

RESOURCE: MATURITY LEVELS OF THE CUSTOMIZED CMMI-SVC FOR TESTING SERVICES AND THEIR PROCESS AREAS

This resource is associated with the following paper:

Assessing the maturity of software testing services using CMMI-SVC: an industrial case study

Classified below by the maturity levels, we discuss the Specific Goals (SGs) and Specific Practices (SPs) of each PA. Also, for each case, we include the original CMMI-SVC list of SGs and SPs to ensure traceability and comparability.

LEVEL 1

As discussed above, level #1 is the 'initial' level in which service execution and delivery is essentially ad-hoc (poorly controlled). There are no PAs in this level.

LEVEL 2

Test service agreement establishment and delivery

The PA name in CMMI-SVC is Service Delivery. However, to be more precise and as we can see from the list of SGs (below), we rephrased to '*Test service agreement establishment and delivery*' in CMMI-SVC. The PA includes both service agreement and service delivery, but it was labeled as 'Service delivery' in CMMI-SVC.

PA name in CMMI-SVC:	Service delivery
Improved name:	Test service agreement establishment and delivery
Purpose:	Deliver test services in accordance with test service agreements put in place in the contract.
<ul style="list-style-type: none"> • SG 1 Establish test service agreements <ul style="list-style-type: none"> ○ SP 1.1 Analyze test service and customer needs ○ SP 1.2 Discuss and negotiate elements of the test service agreement (contract), e.g., basic details such as test requirements, duration/cost, and other issues that we have heard from our industry partners such as regression tests and when to stop testing ○ SP 1.3 Establish the test service agreement (contract) • SG 2 Prepare for test service delivery <ul style="list-style-type: none"> ○ SP 2.1 Establish the test service delivery approach ○ SP 2.2 Prepare for test service operations (mostly internal to the test team) • SG 3 Deliver test services <ul style="list-style-type: none"> ○ SP 3.1 Receive and process test service requests ○ SP 3.2 Operate the test service (including test staff, test processes and test activities) ○ SP 3.3 Maintain the test service (including test staff, test processes and test activities) 	

The list of the original SG's and SP's for this PA in CMMI-SVC are listed below. We customized and modified them based on the specific context of testing services.

- SG 1 Establish service agreements
 - SP 1.1 Analyze existing agreements and service data
 - SP 1.2 Establish the service agreement
- SG 2 Prepare for service delivery
 - SP 2.1 Establish the service delivery approach
 - SP 2.2 Prepare for service system operations
 - SP 2.3 Establish a request management system
- SG 3 Deliver Services
 - SP 3.1 Receive and process service requests
 - SP 3.2 Operate the service system
 - SP 3.3 Maintain the service system

Test requirements management

PA name in CMMI-SVC:	Requirements management
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Improved name:	Test requirements management
Purpose:	Manage requirements of test services to be done and to ensure alignment between those requirements and the test plans and activities.
<ul style="list-style-type: none"> • SG 1 Manage Test Requirements <ul style="list-style-type: none"> ○ SP 1.1 Understand test requirements as documented in the test service agreement (contract) ○ SP 1.2 Manage test requirements changes ○ SP 1.3 Maintain bidirectional traceability of requirements to tests and other artifacts (if any) ○ SP 1.5 Ensure alignment between work products (test deliverables), test activities and test requirements 	

Test project planning

PA name in CMMI-SVC:	Work (project) planning
Improved name:	Test project planning
Purpose:	Establish and maintain plans (major tasks, estimates, risks and resources) for the test service project.
<ul style="list-style-type: none"> • SG 1 Establish Estimates <ul style="list-style-type: none"> ○ SP 1.1 Establish the strategy for the test service ○ SP 1.2 Estimate the scope of the work ○ SP 1.3 Establish estimates of work product and task attributes ○ SP 1.4 Define lifecycle phases ○ SP 1.5 Estimate effort and cost • SG 2 Develop a work plan <ul style="list-style-type: none"> ○ SP 2.1 Establish the budget and schedule ○ SP 2.2 Identify risks ○ SP 2.3 Plan test data management ○ SP 2.4 Plan the resources ○ SP 2.5 Plan the needed knowledge and skills ○ SP 2.6 Plan stakeholder involvement ○ SP 2.7 Establish the work plan, e.g., using Work Breakdown Structure (WBS) • SG 3 Obtain Commitment to the plan <ul style="list-style-type: none"> ○ SP 3.1 Review all plans that affect the work to understand work commitments ○ SP 3.2 Adjust the work plan to reconcile available and estimated resources ○ SP 3.3 Obtain plan commitment from stakeholders 	

