

# 0.1 INTRODUCTION TO LEAN & SIX SIGMA

WHEN YOU NEED TO BE SURE



More things:

1. Process Improvement (Y= process output = symptom.. X's = process inputs = causes)
2. Toolbox (from easy soft tools to powerful statistical tools)
3. Quality level (3.4 mistakes on 1 mil. opportunities)
4. Problem Solving Methodology (Define-Measure, Analyze, Improve, Control)
5. **Fact Based Decisions** (Statistical validation instead of Gut feeling)
6. **Breakthrough Improvement** (more than 50%, diff. to Continuous improvement)
7.  $Y = f(X1, X2, X3, \dots, Xn)$  (funnel down from all potential causes to root causes)

8. Improvements project by projects (no other way for real improvements)
9. Projects run by **full** time BB or part time GB (+resources & support)
10. Six Sigma Infrastructure (Mngm, Champions, Sponsors, Belts, Controllers, Teams)
11. Six Sigma reduces variation (by optimizing vital inputs)

## „ELEVATOR SPEECH”

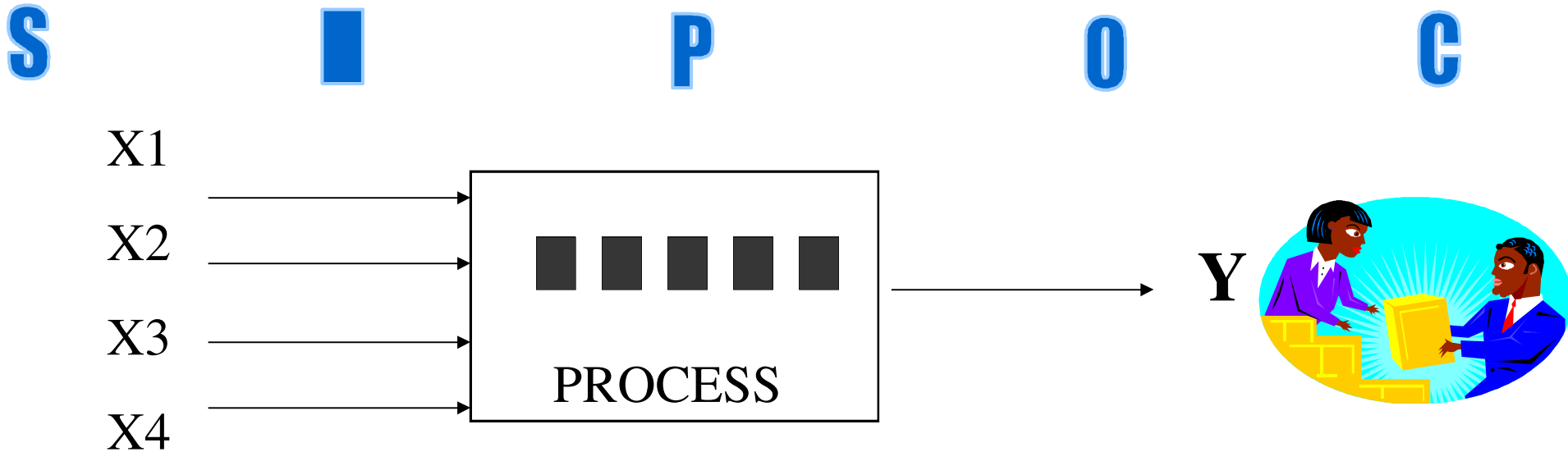
- Lean Six Sigma is the powerful methodology for process improvement
- What ever we do ..... can be presented as a process
- So, Lean Six Sigma is methodology to improve almost anything what we do.



## SOME SIX SIGMA PAROLES

- Don't blame the People ..... blame the process !
- Without data ..... you are just another person with an opinion !
- In God We Trust ..... All Others Bring Data ! (fact based decisions)
- What gets measured .... gets done !
- Six Sigma means... Never Having To Say You're Sorry !!!

