

## ACQUISITION MEASUREMENT INTRODUCTION, GUIDANCE, AND LESSONS LEARNED

PRELIMINARY DRAFT MATERIAL FOR PSM ACQUISITION MEASUREMENT WORKSHOP

### TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>2</b>
1.1	<i>What is Acquisition Measurement? .....</i>	2
1.2	<i>Motivation for Acquisition Organization Measurement .....</i>	5
<b>2</b>	<b>ACQUISITION ORGANIZATION MANAGEMENT INFORMATION NEEDS.....</b>	<b>5</b>
<b>3</b>	<b>GUIDANCE FOR ESTABLISHING EFFECTIVE ACQUISITION ORGANIZATION MEASUREMENT .....</b>	<b>8</b>
3.1	<i>Identify Management Support for Measurement [PSM Establish and Sustain Commitment] .....</i>	8
3.2	<i>Build on Existing Measurement Processes. [PSM Evaluate Measurement &amp; Plan Measurement].....</i>	8
3.3	<i>Plan for Measurement [PSM Plan Measurement &amp; Establish and Sustain Commitment] .....</i>	8
3.4	<i>Perform the Measurement Process [PSM Perform Measurement] .....</i>	8
3.5	<i>Evaluate the Measurement Process [PSM Evaluate Measurement] .....</i>	8
<b>4</b>	<b>LESSONS LEARNED IN ESTABLISHING, SUSTAINING, AND PERFORMING SUPPLIER MONITORING MEASUREMENT .....</b>	<b>9</b>
4.1	<i>Establish a Balanced Set of Acquirer Information Needs .....</i>	9
4.2	<i>Establish the Measurement Plan Jointly with the Supplier .....</i>	9
4.3	<i>Develop Acquirer Measurement Analysis Capability.....</i>	9
4.4	<i>Establish a Culture that Rewards Early Problem and Risk Identification .....</i>	9

#### APPENDIX A: REFERENCES

#### APPENDIX B: MAPPING OF 804, SA-CMM, CMMI-ACQ MODULE, AND MEASUREMENT INFORMATION NEEDS (DRAFT)

## **1 INTRODUCTION**

### **1.1 What is Acquisition Measurement?**

#### **1.1.1 Definitions**

*Acquisition Measurement*, the process an acquirer uses to establish and sustain, plan, perform, and evaluate its measurement activities, has two different applications for the acquisition organization, *Supplier Monitoring Measurement* and *Acquisition Organization Measurement*:

Supplier Monitoring Measurement (SMM) focuses on the acquisition organization's role in obtaining, analyzing and applying contractor data for the purpose of monitoring the supplier. This application of measurement is addressed by existing PSM guidance. Acquirers have begun implementing this guidance, using PSM's Plan Measurement activity to identify measures and its acquisition language to construct the RFP and contract. Largely, these uses of PSM help ensure the supplier's delivered measurement plan and measures can address acquirer information needs regarding development processes, products, progress and risk. However, there has been less emphasis on the acquirer's role in the Perform Measurement activity, i.e., on formalizing a process for validating and analyzing delivered data and making recommendations based on analysis results. Frequently, resources and training are inadequate to establish, sustain and improve an effective acquirer analysis capability. Additional guidance in this area would be helpful.

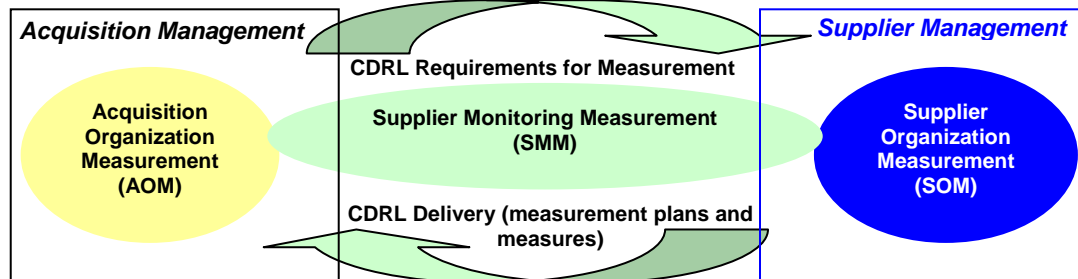
Acquisition Organization Measurement (AOM) focuses on selecting, defining, collecting, and analyzing data for the purposes of managing and monitoring an acquisition organization's internal products, processes and resources. There is little guidance available for this type of measurement. As more acquisition organizations begin to look at improving their own processes, they will need to apply measurement to quantitatively characterize/baseline current capability, develop quantitative goals for selected capability improvements, and assess progress in reaching these goals.

