


Measuring ROI in Low Maturity

Q:PIT Ltd

**Reducing the Cost of Quality
through
Process Improvement,
Information Management
and Teamwork**

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Causes for Failure

Why do so many fail in their improvement programme?

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Five Reasons to Fail

Objectives

- Focus on the satisfying the model, not on the business

Budget

- Demonstrate return on investment within the year

Technical change

- Let the techies do this: it is their problem

We know what is needed

- Don't get the customer involved today, they will be happy that we improve

Do it quickly

- We can't afford to wait

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Basics of Improvement

The Key Factors you Need to Implement First

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Basics of Improvement: Business Focus

Focus on what you need to deliver to your market:

- Less defects, increased quality
- Reduced costs, better investment
- Quicker time to market
- Being Maturity Level X is rarely a business issue

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Basics of Improvement: Culture

Process Improvement is not a technical activity:

- Focus on the cultural change that is needed
- Ensure that the cultural aspects are understood by management
- Generic goals are more important in the long-term than specific goals
- We need people to focus on quality and on improvement, not on compliance
- We need management to demonstrate what they want

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Basics of Improvement: Leadership


Keep your eye on the horizon

- Lead by example
- Learn from mistakes
- Encourage the right attitude rather than the short-term result

Lead so that people can follow

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Basics of Improvement: Quality Assurance

Assurance that people know what they are doing
Assurance that you know how they are doing
Assurance that they know why they are doing it
It is only by knowing what is really happening that we can learn and progress
Quality assurance needs to be seen as a proactive support, not just compliance audits and punishment

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Basics of Improvement: Configuration Management

Configuration management gives us the foundations on which the rest can be built

- Every area, every process needs to ensure the integrity of the system
- This is more than just version control
- This does require investment in a tool

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Basics of Improvement: Process Focus

The Engineering Process Group needs to be implemented at Level 1

- Even though OPF is a maturity level 3 process area, the ownership and co-ordination of processes and improvement paths need to be implemented from the beginning
- Having the OPF in place does not mean that you need to jump over ML2 and have everyone operating at ML3

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Basics of Improvement: Process Framework

Set up the framework for the future

- Consider what you are planning on doing
- Consider how you want to structure the processes
- Set up a process architecture
- Set up a process repository
- Set up a means for reporting processes and potential improvements
- Identify what and how you want to measure

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Basics of Improvement: Measurement


If you don't know what you want to achieve, you will not achieve it

If you cannot measure your achievement, you will not achieve it

If you don't know how far you have come, you will not know if you have arrived

If you cannot demonstrate that you have improved, you will lose your support

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Setting Up the Basics

Setting up all these things requires a significant investment

- How much should you invest?
- What will you get out of it?
- How to persuade management that this is an investment and not a cost?
- How to persuade the board / the shareholders that they are getting benefits out of this?
- How to ensure that this is improving quality of products and the life of the participants, not just creating more bureaucracy?

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Principles of Measurement

What to measure, how to measure


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Purpose of Measurement

- Ensure that you are improving what needs to be improved
- Demonstrate that the improvements are useful to the business
- Demonstrate that progress is supporting the business
- Demonstrate that this is an investment, not a cost

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Principles Of Measurement ^{1/2}

- Specifying the objectives of measurement and analysis such that they are aligned with identified information needs and objectives
- Specifying the measures, data collection and storage mechanisms, analysis techniques, and reporting and feedback mechanisms
- Implementing the collection, storage, analysis, and reporting of the data
- Providing objective results that can be used in making informed decisions, and taking appropriate corrective actions

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Principles Of Measurement ^{2/2}


Objective planning and estimating

Tracking actual performance against established plans and objectives

Identifying and resolving process-related issues

Providing a basis for incorporating measurement into additional processes in the future

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What to Measure

There is not that much we can measure:

- Time
 - o Elapsed
 - o Effort
- Cost
- Quality (defects)
- Size

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Progress and Baselines

Absence of measures is the key reason that organizations are ML1: if you knew the cost of quality, you would already have improved it

Absence of baselines is the key reason that ML1 organizations do not measure

We don't measure, because we have no measurements!

The time to establish the baselines is start measuring is now

But where to start?


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Establishing Measures

Think outside the box:

- What do you need?
- What do you have?
- How long do you need to establish a baseline?




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Quick Baselines

Think outside the box

- Establish a 1-week baseline

Could the productivity of the coming week be representative of your general productivity?





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Measure the Trend

Start measuring the trend without a baseline:

- What is the change between two projects?
- What is the different with yesterday or last week?

