

Level 5 Process Checklists

Overview

Section purpose The purpose of the process checklists is to provide:

- Guidance in identifying which processes are required by the CMM at level 5.
 - Criteria that an organization can use to evaluate its software processes to determine if they are consistent with the CMM at level 5.
 - Information that can be used to develop software processes that are consistent with the CMM at level 5.
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In this section This section contains checklists for the following key process areas:

Key Process Area	See Page
Defect Prevention	L5-Process-3
Technology Change Management	L5-Process-35
Process Change Management	L5-Process-77

Defect Prevention (DP) Process

DP Process - Overview

DP process purpose

The purpose of Defect Prevention is to identify the cause of defects and prevent them from recurring. (L5-1)

DP process description

Defect Prevention involves analyzing defects that were encountered in the past and taking specific actions to prevent the occurrence of those types of defects in the future. The defects may have been identified on other projects as well as in earlier stages or tasks of the current project. Defect prevention activities are also one mechanism for spreading lessons learned between projects.

Trends are analyzed to track the types of defects that have been encountered and to identify defects that are likely to recur. Based on an understanding of the project's defined software process and how it is implemented (as described in the Integrated Software Management and Software Product Engineering key process areas), the root causes of the defects and the implications of the defects for future activities are determined.

Both the project and the organization take specific actions to prevent recurrence of the defects. Some of the organizational actions may be handled as described in the Process Change Management key process area. (L5-1)

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DP Process - Overview, Continued

Section overview

The table below contains a description and the location of each checklist for this key process area.

Checklist	Description	Page
Roles	List of roles participating in process activities.	L5-Process-5
Entry Criteria	Description of when the process can start.	L5-Process-9
Inputs	Description of the work products used by the process.	L5-Process-10
Activities	Description of the activities of the process.	L5-Process-12
Outputs	Description of the work products produced by the process.	L5-Process-16
Exit Criteria	Description of when the process is complete.	L5-Process-20
Reviews and Audits	List of reviews and audits.	L5-Process-27
Work Products Managed and Controlled	List of work products to be managed and controlled.	L5-Process-29
Measurements	Description of process measurements.	L5-Process-30
Documented Procedures	List of the activities to be completed according to a documented procedure.	L5-Process-31
Training	List of training.	L5-Process-32
Tools	List of tools.	L5-Process-33

DP Process - Roles

Roles

The table below lists the roles and the activities in which they participate in the defect prevention process.

√	Roles	Activities Participated in...	Reference
	Causal analysis meeting leader	The (causal analysis meetings) are led by a person trained in conducting causal analysis meetings . (L5-7, A3, 2)	
	Project manager	The software project's activities for defect prevention are reviewed with the project manager on both a periodic and event-driven basis. (L5-15, V2)	
	Senior management	The organization's activities for defect prevention are reviewed with senior management on a periodic basis. (L5-14, V1)	
	Software engineering group or Members of the software engineering group	<input type="checkbox"/> Members of the software engineering group and other software-related groups receive required training to perform their defect prevention activities. (L5-4, Ab4) <input type="checkbox"/> Members of the software engineering group and software-related groups receive feedback on the status and results of the organization's and project's defect prevention activities on a periodic basis. (L5-12, A8)	
	Software engineering manager	The software engineering managers and technical staff are trained for their defect prevention roles. (L5-15, V3, 1)	
	Software-related groups or Members of the software-related groups	<input type="checkbox"/> Members of the software engineering group and other software-related groups receive required training to perform their defect prevention activities. (L5-4, Ab4) <input type="checkbox"/> Members of the software engineering group and software-related groups receive feedback on the status and results of the organization's and project's defect prevention activities on a periodic basis. (L5-12, A8)	

