

# Quality Group Practice Guides

## Metrics Guidelines

### Abstract

The purpose of this section is to introduce the concept of measurement and monitoring when applied to the software development and implementation processes. If you do not measure, you cannot manage, and hence you cannot demonstrate that you are improving by learning from past performance.

### Introduction

Measurement of processes is seen as a critical component of process improvement. Measurement of product helps to assure the quality of deliverables and in turn, also helps in the improvement of processes that contribute to product realisation.

This document should be read in conjunction with the following Quality Group Practice Guides:-

- Process Improvement
- Costs and Benefits
- How to Design, Implement and Maintain an Effective QMS

### Scope

To introduce the concepts of measurement (metrics) and the monitoring of trends as applied to all parts of the software development and implementation life cycle.

## Glossary of Terms

<b>Key Performance Indicators (KPI)</b>	A means of identifying aspects of performance, which are critical and/or mandatory when undertaking a task. Might be applied to a contract, might also be applied to personal or team performance.
<b>Service Level Agreement (SLA)</b>	A means of specifying the expectations of a customer in a support or service relationship. Normally used to contractually specify the minimum level and often regularly reported on.
<b>Balanced Scorecard</b>	The balanced scorecard is a <i>management system</i> (not only a measurement system) that enables organisations to clarify their vision and strategy and translate them into action. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. When fully deployed, the balanced scorecard transforms strategic planning from an academic exercise into the nerve center of an enterprise. The balanced scorecard suggests that we view the organisation from <u>four</u> perspectives, and to develop metrics, collect data and analyze it relative to each of these perspectives: Learning and Growth, Business Process, Customer Satisfaction and Financial

## **Process Description**

Quality boils down to delivering on time, at an agreed cost, a product or service that is fit for purpose and results in a satisfied customer and successful supplier business. To do this repeatedly one needs a set of processes and procedures that describe how to perform the necessary tasks leading to successful delivery of the product or service.

These development and implementation processes can be viewed as a series of contracts between pairs of parties, each of these processes has a number of attributes which contribute directly to its success (such as time and effort/cost). These attributes can and should be measured. An indication of performance can be computed by comparing the planned figures with the actual figures.

A key to improving overall business performance is the improvement of each of the constituent processes to achieve the optimum.

## **Process**

There are a number of steps in setting up a metrics process:-

- ***Decide Which Processes To Measure***

This will depend upon what management insight is required or which of the processes are the focuses for improvement action. To do this the stakeholders in the process outputs need to determine what is important to them from a performance and efficiency point of view. It is certainly pointless taking measures that none of the stakeholders is interested in. Every metrication process **MUST** have a clear pay-back.

- ***Decide What Attributes To Measure***

Attributes come in many shapes and forms but in selecting a set for a process make sure they will give a sound view of the processes performance. Some attributes are bound to be more important than others so they may be weighted in your process.

- ***Select What Currency To Measure In***

The currency of the measure will be largely determined by the attribute. (If the attribute is software error then the currency is 'number'; whereas if the attribute is delivery timeliness the currency is 'time').

- ***Set The Benchmark***

To make any improvement one must establish from where you are starting, so the first measurement that is made is to establish a benchmark.

- ***Decide Upon A Review Process***

Improvement is something that requires constant attention. One needs to set up a process for reviewing the results from the measurement programme comparing with the benchmark (the starting position) to quantify any change.

- ***Determine How To Set Goals For Future Performance***

The final act is to agree goals for future performance of the process (or at least for the next iteration of the measurement programme). Once agreed these become the benchmark and you go round the process again and again until you decide that there is no more value to be achieved.

Measures of poor quality could be the number of 'defects' reported by clients. This may need to be moderated by the number of defects detected before shipping to the client. This may give a measure of the thoroughness of testing. It may also give a measure of the unreadiness of the software/system for testing.

By analysing the defects it may be possible to identify where a particular defect was introduced into the system, for example ambiguous requirements, poor design, poor programming. Such analysis may indicate which processes or parts of process may warrant improvement attention.

Other measures may be used to determine productivity, but many organisations may not be large enough to generate enough measurements to be statistically significant. For example, lines of code per developer per day. Pages of specifications produced/reviewed per day.

Any improvement initiative started as a result of the metrics programme must satisfy a basic test: Is the cost of making the improvement outweighed by the benefit to be gained? Provided it is - then go ahead and invest!

Note: cost and benefit might not always be measured financially but may be a balanced judgment of say customer relationship.

## Metrics and Checklists

The following are just a sample of the types of metrics that could be employed in a typical software development/implementation process. It is important for the stakeholders in the process outputs of each of the processes to determine the appropriate metrics based upon sound business or performance issues:

<b>Stakeholder</b>	<b>Metric</b>
<b>Customer</b>	Customer satisfaction  Balanced Scorecard  Project timescale, cost, functionality, errors  Support timeliness, bug fixes, upgrades, performance against SLA
<b>Senior Management</b>	Customer satisfaction and relationships  Business profitability  Balanced Scorecard  KPIs  Forward order book  Yearly performance against business plan
<b>Middle Management</b>	Overall Project performance against plan, timescale, effort, cost, risk, quality, sub-contractor  KPIs  Sales and marketing performance data  Staff training, retention, skill acquisition
<b>Project Manager</b>	Performance against plan: cost, timescale, risk, error rate, verification and validation performance (both review and testing), SLA performance, QA findings clearance, sub-contractors, suppliers, configuration management and release/update
<b>Test Manager</b>	Mapping of test verification to requirements, testing completeness, test error clearance
<b>Release Manager</b>	Installation defects, customer validation, incident reporting to fix timescale and effectiveness
<b>Quality Assurance Manager</b>	Audit findings clearance, external 9001 assessment non-conformity clearance, summation of Project metrics for senior management visibility, sub-contractor performance

## Further Reading

1. TickIT Guide - Using ISO 9001:2000 for Software Quality Management System Construction, Certification and Continual Improvement.  
[www.tickit.org/guide5.htm](http://www.tickit.org/guide5.htm) and click on 'Executive Overview' to sample.
2. Getting the measure of TickIT [www.tickit.org/measures.pdf](http://www.tickit.org/measures.pdf) - Draft guidance and information about the emerging ISO measurement standards for improving software processes
3. A good source of guidance is the NCC Towards Software Excellence web site: [www.software-excellence.co.uk/](http://www.software-excellence.co.uk/) to which the Intellect Quality Group has contributed material.
4. An article in TickIT International 4Q00 by Dr Maria Stergiou discusses the use of a Balanced Scorecard. [www.tickit.org/international.htm](http://www.tickit.org/international.htm) then click on 4Q00
5. The Balanced Scorecard by Kaplan and Norton - Harvard Business School press - ISBN 0-87564-651-3

There are so many publications and papers on the subject that it is impossible to provide a specific recommendation. To select publications that are relevant to your particular circumstances it is worth undertaking a search. A useful web site for a listing of publications is: [ivs.cs.uni-magdeburg.de/sw-eng/us/bibliography/bib\\_main.shtml](http://ivs.cs.uni-magdeburg.de/sw-eng/us/bibliography/bib_main.shtml)