"Call 911 – Measurement Needs CPR"

Extensive literature has been written about measurement and how to deal with it. And yet, more often than not, organizations are still struggling with implementing a successful measurement program. Ultimately the measurement program loses its credibility and slowly but surely dies. How did this happen? What went wrong? What should we do to bring measurement back on track? What is an indicator? What is a meaningful indicator? This paper addresses these questions and more by describing methods to approach, assess, and revitalize an existing measurement program by addressing its weaknesses.

Measurement activities are frequently performed without an understand of the basic roles of measurement in an organization. In order to understand what we are doing wrong we have to go back to basics and revisit the key measurement roles.
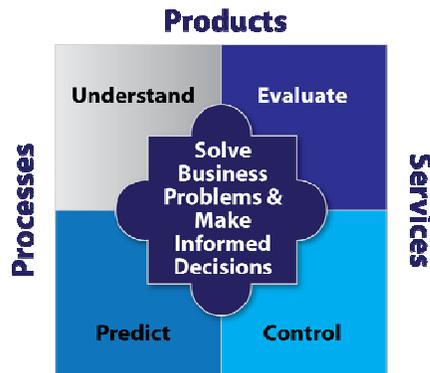

Measurement helps us to understand what should be measured to get the insight and information regarding our processes, products and services; to evaluate the progress toward our pre-defined goals and objectives which will allow us to gain control over processes, products, and services in the short run and, in the long run to predict what will happen in the future.

Ultimately, measurement helps us to solve business problems and to make informed decisions.

There are many factors that lead to a successful measurement program, but three of these factors are considered fundamental to ensure *ongoing* success. First, we need to have a measurement process that is tailored to the specific organization. Second, measures that are identified need to align with the organization's established goals and objectives and should follow an established structure defined by the **Measurement Information Model** and the **Measurement Construct**. Third, measurement results need to be understood and used as part of the decision-making process.

The Measurement Information Model provides a well-defined path that directly supports the decision-making process. Decision-makers need to have informed insight to manage established objectives and goals, and the Information Model helps to identify specific measures to satisfy this need. Measurement results, combined with recommendations, provide the information needed to make informed business and process decisions.

Measurement Information Model Relationships
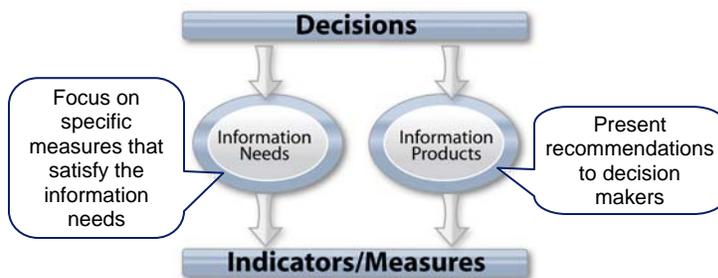
Goals – Questions – Indicators – Measures (GQ(I)M) workshops are important to maintain continuous alignment of indicators and measures with established goals and objective. Measures are selected to satisfy information needs that are responding to organizational or project goals and objectives. These links are essential to ensure that measurement is relevant and meaningful.

The **Measurement Information Model** is also a mechanism that links different measurement concepts and terms and provides a basis for consistently and accurately communicating measurement results. The model aligns the information we *must* have to make decisions with the measures we *should* collect to quantify the information and the entities that *can* be measured. The model also ensures horizontal and vertical alignment and integrates an intangible side which aligns Goals, Information Needs, Measurable Concepts, and Entities, as well as a tangible one which aligns Objectives, Information Products, Indicators, Derived Measures, Base Measures, and Attributes.

Measurement Information Model
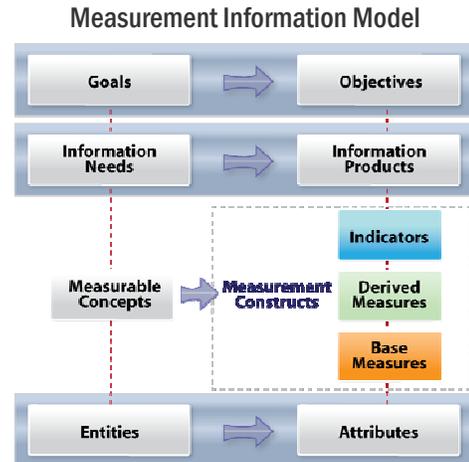
The **Measurement Construct** is a structure that captures a specific way of implementing a Measurable Concept and shows how measures link to specific Information Needs. "The Measurement Information Construct" document is a format that will specify "what" "when" and "how" should be measured and how data will be combined to produce results that will satisfy the identified Information Needs.

Based on the measurement activities there are three levels of measurement that correspond to: Base Measures, Derived Measures, and Indicators.

➢ **Base Measures** are the lowest level of data that can be collected. They are defined by a specified measurement method and represent the raw information generated by the project (no calculations are involved). Examples of base measures are: estimated size, actual size, number of defects.

