects team and frees them up for one week
- Communicates goals, but leaves “how” to the team
- Provides skilled Kaizen facilitator



The “MAGIC” of Kaizen Events is simple...

- 
- highly focused teams
 - right people involved
 - accountability "by Friday"
 - identification of waste
 - application of proven principles
 - experienced coaching
 - rapid change

Kaizen Events

Typical results:

- Throughput time reduced 50-90%
- WIP reduced 20-85%
- Setup time reduced 30-85%
- Defects reduced 50-100%
- Parts/paperwork/people travel distance reduced 50-85%





Standard Work





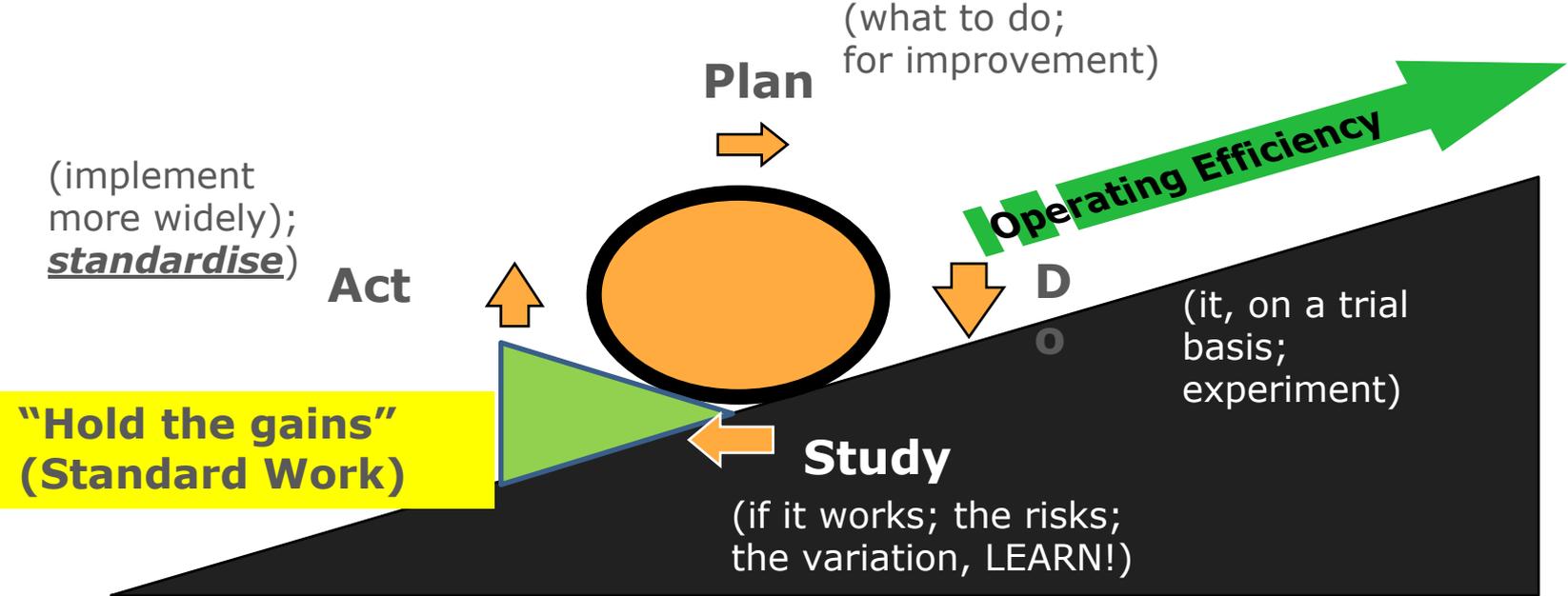
As J. W. Marriott, CEO of Marriot Hotels stated:

“What solid systems and SOPs* do is nip common problems in the bud so that staff can focus on uncommon problems that come their way”.