## WHAT IS PROCESS ?



**Process:** A **value-adding** activity which takes resources/ raw material (X's) from a supplier and produces an output (Y) which **meets customer requirements**



## CONNECTION BETWEEN A PROBLEM AND PROCESS IMPROVEMENT

- What ever is the problem it must have been created in a certain set of activities
- What ever we do, this can be presented in the form of Process (“If we can not present it in the form of process... than we don’t know what we are doing”)
- So, we first need to define the Process (and the Scope) in which our Problem could have been generated.
- The Problem (i.e. the thing that we want to improve) we designate with “Y”, and present it as outcome (i.e. Output) from that Process.
- Once we have defined above Process, we can relax and follow the Steps of Lean Six Sigma methodology that will help us to discover and **prove** the Root- causes of the problem, and find the optimal solution.

For any improvement, we need to improve **2 THINGS, only:**

## 1. EFFICIENCY

## 2. EFFECTIVENESS

Efficiency = Doing things right

Effectiveness= Doing right things

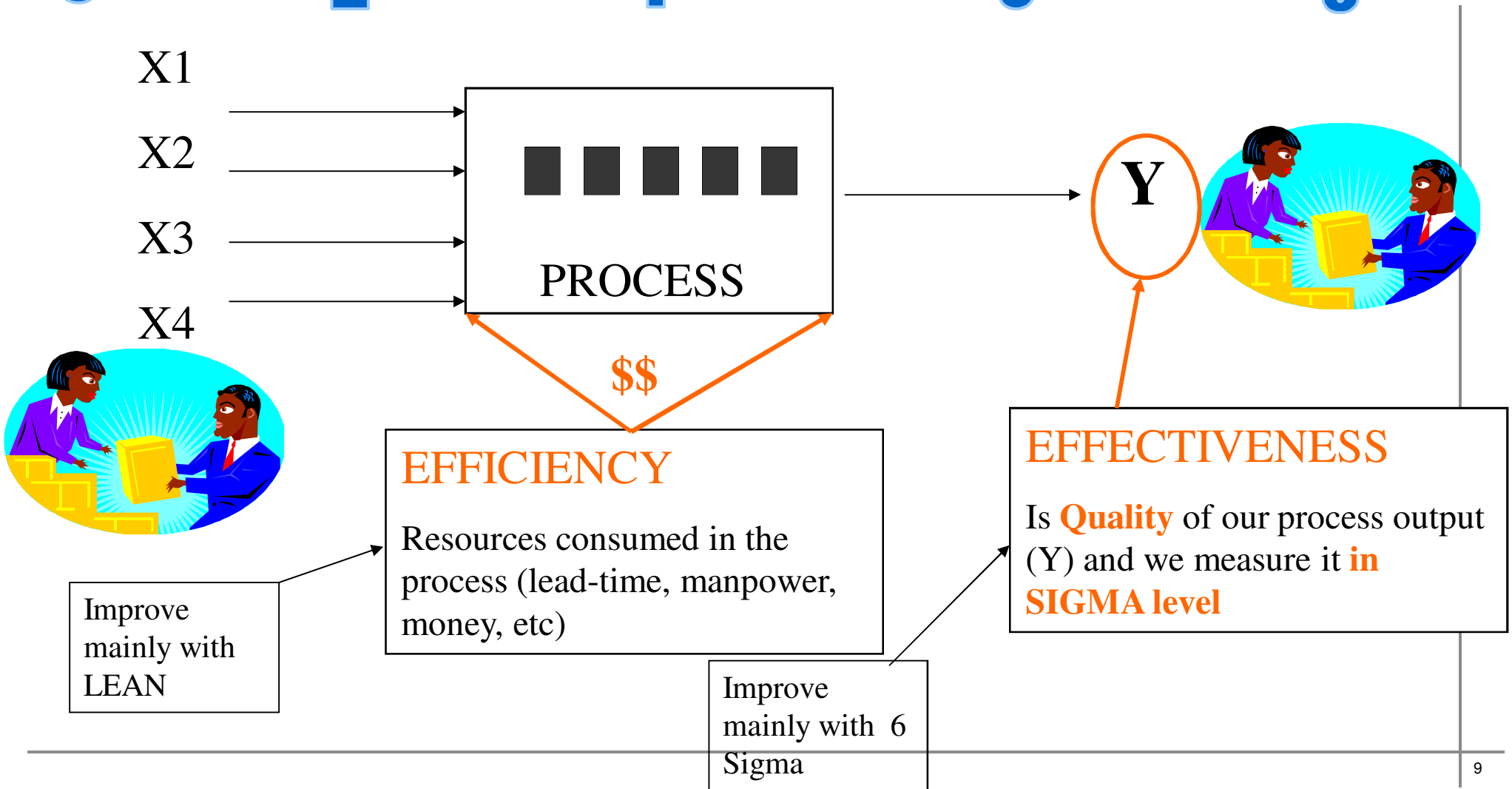
- When working on improvement project we might chose to focus on one of them
- What about right balance ?

