Practical Software and Systems Measurement

Measurement for Process Improvement

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v. 0.4

Joyce Statz

Instructions to Reviewers:

In preparation for discussion at the PSM User Group Conference on July 28, 2004, please review this, considering the following questions:

- Are the explanations of the 3 areas of measurement clear enough for novice readers to understand our intent?
- Is the content of each table consistent with the text describing the measurement area for process improvement?
- Do the measurement specifications need any further elaboration, to be useful to readers?

Note: I'm using the textbook version of PSM as the most current version, against which the tables of measures are being prepared.

Please submit input to be considered there to statz@teraquest.com before July 27, or bring them to the session in person.

Thank you very much!

Table of Contents

1. BACKGROUND INFORMATION

Activities in the Practical Software and Systems Measurement (PSM) community since 1998 have formed the basis for this guidance on measurement for process improvement (PI). Teams met during PSM User Conferences and at PSM Technical Working Group Meetings to discuss the needs for measures, tailor existing PSM guidance to suit process improvement, draft new measurement categories, and explain example measures being used in their organizations for handling process improvement.

This paper consolidates the output of those sessions, leveraging the most recently published PSM guidance for software and systems projects.

2. AREAS OF MEASUREMENT FOR PROCESS IMPROVEMENT

The objectives and issues surrounding process improvement drive the measures required, generally in the following areas:

- Justification of the process improvement program, examining the investment costs and the business impact of the improved processes
- Readiness of the organization for process improvement
- Progress of the process improvement program

Organizations tend to have common categories of information needs, with common questions to be answered for these categories. The measures they develop are diverse, with organizations using subsets of these for justifying their improvement programs and for tracking outcomes. Readiness measures are observed in some organizations, though this is relatively rare.
Most measures of progress with process improvement programs are similar to those of software and systems programs and projects.

2.1 JUSTIFICATION FOR PROCESS IMPROVEMENT PROGRAMS

As for other programs, it is generally necessary for an organization to justify the time and effort to be spent in a process improvement (PI) program. In many organizations, the collection of improvement projects are incorporated into the organization's portfolio management efforts; therefore, improvement programs need to have a sound business case to gain and maintain resources for the program. This type of management care ensures that there is organizational commitment to the program, for documented business reasons – a key to success for any process improvement effort.

The business case used to justify the process improvement project may identify measurable impact in a variety of performance measures – for projects, organizations, and the enterprise as a whole. In addition, there may be measures of value to the users, often exemplified in adoption or compliance measures that show the new processes are both used and useful. Both impact and adoption measures are used to provide motivation for change, compare results of alternate approaches, ensure ongoing value of the ongoing investment, and meet a variety of other organization-specific needs.

Categories of information, common questions to be answered, and examples of candidate measures are discussed further in the section *Measuring Justification for Process Improvement*. In general, the material in this area is applicable to software and systems projects as well.

2.2 READINESS FOR PROCESS IMPROVEMENT

While the justification for a PI program may be clearly established, the current business situation, social environment, personnel situation, or some other factors may argue against starting a program at a particular time. The risks to success may be such that the program should be put on hold until conditions change significantly.

Risk to be addressed, common questions to be answered, and some mechanisms for identifying and analyzing them are discussed further in the section *Measuring Readiness for Process Improvement.*

2.3 PROGRESS WITH PROCESS IMPROVEMENT

Process improvement programs are performed using one or more projects throughout the duration of the improvement program (which may continue for the lifetime of the organization). Thus the progress can generally be measured using the PSM guidance for projects and programs. While all of the standard Information Categories apply, some of the questions addressed for software and systems projects need special interpretation for process improvement (PI) projects. Similarly, some of the Measurable Concepts need to be interpreted in the light of special PI project needs. Some of the measures used by software and systems projects apply directly to PI projects, some need to be tailored, and others are not relevant.

The section *Measuring Process Improvement Progress* describes which Information Categories, Measurable Concepts, and Candidate Measures for software and systems projects apply to PI projects, and how they need to be interpreted.

