Acquisition Measurement

A Collaborative Project of PSM

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<<Add members who have made significant contributions>>

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1 ABOUT THIS PAPER

1.1 Purpose and Intended Audience

The purpose of this paper is to provide a foundation for the discussion and advancement of acquisition measurement. Its primary focus is on improving the way in which acquisition projects and organizations manage and conduct their own activities. A secondary focus is management and oversight of the supplier. As such, the intended audience includes individuals and organizations charged with managing acquisition projects or organizations, performing the day-to-day work of these projects or organizations, and improving acquisition process performance.

The material herein is based heavily on existing guidance developed by the Practical Software and Systems Measurement (PSM) Project. Information is available at www.psmsc.com. Readers unfamiliar with PSM are strongly encouraged to download and read Part 1 of the PSM Guidebook, which provides a brief introduction to PSM.

1.2 Organization

This paper provides acquisition measurement background and guidance as follows.

Section 2 sets the stage by defining *acquisition measurement* and the context and scope of acquisition covered. Several categories of acquisition and supplier measurement are defined, and their use and relationships discussed.

Once *acquisition measurement* has been defined, the motivation for its use is briefly reviewed, from both government and commercial acquirer perspectives. Section 2 concludes by highlighting the importance of attending to the measurement process as well as the measures when establishing and applying a measurement program. These two elements—measures and the measurement process—are addressed in Sections 3 and 4.

Section 3 introduces initial work by the Practical Software and Systems Measurement (PSM) project in identifying acquisition information needs and a corresponding set of acquisition measures. Details of these needs and measures are placed in Appendix C. Next, Section 4 describes how the activities of the PSM process apply to the acquisition measurement process. Both Sections 3 and 4 draw on existing PSM guidance, but while the existing guidance is directed toward the supplier, the focus of this paper is primarily on the unique aspects of the acquirer's role.

The remaining sections of the paper contain supplementary material. Section 5 identifies some references for additional information, while Sections 6 and 7 contain a glossary and acronym list. Finally, Appendices A-E provide materials to assist readers in determining how to identify and define information needs and measures relevant to their own acquisition activities.

2 INTRODUCTION TO ACQUISITION MEASUREMENT

2.1 Acquisition Measurement: Definitions and Scope

This section defines acquisition, acquisition measurement, and the broad categories of measurement relevant to acquisition. It is noted that each term defined herein may have valid alternative definitions, and some of these alternatives are included in Appendix A. However, the discussion in this paper uses the following generalized definition:

> *Acquisition* is the process of acquiring, by agreement (i.e., contract, partnership, or teaming arrangement), products or services to satisfy a specific set of user needs or requirements. The exact set of activities, processes, products and resources involved in an acquisition will depend upon the type of product or service acquired as well as the type of agreement employed in acquisition.

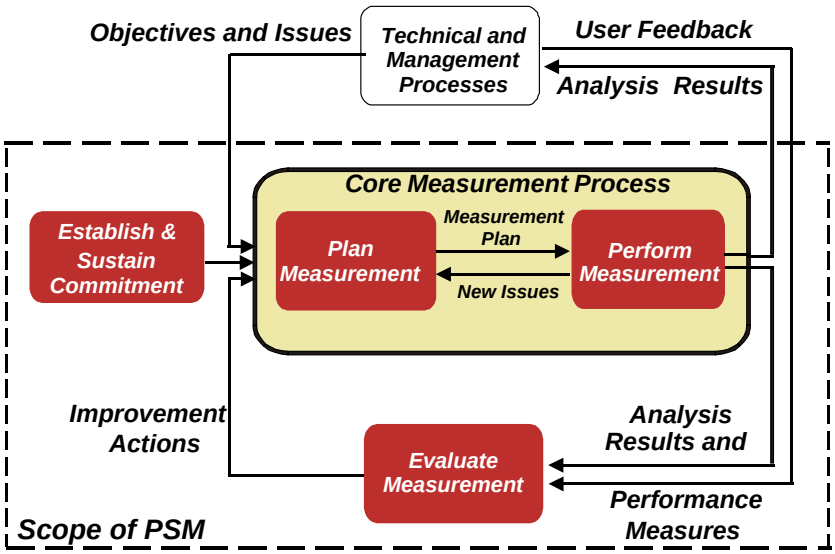
Given the above definition of acquisition, *Acquisition Measurement* may be viewed as the process an acquirer uses to obtain and apply quantitative data for effective management and control over the activities, processes, products and resources needed to conduct acquisition. A sound acquisition measurement process incorporates the four key measurement activities defined in PSM: Establish and Sustain Commitment; Plan Measurement; Perform Measurement; and Evaluate Measurement. Key steps of these activities are summarized in Table 1.

Table 1. Activities of the Practical Software and Systems Measurement (PSM) Process

PSM Activity	Key Activity Steps
Plan Measurement	Identify information needs. Select, prioritize, and specify corresponding measures. Prepare a measurement plan.
Perform Measurement	Collect and validate data. Process and analyze data. Generate reports. Make recommendations that lead to decisions.
Establish and Sustain Commitment	Obtain organizational commitment. Define roles and responsibilities. Provide resources. Review implementation progress.
Evaluate Measurement	Conduct pre-planned, periodic evaluations of the effectiveness of the measures and the measurement process against pre-defined criteria.

Figure 1 illustrates the relationships of the PSM activities with one another and with the technical and management processes of a project or organization. The four red boxes represent the four PSM activities. The gold Core Measurement Process box includes *Plan Measurement* and *Perform Measurement*, which comprise the "up and running" measurement process. *Establish and Sustain Commitment* provides resources and motivation for measurement. *Evaluate Measurement* is a pre-planned, objective, periodic activity to determine whether the measures and measurement process are working as intended.

Figure 1. The Practical Software and Systems Measurement (PSM) Process



To be effective, acquisition measurement must encompass all factors affecting the acquirer's ability to meet objectives, both internal factors the acquirer has control over and external factors it may be

unable to influence. The latter factors need to be measured and analyzed to enable the acquirer to respond appropriately to related risks and problems.

In this paper, the factors of interest for acquisition measurement are grouped into three categories of measurement. These categories are introduced in the next section, along with three corresponding categories of supplier measurement. While all six types of measurement are introduced, this paper is focused on acquisition measurement only, except as it deals with relationships between acquirer and supplier measurement activities. For more information on supplier measurement, consult the PSM Guidebook.

2.1.1 Categories of Acquisition Measurement

The acquirer is the entity responsible for conducting acquisition activities. Acquisition measurement has three different applications for the acquirer, *Project Monitoring Measurement* (PMM), a joint activity with the supplier; Acquirer Project Measurement (APM); and Acquirer Enterprise/Organization Measurement (AEOM). These are defined below. Corresponding categories of supplier measurement include the joint PMM activity, Supplier Project Measurement (SPM), and Supplier Enterprise/Organization Measurement (SEOM).