While both applications of measurement can contribute to successful acquisitions, this paper is currently focused primarily on advancing the second application, Acquisition Organization Measurement. To this end, acquisition problems and impacts are identified in Section 2, and guidance for applying AOM is provided in Section 3. Supplier Monitoring Measurement lessons learned are captured in Section 4 in recognition of the importance of addressing the pitfalls of this type of measurement. Additional information addressing analysis of supplier's measurement data will be provided in a future update to this paper.

**1.1.2 Distinctions Between Types of Acquisition Measurement: Supplier Monitoring Measurement (SMM) vs. Acquisition Organization Measurement (AOM)**

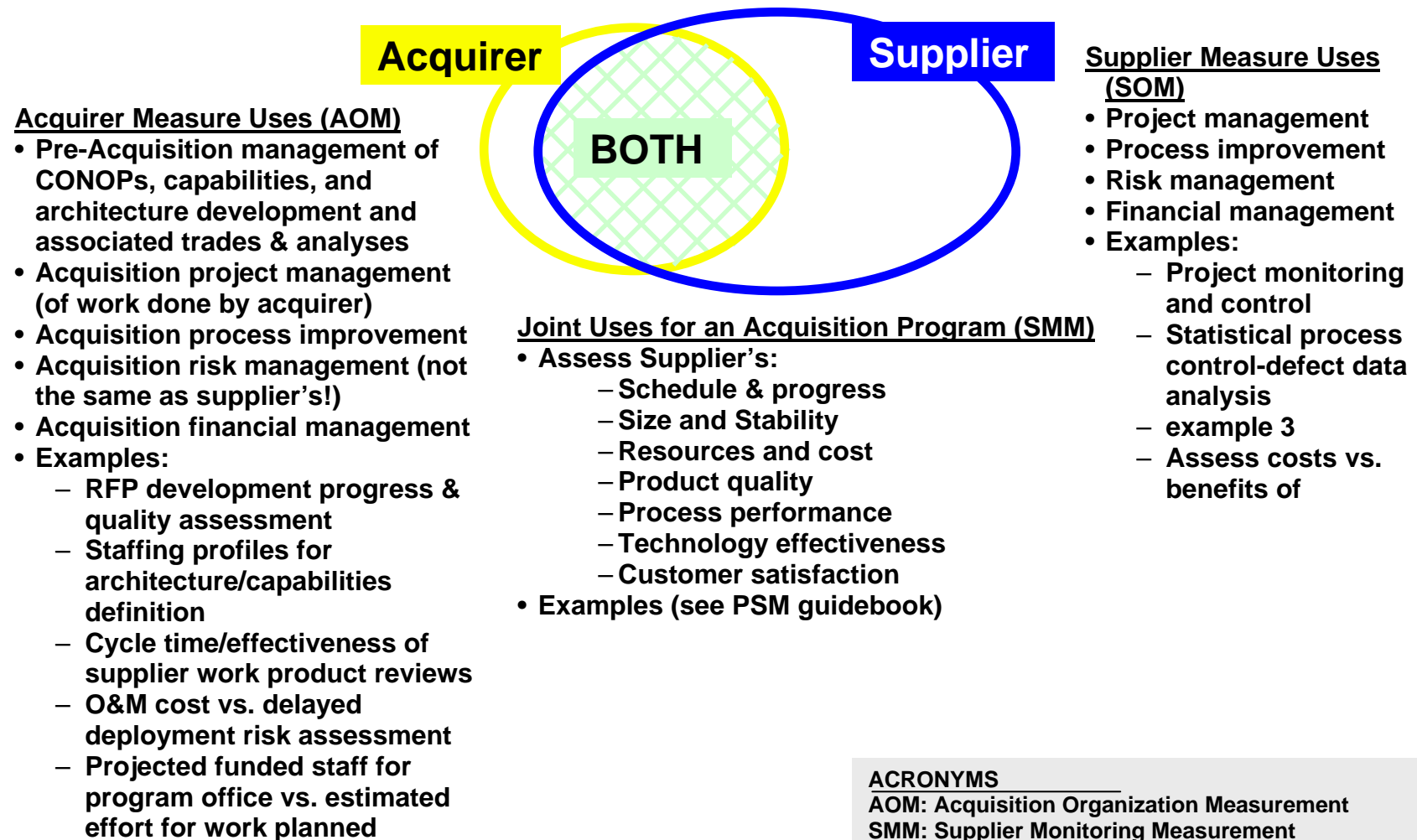
Figure 1 illustrates, at a top level, that SMM requires Acquirer and Supplier participation. The figure also shows that SMM touches both AOM and the Supplier's own internal measurement activity, Supplier Organization Measurement (SOM).