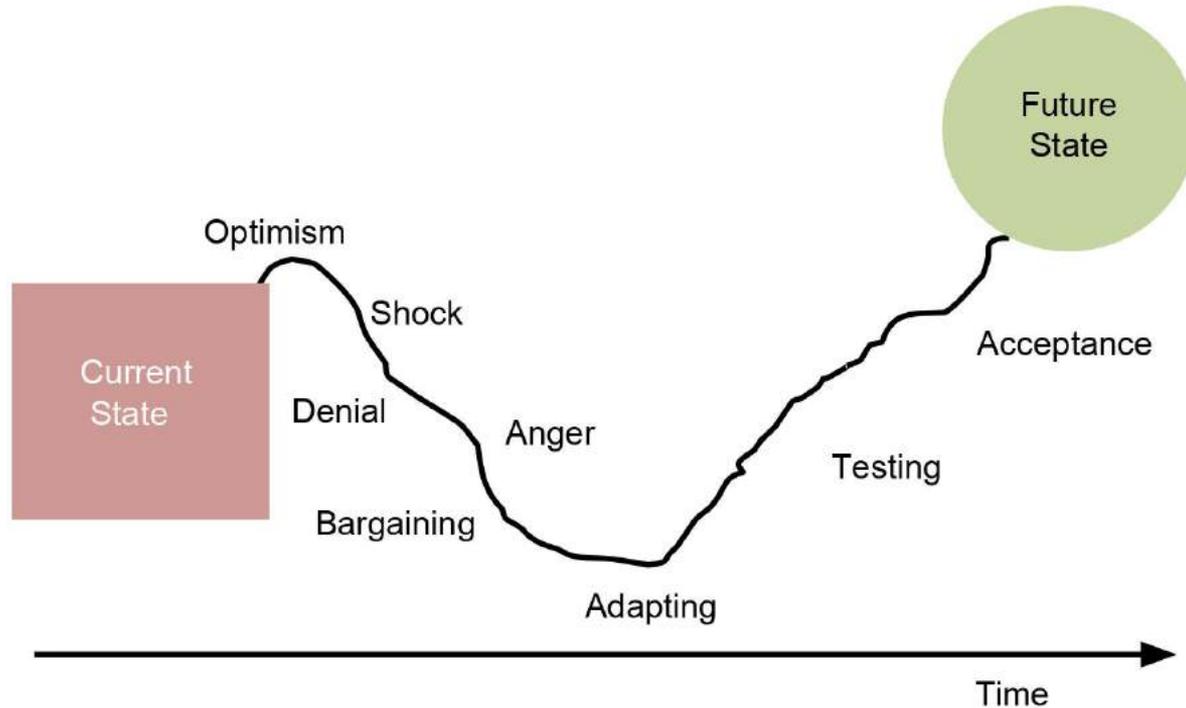
*(standard work is often called Standard Operating Procedures)



