Set Up a Six Sigma Process

- A Simple Way to Implement Six Sigma

May. 2nd, 2005

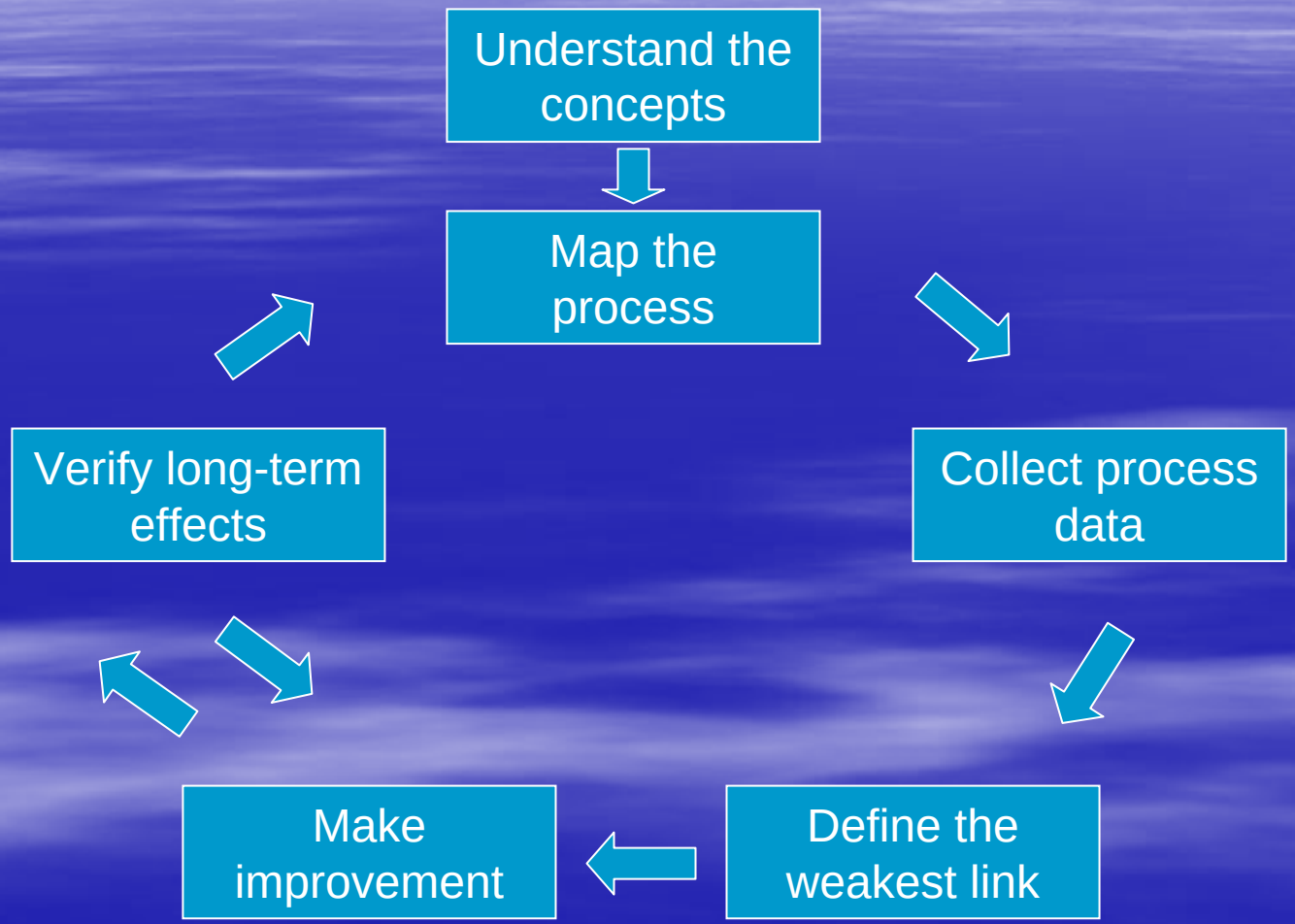
Introduction

- Guiding Principle
- QIT's Approach
- Process Mapping
- Data Collecting
- Data Analysis
- Long-term effects verification

Guiding Principles

- Set up a Six Sigma process can be easy
- The ultimate purpose of process management
  - Monitor process
  - Identify the weakest link
  - Improve the process
  - Verify the long-term effects

QIT's Approach



Understand the Concepts

Defect vs. Defective

- **Defect - A failure to meet one of the acceptance criteria of customers. A defective unit may have one or more defects.**
- **Defective- an ENTRIE UNIT that fails to meet acceptance criteria**

- Example
  - A unit may have 10 defects (discolor, missing part and etc.)
  - A production lot may have 10 rejected units – 10 defectives

Traditional Process Control vs. Six Sigma

- Traditional Process Control focuses on DEFECTIVES and passed performance
- Six Sigma targets DEFECTS and predicts future performance

- Example
  - P chart or nP chart shows the trend and control limits of the defectives
  - Sigma and DPMO measure the possibility of producing a defect
  - Throughput Yield represents the possibility to produce defect free products