**Figure 1. Measurement Activity Relationships**



The distinctions between SMM, AOM and SOM can be further examined by considering where Supplier and Acquirer concerns intersect and where they differ. Figure 2 provides examples.

Figure 2. Acquirer and Supplier Measurement Concerns



ACRONYMS

AOM: Acquisition Organization Measurement

SMM: Supplier Monitoring Measurement

SIM: Supplier Organization Measurement

RFP: Request for Proposal

O&M: Operations and Maintenance

## 1.2 Motivation for Acquisition Organization Measurement

While the value of Supplier Monitoring Measurement has been acknowledged and realized, the motivation for AOM may need explanation. Several reasons exist for applying measurement to an Acquisition Organization, and they all point toward the need for measurement in support of process improvement.

First, for the DoD, 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.

Second, anyone who has worked in or supported an acquisition program office recognizes that poor processes are responsible for problems in source selection, contract negotiation, and contract monitoring and management.

Finally, 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.

Section 2 examines the experiences of participants in the Acquisition Measurement Workshop at the 8<sup>th</sup> Annual PSM Users' Group Conference. 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.

## **2 ACQUISITION ORGANIZATION MANAGEMENT INFORMATION NEEDS**

We can begin to identify information needs by looking at the Acquirer's job and determining what we need to know to plan, manage, and control the work; to support decisions vital to program office health; to identify problems and risks early on; and to determine whether process improvement actions are having the desired effect.

<Table 1 is a brainstorming tool for beginning this process. The table contains a few examples. In the Acquisition Measurement Workshop, we'll add more items, and prioritize them for further discussion and specification. Key to this work will be discussions on what we can realistically measure that can actually be applied to specific Acquisition Organization issues.>

Table 1. Acquisition Organization Problems, Information Needs, and Measurement Concepts<sup>1</sup>

#	Statement of Problem and Impacts (stated as “problem—impacts”)	Improvement Goal	Question or Info Need & PSM Info Categories	Potential Measurable Concepts / Measures <sup>2</sup>	Can Measurement Be Used to Help? (If so, visualize how and briefly explain.)
1	Workload exceeds capacity/capability of existing staff--lots of rework and many tasks not completed	Justify Request for Additional Staff & Different Skills Mix	How many people of what skills do we need to do the work? What are the impacts if don't have? Is the amt of rework above a reasonable threshold? What are the impacts? Are people assigned to work “too many tasks in parallel”? What are the impacts?	# & types of rejected work items (content, format) # & types of work items not done planned vs. actual effort classified by expertise	Decisions on qualifications for staff (we have x effort planned for this kind of work and x effort-hours of expertise available) Personnel already overbooked; consequence of adding low-value task will be inability to complete high-value tasks as planned [Use industry data, as available, to show the range of effective levels of “task swapping”]
2	Low acquirer process maturity – impacts supplier use of mature processes	Justify Request for Acquisition Process Improvement			
3	Requirements poorly understood— inability to develop RFP / contract				
4	Inadequate planning—affects ability to perform work				
5	Inadequate acquirer risk management program—risks not identified; appropriate risk handling methods not applied				
6	Acquisition documentation low quality –inadequate proposals, contract [one root cause: little focus on technical quality and completeness of acquisition work.]				
7	Too many unnecessary meetings/interruptions—personnel too fragmented to complete any task				