What are examples ?



## HOW WE MEASURE EFFICIENCY AND EFFECTIVENESS

S I P O C



**Six Sigma** is about improving quality of our process output (effectiveness), mainly by reducing variation

**Lean** is about reducing the waste from our process and improving the lead time (efficiency)

Still, some effectiveness will be improved with Lean, and some efficiency with Six Sigma.

Six Sigma and Lean are Complementary Methodologies

### ■ Value Added

Any activity that increases the market form or function of the product or service. (These are things the customer is willing to pay for.)

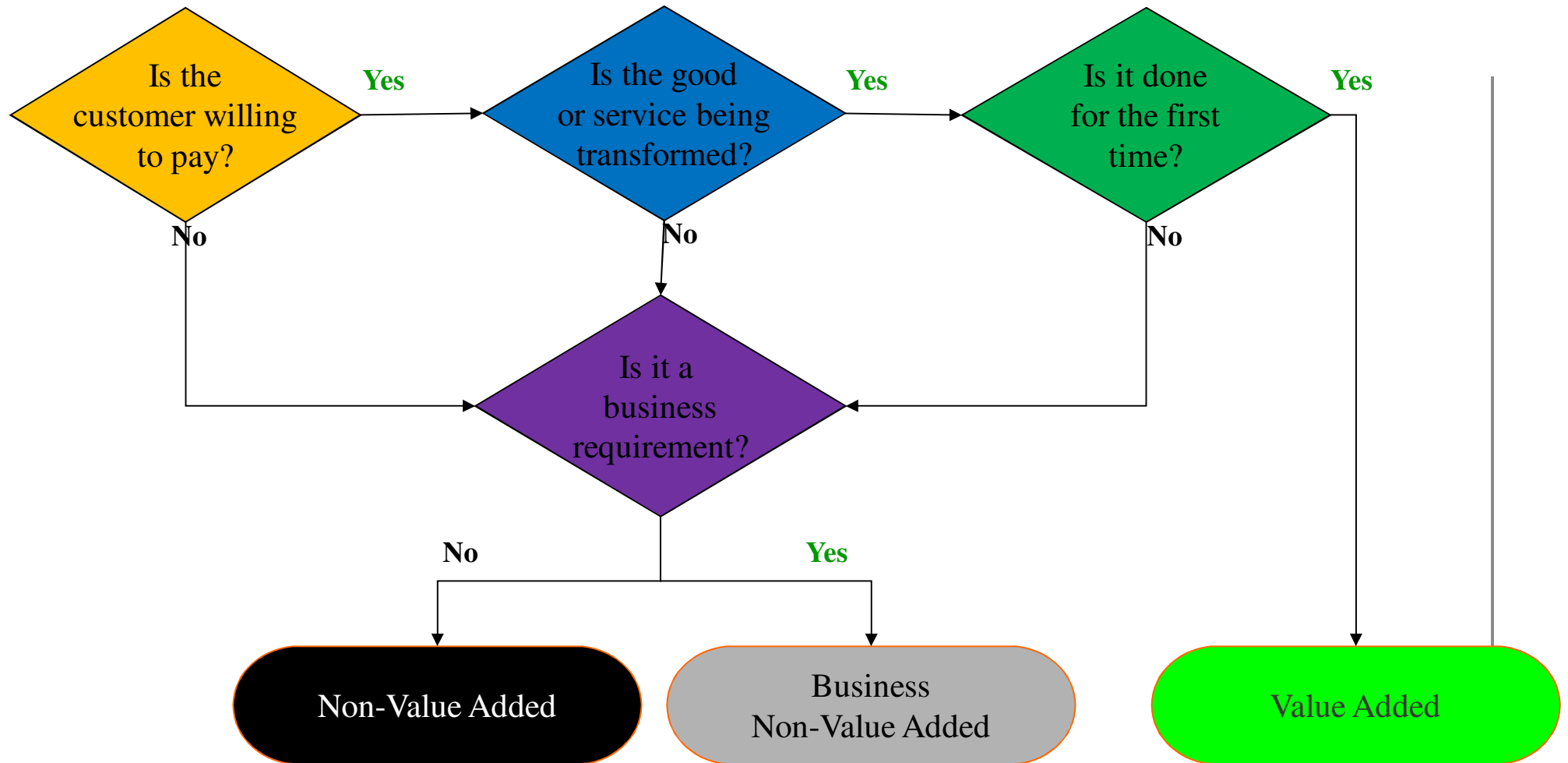
### ■ Non-Value Added (Waste)

Any activity that does not add market form or function or is not necessary. (These activities should be eliminated, simplified, or reduced.)

