

PROJECT MONITORING AND CONTROL

A Project Management Process Area at Maturity Level 2

Purpose

The purpose of Project Monitoring and Control (PMC) is to provide an understanding of the project's progress so that appropriate corrective actions can be taken when the project's performance deviates significantly from the plan.

Introductory Notes

A project's documented plan is the basis for monitoring activities, communicating status, and taking corrective action. Progress is primarily determined by comparing actual work product and task attributes, effort, cost, and schedule to the plan at prescribed milestones or control levels in the project schedule or WBS. Appropriate visibility of progress enables timely corrective action to be taken when performance deviates significantly from the plan. A deviation is significant if, when left unresolved, it precludes the project from meeting its objectives.

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The term *project plan* is used throughout these practices to refer to the overall plan for controlling the project.

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Monitoring and control functions are established early in the project as the project's planning is performed and the acquisition strategy is defined. As the acquisition of technology solutions unfolds, monitoring and control activities are essential to ensure that appropriate resources are being applied and that acquirer activities are progressing according to plan.

When actual status deviates significantly from expected values, corrective actions are taken, as appropriate. These actions may require replanning, which may include revising the original plan, establishing new agreements, or including additional mitigation activities in the current plan.

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If corrective action is required to resolve variances from project plans, these actions should be defined and tracked to closure.

After one or more suppliers are selected and agreements are established, the role of monitoring and control becomes twofold: (1) the acquirer continues to monitor and control its activities and work products while also (2) monitoring and controlling the progress and performance of supplier activities that affect the overall project plan.

The supplier project progress and performance reporting requirements are established in the supplier agreement consistent with the needs of the project.

Related Process Areas

Refer to the Project Planning process area for more information about the project plan, including how it specifies the appropriate level of project monitoring, measures used to monitor progress, and known risks.

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Refer to the Measurement and Analysis process area for more information about the process of measuring, analyzing, and recording information.

Refer to the Agreement Management process area for more information about resolving supplier agreement issues.

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Refer to the Solicitation and Supplier Agreement Development process area for more information about making changes to the supplier agreement.

Specific Goal and Practice Summary

SG 1 Monitor the Project Against the Plan

- SP 1.1 Monitor Project Planning Parameters
- SP 1.2 Monitor Commitments
- SP 1.3 Monitor Project 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

SP 1.8 Monitor Transition to Operations and Support

SG 2 Manage Corrective Action to Closure

- SP 2.1 Analyze Issues
- SP 2.2 Take Corrective Action
- SP 2.3 Manage Corrective Actions

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Specific Practices by Goal

SG 1 Monitor the Project Against the Plan

Actual performance and progress of the project are monitored against the project plan.

Monitoring acquirer progress and performance begins as soon as a plan is established. The acquirer is responsible for monitoring the progress and output of the project. After a supplier is selected and a supplier agreement put in place, the acquirer's monitoring and control activities extend to the supplier and its activities. The acquirer monitors supplier progress, including achievement of requirements established in the supplier agreement and using specified process, product, and service level measures.

Project Monitoring and Control (PMC)

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SP 1.1 Monitor Project Planning Parameters

Monitor actual values of project planning parameters against the project plan.

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Project planning parameters constitute typical indicators of project progress and performance and include attributes of work products and tasks, costs, effort, and schedule. Attributes of the work products and tasks include size, complexity, weight, form, fit, and function.

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Monitoring typically involves measuring actual values of project planning parameters, comparing actual values to estimates in the plan, and identifying significant deviations. Recording actual values of project planning parameters includes recording associated contextual information to help understand measures. An analysis of the impact that significant deviations have on determining the corrective actions to take is handled in specific goal 2 and its specific practices in this process area.