> Project Monitoring Measurement (PMM) focuses on the acquisition organization's role in obtaining, analyzing and applying supplier data for the purpose of monitoring the progress and quality of the acquisition. This application of measurement is addressed by existing PSM guidance. Acquirers use PSM's Plan Measurement activity to identify measures and PSM acquisition language to construct the RFP and contract. Suppliers also use PSM to develop measures and their measurement plans. The Acquirer-Supplier measurement definition and analysis activities for project monitoring have proven most effective when performed jointly. Examples of PMM measures include schedule progress for work units and delivered product defect density for delivered products.
>
> Acquisition Project Measurement (APM) focuses on selecting, defining, collecting, and analyzing data for the purposes of managing and monitoring the effort, schedule, and quality of the *acquirer's internal* products, processes and resources *applied to a given acquisition project*. APM is also responsible for collecting measures to meet enterprise/organizational information needs, as defined by the Acquisition Enterprise/Organization Measurement program (see below). There is little guidance available for APM. Examples of APM measures include progress measures for capability/ CONOPs development, and measures of review cycle time/effectiveness for reviewing internal work products (e.g., RFPs) and contractor deliverables (e.g., specifications).
>
> Acquisition Enterprise/Organization Measurement (AEOM)[1] focuses on enterprise- (or organization-) wide information needs. Examples of such needs include the need to report on organizational performance across a portfolio of acquisition projects, or to analyze needed infrastructure investments. Also, as more acquisition organizations consider improving their own processes, they will need to apply measurement to quantitatively characterize/baseline current capability, develop quantitative goals for improvements, and assess progress in reaching these goals. Examples of AEOM measures include cost, schedule, and defect/failure profiles across projects, and infrastructure performance and usage measures.

While the three categories of measurement identified above focus on the information needs of different levels of an enterprise, the measurement activities performed to meet the information needs will

[1] The distinction between "Enterprise" and "Organization" in this document is simplified as follows: An Organization is taken to be a collection of personnel, processes, and resources, within a larger Enterprise, responsible for acquiring a specified type of product or service or for performing a specified acquisition role within the Enterprise.

usually span levels. For example, if an AEOM information need is identified regarding the quality of Requests for Proposals (RFPs) released across an acquisition organization, then each project in the organization will need to plan for, perform, and evaluate measurement directed toward this information need, as part of its APM work. While the information need is at the organization level, project-level personnel will be involved in planning for collection of RFP quality data, performing some data analysis, and reporting the data as requested by the AEOM activity.

2.1.2 Categories of Supplier Measurement

The supplier is the entity responsible for delivering products or services that satisfy the terms of agreement entered into with an acquirer. The three categories of Supplier Measurement correspond closely to the three categories of acquisition measurement.

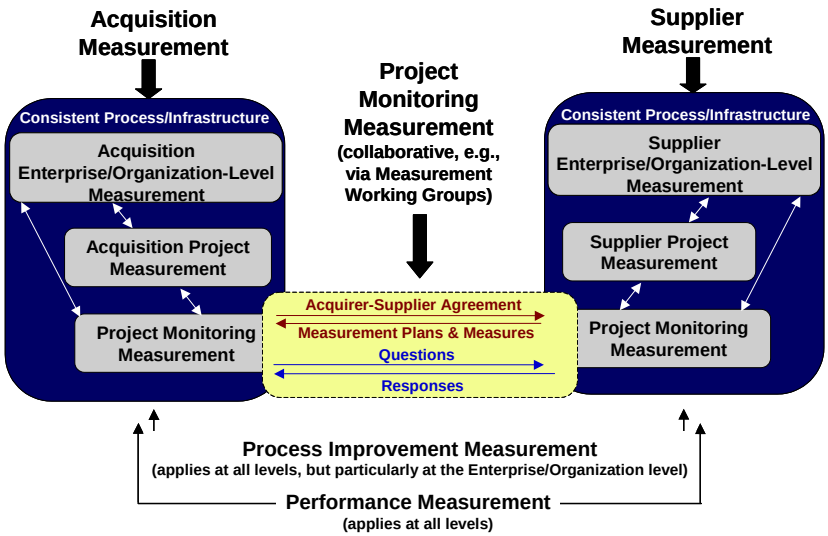
> Project Monitoring Measurement (PMM), for the supplier, focuses on the supplier's role in obtaining, analyzing and delivering data so that together, the supplier and acquirer can identify and manage risks and problems. Again, this application of measurement is addressed in existing PSM guidance. Examples of PMM measures were supplied in Section 2.1.1.
>
> Supplier Project Measurement (SPM) focuses on measures internal to the supplier that impact project management and performance. Example SPM measures include measures related to financial management such as those pertaining to supplier investments in the project.
>
> Supplier Enterprise/Organization Measurement (SEOM) focuses on measures internal to the supplier that focus on enterprise- (or organization-) wide information needs. Examples similar to those for AEOM would include defect profiles across projects and infrastructure performance and usage measures. Examples specific to SEOM would include enterprise-wide productivity and profit data.

Again, while the three categories of supplier measurement focus on information needs at different levels of an enterprise, the measurement activities required will usually span levels. For example, if an SEOM information need is identified regarding the defect densities in delivered products at the organizational level, then each project in the organization will need to plan for, perform, and evaluate measurement directed toward this information need, as part of its SPM work. While the information need is at the organization level, project-level personnel will be involved in planning for collection of defect data, performing some data analysis, and reporting the data as requested by the SEOM activity.

2.1.3 Measurement Category Illustration

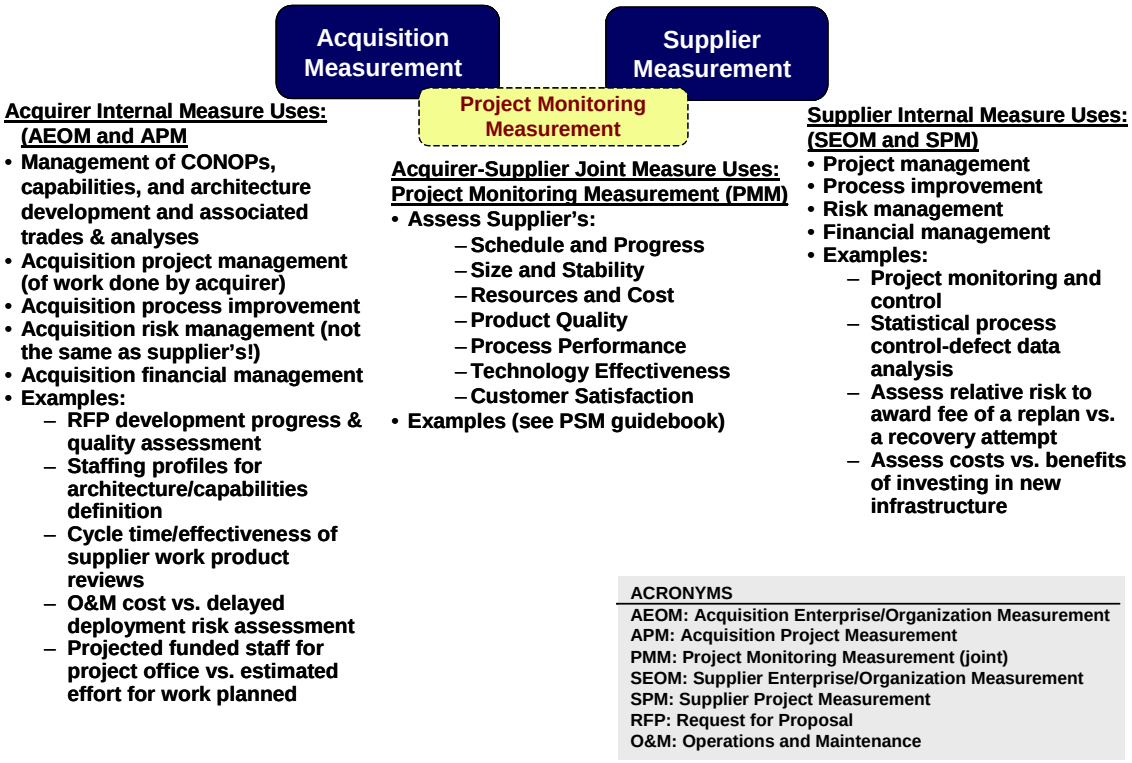
Figure 2 illustrates acquirer and supplier measurement categories. Again, the activities needed to address information needs in each category may require participation from multiple levels of an enterprise. Thus, each of the gray boxes shown refers to measurement roles, rather than organizational levels.

