



Applying PSM to Process Measurement



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7/28/2010 1

Topics



- **Why Measure**
- **Why Process Measurement**
- **Using Measurement Roadmap**
- **Collecting Process Information Needs**
- **Identifying Measurement Concepts**
- **Selecting Measures**
 - **Characteristics of Good Metrics**
- **Summary**



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7/28/2010 2

Why Measure?



- **Manage achieving an objective, goal or issue**
 - **Source: Customer, Company, Program**
 - **Derived from requirements, processes or policies**
 - **Priority**
 - **You measure what is important**

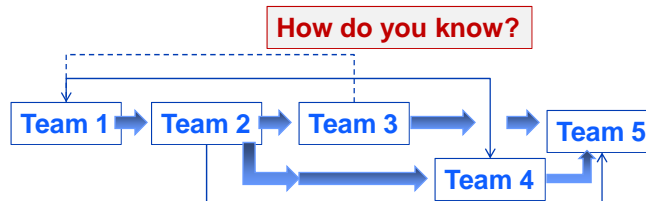
You need to insure your products and services meet your (internal and external) customer expectations effectively and efficiently



Why Measure? (cont.)



- **Can your customer use your work products or services?**
 - **Will they be available when expected?**
 - **Will they meet cost expectations?**
 - **Will they have the quality and maturity expected?**
 - **Will you have too much rework?**



You and your customer must agree on expectations, interfaces and priorities.



Process Measurement



- **3 Basic Types of Measures**
 - **Project Measures**
 - **Schedule, Cost, Quality, Quantity, Resources**
 - **Is the project meeting its commitments?**
 - **Product Measures (physical characteristics)**
 - **Size, Quality, Performance, Complexity, other**
 - **Functionality, Reliability, Maintainability, Usability, ...**
 - **Process Measures (performance of the process)**
 - **Process Efficiency**
 - Does the process create the work products or services using expected resources
 - Cost, schedule, productivity, rework
 - **Process Effectiveness**
 - Does the process create the right work products as executed by trained individuals using available tools?
 - **Consistency of Implementation**
 - Is the process being performed as expected?



Process Measurement



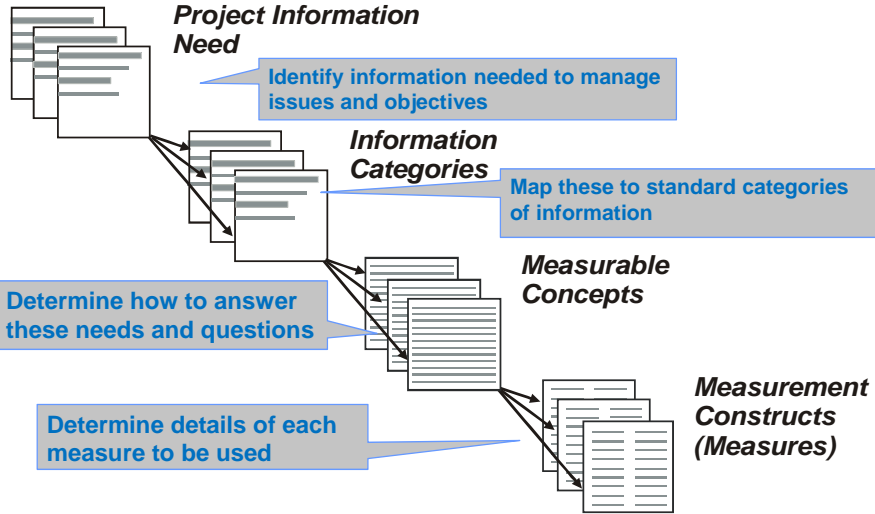
- **Leading indicator (warning) of downstream failures or successes**
- **Understand input and output expectations and impacts if they are not met**
- **Understand cause-affect relationship of inputs, outputs and process performance**
- **Data for future estimates and expectations**

How do we go about getting this information?