Test project monitoring and control

PA name in CMMI-SVC:	Work (project) monitoring and control
Improved name:	Test project monitoring and control
Purpose:	Monitoring the project and service's progress so that appropriate corrective actions can be taken when performance deviates significantly from the plan.
<ul style="list-style-type: none"> • SG 1 Continuously/periodically monitor the work progress against the plan <ul style="list-style-type: none"> ○ SP 1.1 Monitor work planning parameters (work products and tasks, costs, effort, and schedule) ○ SP 1.2 Monitor stakeholder commitments ○ SP 1.3 Monitor risks ○ SP 1.4 Monitor data management ○ SP 1.5 Monitor stakeholder involvement ○ SP 1.6 Conduct progress reviews ○ SP 1.7 Conduct milestone reviews • SG 2 Manage corrective action to closure <ul style="list-style-type: none"> ○ SP 2.1 Analyze issues ○ SP 2.2 Take corrective action ○ SP 2.3 Manage corrective actions 	

Test services sub-contract management

PA name in CMMI-SVC:	Supplier agreement management
Improved name:	Test services sub-contract management
Purpose:	Manage the acquisition of sub-contract services from suppliers.
<ul style="list-style-type: none"> • SG 1 Establish supplier agreements for test services to be sub-contracted <ul style="list-style-type: none"> ○ SP 1.1 Determine acquisition type ○ SP 1.2 Select suppliers ○ SP 1.3 Establish supplier agreements • SG 2 Manage sub-contracted services <ul style="list-style-type: none"> ○ SP 2.1 Monitor sub-contracted services ○ SP 2.2 Accept the sub-contracted services ○ SP 2.3 Ensure transition of services from sub-contractor to client 	

Test products and tools management

PA name in CMMI-SVC:	Did not exist in CMMI-SVC
Improved name:	Test products and tools management

Purpose:	Manage the acquisition of test products from suppliers
<ul style="list-style-type: none"> • SG 1 Establish supplier agreements for test products and tools <ul style="list-style-type: none"> ○ SP 1.1 Determine acquisition type ○ SP 1.2 Select suppliers ○ SP 1.3 Establish supplier agreements • SG 2 Manage test products (tools) <ul style="list-style-type: none"> ○ SP 2.1 Acquire, install and use test products (tools) ○ SP 2.2 Maintain (get updates and support for) test products (tools) 	

Measurement and analysis for test service management

PA name in CMMI-SVC:	Measurement and analysis
Improved name:	Measurement and analysis for test service management
Purpose:	Develop and sustain a measurement capability that is used to support management information needs
<ul style="list-style-type: none"> • SG 1 Align test measurement and analysis activities <ul style="list-style-type: none"> ○ SP 1.1 Establish test measurement objectives ○ SP 1.2 Specify test metrics (examples: test service schedule, cost and quality metrics) ○ SP 1.3 Specify data collection and storage procedures ○ SP 1.4 Specify analysis procedures • SG 2 Provide measurement results <ul style="list-style-type: none"> ○ SP 2.1 Obtain measurement data ○ SP 2.2 Analyze measurement data ○ SP 2.3 Store data and results ○ SP 2.4 Communicate results to stakeholders 	

Test process and product quality assurance

PA name in CMMI-SVC:	Process and product quality assurance
Improved name:	Test process and product quality assurance
Purpose:	Provide staff and management with objective insight into test processes and associated work products.
<ul style="list-style-type: none"> • SG 1 Objectively evaluate test processes and work products <ul style="list-style-type: none"> ○ SP 1.1 Objectively evaluate processes ○ SP 1.2 Objectively evaluate work products (test deliverables such as defects, test reports, etc.) • SG 2 Provide objective insight <ul style="list-style-type: none"> ○ SP 2.1 Communicate and resolve noncompliance issues ○ SP 2.2 Establish records 	

Concrete examples of the types of work products have been provided, e.g., test deliverables such as defects, test reports, etc.