Figure 2. Acquirer-Supplier Measurement Roles and Relationships



The distinctions between measurement categories can be further examined by considering where Supplier and Acquirer concerns intersect and where they differ. Figure 3 provides examples.

Figure 3. Acquirer and Supplier Measurement Concerns



2.2 Motivation for Acquisition Measurement

While the value of Project Monitoring Measurement has been acknowledged and realized, the motivation for AEOM and APM may need explanation. Many reasons exist for applying measurement to an Acquisition Enterprise, Organization, or Project, and they all point toward the need for measurement in support of process improvement.

Anyone who has worked in or supported an acquisition project office recognizes that poor processes are responsible for problems in source selection, contract negotiation, and contract monitoring and management. Acquirers have long asked suppliers to focus on process improvement, and many have made substantial progress. But a successful acquisition is dependent on capable supplier *and* acquirer processes, and it is time for acquirers to revamp their processes so they can help rather than hinder. Measures in support of a given acquisition project office's activities and products fall under the APM category.

For DoD acquirers, public law 107-314, Section 804 of the Bob Stump National Defense Authorization Act for FY03, requires all military departments and those defense agencies that manage Major Defense Acquisition Programs (MDAPs) with a substantial software component to implement a software acquisition process improvement program.[2] This is generally applied at the Enterprise level, and is a key motivation for AEOM.

[I have a note here that Kevin will supply something from the FAR on the motivation for acquisition measurement]

Finally, although practices may differ in commercial firms, acquisition management is still an important activity. While competition may not be the primary motivation, improved supplier management is the goal, especially when goods and services are procured contractually for the firm's internal use or as an element of the goods and services the firm itself markets. *[Don, are you using "competition" in the marketplace sense or in a supplier selection context? Also, please ensure this paragraph is still correct, and fix as you see fit—I made some changes and hope I didn't lose the meaning.]*

2.3 Getting Started: Acquisition Measures and the Measurement Process

Implementing a solid acquisition measurement approach requires a focus in two key areas: identifying and defining measures and defining and establishing a measurement process. Section 3 describes work in progress to identify a set of measures for APM and AEOM. Section 4 provides guidance, recommendations, and lessons learned for implementing an acquisition measurement process. These sections draw on existing PSM guidance, but focus on characteristics of APM and AEOM that have not previously been addressed in detail.

3 IDENTIFYING MEASURES FOR THE ACQUISITION PROJECT AND ENTERPRISE

In the PSM process, the activity of identifying measures begins with a study of the information needed by the project, organization, or enterprise managers and decision makers. For APM, we can identify information needs by looking at the Acquirer's job and the acquisition strategy, and determining what we need to know to plan, manage, and control the work; to support decisions vital to project office health; to identify problems and risks early on; and to determine whether process improvement actions are having the desired effect. Appendix B, Strawman WBS for Acquisition Services, can be used as a guide in identifying the measurable elements of the Acquirer's job.

[2] While Section 804 is directed toward software acquisition, most – if not all – of its requirements apply equally to systems acquisition.

For AEOM, we can identify information needs by studying the questions Enterprise-level managers need to respond to (whether from Congress, the board of directors, or stockholders) that apply across the projects in their portfolios.

At any level, measurement information needs are identified through an iterative process of discussing acquisition problems and risks, proposed process improvements, and quantitative methods for tracking problems, risks, and the impacts of improvement actions. The goal is to make data available for decision making and to justify process improvement actions.

Appendix C, Acquisition ICM[3] Table, contains a draft table constructed from results of the Acquisition Measurement Workshop at the July 2004 PSM Users' Group Conference and updated at an October 2004 Acquisition Measurement Workshop. The table lists acquisition management questions/information needs and potential measures. The appendix also describes the intended use of the table in measurement selection, prioritization, and specification.

4 GUIDANCE FOR ESTABLISHING AN EFFECTIVE ACQUISITION MEASUREMENT PROCESS

Organization of Guidance. The guidance below is a supplement to existing PSM guidance directed toward the key needs and concerns of acquisition project offices, organizations and enterprises. PMM, APM and AEOM are discussed in turn in terms of the four PSM measurement activities, Establish and Sustain Commitment, Plan Measurement, Perform Measurement, and Evaluate Measurement. The discussions follow a consistent format, with a Context Statement, Roles and Responsibilities table, and list of relevant Lessons Learned for each activity.

Process and Infrastructure Efficiencies. A key point, illustrated in Figure 2, is that while three types of acquisition measurement exist, use of a single, consistent measurement process and infrastructure can and should be applied to the extent possible. Early attention to common, automated, and interoperable tools will facilitate this. It is therefore important to look across the three types of acquisition measurement for commonalities and synergies in PSM activities.

Measurement Activity Roles and Responsibilities. For each measurement role, it is necessary to assign responsibilities to individuals with the requisite knowledge, experience and commitment to implement and apply measurement. Role Names and corresponding descriptions are supplied in Table 2.

Table 2. Measurement Implementation Roles

Role Name	Description
Champion	Responsible for promoting the use of measurement and obtaining necessary funding and resources. Also responsible for ensuring the measurement user's information needs are met.
Executive Management	Responsible for identifying enterprise- and organizational-level information needs, supplying resources for enterprise and organizational-level measurement activities, and using data to make decisions impacting the enterprise or organization.
Project Management	Responsible for managing project cost, schedule, quality, performance, and risk. Involved in developing measurement information needs, reviewing measurement plan, and ensuring implementation. Uses measures; evaluates measures and measurement process. Supplies data to enterprise and organizational levels.
Measurement Analyst	Responsible for developing measurement plan, collecting and analyzing data, and reporting results. Also involved in evaluation.
Project Team / Data Providers	Responsible for assisting measurement analyst in identifying and defining measures, reviewing and supplying data, and evaluating the measures and measurement process.

[3] ICM: **I**nformation Need, Measurable **C**oncept, **M**easure

4.1 Project Monitoring Measurement (PMM)

4.1.1 PMM: Establish and Sustain Commitment

Context Statement

For PMM, Establish and Sustain Commitment includes obtaining agreement and resources necessary from both Acquirer and Supplier project management to define, implement and sustain the measurement effort needed to address project management information needs.

Table 3. PMM Roles and Responsibilities for Establish and Sustain Commitment

PMM Role for *Establish and Sustain Commitment*	**PMM Responsibilities for *Establish and Sustain Commitment***
Acquirer and Supplier Champion	– Promote sound use of measurement as a key management/decision tool.
Acquirer and Supplier Project Management	– Commit to using measurement data. – Review and approve measurement plan. – Review and ensure measurement plan implementation. – Identify and support refinements, as needed.
Supplier Project Management	– Include funding in contract expenses or overhead to support data generation and analysis. – Demonstrate in contractual plans intent to supply resources and follow through in supplying them (e.g., POC for data collection, analysis, infrastructure, tools, processes, training, and adaptation of the measures/measurement process).
Acquirer Project Management	– Ensure that the supplier adheres to the responsibilities identified above. – Include funding in project office budget to support data generation and analysis. – Allocate resources to support data generation and analysis (e.g., POC for data management, analysis, infrastructure, tools, processes, training, and adaptation of the measures/measurement process).