Yield vs. Throughput Yield

- Yield - is defined as a percentage of meeting commitments
- Throughput Yield – The possibility to produce defect-free products
- Example
  - 99% Yield means the 99% of the products is accepted and 1% of the products is rejected
  - 99% Throughput Yield means the possibility to produce defect free products is 99%, and the possibility to have a defect is 1%.
- Formula:

$$Ytp = e^{\frac{-Defects}{Units}}$$

$$Yield = (1 - \frac{Defectives}{Units}) \times 100\%$$

Source: Implementing Six Sigma

PPM vs. DPMO

- PPM – Part Per Million
- DPMO – Defects per Million Opportunity

$$PPM = \frac{Defects}{Units} \times 10^6$$

$$DPMO = \frac{Defects}{Units \times Opportunities} \times 10^6$$

Sigma vs. Six Sigma

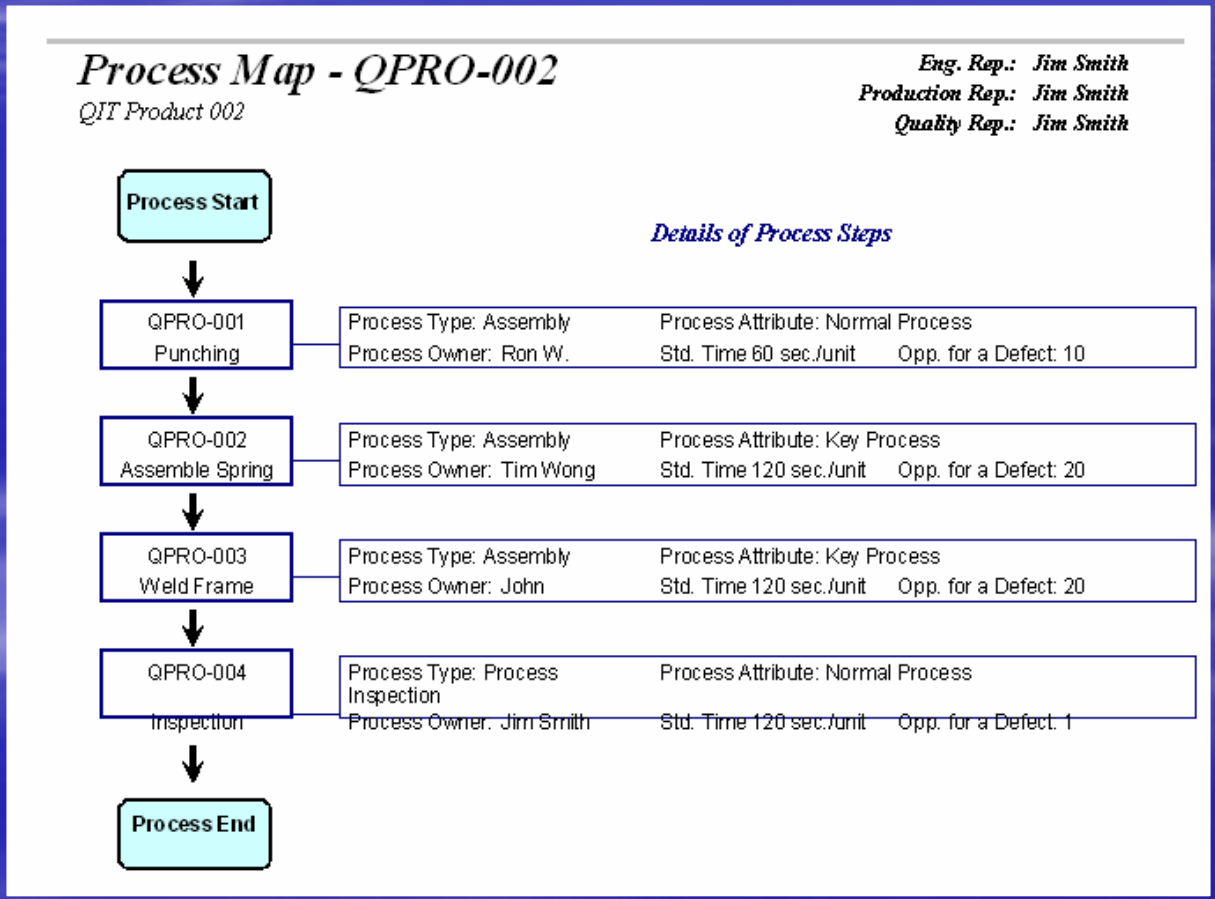
- Sigma, or standard deviation, is used as a scaling factor to convert upper and lower specification limits to Z.
- Six Sigma can be understood/perceived at three levels:
  - **Metric**: 3.4 Defects Per Million Opportunities. DPMO allows you to take complexity of product/process into account. Rule of thumb is to consider at least three opportunities for a physical part/component - one for form, one for fit and one for function, in absence of better considerations.
  - **Methodology**: DMAIC/DFSS structured problem solving roadmap and tools.
  - **Philosophy**: Reduce variation in your business and take customer-focused, data driven decisions.

Source: isixsigma.com

Process Mapping

Process Mapping

- Simply follow the existing process and write down all process steps.



Process Map - QPRO-002

QIT Product 002

Eng. Rep.: ***Jim Smith***
Production Rep.: ***Jim Smith***
Quality Rep.: ***Jim Smith***

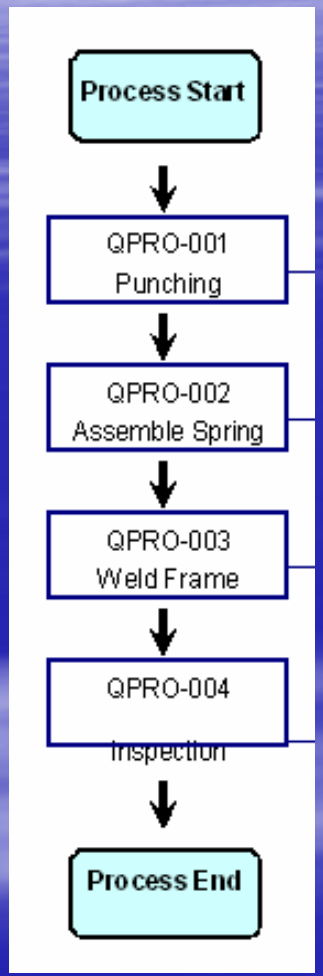
Process Start

Details of Process Steps

QPRO-001 Punching	Process Type: Assembly Process Owner: Ron W.	Process Attribute: Normal Process Std. Time 60 sec./unit Opp. for a Defect: 10
QPRO-002 Assemble Spring	Process Type: Assembly Process Owner: Tim Wong	Process Attribute: Key Process Std. Time 120 sec./unit Opp. for a Defect: 20
QPRO-003 Weld Frame	Process Type: Assembly Process Owner: John	Process Attribute: Key Process Std. Time 120 sec./unit Opp. for a Defect: 20
QPRO-004 Inspection	Process Type: Process Inspection Process Owner: Jim Smith	Process Attribute: Normal Process Std. Time 120 sec./unit Opp. for a Defect: 1