### **Business Non-Value Added ("Required Waste")**

Any activity that is Non-Value Added but is required.

## DEFINING THE VALUE OF AN ACTIVITY



## THE CONCEPT OF VALUE ADDED

Value Added ( $\approx 3$  to  $5\%$ )

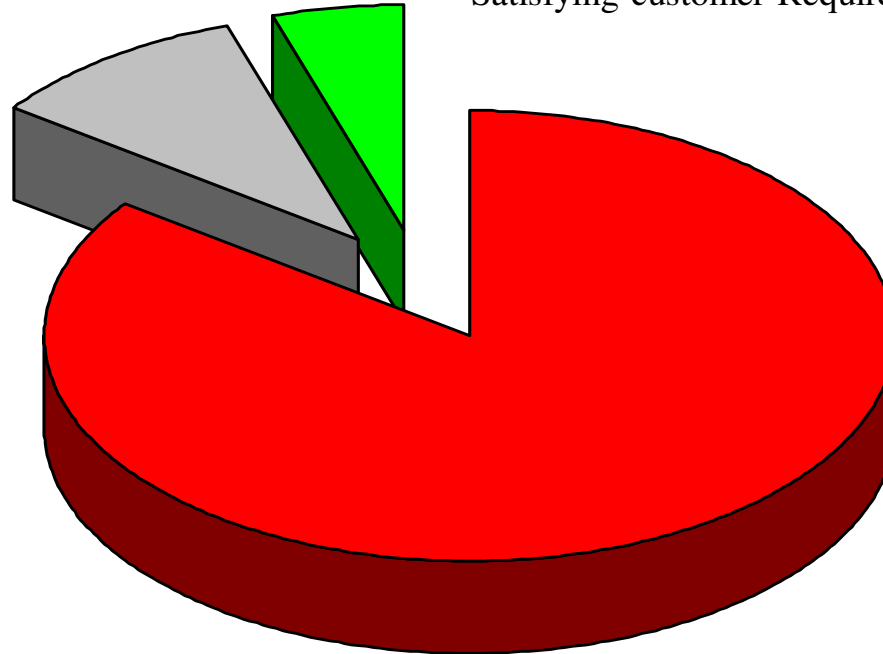
Example:

- Satisfying customer Requirement

Business Non-Value  
Added ( $\approx 10$  to  $15\%$ )

Examples:

- Type in information first time
- Get paper
- Answer customer call



Waste ( $\approx 85\%$ )

Examples:

- Excessive Walking
- Waiting time
- Paper storage
- Paper sorting
- Correct defects
- Transport

## 8 TYPES OF WASTE – "DOWNTIME" MANUFACTURING - OFFICE

1. **Defects** – Correction, errors in documents
  2. **Overproduction** - Doing unnecessary work not requested
  3. **Waiting** for the next process step
  4. **Non-engaged Employees** - Under-utilised employees
  5. **Transportation** - Transport of documents
  6. **Inventory** - Backlog in work queues
  7. **Motion** - Unnecessary motions
  8. **Extra Processing** - Process of getting approvals
- Three New Wastes:  
Inappropriate systems, wasted utility resources, wasted materials

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## WHAT IS A GOOD SIGMA LEVEL ?