3. MEASURING JUSTIFICATION FOR PROCESS IMPROVEMENT

The issues addressed by this information category are those needed to justify investing in a process improvement project, providing data needed to

- compete against other projects for funding
- be compared for value to other projects
- decide whether or not to continue a given project
- be prioritized with other projects
- accumulate historical data for estimates for other projects
- demonstrate having met the objectives

In essence, this area establishes the business case for the PI project, based on an understanding of the investment costs as well as the primary business benefits to be achieved. The business case needs to be visible, actively monitored, and realistic. At major milestones in the program, a review of progress should also examine the viability of the business case.

3.1 PROGRAM OR PROJECT JUSTIFICATION INFORMATION CATEGORIES AND QUESTIONS

While there are many ways to describe costs and benefits of performing a process improvement project (or any other kind of project), at an abstract level the key questions are two:

- What is the cost of this program/project?
- What business benefit will we achieve as an outcome from the program/project?

For PI projects in any organization, the primary cost is the time and effort required to perform the improvement work, to deploy the results into the organization, and to learn to use the new process materials. In addition, there are generally investments in tools (and supporting systems), training, measurement (appraisals, assessments of progress), and (internal or external) consulting guidance from experts in the field.

The benefits from PI programs include outcomes that demonstrate a clear return on investment – added revenue to the organization; new knowledge or capability; improvements to cycle time, product quality, productivity, customer satisfaction, and/or cost. To identify the specific benefits requires questions that usually fall into one of these areas:

- Financial results
- Customer satisfaction
- Internal business processes
- Learning and growth of the organization

The Balanced Scorecard Measurement framework[1], along with the use of strategy maps, provides a method to generate a useful set of questions and measures to support an organization's goals and strategies in these four areas.

The measurable concepts identified for the Process Improvement Justification information category are these:

- Financial – financial goals and benefits from the program
- Customer Satisfaction – satisfying both internal and external customers, generally interested in things like price/performance, mean time to failure, response time to requests, etc.
- Internal Business Processes – practices and methods to develop, maintain, and deliver products and services, as well as to manage the people in the organization
- Learning and Growth - people-related concerns of the organization, such as technical skills of the staff, the number of staff, the level of domain knowledge, personnel turnover and morale, etc.

[1] See Kaplan and Norton books in the References section.

Candidate Questions Being Addressed by Measures		
Information Categories	Measurable Concepts	Questions Addressed
Program/Project Justification	Financial	How much will this project cost? What is the impact of not doing this project? What financial benefit will we achieve? What financial burden will we avoid? What impact will there be to our market share? What impact will there be on the organization assets, e.g., the Total Cost of Ownership of our technology assets?
	Customer Satisfaction	Will this increase customer satisfaction? Will this reduce the level of required customer support?
	Internal Business Processes	Will this improve our ability to meet customer goals or needs? Will this improve our time to market? Will this improve organization efficiency? Will this improve organization effectiveness? Will this reduce our cost of quality? Will this increase our predictability?
	Learning and Growth	Will it improve our workforce capability? Will it help us attract or keep talent? Will it help our resource utilization? Will it help our company morale? Will it help employee satisfaction? Will it increase our return on management? Will it improve our employee/manager ratio?

3.2 PROGRAM OR PROJECT JUSTIFICATION ICM TABLE

The information needs in this area can be met by some of the existing PSM measures, but several additional measures are needed, shown here in bold italic font.

Information – Concept – Measure Mapping		
Information Categories	Measurable Concepts	Prospective Measures

Program/ Project Justification	Financial	• Cost
		  o Amount invested (project, inventory and other costs – including personnel effort)
		  o Opportunity cost (lost revenue or other costs not avoided, by not spending the time or money on this or another effort)
		  o Savings (e.g. effort costs, capital investments, ongoing support, etc.)
		• award fee
		• ***revenue*** from sales, ongoing support, license fees; revenue in order backlog
		• ***market share*** (e.g. % of available market; number of new customers; level of repeat business)
		• derived measures such as asset value (cost of various assets, adjusted for time held), contribution to asset value; return on net assets; Total Cost of Ownership