To Be  
Completed

<sup>1</sup> Use this table to guide completion of the Issue Category Measure (ICM)-AOM table, so that each proposed measure has a specific use, i.e., an action or decision it will support. Draw on measures used in Business Process Re-engineering and associated process improvement initiatives.

<sup>2</sup> These are examples for discussion only. They should not be selected as candidate measures unless they are deemed potentially useful and feasible to implement.

#	Statement of Problem and Impacts (stated as “problem—impacts”)	Improvement Goal	Question or Info Need & PSM Info Categories	Potential Measurable Concepts / Measures <sup>2</sup>	Can Measurement Be Used to Help? (If so, visualize how and briefly explain.)
	adequately				
8	Inadequate pre-systems acquisition analyses on concepts/architecture—unrealistic expectations / RFP				
9	Budget (total and phasing) and schedule out of acquirer’s control— inability to gain approval of feasible plans; continual firefighting				
10	Dysfunctional organizational relationships, division of duties, and behaviors—gaps, overlaps, miscommunications, firefighting				
11	Inadequate, poorly performing, or misused acquisition, engineering, and analysis environment/tools (for requirements, architecture, data management, workflow, decision support, modeling, simulation, etc.)— inefficiencies, lost data, erroneous results.				
12	No lessons learned or post-mortem review process—history repeats itself (repeatedly making the same mistakes) [One root cause: fear of repercussions for surfacing negative information]				
13	Unsuitable acquisition life cycle model—inability to properly manage major critical interdependencies				
14	Requirements volatility driven by changing user wishes or new personnel views				
	< Add more at workshop > < See Acquisition Services WBS >				

To Be  
Completed

### **3 GUIDANCE FOR ESTABLISHING EFFECTIVE ACQUISITION ORGANIZATION MEASUREMENT**

The guidance below is adapted from PSM (see bracketed references to PSM process activities) and summarized for discussion at the Users Group Conference Workshop. The Workshop focus will be on incorporating lessons learned and revising and refining the guidance.

#### **3.1 Identify Management Support for Measurement [*PSM Establish and Sustain Commitment*]**

*3.1.1 Who needs to sponsor measurement (fund it, provide resources and training, and promote its use) and how can this sponsorship be obtained and sustained?*

*3.1.2 How can you get “buy-in” from the organization to be “measured”*

*3.1.3 If you can’t get sponsorship, does it make sense to proceed?*

*3.1.4 If you can’t get at least some “buy-in,” does it still make sense to proceed?*

#### **3.2 Build on Existing Measurement Processes. [*PSM Evaluate Measurement & Plan Measurement*]**

*3.2.1 If a good process is in use for SMM, see if it can be adapted to AOM.*

*3.2.2 If no good process exists, consider developing AOM and SMM so they are consistent (establish consistent processes, infrastructure, and training).*

#### **3.3 Plan for Measurement [*PSM Plan Measurement & Establish and Sustain Commitment*]**

*3.3.1 Establish a Measurement Working Group to Identify Information Needs: target acknowledged issues; consider synergy with SMM [*PSM Plan Measurement*].*

*3.3.2 Prioritize Measures [*PSM Plan Measurement*].*

- *Start with a small set of measures that have a significant potential value.*
- *Select measures that can present upper management with a clear case for the benefits of process improvement supported by measurement.*
- *Begin measure specification, including planning for collection AND analysis (i.e., how the data will be visualized and applied).*
- *Evaluate resource needs and costs.*