PSM Measurement Planning Roadmap

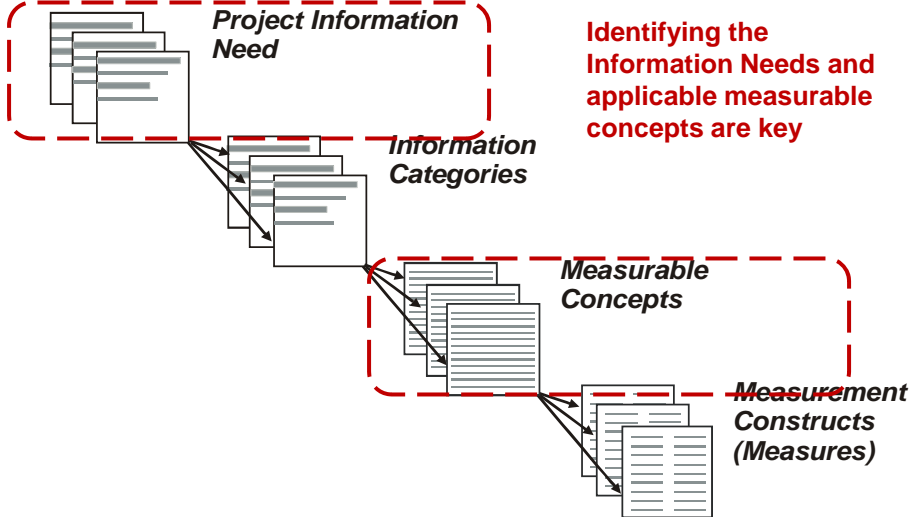
Objectives & Goals



M&A Planning

PSM Measurement Planning Roadmap

Objectives & Goals



M&A Planning

Method Used for Identifying Process Measures



1. Identify each process and its objective (purpose) & issues
2. Identify the inputs and outputs needed by each process to achieve its objective
3. Identify and prioritize information needed about your inputs from your suppliers so you can manage the process to its objectives
 - Map the information needs to information categories to frame the concepts
 - Review remaining information categories for other information needs
4. Communicate the list of inputs, information needs and measurement categories to your suppliers
5. Collect the process team's expected outputs and related information needs from your customers
 - Outputs you must generate including information needs



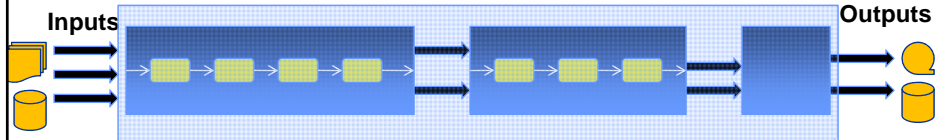
Method Used for Identifying Process Measures



6. Identify internal information needs necessary to manage the process and accomplish objective
 - Map these information needs to the standard categories
 - Review remaining categories for additional information needs
7. Identify measurement concepts to satisfy all information needs from all sources (internal and customer driven)
 - Satisfy 2 sets of information needs (outputs and internal)
8. Identify measurement constructs that satisfy the recognized information needs and related concepts
9. Select final set of measures to be used based on criteria



Process Measurement



- Understand your process and its components
- Identify inputs you need to produce the outputs your customer expects



Process Measurement



1. Understand the purpose / objective of your process
2. Identify inputs and outputs
 - Identify key drivers to your process
 - Inputs are those things you need to perform your process.
 - Outputs are those things required by your customers (internal and external)



Schedule?
Quantity?
Quality?
-Functionality
-Reliability
-Maintainability
Rework?

3. What information do you need about your inputs?
 - Map these information needs to standard categories
 (This will drive what measures your supplier needs to produce and status to you)

4. & 5. Collect the information needs and related categories your customers have about your outputs?
(This will drive what measures you provide your customers.)