You do not need to have a baseline in order to determine the difference between two or three points



Week	Value
1st	10
2nd	12
3rd	11
4th	9
5th	10
6th	8
7th	7
8th	6
9th	5
10th	4
11th	3
12th	3


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Reverse Baseline

Measure your previous project to establish a baseline

- What happened previously?
- What were the results?
- What went wrong?
- What needs to be changed?

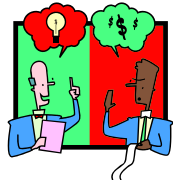


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Estimate the Opposite

Estimate the cost of not having done it:

- What if you had not identified this risk?
- How long would it take if you had only identified this requirements defect in acceptance testing, not in the requirements review?
- What would have been the cost if QA had not identified this?

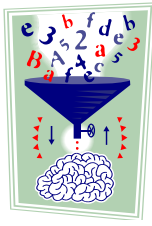


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What Do You Have?


Consider what you already have

- Milestone slippages
- Defects reported
- Time in testing
- Budget
- Overtime




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What is Required?
What do the models and theories require?

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CMMI®


Align Measurement and Analysis Activities

- Establish Measurement Objectives
- Specify Measures
- Specify Data Collection and Storage Procedures
- Specify Analysis Procedures

Provide Measurement Results

- Collect Measurement Data
- Analyse Measurement Data
- Store Data and Results
- Communicate Results

Adapted from CMMI - SEI 2003



FAA-ICMM

Goals

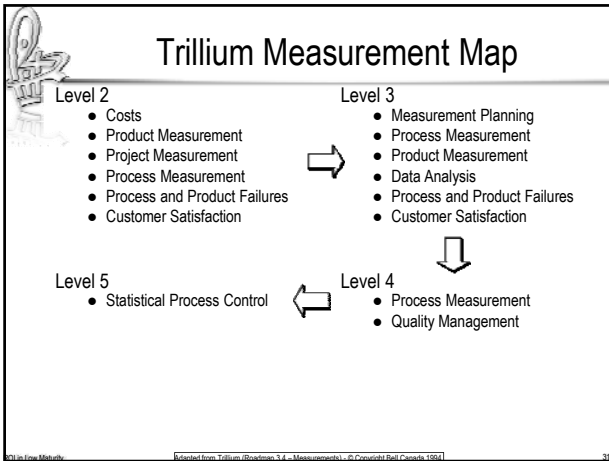
- Measures related to goals, objectives and major issues are established
- Measurement data are collected, analysed, and results are reported
- Measurement data and results are stored for use

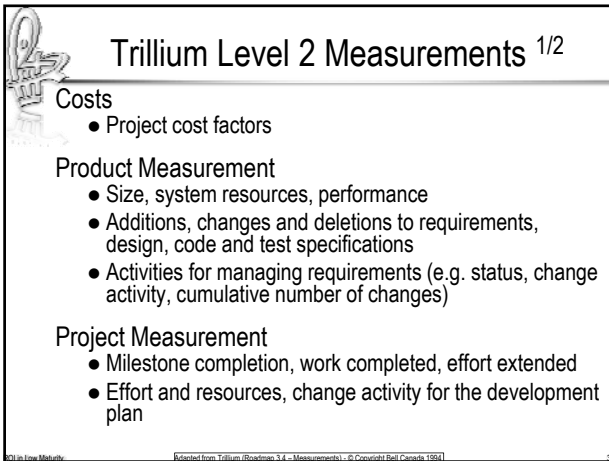
Some general categories of measures:

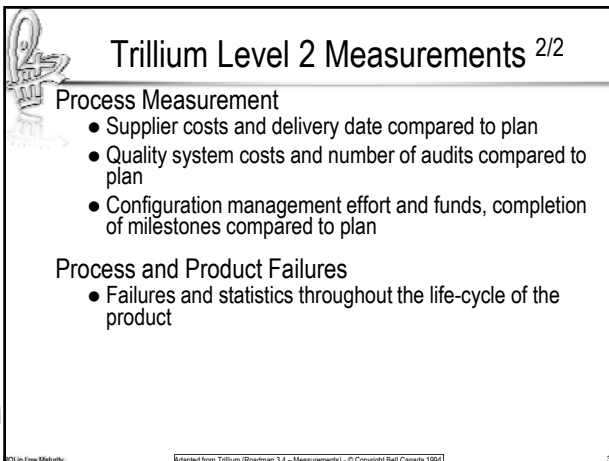
- Schedule and progress
- Resources and cost
- Product size and stability
- Process performance
- Product/service quality
- Contractor performance
- Technology effectiveness