Process End

Transfer Process Map to Traveler



QPRO-002 Traveler

QIT Product 002

Work Order Number _____

Eng. Rep.: Jim Smith
Production Rep.: Jim Smith
Quality Rep.: Jim Smith

Process No.	*Process Name*	*Process Attribute*	*Process Owner*	*Production Start Time*	*Production Finish Time*	*Production Input*	*Defects*
QPRO-001	Punching	Normal Process	Ron W.				
QPRO-002	Assemble Spring	Key Process	Tim Wong				
QPRO-003	Weld Frame	Key Process	John				
QPRO-004	Inspection	Normal Process	Jim Smith				

Data Collecting

Traveler

QPRO-002 Traveler

QIT Product 002

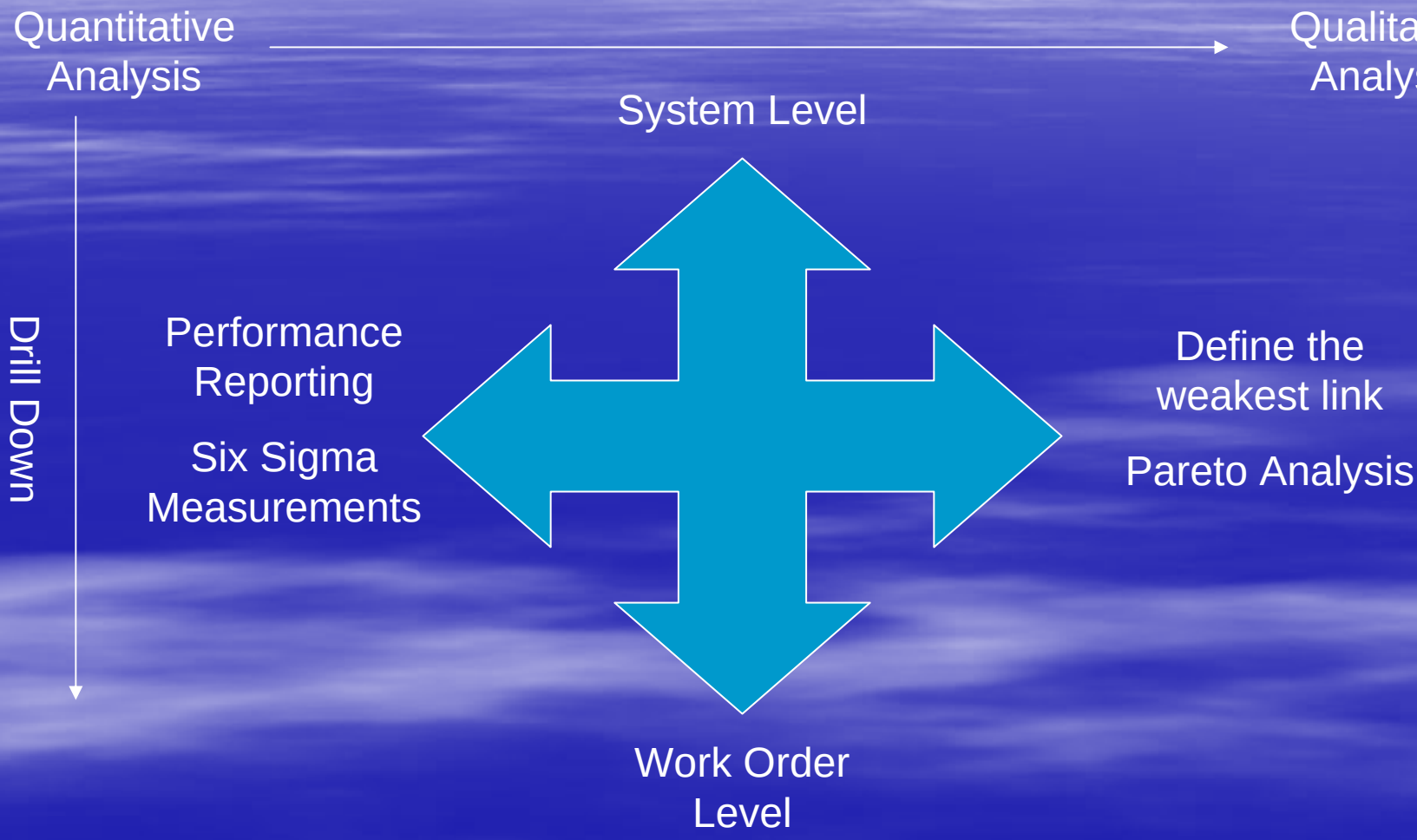