➢ The next level represents the **Derived Measures** which use measurement functions that combine two or more measures to provide more information at a point in time. Examples of derived measures will be provided. Examples of derived measures are: size variance, defect density, defect removal rate.

➢ The highest level - the level where analysis is performed - represents the **Indicators**, that provide estimates or evaluations of specified attributes derived from an analysis model with respect to defined information needs and support the user with respect to making decisions. Examples of indicators are: requirements creep over the life cycle of a project, effort variance, training courses status.

How to choose the right measures and indicators is not the only factor that impacts the success of the measurement program. The intent of measurement is to provide the measurement users with information so they can make better decisions. It is essential to include stakeholders relevant to the subject of measurement to ensure a complete, useful, and effective result. As goals vary by organizational level so do the success factors related to those goals. For example, at the project level we are interested in plan execution, or quality for example, and at the enterprise level we are interested in future capability and customer satisfaction. Accordingly, different success criteria will generate different measures. For example at the project level we measure cost, schedule, effort, information that is crucial to manage the project. At the enterprise level, the interest is to measure the profitability and market share.

Well designed indicators facilitate communication of meaningful results. As a general rule, graphs should be not be too complex and should convey a clear message. Some guidelines of developing effective graphs:

– Have a descriptive title for the indicator, type of data, and component (if applicable) represented by the graph
– Ensure axis labels include type of units and scale markers, such as dates or counts
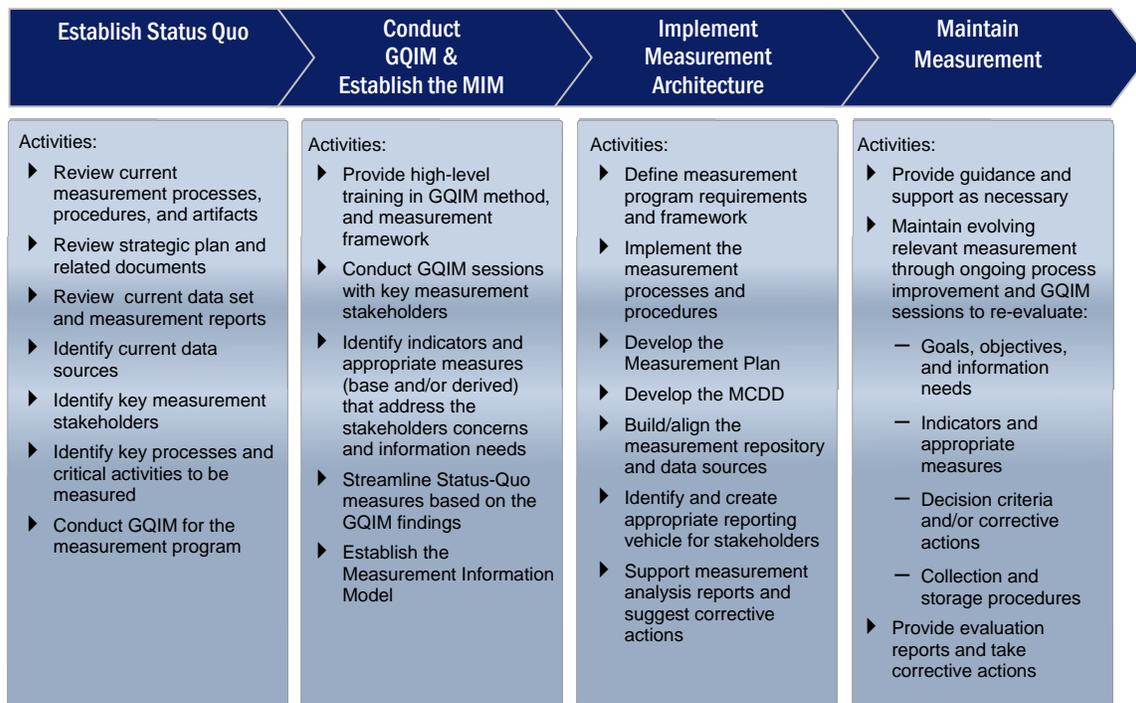
- Use a key that associates a label with each contrasting style of line, bar, or data point
- Use similar conventions for all reports; for example, always use solid boxes for actuals and open boxes for plans
- Adjust the horizontal axis to show the expected range of the data plotted
- Label significant events and trends in the data
- Pick graphical representations that are not misleading

Identifying meaningful indicators is crucial for the Measurement Program success. To guide the choice of the right indicators, use the following questions:

- Is the indicator responding to the program's goal(s) and objective(s)?
- Is the indicator providing the information that stakeholders need to know?
- Is the base or derived measure quantifying the progress towards the program's objective?
- Can the program use the defined set of measures to drive decision-making activities?
- Is the data readily available for collection?