Yield (How good we are)	Process Sigma	Defect per 1.000.000
99,99966 %	6	3,4
99,9970 %	5,5	30
99,9770 %	5	230
99,8650 %	4,5	1.350
99,3790 %	4	6.210
97,730 %	3,5	22.700
93,320 %	3	66.800
84,20 %	2,5	158.000
69,20 %	2	308.000
50 %	1,5	500.000
31 %	1	690.000

### The rule of thumb:

- below 3 Sigma is bad
- 3-4 average
- 4-5 very good
- >5 perfection

• Airplanes are flying on 6,2 Sigma level

• While luggage process is operating on 4 Sigma level

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# PURPOSE PER PHASE MANDATORY ACTIVITY STEPS

Define	Measure	Analyse	Improve	Control
Define the Project Goals and Deliverables	Measure and Validate Baseline Process Parameter	Identify Vital Few Process Inputs that affect the Output	Generate and Implement Optimal Solution	Ensure that the Result Will Last
<b>Activity Steps: Mandatory for Each Phase</b>				
Develop project charter <ul style="list-style-type: none"> <li>Define CTQ / goals</li> <li>Outline project Y</li> <li>Identify problem to be addressed</li> <li>Define team and stakeholder</li> <li>Define defect</li> <li>Define benefit</li> <li>Project plan / scope</li> <li>High level process map</li> </ul>	Baseline CTQ Visualise value stream Streamline value stream  Eliminate waste Implement quick hits Visualise process Identify all inputs (X's) Verify data reliability (Y) Collect output data Baseline Y performance Characterise variation	Filter out Key Process Inputs X's - using subjective tools  Address special causes if applicable  Verify data reliability (X)  Collect data on X's  Validate vital few X's with data  Analyse root cause	Generate possible solutions  Prioritise solutions  Validate/test (pilot) solutions  Develop execution plan	Establish operating tolerances (x)  Re-verify data reliability  Implement sustainable control plan  Standardise, update documents  Quantify benefits  Develop transition and training plan (if applicable)
Review with Sponsor	Review with Sponsor	Review with Sponsor	Review with Sponsor	Review with Sponsor

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# LEAN SIX SIGMA ROADMAP

Six Sigma Methodology and Roadmap for Common Tool Usage				
Define	Measure	Analyse	Improve	Control
Project Charter				Implement Quick Hits at Any Time with Validated Data
SIPOC				
MSA & Baseline Study on Y(s)				
Value Stream Map and Lean Tools				
	Process Map			
	Cause & Effect Study			
	Potential Failure Mode and Effects Analysis			
	Measurement Systems Analysis			
	Data Collection & Sampling			
Statistical Process Behaviour				
Capability Study				
		Quantitative X,Y Relationships		
		Statistical Validation		
Control Plan				
			Celebrate	

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The main Lean diagnostic tool is Value Stream Map. We move from Current to Future Value Stream Map by help of different tools, like the following ones:

■ **Lean Toolbox 1**

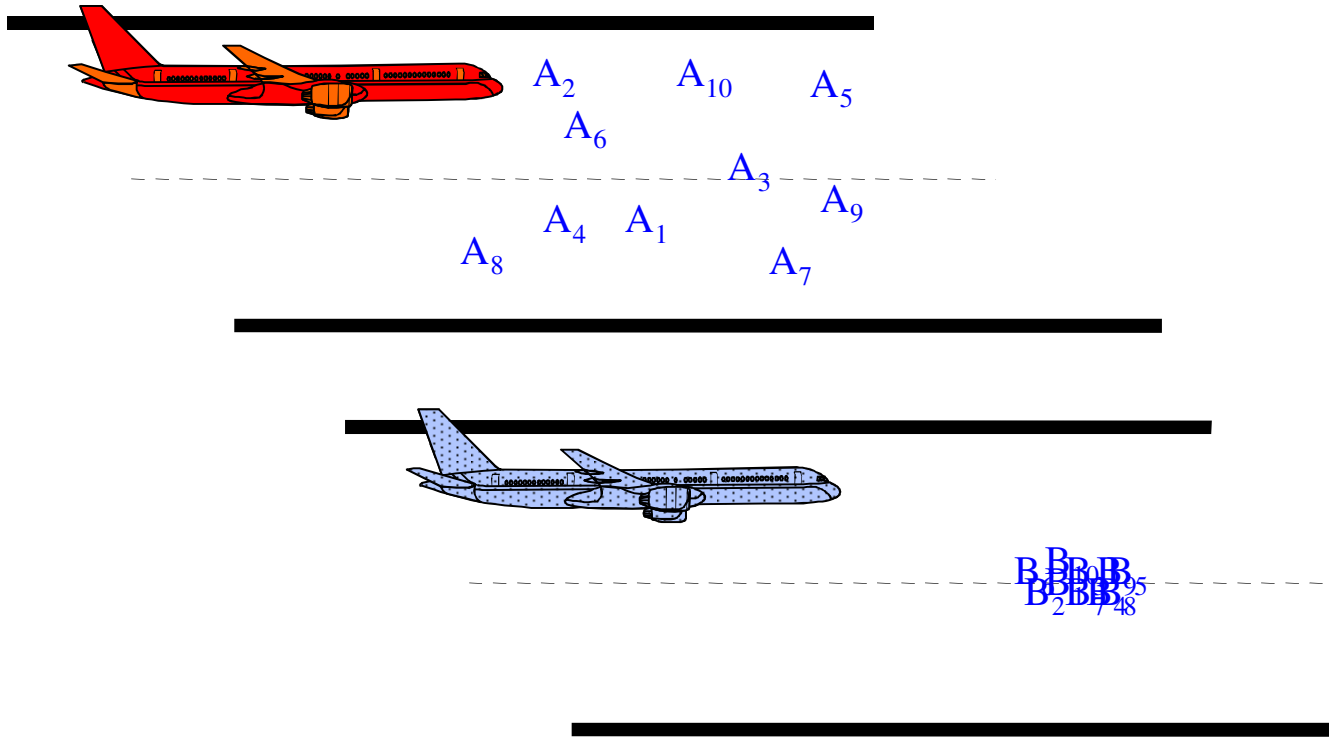
1. Standardised Work and Operator Balance
2. Quality at the Source
3. Workplace Organisation
4. People Involvement
5. Visual Controls and Management
6. Batch Reduction or Elimination