Lessons Learned

DO:

- Increase likelihood of commitment by educating acquirer and supplier Project Management on the value of, and process for, using quantitative data to support information needs.
- Ensure contractual plans include adequate resources and funding allocated to measurement.
- Work to establish an acquirer activity to accept, validate and analyze measures.
- Provide training at all levels that emphasizes the need to encourage reporting of accurate data and explains the consequences of penalizing the supplier for reporting negative information.

4.1.2 PMM: Plan Measurement

Context Statement

For PMM, the foundation for Plan Measurement is a collaborative acquirer-supplier activity that works to identify information needs, select and define effective and efficient measures to address the needs, and develop and implement a measurement plan that will ensure timely, valid data is available, analyzed and applied by both the supplier and acquirer in managing the project.

Table 4. PMM Roles and Responsibilities for Plan Measurement

PMM Role for *Plan Measurement*	**PMM Responsibilities for *Plan Measurement***
Acquirer Project Team	– For contractual agreements: o in RFP, specify contractual delivery of project measurement plan and tailorable set of measures, and require proposal to describe both (see PSM

PMM Role for *Plan Measurement*	PMM Responsibilities for *Plan Measurement*
	Guidebook for sample RFP language). o Ensure measurement expertise exists on proposal review team. – For all types of acquirer-supplier agreements, identify quantitative information needed to manage the project and the agreement and discuss with supplier.
Supplier Project Team	– For contractual agreements: o deliver information on proposed measurement plan and measurement set. – For all types of acquirer-supplier agreements, identify quantitative information needed to manage the project and the agreement and discuss with acquirer.
Acquirer and Supplier Measurement Analysts	– Develop plans for collecting, delivering (supplier)/receiving (acquirer), processing, analyzing, reporting, and using measurement data, and for evaluating the effectiveness of the measures and measurement process. – Identify analysis tools and techniques that need to be procured and that measurement users need training in. – Ensure the evaluation plan includes criteria for evaluating both the measures and the measurement process. Consider evaluations of information needs, priorities, changes due to movement to a new phase, and new measures.
Acquirer/Supplier Project Management and Champion	– Review implementation of measurement plan.

Lessons Learned

DO:

- Establish a joint acquirer/supplier working group to agree on information needs and measures to generate buy-in from both sides. Some of these needs will be joint acquirer-supplier needs and others will be unique to one party. The working group should strive to understand the perspectives and concerns behind the unique needs.
- Establish incentives (e.g., Award Fee) for good measurement practice and for identifying problems and risks early on.
- Identify a balanced set of measures that will supply information related to all project information needs, not just those related to cost and schedule.
- Focus on how measures can be used to provide early warning and insight into risk: in selecting measures, carefully consider how data will be used to address information needs.
- Start with a small set of measures with the ability to grow the set as required.
- Attempt to understand how information needs may change over the acquisition life cycle.; ensure sufficient flexibility exists in the agreement to accommodate information needs as they evolve throughout the life cycle. Establish decision criteria (e.g., thresholds) that can be used in measurement analysis.
- Ensure that the planned frequency and synchronization of data delivery supports information needs.
- Conduct frequent reviews during the planning process to ensure measurement project stand-up is proceeding effectively.
- Collect only the data necessary and sufficient to satisfy information needs; do not collect more data than be analyzed. Conversely, ensure the data collected is sufficient to support problem isolation and causal analysis.
- Ensure the plan for measurement program evaluation is defined to be cost effective and efficient, and that the evaluation sessions are scheduled.

4.1.3 PMM: Perform Measurement

Context Statement

For PMM, the foundation for Perform Measurement is a set of solid measurement plans, for both the acquirer and supplier. An appropriate contractual vehicle should exist defining the measures and the forms and frequency of delivery. The acquirer's measurement plan should include its approach to storing, validating, independently analyzing, and reporting data to decision makers.

Table 5. PMM Roles and Responsibilities for Perform Measurement

PMM Role for *Perform Measurement*	**PMM Responsibilities for *Perform Measurement***
Acquirer and Supplier Measurement Analyst	– Execute a data validation process that is defined in the corresponding (acquirer, supplier) measurement plan. – Normalize data; compare with benchmarks, if they exist. – Perform analysis and be prepared to compare results.
Acquirer and Supplier Project Management and Project Team	– Use the data to make decisions. – Reward reporting of honest data.
Supplier Project Team	– Provide the data for supplier analysis and for delivery to acquirer.
Champion	– Review use of measures.

Lessons Learned

DO:

- Show results to supplier measurement POCs prior to presenting to higher level management. Provide an opportunity to explain discrepancies, fix data problems, etc., before elevating issues.
- Develop an acquirer measurement analysis capability that goes beyond review of Powerpoint indicator slides (Powerpoint slide review is NOT measurement analysis).
- Use the acquirer measurement plan and acquirer-defined analysis process to conduct independent analysis of low-level data.
- Account for data noisiness (e.g., don't attempt more precise analysis than the data warrants) - consider ranges of numbers versus single data points.

4.1.4 PMM: Evaluate Measurement

Context Statement

For PMM, Evaluate Measurement consists of holding workshops both with Acquirer Measurement users and with the Supplier (in the joint working group format) to determine whether measures are delivering the needed information or whether the measures or measurement process should be adjusted.

Table 6. PMM Roles and Responsibilities for Evaluate Measurement

PMM Role for *Evaluate Measurement*	**PMM Responsibilities for *Evaluate Measurement***
Acquirer and Supplier Measurement Analysts & Project Management	– Ensure Evaluation sessions occur as planned. Hold them jointly where possible (it may be advisable to have acquirer and supplier preparation sessions first). – Ensure all stakeholders in the measurement process (measurement users, measurement champion, data providers) are included in the evaluation process – Ensure that measures and the measurement process are revised per evaluation findings, and that the revisions are reflected in performing measurement. – Review the evaluation process to ensure it is cost effective and efficient..
Acquirer/Supplier Project Team and Champion	– Participate in evaluation process.

Lessons Learned

DO:

- Ensure the evaluation sessions occur: without them, the usefulness of the measures and the effectiveness measurement process are likely to deteriorate.

4.2 Acquisition Project Measurement (APM)

4.2.1 APM: Establish and Sustain Commitment

Context Statement

For APM, Establish and Sustain Commitment includes obtaining agreement and resources necessary from Acquirer project and organization management to define, implement and sustain a measurement effort to address acquisition project office performance. This is key, since capable suppliers will likely fail if the products of and interactions with the acquisition project office are deficient.

Table 7. APM Roles and Responsibilities for Establish and Sustain Commitment

APM Role for *Establish and Sustain Commitment*	**APM Responsibilities for *Establish and Sustain Commitment***
Acquirer Champion	– Obtain support for project management to implement APM.
Executive Management	– Commit to using measurement data. – Provide additional resources, if APM is part of organization- or enterprise-wide process improvement.
Acquirer Project Management	– Commit to using measurement data. – Review and approve measurement plan. – Review and ensure measurement plan implementation. – Identify and support refinements, as needed. – Include funding in project office budget to support data generation and analysis. – Allocate resources to support data generation and analysis (e.g., POC for data management, analysis, infrastructure, tools, processes, training, and adaptation of the measures/measurement process).