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Typical Work Products

1. Records of project performance
2. Records of significant deviations

3. Cost performance reports

Typical Supplier Deliverables

1. Supplier project progress and performance reports

2. Records of significant deviations

3. Cost performance reports

Subpractices

1. Monitor progress against the schedule.

Progress monitoring typically includes the following:

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- Periodically measuring the actual completion of activities and milestones
- Comparing actual completion of activities and milestones against the project plan schedule
- Identifying significant deviations from the project plan budget and schedule estimates

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2. Monitor the project's costs and expended effort.

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An example of a system for monitoring and updating the project's costs and expended effort is an Earned Value Management System (EVMS) [GEIA 748 2002].

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Effort and cost monitoring typically includes the following:

- Periodically measuring the actual effort and costs expended and staff assigned
- Comparing actual effort, costs, staffing, and training to the project plan budget and estimates
- Identifying significant deviations from the project plan budget and schedule

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3. Monitor the attributes of work products and tasks.
- Refer to the Project Planning process area for more information about the attributes of work products and tasks.*
- Refer to the Measurement and Analysis process area for more information about measures defined to support management information needs.*

Monitoring the attributes of work products and tasks typically includes the following:

- Periodically measuring the actual attributes of work products and tasks, such as size or complexity (and changes to these attributes)
- Comparing the actual attributes of work products and tasks (and changes to these attributes) to project plan estimates
- Identifying significant deviations from project plan estimates

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Monitoring attributes applies to both acquirer and supplier work products and tasks.

4. Monitor resources provided and used.
- Refer to the Project Planning process area for more information about planned resources.*
- This resource monitoring includes monitoring the availability of resources provided by the supplier for the project.*

5. Monitor the knowledge and skills of project personnel.
- Refer to the Project Planning process area for more information about planning for the knowledge and skills needed to perform the project.*

Monitoring the knowledge and skills of project personnel typically includes the following:

- Periodically measuring the acquisition of knowledge and skills by project personnel
- Comparing actual training obtained to that documented in the project plan
- Identifying significant deviations from estimates in the project plan

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<#>Physical facilities!

<#>Computers, peripherals, and software used in design, manufacturing, testing, and operation!

<#>Networks!

<#>Security environment!

<#>Project staff!

<#>Processes!

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Personnel monitoring includes monitoring the skills and knowledge of supplier personnel provided for the project.

6. Document significant deviations in project planning parameters.

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Project Monitoring and Control (PMC)

Document significant deviations that apply either to acquirer project execution or to supplier deviations from the project plan.

Refer to the Solicitation and Supplier Agreement Development process area for more information about modifying supplier agreements to reflect change requests.

SP 1.2 Monitor Commitments

Monitor commitments against those identified in the project plan.

Resource commitments that result in expenditures (e.g., issued purchase orders and completed supplier deliverables that are accepted) are tracked when the expense is incurred, even prior to formal payment, to ensure that future financial and legal obligations are accounted for as soon as they are incurred. Commitments that do not result in expenditures (e.g., allocation of resources or skill sets) should also be monitored.

Supplier commitments for the project are also monitored by the acquirer through these practices.

Typical Work Products

1. Records of commitment reviews

Subpractices

1. Regularly review commitments (both external and internal).
2. Identify commitments that have not been satisfied or are at significant risk of not being satisfied.
3. Document the results of commitment reviews.

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SP 1.3 Monitor Project Risks

Monitor risks against those identified in the project plan.

Refer to the Project Planning process area for more information about identifying project risks.

Refer to the Risk Management process area for more information about risk management activities.

The acquirer monitors the overall project risk. Many risks are the sole responsibility of the acquirer and may include information that should not be shared with the supplier (e.g., source selection sensitive, re-competition, or internal staffing).

There can also be risks that require careful coordination with suppliers and the establishment of appropriate mechanisms for the escalation of risks and risk status (e.g., feasibility of the technology to meet end-user performance requirements). Shared risks may require jointly planned mitigations.