	Customer Satisfaction	• satisfaction ratings (e.g. customer survey results) • problem reports (e.g. number of complaints or service calls) • effort (e.g. support hours)
	Internal Business Processes	• aggregation of all standard project measures across the organization of interest (e.g. Schedule and Progress, Resources and Cost, Product Size and Stability, Product Quality, Process Performance, Technology Effectiveness, Customer Satisfaction) • derived measures from project measures (e.g. time to market, cost of quality) • derived measures from process measures (e.g. capability baselines composed of aggregate project measures, process capability – current measure of level of performance to baselines and targets)
	Learning and Growth	• experience level (e.g. # of certifications, degrees, years of experience; domain coverage; technology coverage) • staff level (e.g. current employees, managers; number who have left) • staff turnover • satisfaction ratings (e.g. employee survey) • problem reports (e.g. suggestions in the suggestion box; comments in 1-1 session)

4. MEASURING READINESS FOR PROCESS IMPROVEMENT

Handling the risks to process improvement programs is essential, and the readiness measures are useful to establish the level of risk as a program is being considered. Failures of PI programs are expensive not only in the time and effort wasted, but in the loss of motivation for process improvement in the organization. Organizational change is difficult, and people will strongly resist a new change initiative, if they feel they've wasted their time on prior ones, and conditions are still the same.

Measures for this area might be used before, during, or after justification of the project. They may also be helpful when significant organizational changes occur as a PI program is underway.

While this information category is critical to process improvement programs, it also applies to systems and software projects as well.

4.1 Readiness Information Category and Questions

This Information Category is being addressed by two new measurable concepts, to be able to address the questions in the table below.

- Alignment and Commitment: how to determine whether or not the project is aligned with the organization goals, objectives, personnel, and culture. In addition, it seeks to determine whether or not the organization is committed to this project with sufficient involvement of management and availability of resources to enable the project to be successful.
- Process Improvement Capability: overall organizational capability to undertake this project with strong likelihood of success. Measures cover organization capability for doing process improvement, for making organization changes, and for establishing current process capability baselines.

These concepts also reflect the content of the Process Improvement Process Area of ISO 15504, one input to the development of this material.

Candidate Questions Being Addressed by Measures		
Information Categories	Measurable Concepts	Questions Addressed
Process Improvement Readiness	Alignment and Commitment	Is this project consistent with the business goals? What evidence is there of commitment to the project? What is the perceived value to each level of the organization? To what extent are there cultural or political barriers to this project?
	Process Improvement Capability	What is the capability of the organization's PI process? What is the capability of the organization to undertake organization change? (other than forced change) What is the organization's track record with respect to successfully implementing prior major initiatives? Can we establish the current performance of the area addressed by the project?

4.2 PROCESS IMPROVEMENT READINESS ICM TABLE

The information needs in this area can be met by some of the existing PSM measures, but several additional measures are needed, shown here in bold italic font.

Information – Concept – Measure Mapping		
Information Categories	Measurable Concepts	Prospective Measures
Process Improvement Readiness	Alignment and Commitment	• Satisfaction Ratings (e.g. on surveys of organization leaders and others) • ***Process Improvement Risk Ratings*** • ***HR Performance Measures*** • ***Level of Involvement***
	Process Improvement Capability	• Reference Model Ratings • Process Audit Findings • Satisfaction Ratings (e.g. using Organizational Change Surveys, surveys of past experiences) • derived measures from process measures (e.g. capability baselines composed of aggregate project measures, process capability – current measure of level of performance to baselines and targets)

5. MEASURING PROCESS IMPROVEMENT PROGRESS

When monitoring progress, process improvement projects share many characteristics with software and systems projects, thus many of the same information needs exist, and many of the same measures apply. The guidance for measuring progress of PI projects starts from the guidance for software; differences of interpretation are noted in the tables that follow. See Appendices A and B for the tables from which these were derived.

Note that deliverables of PI projects are generally documented organizational processes and process assets, deployed on navigable servers or web sites. Thus, some of the measurable concepts need to be interpreted in terms of the technology and access mechanisms used to *host* access to the process materials, rather than to the deliverables themselves.

5.1 PROCESS IMPROVEMENT PROGRESS INFORMATION CATEGORIES AND QUESTIONS

New questions or adaptations to existing questions, to be able to address this PI measurement area, are indicated in bold, italic font.