Configuration management

PA name in CMMI-SVC:	Configuration management
Improved name:	Configuration management
Purpose:	Establish and maintain the integrity of work products using configuration identification, configuration control, configuration status accounting, and configuration audits.
<ul style="list-style-type: none"> • SG 1 Establish baselines (versions) <ul style="list-style-type: none"> ○ SP 1.1 Identify configuration items (e.g., any work product) ○ SP 1.2 Establish a configuration management system ○ SP 1.3 Create or release baselines (versions) • SG 2 Track and control changes <ul style="list-style-type: none"> ○ SP 2.1 Track change requests ○ SP 2.2 Control configuration items • SG 3 Establish integrity <ul style="list-style-type: none"> ○ SP 3.1 Establish configuration management records ○ SP 3.2 Perform configuration audits 	

LEVEL 3

Strategic test service management

PA name in CMMI-SVC:	Strategic service management
Improved name:	Strategic test service management
Purpose:	Establish and maintain standard test services in concert with strategic needs and plans.
<ul style="list-style-type: none"> • SG 1 Establish strategic needs and plans for standard services <ul style="list-style-type: none"> ○ SP 1.1 Gather and analyze data ○ SP 1.2 Establish plans for standard services • SG 2 Establish standard services 	

<ul style="list-style-type: none"> o SP 2.1 Establish properties of standard services and service levels o SP 2.2 Establish descriptions of standard services

Test capacity and availability management

PA name in CMMI-SVC:	Capacity and availability management
Improved name:	Test capacity and availability management
Purpose:	The purpose is to ensure effective test service system performance and ensure that resources are provided and used effectively to support test service requirements.
<ul style="list-style-type: none"> • SG 1 Prepare for test capacity and availability management <ul style="list-style-type: none"> o SP 1.1 Establish a test capacity and availability management strategy (most probably, the best choice of strategy for test capacity and maturity assessment will be to use the TMMi [14]) o SP 1.2 Select test measures (metrics) and analytic techniques o SP 1.3 Establish test service system representations (this may include model-based representations using test process simulation and system dynamics, e.g., [66-68]) • SG 2 Monitor and analyze test capacity and availability <ul style="list-style-type: none"> o SP 2.1 Monitor and analyze test capacity o SP 2.2 Monitor and analyze test service availability o SP 2.3 Report test capacity and availability management data 	

“Capacity”, in this context, is the degree to which one thing can support, hold, process, or provide test services. In the context of test services, capacity can refer to the amount of test service delivery or maximum number of service requests that a service system can handle successfully within a fixed period of time. We have also included concrete suggestions to assess test capacity and maturity, e.g., Test Maturity Model integration (TMMi) [14].

Furthermore, in SP 1.3, for establishing test service system representations, we have again provided suggestions, e.g., model-based representations using test process simulation and system dynamics, e.g., [66-68].

Incident resolution and prevention

PA name in CMMI-SVC:	Incident resolution and prevention
Improved name:	Incident resolution and prevention
Purpose:	The purpose is to ensure timely and effective resolution of test service incidents and prevention of test service incidents as appropriate.
<ul style="list-style-type: none"> • SG 1 Prepare for incident resolution and prevention <ul style="list-style-type: none"> o SP 1.1 Establish an approach to incident resolution and prevention o SP 1.2 establish an incident management system • SG 2 Identify, Control, and address individual incidents <ul style="list-style-type: none"> o SP 2.1 Identify and record incidents o SP 2.2 Analyze individual incident data o SP 2.3 Resolve incidents o SP 2.4 Monitor the status of incidents to closure o SP 2.5 Communicate the status of incidents • SG 3 Analyze and address causes and impacts of selected incidents <ul style="list-style-type: none"> o SP 3.1 Analyze selected incidents o SP 3.2 Establish solutions to respond to future incidents o SP 3.3 Establish and apply solutions to reduce incident occurrence 	

Test service system transition

PA name in CMMI-SVC:	Service system transition
Improved name:	Test service system transition
Purpose:	The purpose is to deploy new or significantly changed test service system components (e.g., sub-contractors, test engineers, test tools) while managing their effect on ongoing test service delivery. This may include replacing the sub-contractors, test engineers, test tools and test practices used in a current service project.
<ul style="list-style-type: none"> • SG 1 Prepare for test service system transition <ul style="list-style-type: none"> o SP 1.1 Analyze test service system transition needs o SP 1.2 Develop test service system transition plans o SP 1.3 Prepare stakeholders for changes • SG 2 Deploy the test service system <ul style="list-style-type: none"> o SP 2.1 Deploy service system components o SP 2.2 Assess and control the impacts of the transition 	

We have provide discussions in the ‘purpose’ section specific for test services, i.e., “this may include replacing the sub-contractors, test engineers, test tools and test practices used in a current service project”.