Lessons Learned

DO:

- The acquirer project manager needs to be motivated to care about implementing a good measurement process and to use the data.
- The acquirer needs to practice what they preach to the supplier.
- See also lessons learned from Section 4.1.1, *PMM: Establish and Sustain Commitment*.

4.2.2 APM: Plan Measurement

Context Statement

For APM, Plan Measurement consists of identifying information needs related to the Acquisition Project Office's role in the acquisition, including its products, resources, and processes; prioritizing these needs for measurement; and developing and implementing a measurement plan.

Table 8. APM Roles and Responsibilities for Plan Measurement

APM Role for *Plan Measurement*	**APM Responsibilities for *Plan Measurement***
Acquirer Champion	– Ensure measurement plan meets information needs, as "advertised" to Executive Level management. – Review implementation of measurement plan. – Review measurement evaluation plan.
Acquirer Project Management and	– Review acquisition activities and products (see Appendix B, Acquisition Work

APM Role for *Plan Measurement*	APM Responsibilities for *Plan Measurement*
Measurement Analyst	Breakdown Structure) and identify key information needs for each. – Prioritize the information needs and select corresponding measures, considering data availability, effort/cost to collect, and potential value of the data. – Define measures and a PSM-based measurement process, and document in a measurement plan along with roles and responsibilities. Develop plans for collecting, processing, analyzing, reporting, and using measurement data, and for evaluating the effectiveness of the measures and measurement process. – Ensure the evaluation plan includes criteria for evaluating both the measures and the measurement process. Consider evaluations of information needs, priorities, changes due to movement to a new phase, and new measures. – Consider enterprise and organizational information needs and how they might be addressed with the APM measurement set. – Identify data providers and work with them to define a process for providing measures (e.g. template, scripts, process). – Identify analysis tools and techniques that need to be procured and that measurement users need training in.
Acquirer Project Team	– Work with measurement analyst to identify and define measures.

Lessons Learned

DO:

- Start small, especially since APM is likely to be new to most acquisition project offices. Start with a set of measures that have the greatest potential value.
- Focus on how measures can be used to provide early warning and insight into risk: in selecting measures, carefully consider how data will be used to address information needs.
- Inform the supplier of the APM measurement set, as appropriate (intent is to share information, not get approval).
- Conduct frequent reviews during the planning process to ensure measurement project stand-up is proceeding effectively.
- Ensure the plan for measurement program evaluation is defined to be cost effective and efficient, and that the evaluation sessions are scheduled.

4.2.3 APM: Perform Measurement

Context Statement

For APM, Perform Measurement consists of collecting, normalizing, validating, and analyzing data and providing analysis results and recommendations to the project manager.

Table 9. APM Roles and Responsibilities for Perform Measurement

APM Role for *Perform Measurement*	APM Responsibilities for *Perform Measurement*
Acquirer Champion	– Ensure results are being used. Spearhead necessary adjustments.
Acquirer Project Management	– Review results and determine whether actions are necessary to improve acquisition project office performance (e.g., additional resources in one or more areas of expertise, schedule adjustments, requirements changes, or tool enhancements). – Use data to produce better estimates of workload, improve resource allocation, assess technical work progress and quality (e.g., technical portions of RFP), etc. – Share information with enterprise/organizational level management.
Acquirer Measurement Analyst	– Analyze data and provide to project management.
Acquirer Project Team	– Supply data and answer questions.

Lessons Learned
DO:

- Use the data, ask follow-up questions, and adjust the measures/measurement process as needed.
- Summarize and share results with organizational and enterprise management, as appropriate (e.g., put problems on the table).
- Share results with supplier, as appropriate (e.g., be direct when delays are the acquirer's responsibility).
- Capture the data at the source (low-level data) so that you have sufficient data for investigation and can verify accuracy.

4.2.4 APM: Evaluate Measurement

Context Statement
For APM, Evaluate Measurement consists of reviewing measures and the measurement process to determine whether they are accurate, useful, and provide information needed to improve project office performance.

Roles and Responsibilities
Roles and responsibilities are similar to those for the Evaluate Measurement activity in PMM (Section 4.1.4).

Lessons Learned
See Lessons Learned for the Evaluate Measurement activity in PMM (Section 4.1.4).

4.3 Acquisition Enterprise/Organization Measurement (AEOM)

4.3.1 AEOM: Establish and Sustain Commitment

Context Statement
For AEOM, Establish and Sustain Commitment includes clearly identifying the champion for the measurement activity, the information needs, and the source and amount of resources to be applied for measurement. The champion also needs to be clear about the intended use of the data and how the data will be protected from disclosure and improper use.

Table 10. AEOM Roles and Responsibilities for Establish and Sustain Commitment

AEOM Role for *Establish and Sustain Commitment*	**AEOM Responsibilities for *Establish and Sustain Commitment***
Acquirer Champion	– Obtain support for implementation of AEOM. – Identify information needs. – Identify allowable and prohibited uses of measurement data. – Identify resources and funding to be applied toward enterprise measurement, *at both the enterprise and project level.* – Ensure data source protection. – Supply initial parameters and assumptions of measurement program to project/organization managers and others who will need to provide data. Look at existing measurement processes to estimate required resources and personnel qualifications.
Acquirer Project and Executive (Organizational/Enterprise) Management	– Review initial parameters of measurement program and provide feedback to sponsor. – Commit to using measurement data.
Acquirer Project Management	– Identify funding requirements to support data generation and analysis. – Allocate resources to support data generation and analysis (e.g., POC for data management, analysis, infrastructure, tools, processes, training, and adaptation

AEOM Role for ***Establish and Sustain Commitment***	**AEOM Responsibilities for** ***Establish and Sustain Commitment***
	of the measures/measurement process).
Executive Management	– Provide funding.

Lessons Learned

DO:

- Take precautions to ensure data will not be used to punish poor performance; otherwise, the manager will not get the valid, accurate data needed to manage the enterprise.
- Try to ensure long-term commitment to the measurement program, especially when the champion moves on.
- Continuously improve the measurement program to preclude deterioration; re-establish commitment to measurement, with a focus on information needed to sustain and enhance enterprise/organizational performance.

4.3.2 AEOM: Plan Measurement

Context Statement

For AEOM, Plan Measurement consists of identifying information needs related to the organization's or enterprise's goals, objectives, and reporting requirements; selecting, defining, and prioritizing measures to address these needs; communicating the measures and information needs to project managers and other parts of the enterprise from which data are to be obtained; documenting agreements, policies, or directives related to data delivery and usage; and documenting an enterprise measurement plan for conducting the enterprise-wide measurement process.

Table 11. AEOM Roles and Responsibilities for Plan Measurement

APM Role for ***Plan Measurement***	**APM Responsibilities for** ***Plan Measurement***
Acquirer Champion and Enterprise Measurement Analyst	– Review goals, objectives, and reporting requirements and identify information needs. – Identify and document policies, directives, and instructions related to enterprise-level measurement. – Identify existing measures or known data items and indicators (e.g., those already in use by projects/organizations). – Identify data/measure aggregation constructs. – Provide information needs and known measures, data items, indicators, and aggregation structures to project managers or organizations responsible for supplying data.
Enterprise Measurement Analyst	– Once an initial measurement set has been defined, develop a PSM-based measurement process, and document in a measurement plan along with roles and responsibilities, and provide to project/organization managers for review. Develop plans for collecting, processing, analyzing, reporting, and using measurement data, and for evaluating the effectiveness of the measures and measurement process. – Ensure the evaluation plan includes criteria for evaluating both the measures and the measurement process. Consider evaluations of information needs, priorities, and new measures. – Define approach to maintain data integrity - save enough contextual information to be able to interpret data correctly. – Identify analysis tools and techniques that need to be procured and that measurement users need training in.. – Enable projects to compare themselves with organizational norms and focus improvement efforts.