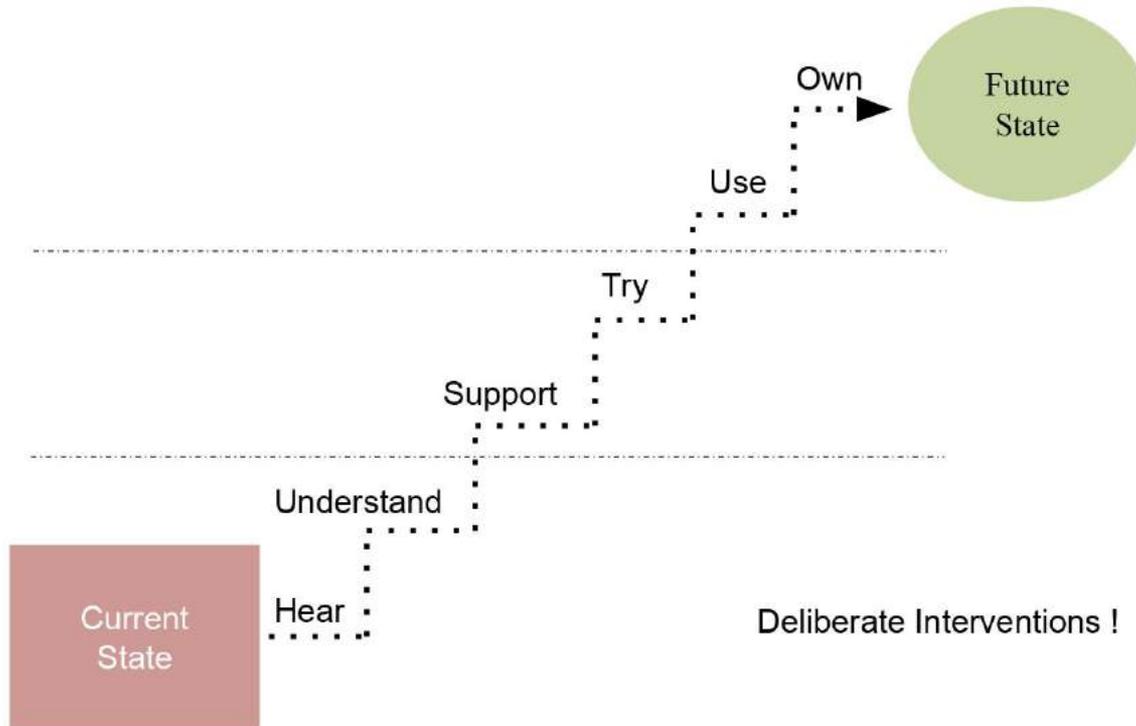
Perfection: The Deming Cycle



Natural Resistance!



Developing Commitment





Quick Changeover



Definition of internal & external operations while a service or process is changed

- **INTERNAL:** can only be carried out when the process has stopped or service is interrupted
- **EXTERNAL:** could be done whilst the service or process is still running

Our Customer is not getting value while Internal operations are part of a changeover



In Practice: Different Approaches same Priority



What steps or changes have been made to achieve minimum Internal Time for these operations to achieve fast changeover?

Eliminate
Combine
Simplify



**Where could you
apply Quick Changeover
ideas in your workplace?**

**Hint: Can be cognitive
changeover too!**



STEP 2 Measure the Current Situation



Start of Process



Activity



Decision

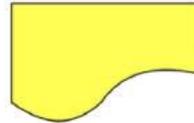


Input / Output



Connector

2



Document



Alternate Process



Purposes and Benefits of FMEA

- Identify potential failure modes and rate the severity of their effects
- Identify critical characteristics (X's)
- Rank potential design and process deficiencies
- Focus on eliminating "root causes" to prevent problems from occurring
- Improve the quality, reliability and safety of products, services and systems
- Increase customer satisfaction
- Reduce development costs and timing
- Document and track actions taken to reduce risk



FMEA Format

Site:			Date Conducted:			
Process:			Participants:			
Level:			Session Leader:			
Process Step	Failure Mode	Failure Effects	Causes	Controls	D E T	R P N
Refer to the Process Map.	What can go wrong or create undesirable outcomes at this step	If it happens, what will the effect be	What is the cause/s of the failure	What controls are in place to prevent or detect the failure		

- FMEA serves as an Action Plan to control or eliminate the Root Causes!
- Like the Process Map, the FMEA is a living document that should be updated frequently as new information is available or action item status changes.

Action	Resp	Timing	P S	P O	P D	P R P N
What specific actions are required to improve the RPN number	Who will be accountable for implementing the change	When is completion of the action required or planned				

The FMEA Process

Severity Rating Table (Severity of the Effect)

Rating	Description
1	An opportunity for improvement is identified, but no action is needed. Consequence of failure is negligible.
2	Consequence of failure is slight. Customers will probably not see the defect.
3	Consequence of failure is moderate. Some customers may detect and reject the service/product.
4	Product, process or service is severely degraded. The customer will detect and may work through the problem, or reject it.
5	Consequence of failure is severe. Product/service will not function/perform for customer.



The FMEA Process

Occurrence Rating Table (Occurrence of the Cause)

Rating	Description
1	Remote possibility of occurrence
2	Low failure rate occurrence.
3	Moderate failure rate.
4	Frequent failure rate.
5	High probability of failure. It is almost certain the failure will occur.



The FMEA Process

Detection Rating Table

“Detect ability” of the Control

Rating	Description
1	<ul style="list-style-type: none">• Highest probability of the defect being detected before reaching the customer.• A control that almost completely prevents a cause from occurring.
2	<ul style="list-style-type: none">• Very high chance that the defect will be detected before reaching the customer.• A control that typically prevents the defect from occurring.
3	<ul style="list-style-type: none">• Moderate chance that the defect will be detected before reaching the customer.• A control that detects the cause after it has occurred.
4	<ul style="list-style-type: none">• Low chance of the defect being detected before getting to the customer.• Few or no controls to prevent the cause, some controls to detect the cause.
5	<ul style="list-style-type: none">• Lowest probability of the defect being detected before reaching the customer. The customer may make a complaint against the product/service, or may reject it.• No consistent controls to prevent or detect the cause.