Test service continuity

PA name in CMMI-SVC:	Service continuity
Improved name:	Test service continuity
Purpose:	The purpose is to establish and maintain plans to ensure continuity of test services during and following any significant disruption of normal operations.
	<ul style="list-style-type: none">• SG 1 Identify essential service dependencies<ul style="list-style-type: none">○ SP 1.1 Identify and prioritize essential functions○ SP 1.2 Identify and prioritize essential resources• SG 2 Prepare for service continuity<ul style="list-style-type: none">○ SP 2.1 Establish service continuity plans○ SP 2.2 Establish service continuity training○ SP 2.3 Provide and evaluate service continuity training• SG 3 Verify and validate the service continuity plan<ul style="list-style-type: none">○ SP 3.1 Prepare for the verification and validation of the service continuity plan○ SP 3.2 Verify and validate the service continuity plan○ SP 3.3 Analyze results of verification and validation of the service continuity plan

Test service system development

PA name in CMMI-SVC:	Service system development
Improved name:	Test service system development
Purpose:	The purpose is to analyze, design, develop, integrate, verify, and validate test service systems, including service system components, to satisfy existing or anticipated service agreements.
	<ul style="list-style-type: none">• SG 1 Prepare for test service system transition<ul style="list-style-type: none">○ SP 1.1 Analyze service system transition needs○ SP 1.2 Develop service system transition plans○ SP 1.3 Prepare stakeholders for changes• SG 2 Deploy the service system<ul style="list-style-type: none">○ SP 2.1 Deploy service system components○ SP 2.2 Assess and control the impacts of the transition

Organizational test process focus (improvement)

PA name in CMMI-SVC:	Organizational process focus
Improved name:	Organizational test process focus (improvement)
Purpose:	The purpose is to plan, implement, and deploy organizational test process improvements based on a thorough understanding of current strengths and weaknesses of the organization's test processes and process assets. Test process improvement (TPI) activities will likely use test maturity assessment and test process improvement models discussed in Section 2.1.
	<ul style="list-style-type: none">• SG 1 Determine test process improvement opportunities<ul style="list-style-type: none">○ SP 1.1 Establish organizational process needs○ SP 1.2 Appraise the organization's processes○ SP 1.3 Identify the organization's test process improvements• SG 2 Plan and implement test process actions<ul style="list-style-type: none">○ SP 2.1 Establish process action plans○ SP 2.2 Implement process action plans• SG 3 Deploy Organizational test process assets and incorporate experiences<ul style="list-style-type: none">○ SP 3.1 Deploy organizational process assets○ SP 3.2 Deploy standard processes○ SP 3.3 Monitor the implementation○ SP 3.4 Incorporate experiences into organizational process assets

Organizational test training

PA name in CMMI-SVC:	Organizational training
Improved name:	Organizational test training
Purpose:	The purpose is to develop skills and knowledge of people (testers and test engineers) so they can perform their roles effectively and efficiently.
	<ul style="list-style-type: none">• SG 1 Establish an organizational test training capability<ul style="list-style-type: none">○ SP 1.1 Establish strategic test training needs○ SP 1.2 Determine which test training needs are the responsibility of the organization○ SP 1.3 Establish an organizational training tactical plan○ SP 1.4 Establish a training capability• SG 2 Provide Training<ul style="list-style-type: none">○ SP 2.1 Deliver training○ SP 2.2 Establish training records○ SP 2.3 Assess training effectiveness

Integrated test project management

PA name in CMMI-SVC:	Integrated work (project) management
Improved name:	Integrated test project management
Purpose:	The purpose is to establish and manage the test work (activities) and the involvement of relevant stakeholders according to an integrated and defined process that is tailored from the organization's set of standard processes.
	<ul style="list-style-type: none"> • SG 1 Use the defined test process for the work <ul style="list-style-type: none"> ○ SP 1.1 Establish the defined test process ○ SP 1.2 Use organizational test process assets for planning work activities ○ SP 1.3 Establish the test work environment ○ SP 1.4 Integrate plans ○ SP 1.5 Manage the work using integrated plans ○ SP 1.6 Establish test teams ○ SP 1.7 Contribute to organizational process assets • SG 2 Coordinate and collaborate with relevant stakeholders <ul style="list-style-type: none"> ○ SP 2.1 Manage stakeholder involvement ○ SP 2.2 Manage dependencies ○ SP 2.3 Resolve coordination issues