APM Role for *Plan Measurement*	APM Responsibilities for *Plan Measurement*
Acquirer Project and Organization Management	– Review enterprise information needs and measures and incorporate into project-level measurement activities and measurement plans (APM and/or PMM) OR suggest alternatives, if appropriate. – Identify issues with proposed enterprise measurement activities. – Review and make recommendations on enterprise measurement plan. – Decide on appropriate levels of data reporting/aggregation.
Acquirer Project Team	– Work with measurement analyst to identify and define measures.

Lessons Learned

DO:

- Start small, especially since AEOM is likely to be new to most acquisition organizations and project offices. Start with a set of measures that have the greatest potential value.
- Conduct frequent reviews during the planning process to ensure measurement project stand-up is proceeding effectively.
- Ensure the plan for measurement program evaluation is defined to be cost effective and efficient, and that the evaluation sessions are scheduled.
- Involve project / organization managers who will need to supply data.
    - Consider existing measures from APM and PMM.
    - Standardize where possible (perhaps on Information Needs, if not measures).
    - Define comprehensive measurement specifications to enable roll-up/aggregation across organizations/enterprise.
- Ensure the measurement process is designed to respond to evolving information needs.
- Allow drill down (to find common root causes), as well as aggregation (to represent organizational performance).
- Include project managers in the process for defining information needs.
- Allow tailoring at the project level.

4.3.3 AEOM: Perform Measurement

Context Statement

For AEOM, Perform Measurement consists of collecting, normalizing, validating, and analyzing data and asking questions/making enterprise-wide decisions based on the data collected.

Table 12. APM Roles and Responsibilities for Perform Measurement

APM Role for *Perform Measurement*	APM Responsibilities for *Perform Measurement*
Enterprise Measurement Analyst	– Analyze data and provide report to executive manager/champion.
Acquirer Project and Organization Management	– Provide requested data to organization/enterprise (usually delegated to project measurement analyst - usually aggregated from project level data). – Respond to questions/requests for further analysis.
Executive Managers and Other Measurement Users	– Review report and recommendations; make decisions based on the data.

Lessons Learned

DO:

- Use the data; ask follow-up questions.
- Share enterprise-wide results (but not sources) with project / organization managers.
- Maintain data integrity. *[Define what we mean by this.]*

DO NOT:

- Penalize the project or organization for reporting negative information; else, complete and honest data will not be reported. The key purpose of the data is to help the project manager improve and thereby help the organization/enterprise improve as well.

4.3.4 AEOM: Evaluate Measurement

Context Statement
For AEOM, Evaluate Measurement consists of reviewing measures and the measurement process to determine whether they are accurate, useful, and provide information needed to improve project office performance of its role in the acquisition.

Roles and Responsibilities
Roles and responsibilities are similar to those for the Evaluate Measurement activity in PMM (Section 4.1.4).

Lessons Learned
See Lessons Learned for the Evaluate Measurement activity in PMM (Section 4.1.4).

5 REFERENCES

- ***Practical Software Measurement: Objective Information for Decision Makers, McGarry, Card, Jones, Layman, Clark, Dean, Hall***
- PSM Guidance (www.psmsc.com)
- ***ISO/IEC 15939***
- Army Software Metrics INSIGHT articles (www.armysoftwaremetrics.org/products/insight.asp)
- ***Software Acquisition Management: Managing the Acquisition of Custom Software Systems, Donald J. Reifer and John J. Marciniak***

6 GLOSSARY

7 ACRONYMS

APPENDIX A: DEFINITIONS RELEVANT TO ACQUISITION AND THE ACQUISITION PROCESS

The working group involved in defining this paper's content has experience that spans a variety of entities that acquire products and services. Government development contractors, Department of Defense services, civil government agencies, commercial industry, FFRDCs and SETAs were represented. The group discovered a number of differences in the definitions of terms used to discuss acquisition measurement, differences reflecting the acquirer's regulatory environment, acquisition instruments, and organizational structure.

This appendix is an attempt at identifying the definitions the group reviewed for key terms used in this paper. The following key terms are defined; the source of each definition is cited along with the definition. Where more than one definition is included, the definition used in this paper appears first and is indicated by *. The glossary also defines these and other terms, but the group determined that the above were significant enough to treat in a separate appendix.

Basic Term	Definition Source(s)
Acquirer	ISO 15288
Acquisition	This paper (the definition used in this paper is a generalization of the definitions contained in the other references listed) Defense Acquisition University (DAU) Federal Acquisition Regulation (FAR) Software Acquisition Capability Maturity Model (SA-CMM) Capability Maturity Model Integration for Systems Engineering, Software Engineering, Integrated Product and Process Development and Supplier Sourcing (CMMI-SE/SW/IPPD/SS)
Acquisition Enterprise	This paper
Acquisition Organization	SA-CMM
Acquisition Planning	FAR
Acquisition Process	SA-CMM
Acquisition Project	SA-CMM
Acquisition Strategy	CMMI
Enterprise	CMMI and ISO 15288
Organization	CMMI and ISO 15288
Organizational Unit	CMMI
Project	ISO 15288, CMMI and SA-CMM
Project Manager	CMMI and SA-CMM
Project Office	SA-CMM
Program	CMMI
Supplier	ISO 15288, CMMI and SA-CMM
Entity Discussion	
Following definitions of the above terms, this appendix attempts to clarify the distinctions between the following types of entities, as employed in this paper: Enterprise, Organization, Project, and Program Distinctions	

Definitions of Terms

Acquirer The stakeholder that acquires or procures a product or service from a supplier. [Source: ISO/IEC 15288:2002(E), Systems Engineering – System life cycle processes]

Acquisition is the process of acquiring, by agreement (i.e., contract, partnership, or teaming arrangement), products or services to satisfy a specific set of user needs or requirements. The exact set of activities, processes, products and resources involved in an acquisition will depend upon the type of product or service acquired and the type of agreement employed in the acquisition. [Source: This paper.]

Acquisition is the conceptualization, initiation, design, development, test, contracting, production, deployment, support, modification, and disposal of systems, supplies, or services to satisfy a specific set of user needs or capability requirements. [Source: paraphrased from DAU on-line glossary, version 11, http://akss.dau.mil/jsp/Glossary.jsp]

Acquisition means the acquiring by contract with appropriated funds of supplies or services (including construction) by and for the use of the Federal Government through purchase or lease, whether the supplies or services are already in existence or must be created, developed, demonstrated, and evaluated. Acquisition begins at the point when agency needs are established and includes the description of requirements to satisfy agency needs, solicitation and selection of sources, award of contracts, contract financing, contract performance, contract administration, and those technical and management functions directly related to the process of fulfilling agency needs by contract. [Source: FAR Volume 1, Part 2, Definitions of Words and Terms, Subpart 2.1, Definitions, Issued September 2001 by the GSA, DoD, and NASA, http://www.arnet.gov/far/loadmainre.html]

Acquisition The process of obtaining through contract. [Source: SA-CMM, Version 1.03, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/publications/documents/02.reports/02tr010.html]

Acquisition The process of obtaining through contract, any discrete action or proposed action by the acquisition entity that would commit to invest (appropriated funds) for obtaining products and services. [Source: CMMI-SE/SW/IPPD/SS, Version 1.1, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/cmmi/models/models.html]

Acquisition Enterprise A collection of acquisition organizations reporting to the same acquisition authority. Enterprises may be composed of other enterprises. [Source: this paper]

****Acquisition Organization*** That entity which has the oversight responsibility for the acquisition project and which may have purview over the acquisition activities of a number of projects or contract actions. [Source: SA-CMM, Version 1.03, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/publications/documents/02.reports/02tr010.html]

That entity which has the oversight responsibility for the acquisition project and which may have purview over the acquisition activities of a number of projects or contract actions.