Error Proofing
Poka Yoke



Poka-Yoke = Error Proofing

DEFINITION

A device which prevents a process from

- making an error or ~~?~~ **prediction**
- passing a defect to user **?** **detection**

When a defect is predicted or an error detected:

- The process is **shut down** or
- A **control** prevents going ahead or
- A **warning** is sent





Goes on Pink...Dries Bright White



Error Proofing – Hospital Fitting



Error Proofing: Soft Drink Ring



Problem: The original design pulled the ring off the can resulting in a safety hazard.



Solution: Lever the ring down to break the seal and hold the ring in place.



Error Proofing - Other



Seat belt warning light/buzzer



Automatic washroom



Egg carton



Lawn mower two hand start



Fuel pumps size & colour



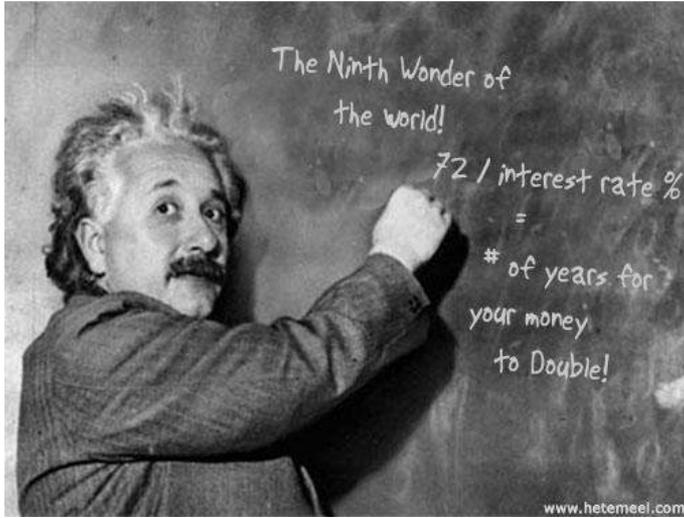
Height restrictions

How did Staff @ JFK Airport Reduce Cleaning Frequency by 80%?



Mistake Proofing @ it's Best or Worse!





Albert Einstein called compound interest “the greatest mathematical discovery of all time”.

The Compounding Impact of Everyday Improvement

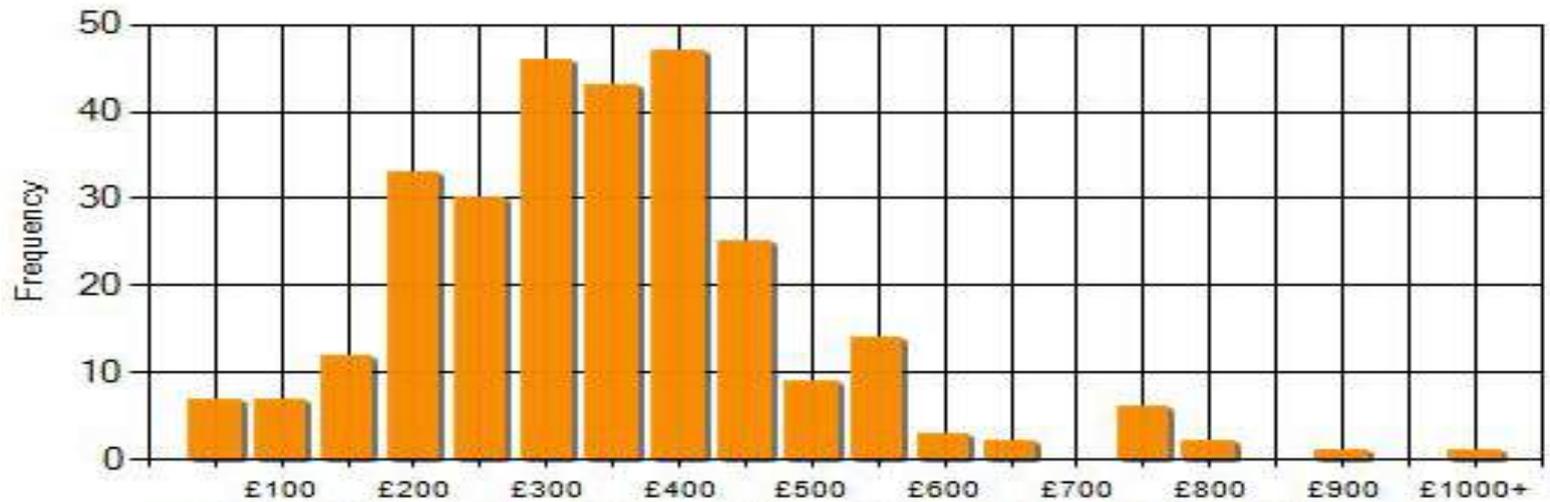
If everyone even improved their job 0.1% everyday that adds up to a 25% improvement per person year on year. That equates to a colossal advantage over time.