Decision analysis and resolution

PA name in CMMI-SVC:	Decision analysis and resolution
Improved name:	Decision analysis and resolution
Purpose:	The purpose is to analyze possible decisions using a formal evaluation process that evaluates identified alternatives against established criteria.
	<ul style="list-style-type: none"> • SG 1 Evaluate Alternatives <ul style="list-style-type: none"> ○ SP 1.1 Establish guidelines for decision analysis ○ SP 1.2 Establish evaluation criteria ○ SP 1.3 Identify alternative solutions ○ SP 1.4 Select evaluation methods ○ SP 1.5 Evaluate alternative solutions ○ SP 1.6 Select solutions

Risk management

PA name in CMMI-SVC:	Risk management
Improved name:	Risk management
Purpose:	The purpose is to identify potential problems before they occur so that risk handling activities can be planned and invoked as needed across the life of the product or work to mitigate adverse impacts on achieving objectives.
	<ul style="list-style-type: none"> • SG 1 Prepare for risk management <ul style="list-style-type: none"> ○ SP 1.1 Determine risk sources and categories ○ SP 1.2 Define risk parameters ○ SP 1.3 Establish a risk management strategy • SG 2 Identify and analyze risks <ul style="list-style-type: none"> ○ SP 2.1 Identify risks ○ SP 2.2 Evaluate, categorize, and prioritize risks • SG 3 Mitigate risks <ul style="list-style-type: none"> ○ SP 3.1 Develop risk mitigation plans ○ SP 3.2 Implement risk mitigation plans

LEVEL 4

Organizational test process performance

PA name in CMMI-SVC:	Organizational process performance
Improved name:	Organizational test process performance
Purpose:	The purpose is to establish and maintain a quantitative understanding of the performance of selected processes in the organization's set of standard processes in support of achieving quality and process performance objectives, and to provide process performance data, baselines, and models to quantitatively manage the organization's work.
	<ul style="list-style-type: none"> • SG 1 Establish performance baselines and models <ul style="list-style-type: none"> ○ SP 1.1 Establish quality and process performance objectives ○ SP 1.2 Select processes ○ SP 1.3 Establish process performance measures ○ SP 1.4 Analyze process performance and establish process performance baselines ○ SP 1.5 Establish process performance models

Organizational test project performance

PA name in CMMI-SVC:	Organizational project performance (quantitative work management)
Improved name:	Organizational test project (quantitative test project performance management)

Purpose:	The purpose is to quantitatively manage the work to achieve the established quality and process performance objectives for the work.
<ul style="list-style-type: none"> • SG 1 Prepare for quantitative management <ul style="list-style-type: none"> ○ SP 1.1 Establish the work objectives ○ SP 1.2 Compose the defined process ○ SP 1.3 Select sub-processes and attributes ○ SP 1.4 Select measures and analytic techniques • SG 2 Quantitatively manage the work <ul style="list-style-type: none"> ○ SP 2.1 Monitor the performance of selected sub-processes ○ SP 2.2 Manage work performance ○ SP 2.3 Perform root cause analysis 	

LEVEL 5

Organizational test process and performance improvement

PA name in CMMI-SVC:	Organizational performance management
Improved name:	Organizational test process and performance improvement
Purpose:	The purpose is to proactively manage the organization's performance to meet its business objectives.
<ul style="list-style-type: none"> • SG 1 Manage business performance <ul style="list-style-type: none"> ○ SP 1.1 Maintain business objectives ○ SP 1.2 Analyze process performance data ○ SP 1.3 Identify potential areas for improvement SG 2 (Select improvements) • SG 2 Select improvements <ul style="list-style-type: none"> ○ SP 2.1 Elicit suggested improvements ○ SP 2.2 Analyze suggested improvements ○ SP 2.3 Validate improvements ○ SP 2.4 Select and implement improvements for deployment • SG 3 Deploy improvements <ul style="list-style-type: none"> ○ SP 3.1 Plan the deployment ○ SP 3.2 Manage the deployment ○ SP 3.3 Evaluate improvement effects 	

Causal analysis and resolution

PA name in CMMI-SVC:	Causal analysis and resolution
Improved name:	Causal analysis and resolution
Purpose:	The purpose is to identify causes of selected outcomes and take action to improve process performance.
<ul style="list-style-type: none"> • SG 1 Determine causes of selected outcomes <ul style="list-style-type: none"> ○ SP 1.1 Select outcomes for analysis ○ SP 1.2 Analyze causes • SG 2 Address causes of selected outcomes <ul style="list-style-type: none"> ○ SP 2.1 Implement action proposals ○ SP 2.2 Evaluate the effect of implemented actions ○ SP 2.3 Record causal analysis data 	