Candidate Questions Being Addressed by Measures		
Information Categories	Measurable Concepts	Questions Addressed
Schedule and Progress Resources and Cost Product Size and Stability Technology Effectiveness Customer Feedback	Concepts from the software table apply	Questions from the software table apply, with minimal interpretation needed
Product Quality	These apply directly: Functional Correctness Usability Reliability	Questions from the software table apply, with minimal interpretation needed Assumption: Reliability applies to the mechanisms used to host the processes
	Maintainability	How much maintenance does the system require? ***[applies to both the process materials and the mechanisms used to host the process]*** How difficult is it to maintain? ***[applies to the process materials]***
	Efficiency	Does the target system make efficient use of system resources? ***[for the mechanisms used to host the processes]***
	Portability	To what extent can the functionality be hosted on different platforms? ***[for the mechanisms used to host the processes]*** ***How easily can the process materials be tailored to meet circumstances of use?***
Process Performance	Concepts apply to the process being used for building and maintaining process materials	Questions need to be interpreted in the sense of building and maintaining process materials

5.2 PROCESS IMPROVEMENT PROGRESS ICM TABLE

New measures (or significant adaptations) needed to address this PI measurement area, are indicated in bold, italic font.

Information – Concept – Measure Mapping

Information Categories	Measurable Concepts	Prospective Measures	Adaptations for PI Projects
Schedule and Progress	Milestone Completion	Milestone Dates	No change
	Critical Path Performance	Slack Time	No change
	Work Unit Progress	Requirements Traced Requirements Tested Problem Reports Opened Problem Reports Closed Reviews Completed Change Requests Opened Change Requests Resolved Units Designed Units Coded Units Integrated Test Cases Attempted Test Cases Passed Action Items Opened Action Items Completed	Most require no change. • Units Coded becomes Units Developed These can be interpreted in terms of pilot tests of process materials. • Test Cases Attempted • Test Cases Passed
	Incremental Capability	Components Integrated Functions Integrated	No change
Resources and Cost	Personnel Effort	Staff Level Development Effort Experience Level Staff Turnover	No change
	Financial Performance	BCWS, BCWP, ACWP Budget Cost	No change
	Environment and Support Resources	Quantity Needed Quantity Available Time Available Time Used	No change
Product Size and Stability	Physical Size and Stability	Database Size Components Interfaces Lines of Code	Use in terms of process materials, e.g. • Web pages • Individual process items
	Functional Size and Stability	Requirements Functional Changes Function Points	No change No change Does not apply

Information Categories	Measurable Concepts	Prospective Measures	Adaptations for PI Projects
Product Quality	Functional Correctness	Defects Age of Defects Technical Performance Level	No change No change ***Adapt to address fitness for use [example provided]***
	Maintainability	Time to Restore Cyclomatic Complexity	Not applicable Not applicable
	Efficiency	Utilization Throughput Response Time	Not applicable to the process materials, apply to host mechanisms/ systems
	Portability	Standards Compliance	***Tailoring Difficulty***
	Usability	Operator Errors	No change
	Reliability	Mean-time-to-failure	Not applicable to the process materials, but do apply to mechanisms used to host them
Process Performance	Process Compliance	Reference Model Rating Process Audit Findings	Not applicable Applies with respect to use of standards for process development and maintenance
	Process Efficiency	Productivity Cycle Time	Apply to the processes used for process development and maintenance
	Process Effectiveness	Defects Contained Defects Escaping Rework Effort Rework Components	Apply to the processes used for process development and maintenance
Technology Effectiveness	Technology Suitability	Requirements Coverage	Applies to process standards and to mechanisms used to host the process set
	Technology Volatility	Baseline Changes	Applies to process standards and to mechanisms used to host the process set
Customer Satisfaction	Customer Feedback	Satisfaction Ratings Award Fee	No change Not applicable
	Customer Support	Requests for Support Support Time	No change No change

ACKNOWLEDGEMENTS

Many people played a role in developing this guidance, and we apologize if we no longer have the names of all the contributors. The effort was originally led by Don Dortenzo, and we dedicate this paper to his memory, in hope that it meets his original expectations.

Some of those involved in the work during the six years of its gestation include: Walter Benesch, Mike Bowern, George Brotbeck, Joe Caravello, Chui Fan Cheng, Peter Desilva, Harpal Dhama, Don Gantzer, Paul Helmich, Paul Janusz, Cheryl Jones, Sara Kidnell, Beth Layman, Tom Logan, Bob MacIver, Guy Mercurio, Jerry Moore, Wendell Mullison, Carol Muskett, William L. Norris, Jr., Dave Putnam, Natalie Reed, Kevin Richins, Garry Roedler, Terry Rout, Ken Stranc,, Joyce Statz.