The 5 Whys



Histogram



**The Greatest Management
Principle of all Time**

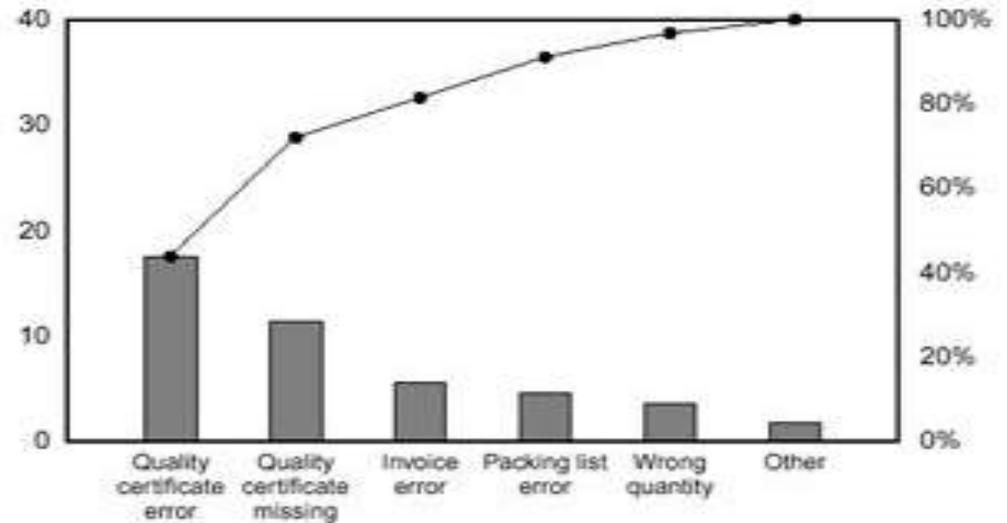
80/20



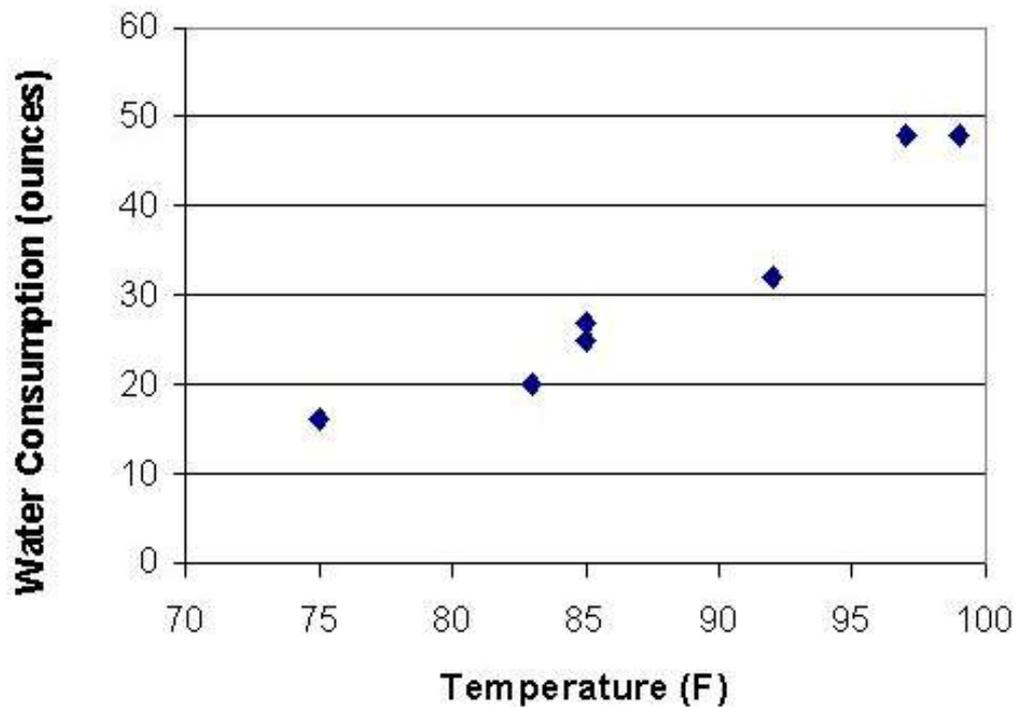
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Pareto Chart (80/20 Rule)