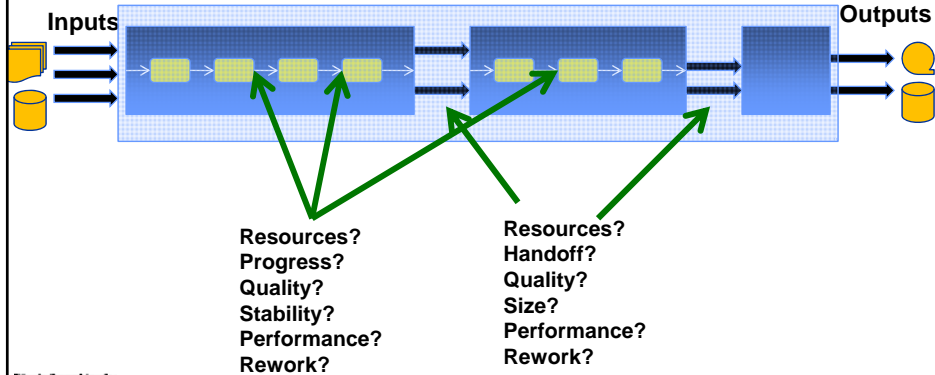
Schedule?
Cost?
Quantity?
Quality?
-Functionality
-Reliability
-Maintainability
-Others
Rework?