Work Order Number WO-0504018

Eng. Rep.: Jim Smith
Production Rep.: Jim Smith
Quality Rep.: Jim Smith

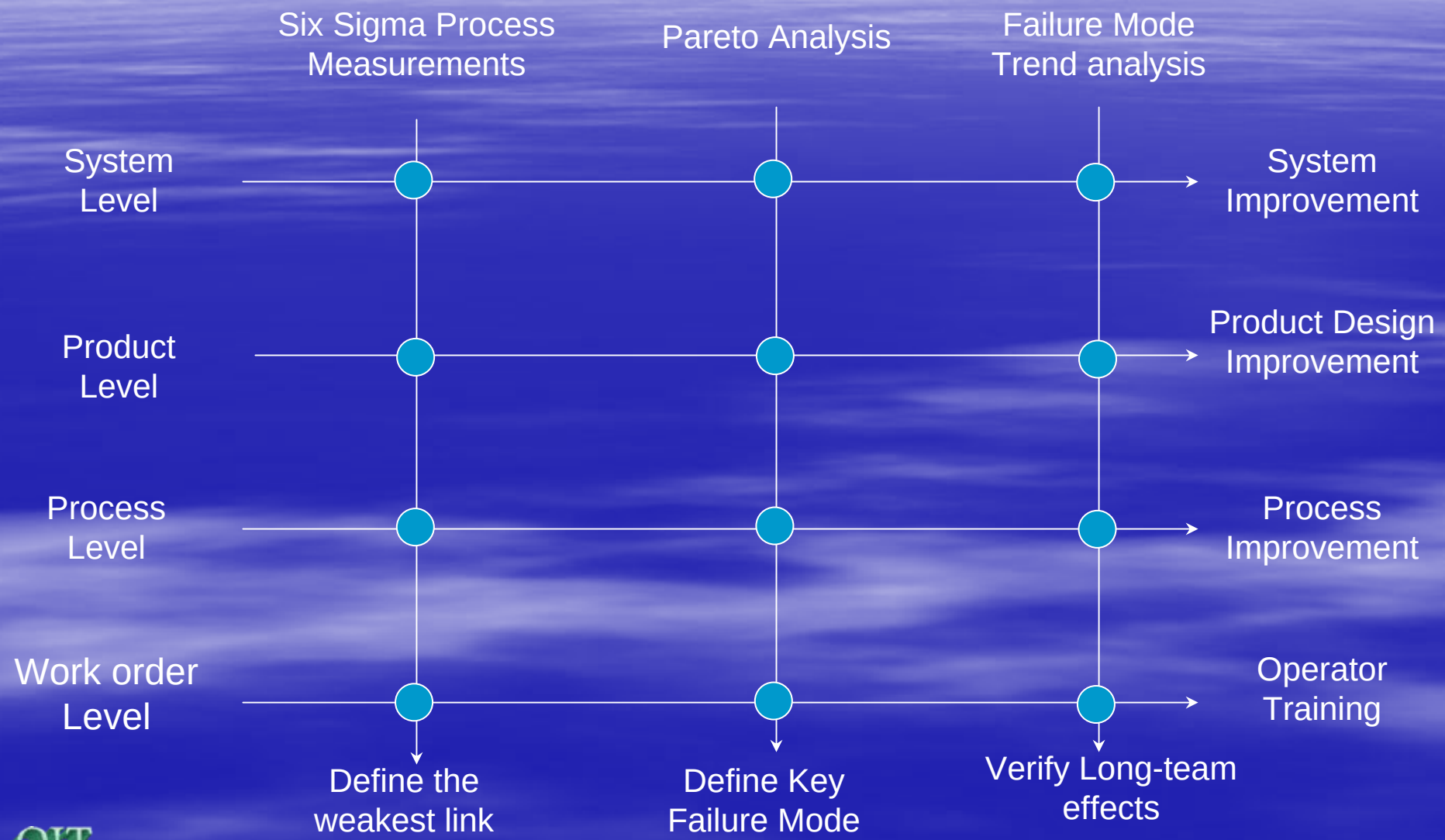
Process No.	Process Name	Process Attribute	Process Owner	Production Start Time	Production Finish Time	Production Input	Defects
QPRO-001	Punching	Normal Process	Ron W.	8:00AM 12/1/2005	8:15AM 12/1/2005	100	10
QPRO-002	Assemble Spring	Key Process	Tim Wong	8:15AM 12/1/2005	8:30AM 12/1/2005	90	0
QPRO-003	Weld Frame	Key Process	John	8:30AM 12/1/2005	9:00AM 12/1/2005	90	2
QPRO-004	Inspection	Normal Process	Jim Smith	9:00AM 12/1/2005	10:00AM 12/1/2005	90	0