*3.3.3 Develop a proposal based on the above and get management commitment to go forward [*PSM Establish and Sustain Commitment*].*

*3.3.4 Complete the measurement plan based on the commitment obtained, and begin implementation [*PSM Plan Measurement*].*

*3.3.5 Plan frequent “vector checks” with management and with the Measurement Working Group to ensure continuing support [*PSM Establish and Sustain Commitment*].*

#### **3.4 Perform the Measurement Process [*PSM Perform Measurement*]**

*3.4.1 Collect, validate and analyze data.*

*3.4.2 Use data to support decisions on program office estimation of workload, allocation of resources, technical work progress and quality, need for training or tools, etc.*

*3.4.3 Use data to identify new information needs (return to 3.3).*

#### **3.5 Evaluate the Measurement Process [*PSM Evaluate Measurement*]**

*3.5.1 Every few months, convene the Measurement Working Group to evaluate the measures and the measurement process and recommend improvements (return to 3.3).*

**Refine above/add lessons learned**



#### **4 LESSONS LEARNED IN ESTABLISHING, SUSTAINING, AND PERFORMING SUPPLIER MONITORING MEASUREMENT**

< Cheryl's info on how the best SMM activities are implemented in acquisition organizations. >

##### **4.1 Establish a Balanced Set of Acquirer Information Needs**

- Shift from the traditional focus on cost-schedule-performance to a greater emphasis on planning and progress, product quality and process effectiveness, technology, risk, and stability.

##### **4.2 Establish the Measurement Plan Jointly with the Supplier**

- Use a joint acquirer-supplier Measurement Working Group to discuss acquirer information needs and select and specify measures.
- Specify measures and analysis procedures so they provide early warning.
- Ensure the set of delivered measures can be modified over the life cycle as information needs evolve.
- Ensure delivery of low-level data, not just Powerpoint Charts (this enables acquirer root cause and trend analysis).

##### **4.3 Develop Acquirer Measurement Analysis Capability**

- Adapt the PSM analysis model to the program measurement plan, and use the model in identifying root causes and predicting future risks and problems.
- Obtain infrastructure and other resources to perform analysis on delivered data.
- Allocate and train personnel to validate and analyze delivered data.

##### **4.4 Establish a Culture that Rewards Early Problem and Risk Identification**

- Do not penalize reporting of negative information.
- Establish incentives (e.g., Award Fee) for good measurement practice and for identifying problems and risks early on.

**Refine above/add more**

#### **APPENDIX A: REFERENCES**

- Strawman WBS for Acquisition Services (from Workshop Part a)
- Draft ICM-AOM (from Workshop Part c)
- Draft AOM Measure Specifications (when available)
- PSM Guidance ([www.psmc.com](http://www.psmc.com))
- Army Software Metrics INSIGHT articles ([www.armysoftwaremetrics.org/products/insight.asp](http://www.armysoftwaremetrics.org/products/insight.asp))