Process Measurement



6. Identify internal information needs you have to manage the process
- Map to information categories

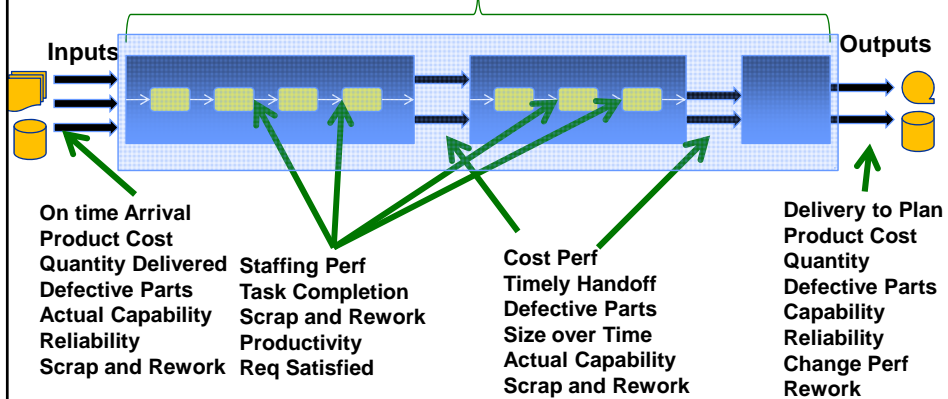


Process Measurement



7. Identify measurement concepts to satisfy the information needs
- Identify the measurement points and available data

- Cost Perf**
Schedule Perf
Staffing Perf
Productivity

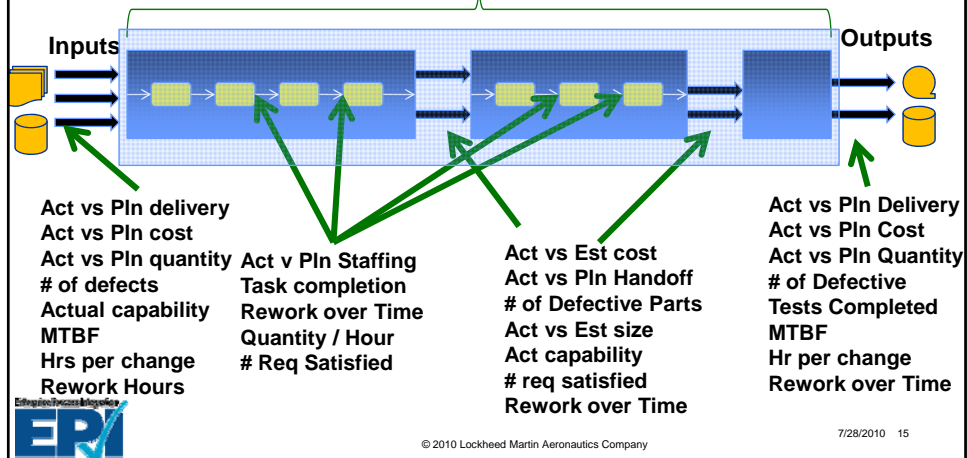


Process Measurement



Act vs Budget
Act vs Pln Schedule
Act vs Pln Staffing
Quantity / Hour

8. Identify existing or new indicators and measures to satisfy the measurement concepts
9. Select final set of indicators



Process Measurement



- **Keep in mind your objective and expectations**
 - What are you trying to achieve?
 - What is the highest priority?
 - What did you and your customer agree upon?
- **Only go one or two levels below your management focus**
- **Identify the key attributes and characteristics related to the objective**
 - Schedule and Progress?
 - Cost expectations?
 - Meet quality expectations?
 - Consistency?
- **Prioritize your objectives and related key attributes & characteristics**
- **Look for causal relationships (drivers)**



Measurement Indicators (examples)

If process delivering according to schedule is important.

<u>Information Need</u>	<u>Measurable Concept (Indicator)</u>
IN: Are interim work products being completed on time?	<ul style="list-style-type: none"> •Actual vs Planned completion of task over time
IN: Is there rework that will impact delivery?	<ul style="list-style-type: none"> •Actual vs expected rework accumulated over time
IN: Are your inputs arriving according to schedule?	<ul style="list-style-type: none"> •Actual vs planned delivery of inputs •Actual vs planned task completion of supplier tasks
IN: Is internal progress matching planned execution?	<ul style="list-style-type: none"> •Actual vs planned completion of internal tasks



Measurement Concepts (examples)

If performing cost to budget is important.

<u>Information Need</u>	<u>Measurable Concept (Indicator)</u>
IN: Is budget being used as planned?	<ul style="list-style-type: none"> •Actual vs Planned budget expenditure over time •At process and sub process level
IN: Is there rework impact to budget?	<ul style="list-style-type: none"> •Actual vs expected rework accumulated over time
IN: Are your estimates consistent with actuals?	<ul style="list-style-type: none"> •Difference between actuals and estimates over time
IN: Are suppliers performing to cost budget?	<ul style="list-style-type: none"> •Actual vs planned budget expenditure of suppliers



Measurement Concepts (examples)



If product quality is important.

<u>Information Need</u>	<u>Measurable Concept (Indicator)</u>
IN: Does product satisfy requirements?	<ul style="list-style-type: none"> •# of test procedures past •# of defects found in peer reviews •# of defects delivered
IN: Does the product have appropriate quality and defect free?	<ul style="list-style-type: none"> •# of FOD per final product •Actual defects vs expected defects •Amount of scrap and rework over time
IN: Is the product reliable?	<ul style="list-style-type: none"> •Mean time between failures
IN: Is the product usable?	<ul style="list-style-type: none"> •# of user problem reports over time
IN: What is quality of interim work products?	<ul style="list-style-type: none"> •# of defects found in peer reviews •Amount of scrap, rework and repair

FOD: Foreign Object Damage



Measurement Concepts (examples)



If process execution consistency is important.