Adapted from FAA/ICMM - Published by the Federal Aviation Administration, 2001















Establishing a Measurement Process

Making it happen

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The 6-Sigma Approach: DMAIC

Define

- Understand what are the key processes

Measure

- Identify and collect measurements of success

Analyse

- See what are the issues


Improve

- Make useful improvements

Control

- Manage the process

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DMAIC : Define

Charter

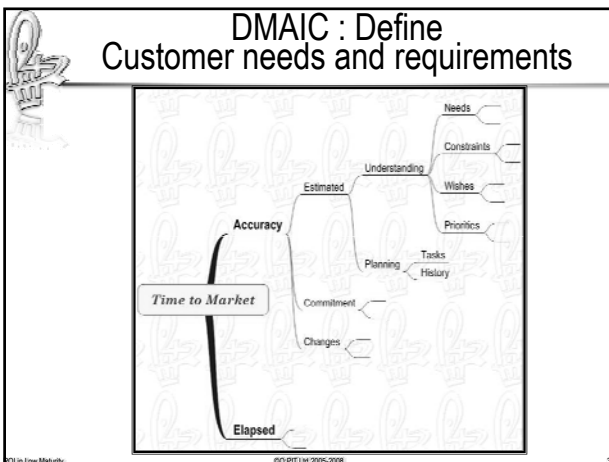
- Customer needs and requirements
- High-level process map
- Agree on the high-level steps

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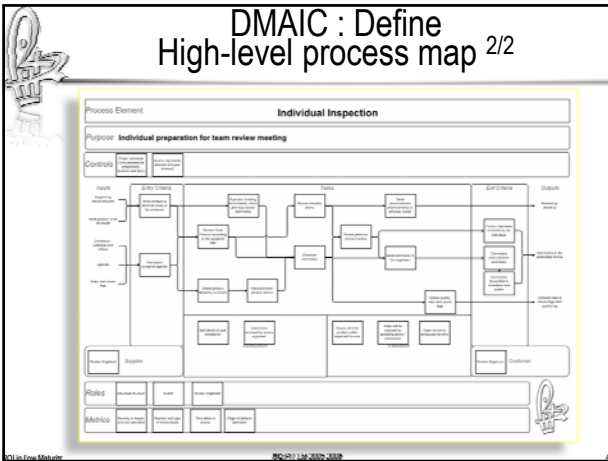
DMAIC : Define Charter

Business case	Why do we want to change anything? What is the business reason for spending time on this?
Problem statement	A detailed description of what is the problem Possibly include a quantitative description of the expected benefits and targets
Project scope	What is the scope of this project, what is included, where are the limits?
Goals and objectives	Description of what we hope to achieve through this approach
Milestones	Dates and deliverables for each of the main phases
Roles and responsibilities	Who is taking responsibility for this problem? Who is the sponsor? Who are the process improvement team members?



- ### DMAIC : Define High-level process map ^{1/2}
- Name the process
 - Establish the start and stop points of the process
 - Determine the output(s) of the process
 - Determine the customer(s) of the process
 - Determine the supplier(s) of the process
 - Determine the input(s) of the process





DMAIC : Measure

Define how you are going to measure:

- Create a data collection map
- Create data collection forms

Implement your data collection plan

Start making some statistics:

- Calculate baseline sigma
- Establish a basic control chart

DMAIC : Measure Data collection map creation

What to measure

Type of measure

Type of data


Operational definitions

Targets / specifications

Data collection forms

Sampling






DMAIC : Measure

Data collection plan

Data collection forms

- Determine what a defect is
- Determine reason codes for defects
- Determine the time frame for data collection
- Determine a grid for data collection

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DMAIC : Measure

Calculating Baseline


Standard Sigma Baseline:

- $1000000 * (\text{number of defects} / (\text{number of units} * \text{number of opportunities}))$

The Sigma baseline is not a requirement but a possibility

- Once you have made a few measurements, establish a baseline
- This does not have to be based on a statistically representative sample, but it does need to be understood for what it is

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DMAIC : Analyse

Data Analysis

- Discrete
- Continuous

Process analysis

- Sub-process mapping
- Nature of work

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DMAIC : Analyse Data Analysis ^{1/2}

Discrete

- Pareto
- Pie chart

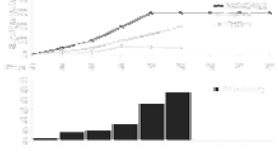

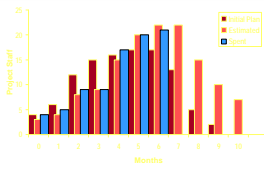
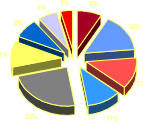
Continuous