For others who participated and for whom we don't have a trail of your commitment, thank you very much, and we apologize for not being able to recognize you publicly.

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APPENDIX A INFORMATION CATEGORIES AND QUESTIONS FROM PSM 4.0[2]

Candidate Questions Being Addressed by Measures		
Information Categories	Measurable Concepts	Questions Addressed
Schedule and Progress	Milestone Completion	Is the project meeting scheduled milestones?
	Critical Path Performance	Are critical tasks or delivery dates slipping?
	Work Unit Progress	How are specific activities and products progressing?
	Incremental Capability	Is capability being delivered as scheduled in incremental builds and releases?
Resources and Cost	Personnel Effort	Is effort being expended according to plan? Is there enough staff with the required skills?
	Financial Performance	Is project spending meeting budget and schedule objectives?
	Environment and Support Resources	Are needed facilities, equipment, and materials available?
Product Size and Stability	Physical Size and Stability	How much are the product's size, content, physical characteristics, or interfaces changing?
	Functional Size and Stability	How much are the requirements and associated functionality changing?
Product Quality	Functional Correctness	Is the product good enough for delivery to the user? Are identified problems being resolved?
	Maintainability	How much maintenance does the system require? How difficult is it to maintain?
	Efficiency	Does the target system make efficient use of system resources?
	Portability	To what extent can the functionality be hosted on different platforms?
	Usability	Is the user interface adequate and appropriate for operations? Are operator errors within acceptable bounds?
	Reliability	How often is service to users interrupted? Are failure rates within acceptable bounds?
Process Performance	Process Compliance	How consistently does the project implement the defined processes?
	Process Efficiency	Are the processes efficient enough to meet current commitments and planned objectives?
	Process Effectiveness	How much additional effort is being expended due to rework?
Technology Effectiveness	Technology Suitability	Can technology meet all allocated requirements, or will additional technology be needed?
	Technology Volatility	Does new technology pose a risk because of too many changes?
Customer Satisfaction	Customer Feedback	How do our customers perceive the performance on this project? Is the project meeting user expectations?
	Customer Support	How quickly are customer support requests being addressed?

[2] Source: PSM Support Center. *Practical Software and Systems Measurement, Objective Information for Decision Makers*. Version 4.0B, October 2000, p. 2-14

APPENDIX B I-C-M TABLE FROM PSM 4.0 [3]

Information – Concept – Measure Mapping		
Information Categories	Measurable Concepts	Prospective Measures
Schedule and Progress	Milestone Completion	Milestone Dates
	Critical Path Performance	Slack Time
	Work Unit Progress	Requirements Traced Requirements Tested Problem Reports Opened Problem Reports Closed Reviews Completed Change Requests Opened Change Requests Resolved Units Designed Units Coded Units Integrated Test Cases Attempted Test Cases Passed Action Items Opened Action Items Completed
	Incremental Capability	Components Integrated Functionality Integrated
Resources and Cost	Personnel Effort	Staff Level Development Effort Experience Level Staff Turnover
	Financial Performance	BCWS, BCWP, ACWP Budget Cost
	Environment and Support Resources	Quantity Needed Quantity Available Time Available Time Used
Product Size and Stability	Physical Size and Stability	Database Size Components Interfaces Lines of Code
	Functional Size and Stability	Requirements Functional Changes Function Points

[3] Source: McGarry, John, et.al., *Practical Software Measurement, Objective Information for Decision Makers* Boston, MA: Addison-Wesley, 2002, p. 37.

Information Categories	Measurable Concepts	Prospective Measures
Product Quality	Functional Correctness	Defects Age of Defects Technical Performance Level
	Maintainability	Time to Restore Cyclomatic Complexity
	Efficiency	Utilization Throughput Response Time
	Portability	Standards Compliance
	Usability	Operator Errors
	Reliability	Mean-time-to-failure
Process Performance	Process Compliance	Reference Model Rating Process Audit Findings
	Process Efficiency	Productivity Cycle Time
	Process Effectiveness	Defects Contained Defects Escaping Rework Effort Rework Components
Technology Effectiveness	Technology Suitability	Requirements Coverage
	Technology Volatility	Baseline Changes
Customer Satisfaction	Customer Feedback	Satisfaction Ratings Award Fee
	Customer Support	Requests for Support Support Time