<u>Information Need</u>	<u>Measurable Concept (Indicator)</u>
IN: Are there any compliance issues?	<ul style="list-style-type: none"> •# of audit findings per process
IN: Is the process performing consistently?	<ul style="list-style-type: none"> •# of products over time •# of defective products over time •# of labor hours over time
IN: Does the process need to be improved?	<ul style="list-style-type: none"> •# of process change requests over time



Measurement Constructs



- **Create list of potential indicators for the process**
 - Review standard indicators for match to measurement concepts
 - Review program specific indicators for match to measurement concepts
 - Identify new indicators needed based on remaining measurement concepts
 - Remove any duplication

Make sure they satisfy the measurable concepts identified



Select Final Set of Measures



Select your final set of measures based on the specific criteria

- **Effectiveness:** Does the measure satisfies the information need? Does the measure address management focus?
- **Relevance/Applicability to Domain:** Is the measure applicable to the process, product, or program domain? Does it address multiple information needs?
- **Clarity:** Can it be clearly interpreted?
- **Completeness:** Does the measure addresses key attributes of the information needs?
- **Timeliness/In-Process Insight:** Will the data be available when it is needed? Does the measure provide insight as the process is performed?
- **Simplicity:** Can the data easily be collected, analyzed, and understood?
- **Cost Effectiveness and Availability of Data:** Are the data economical to collect or currently being collected for some other reason? Is the information worth the cost to collect and analyze?
- **Repeatability:** Will the same results be obtained under the same conditions regardless of the analyst?
- **Accuracy:** Will the measures accurately satisfy the information need?
- **Lifecycle Coverage:** How much of the lifecycle phases does the measure cover?



Characteristics of a Good Indicator

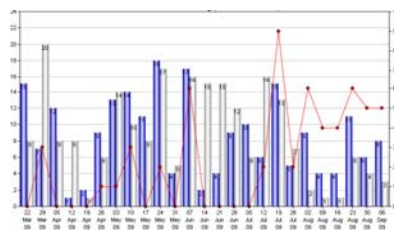


Major elements of a good indicator (metric)

1. **Purpose:** It must align to a business or management question (s). Satisfies one or more management information need.
2. **Target:** Target should align with goal or objective that drives the information need. Identify the target value and provide analysis to that target.
3. **Thresholds:** Are there interim targets of goodness? If so provide analysis to those interim targets.
4. **Trend:** What has the metric done over time? Getting better or worse? Is your Process in Control? Include trending analysis.
5. **Understandability:** The metric should be easily interpreted. Does it have a title, date, legend and scale?
6. **Owner:** Who is responsible for generating and analyzing the Metric ?
7. **Consumer:** Who must take action based on the results? Report analysis results to the consumer.
8. **Repeatable:** Will the measure give the same results under the same circumstances regardless of the analyst?

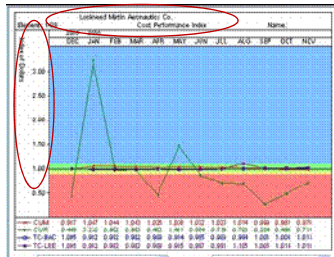


Characteristics of a Good Indicator (cont.)



Poor Metric Graph

- *Not easily understood*
 - *Metric should clearly show status and trend*
 - *No title or legend*
 - *No target*
- *Overly complex—Too much data on one graph*



Better Metric Graph

- *Goals & Thresholds provided*
 - *Metric shows status and trend*
 - *Title, legend and scale provided*
- *Easier to understand at a glance*



Graphical Techniques



Uses of some common graphical techniques

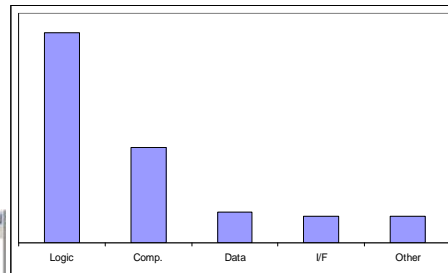
Graphical Technique	Tend Analysis	Comparisons	Execution Consistency	Causal analysis	Target
Line Chart	Yes	Yes	Yes	No	Yes
Column Chart	No	Yes	No	Yes	Yes
Pareto Chart	No	Yes	No	Yes	No
Control Chart	Yes	No	Yes	No	Yes
Bar Chart	No	Yes	No	Yes	Yes
Rock Pile chart	Yes	Yes	No	No	Yes
Histogram	No	Yes	No	No	Yes



Graphical Techniques (cont.)