- Frequency distribution check sheet
 - Machines in the process
 - Materials used in the process
 - Methods in the process
 - Nature or environment
 - The measurement itself
 - People
- Run chart



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DMAIC : Analyse Data Analysis ^{2/2}





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DMAIC : Analyse Process Analysis


Sub-process mapping

Nature of work

- Sub-process selection
 - Customer considers the sub-process important
 - There is a physical change
 - It is done right the first time
- Non-value-added activities
 - Internal failure
 - External failure
 - Delays
 - Controls and inspections
 - Preparation and set up
 - Moves
 - Value enabling
- Micro-problem statement




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Putting into Practice

Giving it a try

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Define Objective

Basic objectives for process improvement:

- Cycle time (efficiency)
- Cycle time slippage (repeatability)
- Effort to find and fix defects
- Effort slip rate (predictability)
- Customer reported defects (quality)
- Feature slip rate

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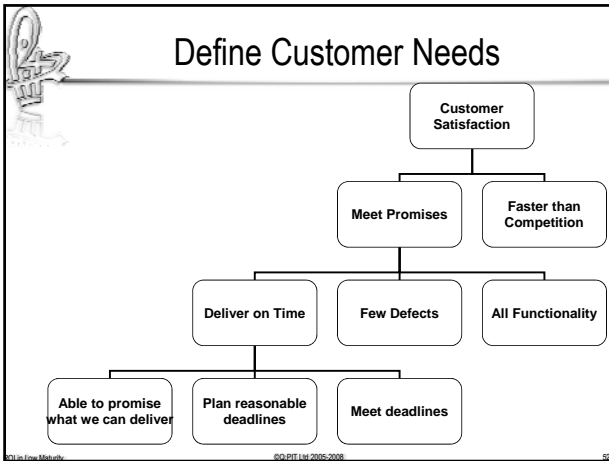


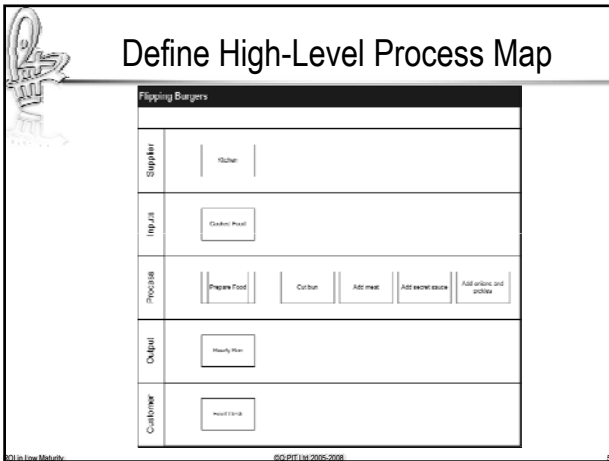
Charter

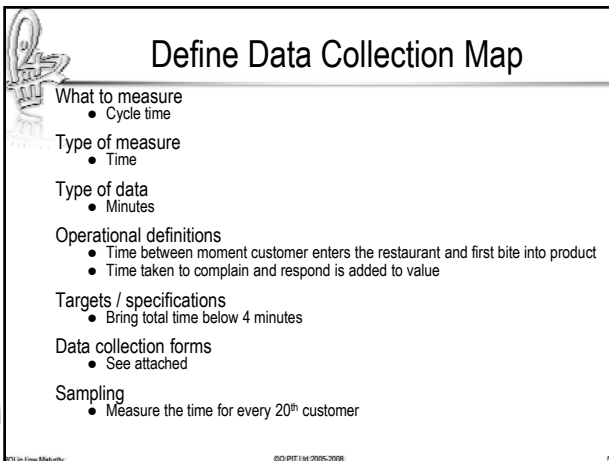
Business case	Improving the satisfaction of existing customers will directly impact repeat business
Problem statement	Customers are currently not satisfied because we regularly deliver late
Project scope	All projects within the local development centre
Goals and objectives	Identify how we can reduce the time to deliver
Milestones	Define: 1 week from now
	Measure: 3 weeks from now
	Analyse: 4 weeks from now
	Improve: 2 months from now
	Control: 6 months from now
Roles and responsibilities	Manager to provide data Measurement specialist to provide analysis