Typical Work Products

1. Records of project risk monitoring

Typical Supplier Deliverables

1. Records of supplier risk monitoring

Subpractices

1. Periodically review the documentation of risks in the context of the project's current status and circumstances.

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This review includes the risks defined in the solicitation package, those identified by the supplier in their proposal, and those raised as part of regular supplier status reporting.

2. Revise the documentation of risks as additional information becomes available.

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3. Communicate the risk status to relevant stakeholders.

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Examples of risk status include the following:

- A change in the probability that the risk occurs
- A change in risk priority

SP 1.4 Monitor Data Management

Monitor the management of project data against the project plan.

Refer to the Plan Data Management specific practice in the Project Planning process area for more information about identifying types of data to be managed and how to plan for their management.

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Once plans for the management of project data are made, the management of that data must be monitored to ensure that those plans are accomplished.

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Typical Work Products

1. Records of data management

Typical Supplier Deliverables

1. Records of supplier data management

Subpractices

1. Periodically review data management activities against their description in the project plan.
2. Identify and document significant issues and their impacts.
3. Document results of data management activity reviews.

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SP 1.5 Monitor Stakeholder Involvement

Monitor stakeholder involvement against the project plan.

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Refer to the Plan Stakeholder Involvement specific practice in the Project Planning process area for more information about identifying relevant stakeholders and planning appropriate involvement with them.

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Once stakeholders are identified and the extent of their involvement in the project is specified in project planning, that involvement must be monitored to ensure that appropriate interactions are occurring.

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This monitoring is particularly true in a system of systems environment in which the involvement of owners, acquirers, and customers of other systems in the system of systems is crucial to the success of that system of systems.

Typical Work Products

1. Records of stakeholder involvement

Typical Supplier Deliverables

1. Records of supplier involvement

Subpractices

1. Periodically review the status of stakeholder involvement.
2. Identify and document significant issues and their impacts.
3. Document the results of stakeholder involvement status reviews.

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SP 1.6 Conduct Progress Reviews

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Periodically review the project's progress, performance, and issues.

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Progress reviews are project reviews to keep stakeholders informed. These project reviews can be informal and may not be specified explicitly in project plans.

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Refer to the Agreement Management process area for more information about conducting reviews with the supplier per the supplier agreement.

Refer to the Solicitation and Supplier Agreement Development process area for more information about establishing review requirements in the supplier agreement.

Typical Work Products

1. Documented project review results

Typical Supplier Deliverables

1. Supplier project progress and performance reports
2. Supplier review materials and reports
3. Documentation of product and document deliveries

Subpractices

1. Regularly communicate status on assigned activities and work products to relevant stakeholders.

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Managers, staff members, customers, end users, suppliers, and other relevant stakeholders in the organization are included in reviews, as appropriate.

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2. Review the results of collecting and analyzing measures for controlling the project.

Examples of classes of commonly used acquirer measures include the following:

- Requirements volatility
- Return on investment
- Cost performance index
- Number of defects per phase and by severity of defects
- Schedule performance index
- Customer satisfaction trends
- Supplier performance and relationship trends

Refer to the Measurement and Analysis process area for more information about measuring and analyzing project performance data.

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3. Identify and document significant issues and deviations from the plan.

This activity includes identifying and documenting both acquirer and supplier issues and deviations.

4. Document change requests and problems identified in work products and processes.

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Refer to the Configuration Management process area for more information about managing changes.

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5. Document the results of reviews.

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6. Track change requests and problem reports to closure.

SP 1.7 Conduct Milestone Reviews

Review the project's accomplishments and results at selected project milestones.

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Refer to the Project Planning process area for more information about milestone planning.

Refer to the Measurement and Analysis process area for more information about the process of measuring, analyzing, and recording project performance data.

Milestone reviews are planned during project planning and are typically formal reviews.

Typical Work Products

1. Documented milestone review results

Typical Supplier Deliverables

1. Documented measurement results

2. Measurement analysis reports

Subpractices

1. Conduct milestone reviews with relevant stakeholders at meaningful points in the project's schedule, such as the completion of selected stages.