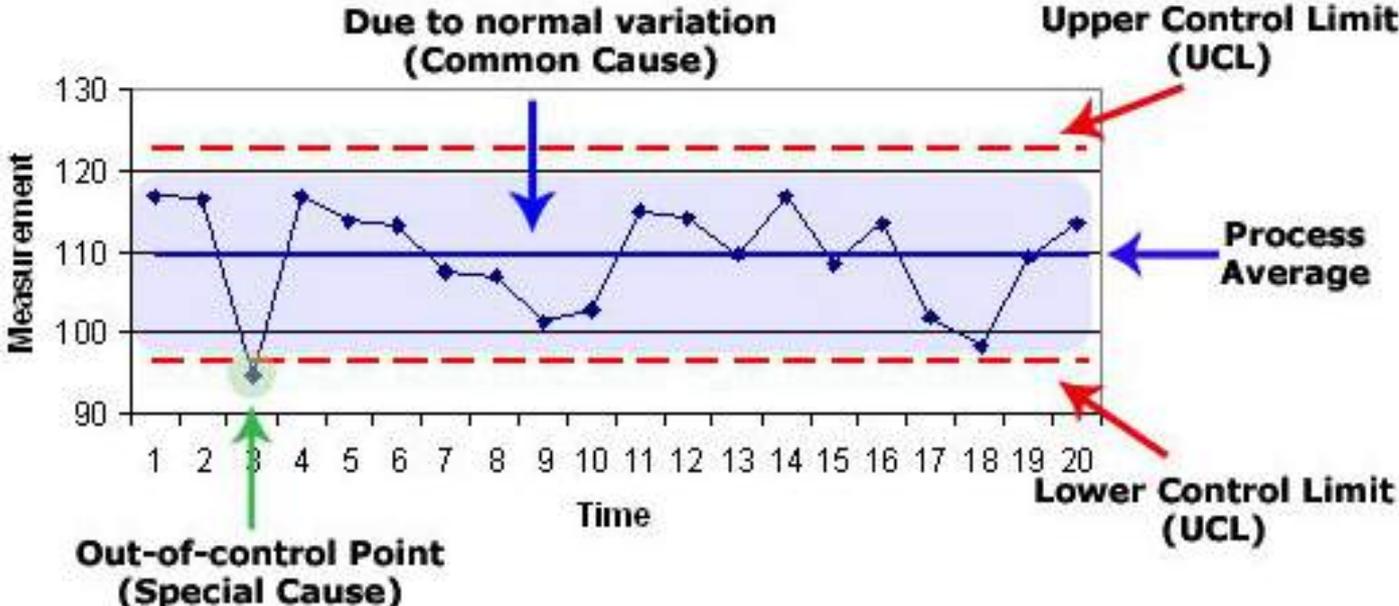
Types of Customer Complaints



Scatter Diagram



Control Chart





Imagine if 1 % of the ideas, improvements, and solutions swimming in the minds of our workers were acknowledged, considered, and implemented. Our workplace would change in remarkable ways, and we would gain a huge economic advantage.

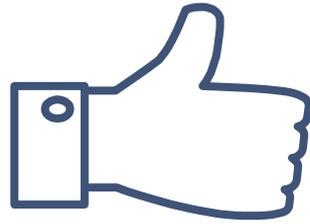


Management of Change

"The soft stuff is the hard stuff"

Personal change precedes organisational change





THANKS!

Any questions?

You can find me at

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