Data Analysis

Analysis Approach



QIT Analysis Matrix

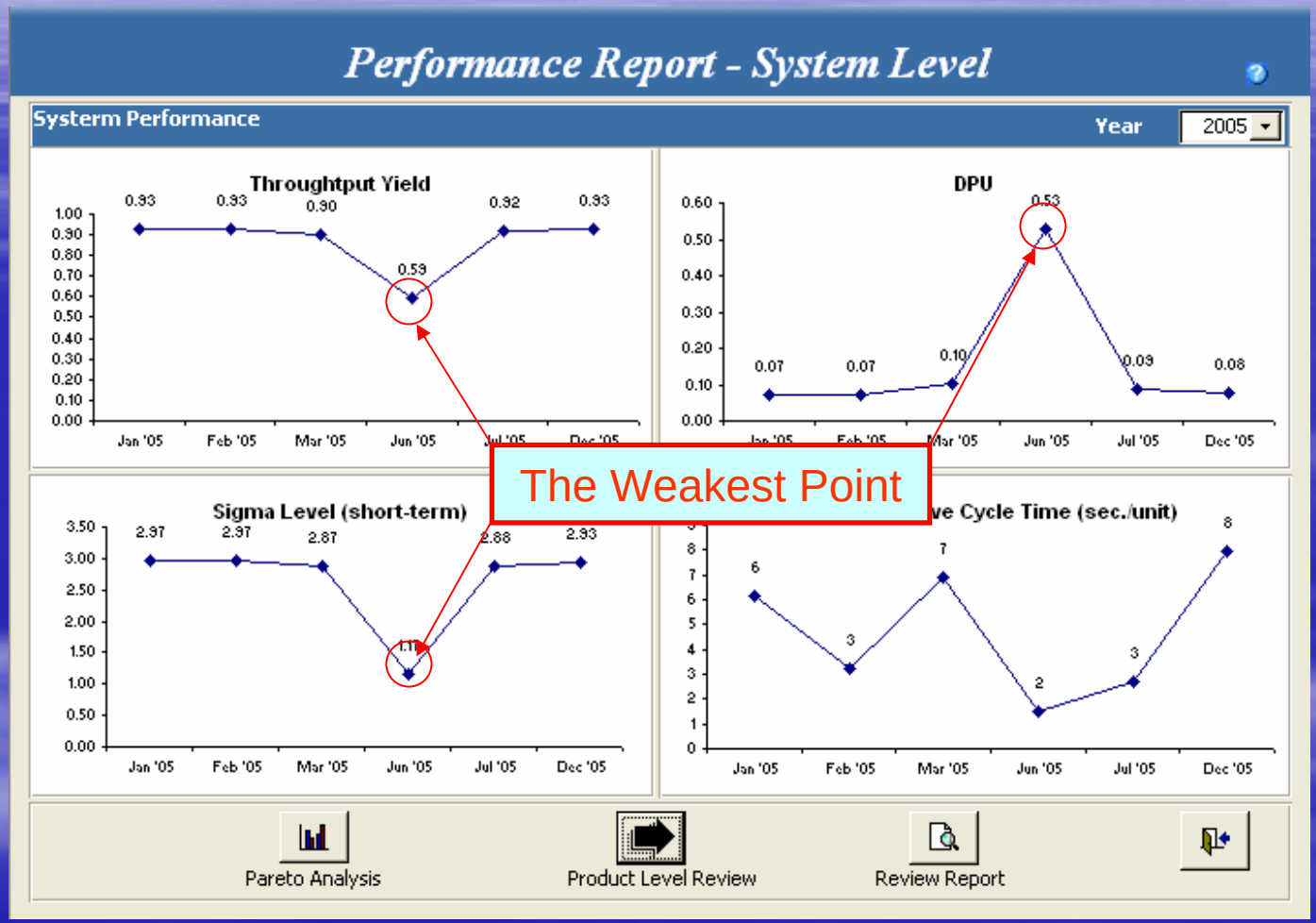


Examples of Data Analysis

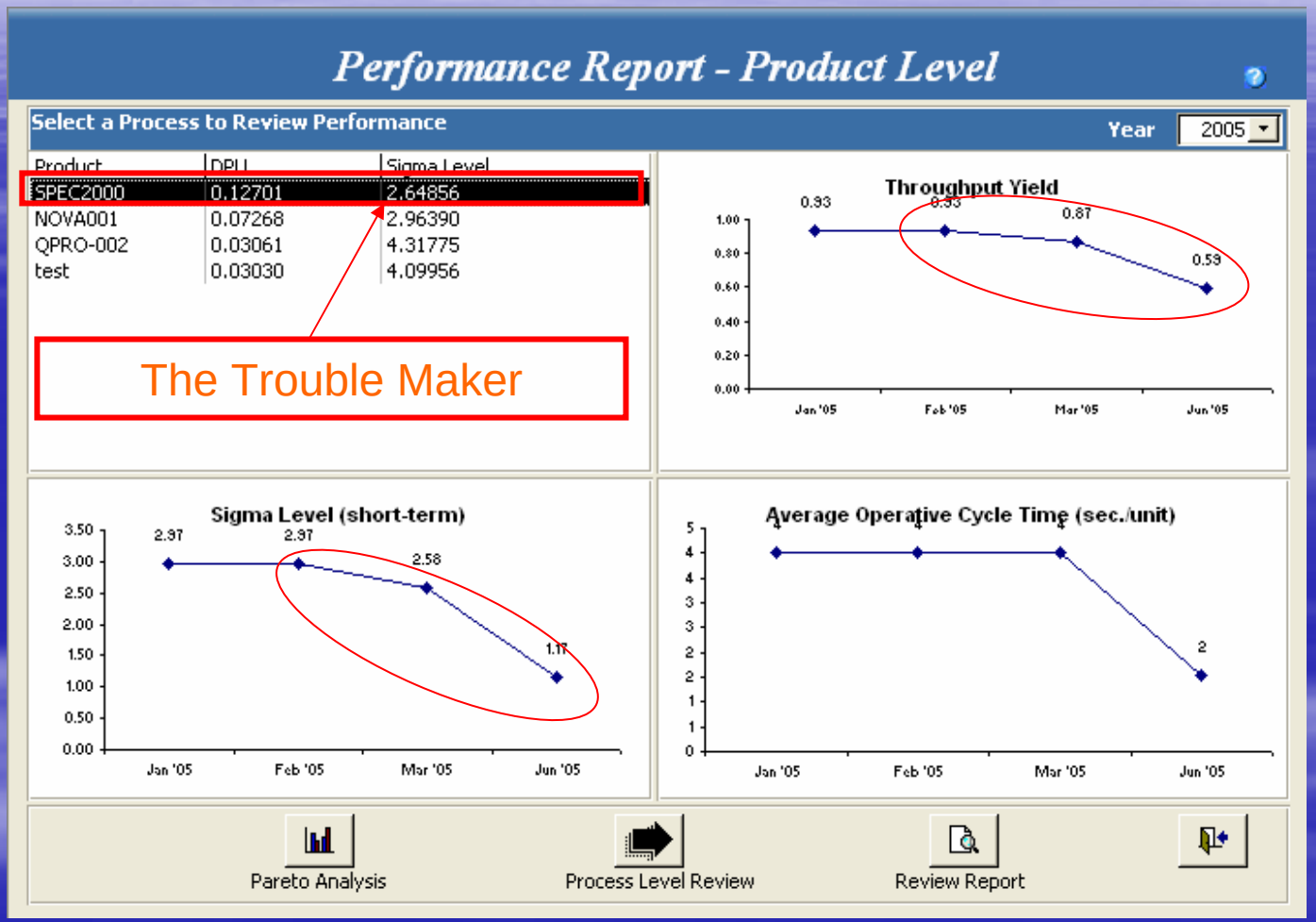
Next we are going to use examples from QIT Production Quality Management System to demonstrate the analysis approaches.