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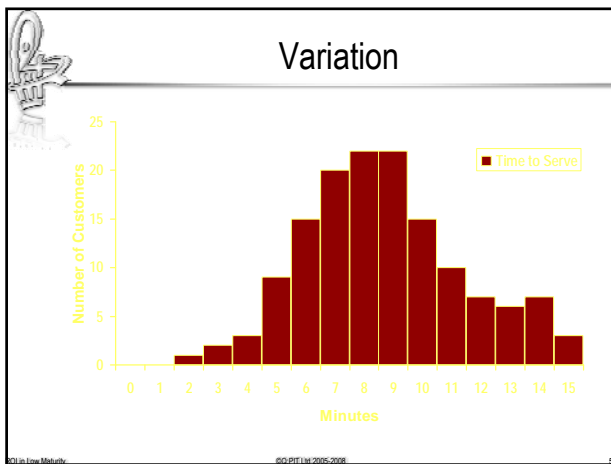


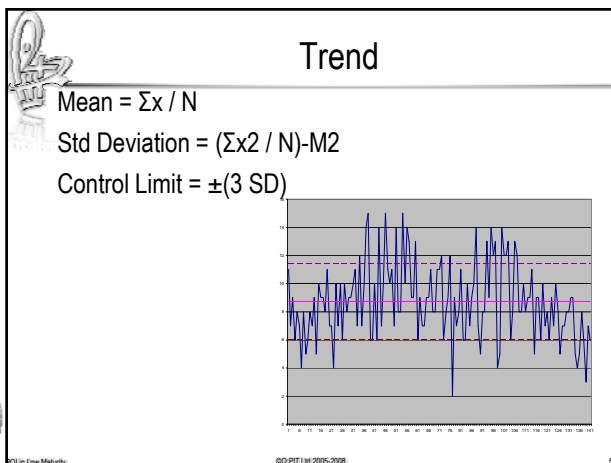





Measure Results

Nr	Entered	Ordered	Served	Complaints	Total
42	12:15	12:17	12:18	-	3
43	12:25	12:27	12:32	-	7
44	12:35	12:40	12:43	-	8
45	12:50	12:58	13:05	00:02	17
<i>Average:</i>					










Identify Sub-Processes

Sub-Processes:

- Queuing
- Choosing
- Waiting for selection
 - Sandwich
 - Fries
 - Drink
 - Deserts
- Paying

Identify the detailed measurements

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Now Do It

Define your improvements
Keep on measuring
Demonstrate that you are doing the right thing
Because, if you cannot measure it, you cannot improve it

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Appendix

Some Measurement Tools

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Measurement Chart

Define what you need to measure

Define what are the added-value elements

Step	Value Added	Non VA	Time
Request bid	X		24
Bids are reviewed		X wait	48
Finalists contacted	X		1
Re-negotiate bid		X error	24
Try alternative vendor		X prep.	48
Wait for final submission		X wait	48
Award contract	X		1
Contact vendor	X		1
Total			196

Cause and Effect Diagram

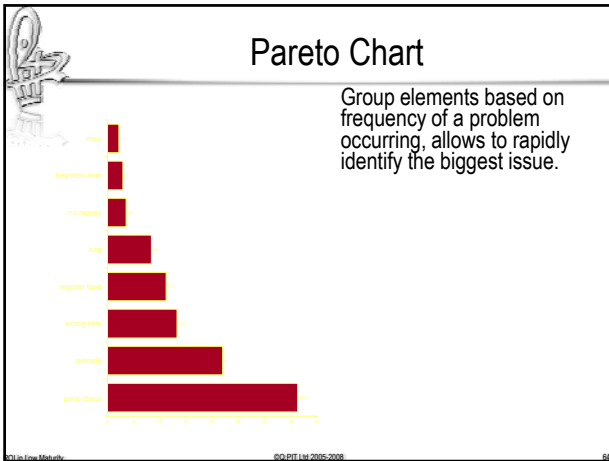
Identify the root causes of problems, classify them into general categories

Suggested general categories are Machine, Methods, Measurement, Materials, People and Environment, but others are possible

Histogram

Classify sequential events, see the "bell-curve", in which the most frequent case is bound by examples of lesser frequency tapering off in both directions





Some Additional Reading

Six-Sigma for Everyone

- George Eckes, 2003
- John Wiley and Sons, Editor
- ISBN 0-471-28156-5

Application of the Indicator Template for Measurement and Analysis

- Wolfhart Goethert and Jeannine Sivy, 2004
- Software Engineering Measurement and Analysis Initiative
- SEI Technical Note CMU/SEI-2004-TN-024

Metrics and Models in Software Quality Engineering

- Stephen H. Kan 2003
- Addison Wesley / Pearson Education
- ISBN 0-201-72915-6

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