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Managers, staff members, customers, end users, suppliers, and other relevant stakeholders in the organization are included in milestone reviews, as appropriate.

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Conduct milestone reviews with the supplier as specified in the supplier agreement.

Refer to the Acquisition Technical Management process area for more information about conducting technical reviews with the supplier per the supplier agreement.

Refer to the Solicitation and Supplier Agreement Development process area for more information about establishing review requirements in the supplier agreement.

2. Review commitments, the plan, the status, and risks of the project.
3. Identify and document significant issues and their impacts.
4. Document results of the review, action items, and decisions.
5. Track action items to closure.

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SP 1.8 Monitor Transition to Operations and Support

Monitor transition to operations and support.

The acquirer monitors and controls the transition of the accepted product or service against the plan for transition to operations and support.

Refer to the Plan Transition to Operations and Support specific practice in the Project Planning process area for more information about planning for the transition of the product or service to operations and support.

Typically, the supplier has a role in integrating and packaging products and prepares for the transition to operations and support, including support for business user acceptance; the acquirer monitors these supplier activities. These expectations of the supplier and the acceptance criteria for transition to operations and support are included in the solicitation package and then the supplier agreement.

Typical Work Products

1. Transition readiness report
2. Records of transition to support reviews
3. Transition analysis report

Typical Supplier Deliverables

1. Training materials and supporting artifacts

2. Site readiness report
3. Verification reports
4. Training records
5. Operational readiness reports
6. Test results
7. Pilot results

Subpractices

1. Monitor the operations and support organization's capability and facilities designated to receive, store, use, and maintain acquired products.

The acquirer makes adequate provisions through the supplier agreement or in-house operations and support organizations to operate the acquired product. Typically, the acquirer uses verification practices to confirm that the organization, physical environment, and operations and support resources are equipped to execute operations and support activities.

The acquirer also reviews operations and support organizations designated to take responsibility for the operation of the product and to ensure that resources identified and budgeted are available when needed. The designated operations and support organizations demonstrate their readiness (i.e., capability and capacity) to accept responsibility for the product and to ensure uninterrupted support. Typically, a demonstration involves execution of all the activities of operations (e.g., a pilot).

2. Monitor the delivery of training for those involved in receiving, storing, using, and maintaining acquired products.

Typically, the supplier develops training resources for the product. Training materials and resources are specified in the supplier agreement to meet the needs of various audiences (e.g., operations staff, support staff, end users). The acquirer verifies that training is provided at the appropriate time to the appropriate audience and determines whether the training capability provided is adequate.

3. Review pilot results, if any, and operational readiness reports for the acquired product.

Determine readiness of the product and involved stakeholders, such as the operations and support organizations, for the transition of responsibility. The acquirer typically uses transition readiness criteria and verification and validation practices to determine if the supplier-delivered products meet specified requirements. The criteria also address the readiness of the product for maintenance over the intended product lifecycle.

4. Review and analyze the results of transition activities.

The acquirer reviews and analyzes the results of transition activities and determines whether corrective actions must be completed before responsibility is transferred to the operational and support organizations.

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Example reports and logs used by the acquirer include the following:

- Transition activity reports, including quality measures collected during the pilot and the warranty period
- Problem tracking reports, detailing resolution time, escalation, and root cause analysis
- Change management reports
- Configuration management records
- Operation logs to determine that sufficient information is stored to support reconstruction
- Security reports
- Actual operations and support costs compared to estimates

SG 2 Manage Corrective Action to Closure

Corrective actions are managed to closure when the project's performance or results deviate significantly from the plan.

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When the acquirer determines (e.g., through its monitoring of measurement data) that supplier progress does not appear to be sufficient to meet a service level defined in the supplier agreement, then the acquirer initiates and manages corrective action with the supplier.