**APPENDIX B: MAPPING OF 804, SA-CMM, CMMI-ACQ MODULE, AND 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.

<b>Section 804 Institutionalization and Acquisition Process Areas (PAs)</b>	<b>Software Acquisition-CMM (SA-CMM) Institutionalization Features and Key PAs (KPAs) with Maturity Level (ML)</b>	<b>CMMI Acquisition Module (CMMI-AM) PAs &amp; Generic Practices (GPs)</b>	<b>Measurement Information Needs</b>
<b>For the acquisition process improvement program as a whole, establish and sustain:</b> <ul style="list-style-type: none"><li>• Goals, milestones and measures associated with planned process improvements</li><li>• Resources to be applied, including mechanisms for ensuring appropriate training and experience for key personnel</li><li>• Approach and evaluation criteria for guiding and assessing process improvement activities and goals</li><li>• Measures for performance measurement and continuous process improvement</li><li>• Mechanisms for ensuring adherence to the established program</li></ul>	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	
<b>For each 804 Process Area, establish and sustain:</b> <ul style="list-style-type: none"><li>• Organizational commitment/ resources/ responsibilities<ul style="list-style-type: none"><li>– Policy &amp; plan</li><li>– Resources, responsibility and authority for performing process and developing work products/providing services</li></ul></li></ul>	<b>SA-CMM Process (IFs) (for each SA-CMM KPA, establish and sustain:)</b> <ul style="list-style-type: none"><li>• Commitment to Perform</li><li>• Ability to Perform</li><li>• Measurement and Analysis</li><li>• Verifying Implementation</li></ul>	<b>CMMI Acquisition Module GPs (for each CMMI-AM PA, establish and sustain):</b> <ol style="list-style-type: none"><li>1. Establish and maintain organizational policy</li><li>2. Establish and Maintain plan for performing the process</li><li>3. Provide adequate resources for performing the process, developing the work products, and providing the services of the process</li><li>4. Assign responsibility and authority for</li></ol>	

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
<ul style="list-style-type: none"> <li>– Training</li> <li>• Management of acquisition processes and work products               <ul style="list-style-type: none"> <li>– Documented/updated process</li> <li>– Work products under CM and reviewed for quality</li> </ul> </li> <li>• Monitoring and improvement activities to better achieve the purpose of the process, aligned with supporting the acquisition requirements               <ul style="list-style-type: none"> <li>– Process monitored and controlled against plan and appropriate corrective action taken</li> <li>– Process performance objectively evaluated against description/procedures and non-compliance addressed</li> <li>– 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</li> <li>– Relevant stakeholders are involved, as planned, and activities, status and results of process are reviewed with higher level management and issues are resolved</li> </ul> </li> </ul>	<p>SA-CMM PA:</p> <ul style="list-style-type: none"> <li>• Training Program (3)</li> <li>• Others</li> </ul>	<p>performing the process, developing the work products, and providing the services of the process</p> <ol style="list-style-type: none"> <li>5. Train the people performing or supporting the process as needed</li> <li>6. Place designated work products of the process under appropriate levels of CM</li> <li>7. Identify and involve relevant stakeholders as planned</li> <li>8. Monitor and control the process against the plan for performing the process and take corrective action</li> <li>9. Objectively evaluate adherence of the process against its process description, standards and procedures and address noncompliance</li> <li>10. Review the activities, status and results of the process with higher level management and resolve issues</li> <li>11. Establish and maintain the description of a defined process</li> <li>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</li> </ol> <p><b>CMMI-AM PA:</b></p> <ul style="list-style-type: none"> <li>• 2.6 Organizational Environment for Integration</li> <li>• Others</li> </ul>	
Acquisition Planning (must support evolutionary & spiral development)	<ul style="list-style-type: none"> <li>• Software Acquisition Planning (2)</li> </ul>	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	<ul style="list-style-type: none"> <li>Requirements Development and Management (2)</li> <li>User Requirements (3)</li> </ul>	2.10 Requirements Development 2.11 Requirements Management	
Configuration Management	--	2.1 Configuration Management	
Risk Management	<ul style="list-style-type: none"> <li>Acquisition Risk Management (3)</li> </ul>	2.12 Risk Management	
Project Management & Oversight	<ul style="list-style-type: none"> <li>Project Management (2)</li> <li>Contract Tracking and Oversight (2)</li> <li>Contract Performance Management (3)</li> <li>Project Performance Management (3)</li> <li>Quantitative Acquisition Management (4)</li> </ul>	2.3 Integrated Project Management 2.8 Project Monitoring and Control	
Test and Evaluation	<ul style="list-style-type: none"> <li>Evaluation (2)</li> </ul>	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)	<ul style="list-style-type: none"> <li>Solicitation (2)</li> </ul>	2.2 Decision Analysis and Resolution 2.13 Solicitation and Contract Monitoring	
--	<ul style="list-style-type: none"> <li>Transition to Support (2)</li> </ul>	2.14 Transition to Operations and Support	