APPENDIX C PROCESS IMPROVEMENT MEASUREMENT SPECIFICATIONS

Specifications for Process Improvement-Specific PSM Measures

Information Category	Measurable Concept	Measures
Program Justification	Financial	Revenue Market Share
Process Improvement Readiness	Alignment and Commitment	Process Improvement Risk Ratings HR Performance Measures Level of Involvement
Process Improvement Progress: Product Quality	Functional Correctness	Technical Performance Level (adaptation of standard one)
Process Improvement Progress: Product Quality	Portability	Tailoring Difficulty

Measure	Revenue
Measurable Concept	Financial
Information Category	Program Justification
Description of Measure: Computes the amount of income projected or realized (depending on use of the measure) from sale of relevant products or services	

Selection Guidance	Specification Guidance
Project Application • Applies to any type of transaction for which a customer pays money	**Typical Data Items** • Product • Services
Process Integration • Include in computations of forecasted earnings • Include in computation of income received	**Typical Attributes** • Number of units sold • Price per unit
Usually Applied During • Planning a product or project • Regular review of income stream	**Typical Aggregation Structure** • Product • Service • Organization • Category of product or service
	Typically collected for each • Product or service • Time period of sale or service
	Count Actuals Based on • Completion of a time period • Completion of a product or service offering

Measure	Market Share
Measurable Concept	Financial
Information Category	Program Justification

Description of Measure:
Computes the portion of the available market to be (or being) served by the organization.

Selection Guidance	Specification Guidance
Project Application • To establish or validate plans for taking a product offering to market • To monitor organization performance in a market segment	**Typical Data Items** • Available market size • Available market value • Total market size held by this product offering • Total market value held by this product offering
Process Integration • Used with other data about market characteristics and organization process performance, when estimating potential revenue from a new product offering • Used with data about current sales by this organization and others, to monitor the viability of a product offering	**Typical Attributes** • Number of potential users for products of this type, by geographic location of users • Number of actual (or projected) users for this product offering, by geographic location • Price of this offering, by categories (geographic, other as appropriate) • Price of competitive offerings, by categories
Usually Applied During • Product and market planning • Managing the business and monitoring contributions of particular product offerings to the organization revenue stream	**Typical Aggregation Structure** • Individual product • Product line • Geographic location • Individual competitor
	Typically collected for each • Product • Product line • Major geographic sales region • Major competitor
	Count Actuals Based on • Change in marketing strategy • Change in product offerings • Change in product capability • Change in competition

Measure	Process Improvement Risk Ratings
Measurable Concept	Alignment and Commitment
Information Category	Process Improvement Readiness

Description of Measure:

Rating of level of risk against categories of risk factors that affect process improvement effectiveness, addressing sources of risk that reflect aspects such as

- lack of business reasons for pursuing improvement
- unrealistic expectations of improvement
- placement of the project too low in the organization to make the change
- organization churn
- process thrashing/churn
- inexperienced process improvement team or leader
- inadequate support by senior management

(See the TeraQuest Process Improvement Risk Factor Table as an example of a reference used for risk identification with such categories of risk factors.)

Selection Guidance	Specification Guidance
Project Application • Used with any process improvement program	**Typical Data Items** • Categories of risk sources • Indicators of potential risk • Associated risk statement
Process Integration • Use as part of starting up an improvement effort • Include at key phase end points of an improvement program • Record specific lessons learned about risks into the table used as a reference for identifying risks	**Typical Attributes** • Cues to map current situation against indicators of high, medium, or low risk • Rating of high, medium, low applicability • Risk statements – description, probability level, level of loss, level of overall exposure for the program
Usually Applied During • Process improvement initiation • Justification of ongoing investment in a process improvement program	**Typical Aggregation Structure** • Category of risk • Rating level (high, medium, low) • Separation above and below a certain exposure threshold
	Typically collected for each • Improvement initiative what is a major investment of the organization • Sub-projects within an initiative
	Count Actuals Based on • Completion of risk identification

Measure	HR Performance Measures
Measurable Concept	Alignment and Commitment
Information Category	Process Improvement Readiness

Description of Measure:
Measurable performance evaluation objectives of individuals at various levels of the organization (especially in management ranks) are linked to their responsibility to the process improvement program as incentives to participate in making the program succeed. Attainment of the objective is generally based on involvement in the program, the results of the program, or a combination of these.