If the supplier does not comply appropriately with the acquirer's initiation of corrective action, the acquirer escalates and resolves this issue as a supplier agreement issue.

SP 2.1 Analyze Issues

Collect and analyze issues and determine corrective actions necessary to address them.

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Corrective action is taken for both acquirer deviations and when supplier execution does not align with project planning (e.g., milestones and work product date slippages).

Many issues and corrective actions are the sole responsibility of the acquirer and may include information that should not be shared with the supplier (e.g., source selection sensitive, re-competition, and internal staffing).

Typical Work Products

1. List of issues needing corrective actions

Typical Supplier Deliverables

1. List of supplier issues needing corrective action by the acquirer

Subpractices

1. Gather issues for analysis.

Issues are collected from reviews and the execution of other processes.

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- Examples of issues to be gathered include the following:
- Issues discovered when performing technical reviews, verification, and validation activities
 - Significant deviations in project planning parameters from estimates in the project plan
 - Commitments (either internal or external) that have not been satisfied
 - Significant changes in risk status
 - Data access, collection, privacy, or security issues
 - Stakeholder representation or involvement issues

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2. Analyze issues to determine the need for corrective action.

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Refer to the Project Planning process area for more information about corrective action criteria.

Corrective action is required when the issue, if left unresolved, may prevent the project from meeting its objectives.

SP 2.2 Take Corrective Action

Take corrective action on identified issues.

Some corrective actions may be assigned to a supplier. The acquirer oversees corrective actions assigned to the supplier, as appropriate.

Typical Work Products

1. Corrective action plans

Typical Supplier Deliverables

1. Corrective action plans for supplier issues

Subpractices

1. Determine and document the appropriate actions needed to address identified issues.

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Refer to the Project Planning process area for more information about the project plan when replanning is needed.

- Examples of potential actions include the following:
- Modifying the statement of work
 - Modifying requirements
 - Revising estimates and plans
 - Renegotiating commitments
 - Adding resources
 - Changing processes
 - Revising project risks

2. Review and get agreement with relevant stakeholders on the actions to be taken.
3. Negotiate changes to internal and external commitments.

SP 2.3 Manage Corrective Actions

Manage corrective actions to closure.

Typical Work Products

1. Corrective action results

Typical Supplier Deliverables

1. Corrective action results for supplier issues

Subpractices

1. Monitor corrective actions for their completion.
2. Analyze results of corrective actions to determine the effectiveness of the corrective actions.
3. Determine and document appropriate actions to correct deviations from planned results for corrective actions.

Lessons learned as a result of taking corrective action can be inputs to planning and risk management processes.

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Project Monitoring and Control (PMC)

Generic Practices by Goal

Continuous Only**GG 1 Achieve Specific Goals**

The process supports and enables achievement of the specific goals of the process area by transforming identifiable input work products to produce identifiable output work products.

GP 1.1 Perform Specific Practices

Perform the specific practices of the project monitoring and control process to develop work products and provide services to achieve the specific goals of the process area.

GG 2 Institutionalize a Managed Process

The process is institutionalized as a managed process.

GP 2.1 Establish an Organizational Policy

Establish and maintain an organizational policy for planning and performing the project monitoring and control process.

Elaboration:

This policy establishes organizational expectations for monitoring performance against the project plan and managing corrective action to closure when actual performance or results deviate significantly from the plan.

GP 2.2 Plan the Process

Establish and maintain the plan for performing the project monitoring and control process.

Elaboration:

This plan for performing the project monitoring and control process can be part of (or referenced by) the project plan, as described in the Project Planning process area.

GP 2.3 Provide Resources

Provide adequate resources for performing the project monitoring and control process, developing the work products, and providing the services of the process.

Elaboration:

Examples of resources provided include the following tools:

- Cost tracking systems
- Effort reporting systems
- Action item tracking systems
- Project management and scheduling programs

GP 2.4 Assign Responsibility

Assign responsibility and authority for performing the process, developing the work products, and providing the services of the project monitoring and control process.