Acquisition Planning the process by which the efforts of all personnel responsible for an acquisition are coordinated and integrated through a comprehensive plan for fulfilling the agency need in a timely manner and at a reasonable cost. It includes developing the overall strategy for managing the acquisition. [Source: FAR Volume 1, Part 2, Definitions of Words and Terms, Subpart 2.1, Definitions, Issued September 2001 by the GSA, DoD, and NASA, http://www.arnet.gov/far/loadmainre.html]

Acquisition Process A set of activities that are used to acquire products. There are two aspects to the Acquisition Process: (1) acquisition organization's standard acquisition process – the acquisition organization's fundamental acquisition process which guides the establishment of each project's defined acquisition process, and (2) project's defined acquisition process – the project's tailored

version of (1). [Source: Paraphrased from SA-CMM, Version 1.03, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/publications/documents/02.reports/02tr010.html]

Acquisition Project a managed set of interrelated resources that acquirers one or more products for a customer or end user. This set of resources has a definite beginning and end and typically operates according to a plan. Such a plan is frequently documented and specifies the product to be delivered or implemented, the resources and funds used, the work to be done, and a schedule for doing the work. [Source: Paraphrased from the definition for Project in CMMI-SE/SW/IPPD/SS, Version 1.1, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/cmmi/models/models.html]

Acquisition Project An undertaking that is focused on acquiring products. [Source: SA-CMM, Version 1.03, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/publications/documents/02.reports/02tr010.html]

Acquisition Strategy The specific approach to acquiring products and services that is based on considerations of supply sources, acquisition methods, requirements specification types, contract or agreement types, and the related acquisition risk. [Source: CMMI-SE/SW/IPPD/SS, Version 1.1, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/cmmi/models/models.html]

Enterprise When CMMI models refer to an "enterprise," they illustrate the larger entity not always reached by the word "organization." Companies may consist of many organizations in many different locations with different customers. The word "enterprise" refers to the full composition of companies. For purposes of this paper, see ***Acquisition Enterprise***. [Source: CMMI-SE/SW/IPPD/SS, Version 1.1, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/cmmi/models/models.html]

Enterprise That part of an organization with responsibility to acquire and to supply products and/or services according to agreements. Note that an organization may be involved in several enterprises and an enterprise may involve one or more organizations. For purposes of this paper, see ***Acquisition Enterprise***. [Source: ISO/IEC 15288:2002(E), Systems Engineering – System life cycle processes]

Organization An administrative structure in which people collectively manage one or more projects as a whole, and whose projects share a senior manager and operate under the same policies. However, the word "organization" as used throughout CMMI models can apply to one person who performs a function in a small organization that might be performed by a group of people in a large organization. For purposes of this paper, see ***Acquisition Organization***. Source: CMMI-SE/SW/IPPD/SS, Version 1.1, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/cmmi/models/models.html]

Organization A group of peopole and facilities with an arrangement of responsibilities, authorities and relationships. [Source: ISO/IEC 15288:2002(E), Systems Engineering – System life cycle processes]

Organizational Unit A portion of an organizational unit that deploys one or more processes that have a coherent process context and operates within a coherent set of business objectives. An organizational unit is typically part of a larger organization, although in a small organization, the organizational unit may be the whole organization. [Source: Paraphrpased from CMMI-

SE/SW/IPPD/SS, Version 1.1, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/cmmi/models/models.html]

Program *(1) A project. (2) A collection of related projects and the infrastructure that supports them, including objectives, methods, activities, plans, and success measures. See also CMMI definition for "project." Note that this paper uses definition (1). [Source: CMMI-SE/SW/IPPD/SS, Version 1.1, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/cmmi/models/models.html]

****Project*** An endeavor with defined start and finish dates undertaken to create a product or service in accordance with specified resources and requirements. [Source: ISO/IEC 15288:2002(E), Systems Engineering – System life cycle processes]

Project In CMMI models, a "project" is a managed set of interrelated resources that delivers one or more products to a customer or end user. This set of resources has a definite beginning and end and typically operates according to a plan. Such a plan is frequently documented and specifies the product to be delivered or implemented, the resources and funds used, the work to be done, and a schedule for doing the work. A project can be composed of projects. [Source: CMMI-SE/SW/IPPD/SS, Version 1.1, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/cmmi/models/models.html]

Project An undertaking that is focused on acquiring or developing a specific product or products. Typically, a project as its own funding, cost accounting, and delivery schedule. [Source: SA-CMM, Version 1.03, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/publications/documents/02.reports/02tr010.html]

****Project Manager*** The role with total business responsibility for the entire project; the individual who directs, controls, administers and regulates a project. [Source: SA-CMM, Version 1.03, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/publications/documents/02.reports/02tr010.html]

Project Manager The person responsible for planning, directing, cotnrolling, structuring, and motivating the project. [Source: CMMI-SE/SW/IPPD/SS, Version 1.1, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/cmmi/models/models.html]

Project Office The aggregate of individuals assigned responsibility for acquisition in the contracted effort. A project office may vary in size from a single individual assigned part time to a large organization assigned full time. [Source: SA-CMM, Version 1.03, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/publications/documents/02.reports/02tr010.html]

****Supplier*** An organization or an individual that enters into an agreement with the acquirer for the supply of a product or service, even if that entity is part of the acquiring organization. [Source: Paraphrased from ISO/IEC 15288:2002(E), Systems Engineering – System life cycle processes]

Supplier (1) An entity delivering products or performing services being acquired. (2) An individual, partnership, company, corporation, association, or other service having an agreement (contract) with an acquirer for the design, development, manufacture, maintenance, modification, or supply of items under the terms of an agreement (contract). [Source: CMMI-SE/SW/IPPD/SS, Version 1.1, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/cmmi/models/models.html]

Supplier The entity delivering the product being acquired by contract, even if that entity is part of the acquiring organization. [Source: SA-CMM, Version 1.03, Software Engineering Institute, March 2002, http://www.sei.cmu.edu/publications/documents/02.reports/02tr010.html]

Entity Discussion

This section of the appendix attempts to clarify the distinctions between the following types of entities, as employed in this paper:

- Enterprise
- Organization
- Project
- Program

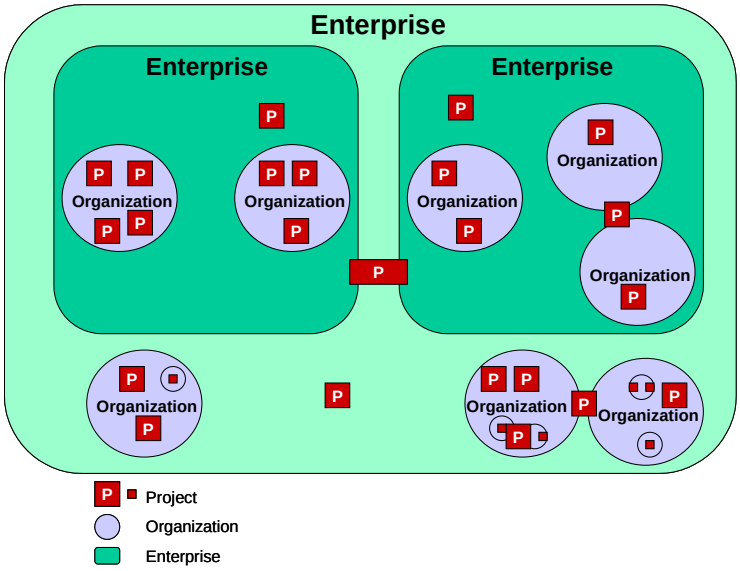
Enterprise. The term ***Enterprise*** herein refers to the Acquisition Enterprise, which is a collection of acquisition organizations reporting to the same acquisition authority. Enterprises may be composed of other enterprises.