■ **Lean Toolbox 2**

7. Poka Yoke
8. Cellular Teaming Concepts
9. Pull Systems
10. Equipment Reliability
11. Levelling, Management Timeframe and Takt Image
12. SMED

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## WHAT IS VARIATION?



*Which pilot do you prefer ?*

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A vital part of Six Sigma is to discover relations of :

$$Y = f (X1 + X2 + X3 + \dots Xn)$$

Y = Dependent, Outcome, Symptom    X = Independent, Cause, Problem

Y = Process Output

X= Process inputs or whatever  
influence Y

- Our Outputs (Y) are determined by our Inputs (X's). If we know enough about our X's we can accurately predict Y.
- By knowing and controlling the X's, we reduce the variability in Y. Example of  $Y=f(X)$  ....  
Profit = f (Customer, Process, Employee)

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- Imagine you are the General Manager of a supermarket chain with many employees. You will be out of the country for three months and have asked your staff to fax you a weekly report on every Monday morning. What information/metrics would you like to see in that fax?

**Allstores Inc. Weekly Report**

- You are headed to the supermarket ...
- The things you would like to buy are available at several supermarkets in your area. All are almost equidistant from your home.
- What criteria do you use to decide to which supermarket to go?

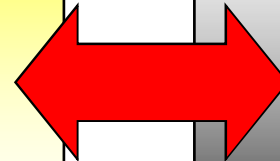
**Criteria To Decide To Which  
Supermarket I Should Go**

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- Compare your General Manager list vs. your Customer list.
  - How well do your lists match?

### Allstores Inc. Weekly Report

### Criteria To Decide Which Supermarket to go shopping



- If you were to redo the General Manager's list ... What would the list look like now that you know what the customer wants?

### Allstores Inc. Weekly Report

Customer Focused

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### **Project Sponsor,**

supports the project leader and is the customer and resource provider to the project. Follow-up the Six Sigma project and leverage the gains.

### **Master Black Belt,**

is a specially trained and very experienced Black Belt Provides Black/Green Belt and Champion training and coaches the Belts in projects. May lead own projects.

### **Process Owner,**

is responsible for the design of the common process and decides on any changes of that process.

### **Black/Green Belts,**

leading teams in getting results through Six Sigma projects. Black Belts are full-time committed and Green Belts part-time.



### **Project Team Members,**

cross functional, with good business process knowledge.

### **Six Sigma Steering Group,**

i.e. Management team, responsible for running the Six Sigma programme within the organisation scope.

### **Six Sigma Champion,**

Group, Division and BU-level Deployment responsibility and the programme process owner within the organisation.

### **Controller,**

Initial evaluator of the project to define the potential economical gains. Monitor and confirm project results.