GP 2.5 Train People

Train the people performing or supporting the project monitoring and control process as needed.

Elaboration:

Examples of training topics include the following:

- Monitoring and control of projects
- Risk management
- Data management

GP 2.6 Manage Configurations

Place designated work products of the project monitoring and control process under appropriate levels of control.

Elaboration:

Examples of work products placed under control include the following:

- Project schedules with status
- Project measurement data and analysis
- Earned value reports

GP 2.7 Identify and Involve Relevant Stakeholders

Identify and involve the relevant stakeholders of the project monitoring and control process as planned.

Elaboration:

Refer to Table 6.2 on page 95 in Generic Goals and Generic Practices for more information about the relationship between generic practice 2.7 and the Monitor Stakeholder Involvement practice in the Project Monitoring and Control process area.

Examples of activities for stakeholder involvement include the following:

- Assessing the project against the plan
- Reviewing commitments and resolving issues
- Reviewing project risks
- Reviewing data management activities
- Reviewing project progress
- Managing corrective actions to closure

GP 2.8 Monitor and Control the Process

Monitor and control the project monitoring and control process against the plan for performing the process and take appropriate corrective action.

Elaboration:

Refer to Table 6.2 on page 95 in Generic Goals and Generic Practices for more information about the relationship between generic practice 2.8 and the Project Monitoring and Control process area.

Examples of measures and work products used in monitoring and controlling include the following:

- Number of open and closed corrective actions
- Schedule with status for monthly financial data collection, analysis, and reporting
- Number and types of reviews performed
- Review schedule (planned versus actual and slipped target dates)
- Schedule for collection and analysis of monitoring data

GP 2.9 Objectively Evaluate Adherence

Objectively evaluate adherence of the project monitoring and control process against its process description, standards, and procedures, and address noncompliance.

Elaboration:

Examples of activities reviewed include the following:

- Monitoring project performance against the project plan
- Managing corrective actions to closure

Examples of work products reviewed include the following:

- Records of project performance
- Project review results

GP 2.10 Review Status with Higher Level Management

Review the activities, status, and results of the project monitoring and control process with higher level management and resolve issues.

Staged Only

GG3 and its practices do not apply for a maturity level 2 rating, but do apply for a maturity level 3 rating and above.

Continuous/Maturity Levels 3 - 5 Only

GG 3 Institutionalize a Defined Process

The process is institutionalized as a defined process.

GP 3.1 Establish a Defined Process

Establish and maintain the description of a defined project monitoring and control process.

GP 3.2 Collect Improvement Information

Collect work products, measures, measurement results, and improvement information derived from planning and performing the project monitoring and control process to support the future use and improvement of the organization's processes and process assets.

Elaboration:

Examples of work products, measures, measurement results, and improvement information include the following:

- Records of significant deviations
- Criteria for what constitutes a deviation
- Corrective action results

Continuous Only

GG 4 Institutionalize a Quantitatively Managed Process

The process is institutionalized as a quantitatively managed process.

GP 4.1 Establish Quantitative Objectives for the Process

Establish and maintain quantitative objectives for the project monitoring and control process, which address quality and process performance, based on customer needs and business objectives.

GP 4.2 Stabilize Subprocess Performance

Stabilize the performance of one or more subprocesses to determine the ability of the project monitoring and control process to achieve the established quantitative quality and process-performance objectives.

Continuous Only

GG 5 Institutionalize an Optimizing Process

The process is institutionalized as an optimizing process.

GP 5.1 Ensure Continuous Process Improvement

Ensure continuous improvement of the project monitoring and control process in fulfilling the relevant business objectives of the organization.

GP 5.2 Correct Root Causes of Problems

Identify and correct the root causes of defects and other problems in the project monitoring and control process.