Organization. The term ***Organization*** herein refers to the Acquisition Organization, that entity which has the oversight responsibility for the acquisition project and which may have purview over the acquisition activities of a number of projects or contract actions.

Project. The term ***Project*** herein refers to an Acquisition Project, which is a managed set of interrelated resources that acquirers one or more products for a customer or end user. This set of resources has a definite beginning and end and typically operates according to a plan. Such a plan is frequently documented and specifies the product to be delivered or implemented, the resources and funds used, the work to be done, and a schedule for doing the work.

Program. The term ***Program*** herein is synonymous with Project.

Figure 4. Enterprise-Organization-Project



As shown in the figure, an Enterprise may contain other Enterprises, Organizations, or Projects that report directly to Enterprise Level management. Organizations are generally responsible for multiple projects and may contain other organizations. Multiple organizations or enterprises may be involved in a project.

APPENDIX B: STRAWMAN WORK BREAKDOWN STRUCTURE FOR ACQUISITION SERVICES

APPENDIX C: ACQUISITION ICM (Information Needs, Measurable Concepts, Measures) TABLE

[I have a reminder that, in this section, before the table, we need to include front matter that defines the measurement categories as well as the terms program, project, enterprise and organization. See the end of Appendix A – Entity Discussion -- for some Fodder.]

APPENDIX E: MAPPING SECTION 804, SA-CMM, & CMMI-AM, TO MEASUREMENT INFORMATION NEEDS *(DRAFT)*

This appendix maps from Section 804 processes and institutionalization goals to the Software Acquisition CMM, CMMI Acquisition Module, and associated information needs. This is a draft; hence, some of the process area mappings may be in error.

The purpose of the table is to provide a tool for selecting measures to support implementation of Section 804.

Section 804 Institutionalization and Acquisition Process Areas (PAs)	Software Acquisition-CMM (SA-CMM) Institutionalization Features and Key PAs (KPAs) with Maturity Level (ML)	CMMI Acquisition Module (CMMI-AM) PAs & Generic Practices (GPs)	Measurement Information Needs
For the acquisition process improvement program as a whole, establish and sustain: • Goals, milestones and measures associated with planned process improvements • Resources to be applied, including mechanisms for ensuring appropriate training and experience for key personnel • Approach and evaluation criteria for guiding and assessing process improvement activities and goals • Measures for performance measurement and continuous process improvement • Mechanisms for ensuring adherence to the established program	KPAs (ML): Process Definition and Maintenance (3) Quantitative Process Management (4) Acquisition Innovation Management (5) Continuous Process Improvement (5)	PAs: 2.5 Measurement and Analysis 2.7 Product and Process Quality Assurance	
For each 804 Process Area, establish and sustain: • Organizational commitment/ resources/ responsibilities – Policy & plan – Resources, responsibility and authority for performing process and developing work products/providing services – Training	**SA-CMM Process (IFs) (for each SA-CMM KPA, establish and sustain:)** • Commitment to Perform • Ability to Perform • Measurement and Analysis • Verifying Implementation SA-CMM PA:	**CMMI Acquisition Module GPs (for each CMMI-AM PA, establish and sustain):** 1. Establish and maintain organizational policy 2. Establish and Maintain plan for performing the process 3. Provide adequate resources for performing the process, developing the work products, and providing the services of the process 4. Assign responsibility and authority for performing the process, developing the	

Section 804 Institutionalization and Acquisition Process Areas (PAs)	Software Acquisition-CMM (SA-CMM) Institutionalization Features and Key PAs (KPAs) with Maturity Level (ML)	CMMI Acquisition Module (CMMI-AM) PAs & Generic Practices (GPs)	Measurement Information Needs
• Management of acquisition processes and work products – Documented/updated process – Work products under CM and reviewed for quality • Monitoring and improvement activities to better achieve the purpose of the process, aligned with supporting the acquisition requirements – Process monitored and controlled against plan and appropriate corrective action taken – Process performance objectively evaluated against description/procedures and non-compliance addressed – Information from planning and performing is collected from work products, measures, and improvement efforts to support use and improvement of organizational processes and process assets – Relevant stakeholders are involved, as planned, and activities, status and results of process are reviewed with higher level management and issues are resolved	• Training Program (3) • Others	work products, and providing the services of the process 5. Train the people performing or supporting the process as needed 6. Place designated work products of the process under appropriate levels of CM 7. Identify and involve relevant stakeholders as planned 8. Monitor and control the process against the plan for performing the process and take corrective action 9. Objectively evaluate adherence of the process against its process description, standards and procedures and address noncompliance 10. Review the activities, status and results of the process with higher level management and resolve issues 11. Establish and maintain the description of a defined process 12. Collect work products, measures, measurement results and improvement information derived from planning and performing the process to support the future use and improvement of the organization's processes and process assets **CMMI-AM PA:** • 2.6 Organizational Environment for Integration • Others	
Acquisition Planning (must support evolutionary & spiral development)	• Software Acquisition Planning (2)	2.9 Project Planning	

Section 804 Institutionalization and Acquisition Process Areas (PAs)	Software Acquisition-CMM (SA-CMM) Institutionalization Features and Key PAs (KPAs) with Maturity Level (ML)	CMMI Acquisition Module (CMMI-AM) PAs & Generic Practices (GPs)	Measurement Information Needs
Requirements Development and Management	• Requirements Development and Management (2) • User Requirements (3)	2.10 Requirements Development 2.11 Requirements Management	
Configuration Management	--	2.1 Configuration Management	
Risk Management	• Acquisition Risk Management (3)	2.12 Risk Management	
Project Management & Oversight	• Project Management (2) • Contract Tracking and Oversight (2) • Contract Performance Management (3) • Project Performance Management (3) • Quantitative Acquisition Management (4)	2.3 Integrated Project Mangaement 2.8 Project Monitoring and Control	
Test and Evaluation	• Evaluation (2)	2.15 Validation 2.16 Verification	
Integrated Team Management	--	2.4 Integrated Teaming	
Solicitation and Source Selection (including criteria for evaluating past performance, process maturity and product maturity)	• Solicitation (2)	2.2 Decision Analysis and Resolution 2.13 Solicitation and Contract Monitoring	
--	• Transition to Support (2)	2.14 Transition to Operations and Support	

APPENDIX E: SAMPLE ACQUISITION MEASURE SPECIFICATIONS (FOR APM AND AEOM MEASURES)