Visit QITConsulting.com to find out more details and download QIT Production Quality Management System

Example – System Level Performance Report

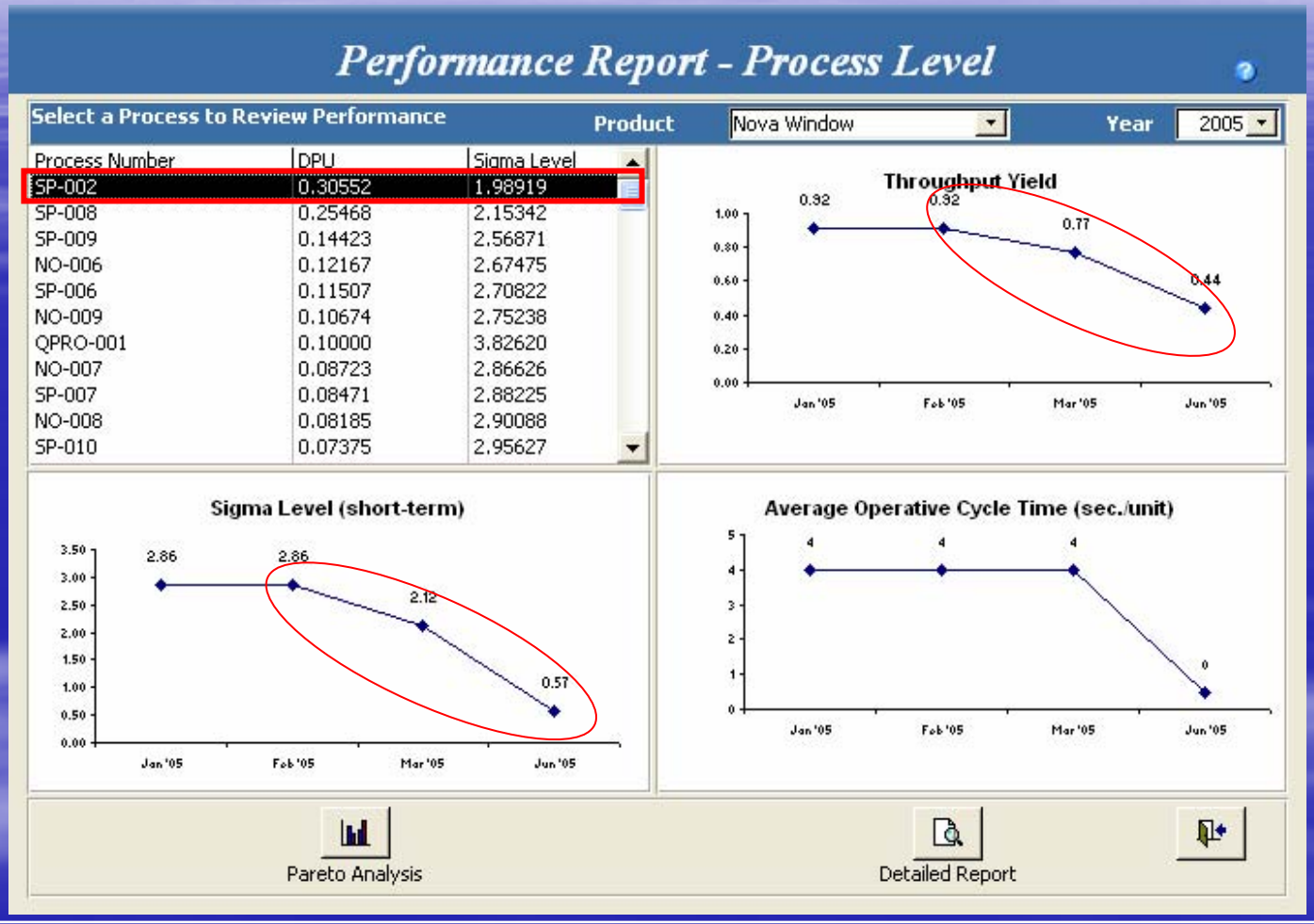


Example – Product Level Performance Report



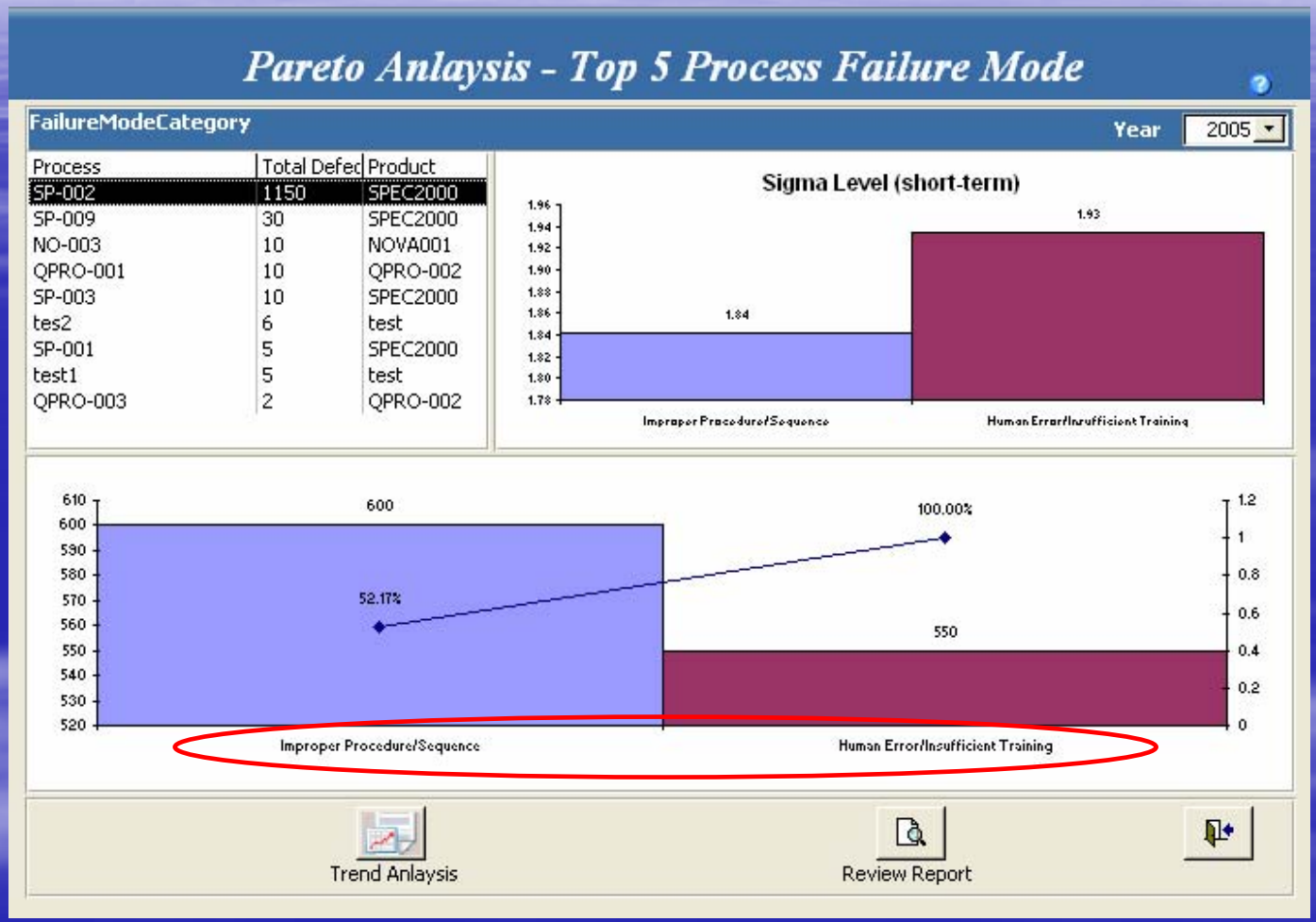
This example not only discovers the Trouble Maker, but also shows the product quality is in a down trend.