Pareto Charts
Column chart ordering results largest to smallest



Column Charts
Identifies totals by category or grouping of data. Results is not ordered. May include a target value. May compare planned and actual for a category

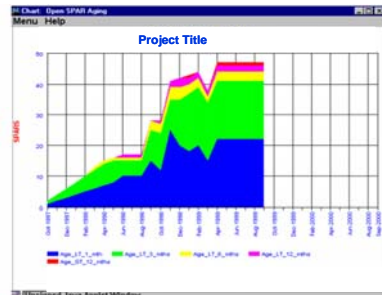
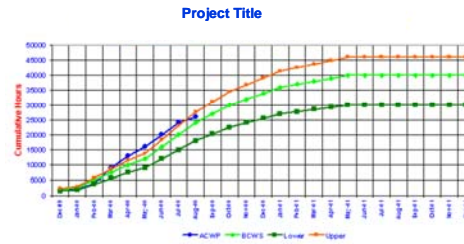


Graphical Techniques (cont.)



Line Charts

Provides time-based trend analysis. Usually compares actual to expected over time.



Rock pile Charts

Provides time based trend analysis including comparison to other data and targets. Useful in showing aggregates of similar data sets.

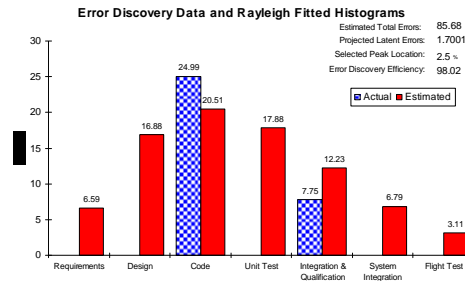


Graphical Techniques (cont.)



Histogram Charts

Column chart used to identify distribution of data. Helps identify type of control chart



Control Charts

Compares actual execution or defects to average and statistical expectation. Time based. Type of control chart based on type of data



Reporting Metrics Results



Definition: Define What is Being Measured Goal: Document What We Want the Measure To Be Process Owner: Name / Phone # Metric POC: Name / Phone # Frequency: Monthly As Of: MM-DD-YY Assessment / Root Causes: <ul style="list-style-type: none"> First Major Bullet Assessment <small>—Secondary Bullets are 2 Lines</small> Intent is to provide identifying causes/drivers and analysis—Pareto chart or similar assessment methodology Apply 4-step problem-solving methodology Formatting Notes: Use bullets & Arial font First Major Bullets 14 Bold. Secondary Bullets 12 Italic Changes from last briefing should be in blue font 	Copy metric/charts to put in upper right quadrant. Insert by Paste Special, PowerPoint Presentation Object. Size to fit upper right quadrant space. Right click and select Presentation Object → Show. Save when done. To Edit, right click, select Presentation Object → Open, edit information, and Save.
Countermeasures: <ul style="list-style-type: none"> Major Bullet for 1st Action ECD / % Complete 	Yellow/red items require an action plan including final step needed to RTG and planned closure date (ECD). Include % complete (by shading corresponding box) each time reported. Actual closure date should be reported when action is complete. Changes from last briefing should be in blue font.
Color Criteria Details — See Next Page	

Reporting Metric

- Purpose including objective
- Date of data or analysis
- Summary of results
- Graph
- Summary of current analysis
- Recommended actions to get back on track
- Why do the metric if you are not going to provide analysis?

Measurement and Analysis Process requires a summary of the analysis and recommended actions be included when reporting metrics.
Do not report a graph without analysis.



Summary



- **Process Measurement**
 - **Understand your process**
 - Objective and Purpose
 - **Identify the Information Needs**
 - Inputs from suppliers
 - Outputs to customers
 - Internal management
 - Key characteristics
 - **Identify the Measurable Concepts**
 - **Identify the Measurement Constructs**



Contact Information



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