Although extensive literature has been written about measurement, some organizations are still struggling with implementing a successful measurement program. The methodology presented in the diagram below combines the GQ(I)M framework with the concept of a measurement architecture, and shows step by step the process we need to follow in order to assess the current measurement program, address its weaknesses, and bring it back on track to effectively support the business decision-making process.

Steps to implement a Meaningful Measurement Program

Establish Status Quo	Conduct GQIM & Establish the MIM	Implement Measurement Architecture	Maintain Measurement
Activities:	Activities:	Activities:	Activities:
▶ Review current measurement processes, procedures, and artifacts	▶ Provide high-level training in GQIM method, and measurement framework	▶ Define measurement program requirements and framework	▶ Provide guidance and support as necessary
▶ Review strategic plan and related documents	▶ Conduct GQIM sessions with key measurement stakeholders	▶ Implement the measurement processes and procedures	▶ Maintain evolving relevant measurement through ongoing process improvement and GQIM sessions to re-evaluate:
▶ Review current data set and measurement reports	▶ Identify indicators and appropriate measures (base and/or derived) that address the stakeholders concerns and information needs	▶ Develop the Measurement Plan	– Goals, objectives, and information needs
▶ Identify current data sources		▶ Develop the MCDD	– Indicators and appropriate measures
▶ Identify key measurement stakeholders	▶ Streamline Status-Quo measures based on the GQIM findings	▶ Build/align the measurement repository and data sources	– Decision criteria and/or corrective actions
▶ Identify key processes and critical activities to be measured	▶ Establish the Measurement Information Model	▶ Identify and create appropriate reporting vehicle for stakeholders	– Collection and storage procedures
▶ Conduct GQIM for the measurement program		▶ Support measurement analysis reports and suggest corrective actions	▶ Provide evaluation reports and take corrective actions

The Measurement Architecture incorporates the fundamental components necessary to implement the measurement effectively and how they are integrated together

3

A quick assessment of the measurement program "before" and "after" implementing the above methodology provides the following diagnosis:

BEFORE	AFTER

☑ Too many measures lose the focus
☑ Broad data capture, not everything is relevant
☑ Measures don't reflect valid information needs (concerns or critical activities)
☑ No "indicators" established to show trend
☑ Progress not tracked against pre-defined milestones
☑ Don't support decision-making process (no decision criteria, no analysis model)
☑ No measurement analysis or evaluation performed
☑ No standard format for measures and indicators
☑ Data is unreliable; measures can not be validated for accuracy
	☑ GQ(I)M session performed - Indicators and measures are aligned with goals/objectives and address valid information needs;
	☑ Number of measures/Indicators significantly reduced
	☑ Measurement architecture implemented
	  - Measurement information model
	  - Measurement processes & procedures
	  - Measurement plan
	  - Indicators and measures captured in a structured form (MCDD)
	  - Measurement repository & data sources
	  - Measurement reports
	☑ Measures/Indicators support the decision-making process

We have seen above what we can do to "save" the measurement. Lets see now the things that can actually "kill" it.

Top "causes of death" for measurement:

▸ Try to measure everything (lose the focus)
▸ Just collect a bunch of data because it's available
▸ Measure things because some other program measured those things
▸ Use a "Bottoms-up" approach; we have our answers, now what are the questions?
▸ Don't align measures and indicators to well-articulated business goals, objectives, and current information needs
▸ Identify single measures to evaluate complex processes
▸ Collect data but fail to perform analysis
▸ Perform analysis but fail to take corrective actions
▸ Assume that measures and indicators are "set in stone"

Measurement Key Take Aways:

➕ The act of measuring does not, by itself, provide any real benefit

➕ Benefits are achieved when the information and insight provided by measurement are used to make informed decisions

➕ The activity of measuring often reveals larger issues and deeper problems than those that were the original reasons for measurement

"Knowing what to measure and how to measure it makes a complicated world much less so."

-Stephen D. Levitt

References

- Practical Software & Systems Measurement: http://www.psmsc.com
- Practical Software Measurement (PSM) Guidebook
- Goal-Driven Software Measurement Guidebook, W. Goethert *et. al.*
  http://www.sei.cmu.edu/publications/documents/96.reports/96.hb.002.html

Biography:

Mrs. Nanu is an Associate with Booz Allen Hamilton. She has an MBA from the University of New Orleans, Louisiana, and an MS in Electronics and Telecommunications, from the Polytechnic Institute, Bucharest, Romania.

Mrs. Nanu has over 20 years of professional experience in strategic planning, market analysis, contract negotiation, software cost estimation, measurement, and process improvement. Her other areas of expertise include CMMI, Practical Software Measurement (PSM), and Function Point Analysis (FPA). Mrs. Nanu is an active member of the International Function Point Users Group (IFPUG), and is a Certified Function Point Specialist (CFPS). Currently she is a member of the International Function Point Users Group (IFPUG) Membership Committee.

Mrs. Nanu is a frequent speaker at project management, measurement, and process improvement conferences.