Example – Process Level Performance Report



By drill down to the process level of the Trouble Maker, this example highlights the key processes, which drag down the product quality.

Example – Process Level Pareto



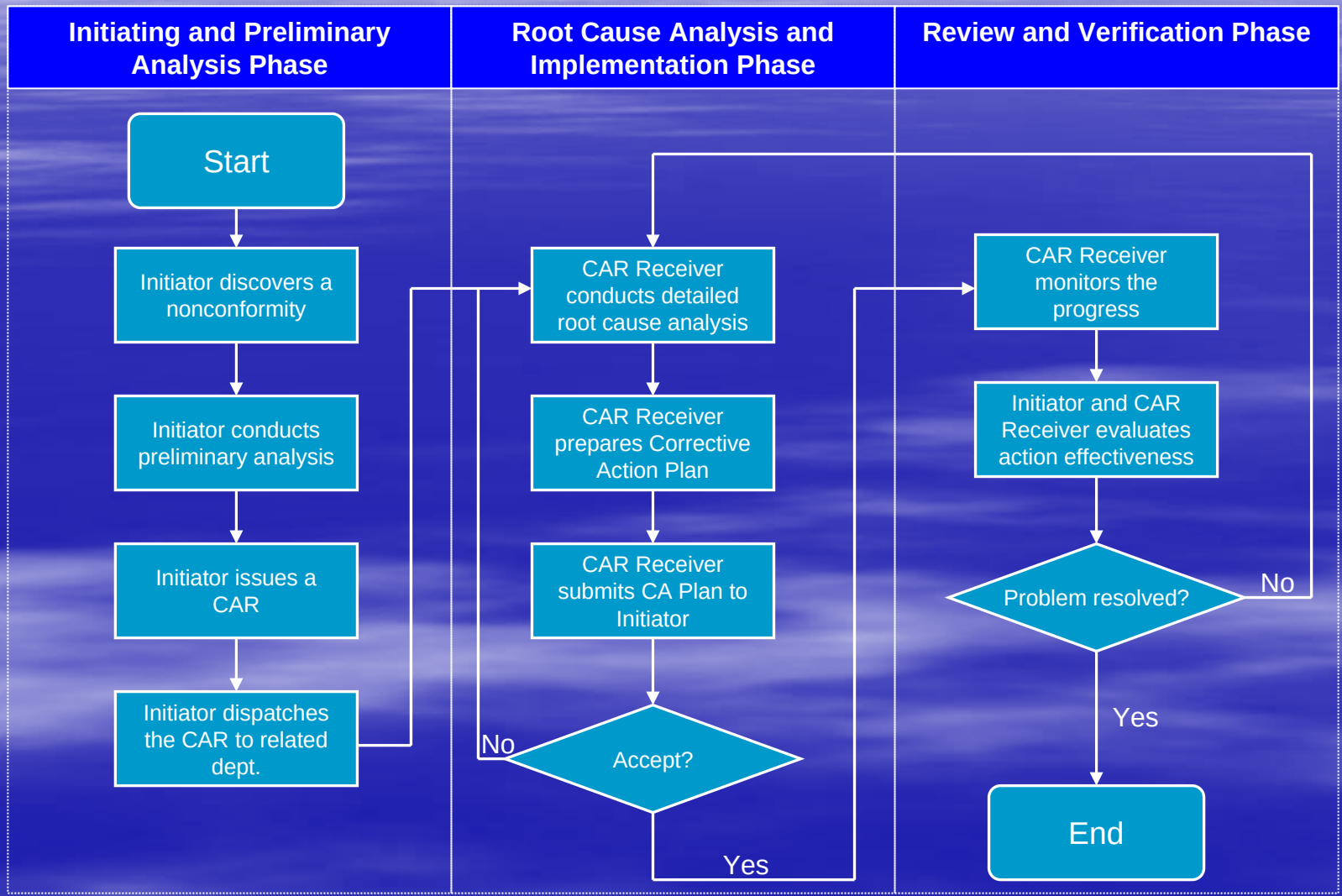
Now the key failure modes are defined, and a CAR need to be issued to this process owner.