Selection Guidance	Specification Guidance
Project Application • Any process improvement program or specific project	**Typical Data Items** • number of managers and employees who have incentive measures
Process Integration • Sometimes used for all levels of the organization, not just management • Generally a low percentage of compensation is allocated to process improvement • It is best if the measure cannot be compromised • It is best if the measure is aligned with the business objectives	**Typical Attributes** • levels of managers and employees with incentives for the program • roles of managers and employees who have incentives for the program
Usually Applied During • all phases of full proves improvement program • performance evaluation life cycle	**Typical Aggregation Structure** • organization • management/employee level
	Typically collected for each • individual
	Count Actuals Based on • completion of the time period for the goal

Measure	Level of Involvement
Measurable Concept	Alignment and Commitment
Information Category	Process Improvement Readiness

Description of Measure:
Determines the level of involvement of senior management in project-related activities, to gauge level of organization support for project success. Involvement can be observed in various types of activities, with different levels of focus and depth.

Individual quantitative measures vary, focusing on time being spent by management and activities being performed by management, to ensure the organization is motivated to adopt required changes in their performance.

Selection Guidance	Specification Guidance
Project Application • Any process improvement program or project	**Typical Data Items** • count of managers involved • time to react to a request for decision or help • meeting participation • meeting attendance

Process Integration
• During initiation phases, the communication is focused on rationale for the program or project; ongoing reviews and communication by management are planned into the program or project.
• Throughout the program or project, the communication is an ongoing flow.
	Typical Attributes
	• number of managers involved, compared to a threshold for effectiveness in reaching the whole organization (ex. 3 of 5 need to be active)
	• calendar time (planned, actual)
	• meeting attributes:
	  • types of meetings involving management (e.g. steering committee, status, issue escalation)
	  • # of attendees by level of management
	  • frequency of meeting (annual, monthly, etc.)
	  • # actions taken
	  • # decisions reached
	• % of planned meetings in which process improvement is discussed as an agenda item

Usually Applied During • Throughout program or project	**Typical Aggregation Structure** • Organization/ sub-organization • Time period
	Typically collected for each • Meeting or request for assistance
	Count Actuals Based on • meeting completions • request completion • target date

Measure	Technical Performance Level (adaptation)
Measurable Concept	Functional Correctness
Information Category	Process Improvement Progress – Product Quality

Description of Measure:
This measure addresses how well the process material developed by the process improvement effort fits the needs of the people who will use it.

Selection Guidance	Specification Guidance
Project Application • Any process material	**Typical Data Items** • Level of adoption of the process material • Frequency that tailoring is required • Usability survey results • number of waivers issued • process audit findings related to the material
Process Integration • Appropriate training may affect the measure • Initiate use of this measure upon release of the process material, if pilots indicate trouble using it • Collect this measure on any troublesome process material, based on problem reports	**Typical Attributes** • Reasons for adoption/not • Tailored/not tailored • Reported level of usability • Types of waivers, reasons • Types of audit findings
Usually Applied During • selection of resources for the project • requirements definition • roll-out of the improvement	**Typical Aggregation Structure** • process material (individual item) across organizational use
	Typically collected for each • Instance of use of the material
	Count Actuals Based on • Completion of planning for use

Measure	Tailoring Difficulty
Measurable Concept	Portability
Information Category	Process Improvement Progress – Product Quality

Description of Measure:
The Tailoring Difficulty measure describes how much work is required to tailor process material to meet the different types of use for that material.

Selection Guidance	Specification Guidance
Project Application • applies to any process material	**Typical Data Items** • amount of change • time required to make the change
Process Integration • Tailoring should be based on guidance in the process set, or be approved by Quality Assurance	**Typical Attributes** • number of process aspects (features, requirements) to change • type of change (added, deleted, modified) • amount (% of total element changed) • time required (hours)
Usually Applied During • planning for use of the material	**Typical Aggregation Structure** • by process element, across the organization's use
	Typically collected for each • instance of tailoring
	Count Actuals Based on • Completion of tailoring