Analysis Summary

- System performance review
  - To define the weakest point
- Product Level performance review
  - To define Trouble Maker
- Process Level performance review
  - To define key process
- Finally, Pareto analysis in Process level
  - To discover key failure mode

Improve the Process

Corrective Action Management System

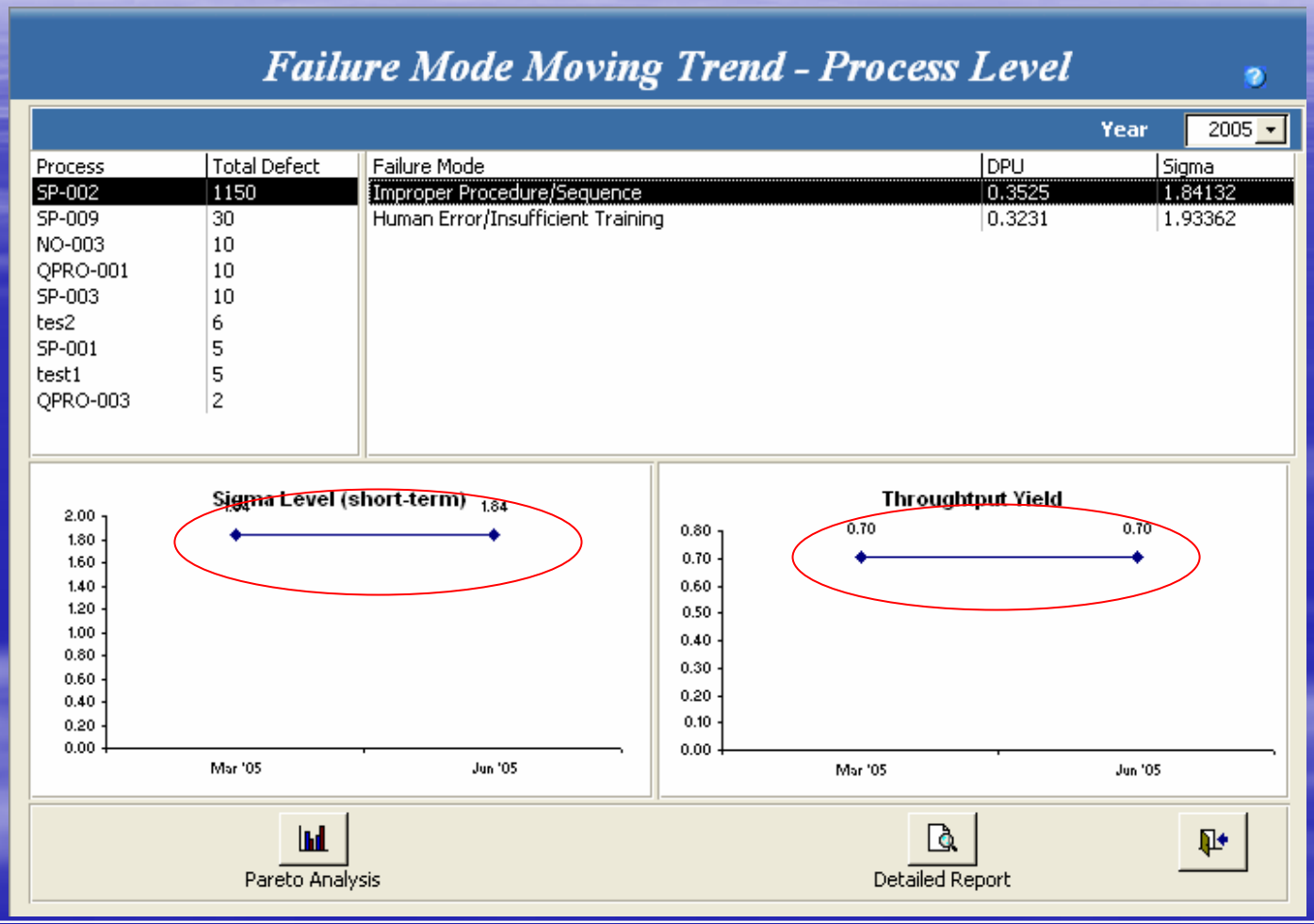


QIT Corrective Action Management System

- To find out more about a corrective action management system, please visit QIT On Line Training section.

Verify Long-term Effects

The Effects of the Corrective Actions

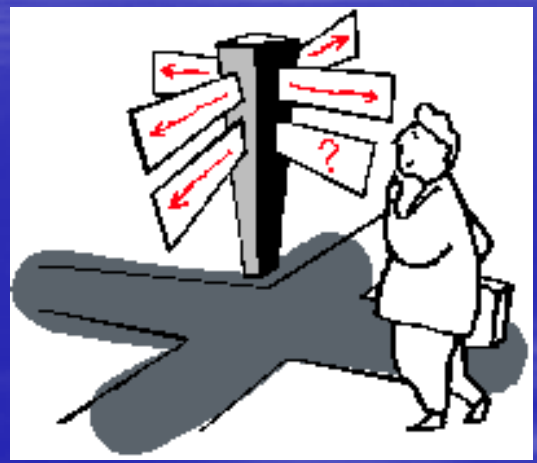


The improvement activities do not affect the process performance. New CAR is needed.

Summary

- Having the correct understanding of Six Sigma concepts and utilizing the right tool, Six Sigma implementation could be simple.
- The success factor of implementing Six Sigma is to define the key issues and resolve the key issues.

Need more information and helps?



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