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DP Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the defect prevention process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	Software quality assurance (SQA) group	The software quality assurance group reviews and/or audits the activities and work products for defect prevention and reports the results. (L5-15, V3)	
	Submitters of the action proposals	Each of the teams assigned to coordinate defect prevention activities document their rationale for decisions and provide the decision and the rationale to the submitters of the action proposals . (L5-9, A4, 6)	
	Team performing the software task or Members of the team performing the software task	<input type="checkbox"/> At the beginning of a software task, the members of the team performing the task meet to prepare for the activities of that task and the related defect prevention activities. (L5-6, A2) <input type="checkbox"/> Each team that performs a software task conducts causal analysis meetings. (L5-7, A3, 1)	
	Teams assigned to coordinate defect prevention activities (the organization-level team or the teams for each software project)	<input type="checkbox"/> Each of the teams assigned to coordinate defect prevention activities meets on a periodic basis to review and coordinate implementation of action proposals from the causal analysis meetings. (L5-8, A4) <input type="checkbox"/> The teams : <ul style="list-style-type: none"> <input type="checkbox"/> Review the output from the causal analysis meetings and select action proposals that will be addressed. <input type="checkbox"/> Review action proposals that have been assigned to them by other teams coordinating defect prevention activities in the organization and select action proposals that will be addressed. <input type="checkbox"/> Review actions taken by the other teams in the organization to assess whether these actions can be applied to their activities and processes. 	
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DP Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the defect prevention process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	Teams assigned to coordinate defect prevention activities (the organization-level team or the teams for each software project), continued	<ul style="list-style-type: none"> <input type="checkbox"/> The teams: (L5-8, A4) <ul style="list-style-type: none"> <input type="checkbox"/> Perform a preliminary analysis of the action proposals and set their priorities. <input type="checkbox"/> Reassign action proposals to teams at another level in the organization, as appropriate. <input type="checkbox"/> Document their rationale for decisions and provide the decision and the rationale to the submitters of the action proposals. <input type="checkbox"/> Assign responsibility for implementing the action items resulting from the action proposals. <ul style="list-style-type: none"> <input type="checkbox"/> Implementation of the action items includes making immediate changes to the activities that are within the purview of the team and arranging for other changes. <input type="checkbox"/> Members of the team usually implement the action items, but, in some cases, the team can arrange for someone else to implement an action item. <input type="checkbox"/> Review results of defect prevention experiments and take actions to incorporate the results of successful experiments into the rest of the project or organization, as appropriate. <input type="checkbox"/> Track the status of the action proposals and action items. 	
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DP Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the defect prevention process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	Teams assigned to coordinate defect prevention activities (the organization-level team or the teams for each software project), continued	<ul style="list-style-type: none"> <input type="checkbox"/> The teams: (L5-8, A4) <ul style="list-style-type: none"> <input type="checkbox"/> Document software process improvement proposals for the organization's standard software process and the projects' defined software processes as appropriate. <input type="checkbox"/> Review and verify completed action items before they are closed. <input type="checkbox"/> Ensure that significant efforts and successes in preventing defects are recognized. <input type="checkbox"/> Defect prevention data are documented and tracked across the teams coordinating defect prevention activities. (L5-11, A5) 	
	Teams at another level in the organization	The teams assigned to coordinate defect prevention activities reassign action proposals (from the causal analysis meetings) to teams at another level in the organization , as appropriate. (L5-9, A4, 5)	
	Technical staff	The software engineering managers and technical staff are trained for their defect prevention roles. (L5-15, V3, 1)	

DP Process - Entry Criteria

Input-based entry criteria

There are no input-based entry criteria in the defect prevention process.

General entry criteria

The CMM recommends that the conditions described in the table below be satisfied before entering the defect prevention process.

√	Condition	References
	The organization follows a written policy for defect prevention activities (L5-2, C1). [Refer to Level 5 Policies for additional information regarding DP policy.]	
	An organization-level team to coordinate defect prevention activities exists. (L5-3, Ab1)	
	The organization-level team to coordinate defect prevention activities is either part of the group responsible for the organization's software process activities (e.g., software engineering process group) or its activities are closely coordinated with that group. (L5-3, Ab1, 1)	
	A team to coordinate defect prevention activities for the software project exists. (L5-3, Ab2)	
	This team is closely tied to the team responsible for developing and maintaining the project's defined software process . (L5-3, Ab2, 1)	
	Adequate resources and funding are provided for defect prevention activities at the project and organization levels. (L5-4, Ab3)	
	Defect prevention activities are planned into each person's responsibilities, as appropriate. (L5-4, Ab3, 1)	
	Management participation in the defect prevention activities is planned. (L5-4, Ab3, 2)	
	Each software project is represented on the team coordinating defect prevention activities for the organization , as appropriate. (L5-4, Ab3, 3)	
	Tools to support defect prevention activities are made available. (L5-4, Ab3, 4)	
	Members of the software engineering group and other software-related groups receive required training to perform their defect prevention activities. (L5-4, Ab4)	

DP Process - Inputs

Inputs

The table below lists the recommended inputs to the defect prevention process.

√	Input	Org. Input	References
	Action items resulting from the action proposals (from the causal analysis meetings). (L5-9, A4, 7)		
	Action proposals from the causal analysis meetings. (L5-8, A4)		
	Categories of root causes. (L5-7, A3, 4)		
	Changes to software methods. (L5-6, A2, 1)		
	Completed action items (resulting from action proposals from the causal analysis meetings). (L5-10, A4, 11)		
	Inputs required and available for the (software) task. (L5-6, A2, 2)		
	List of errors that are commonly made or introduced during the current stage. (L5-6, A2, 6)		
	Methods to be used to evaluate the outputs. (L5-6, A2, 4)		
	Methods to be used to verify adherence to the software process. (L5-6, A2, 5)		
	Organization's standard software process. (L5-10, A4, 10)		
	Output from the causal analysis meetings. (L5-9, A4, 1)		
	Outputs to be produced with examples, if available. (L5-6, A2, 3)		
	Projects' defined software processes. (L5-3, Ab2, 1)		
	Recommended preventive actions (for errors that are commonly made or introduced during the current stage). (L5-6, A2, 6)		
	Results of defect prevention experiments. (L5-10, A4, 8)		
	Results of successful (defect prevention) experiments. (L5-10, A4, 8)		
	Software methods. (L5-6, A2, 1)		
	Software product quality goals for the software project. (L5-7, A2, 9)		

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DP Process - Inputs, Continued

Inputs, continued

The table below lists the recommended inputs to the defect prevention process, continued from the previous page.

√	Input	Org. Input	References
	Software product quality goals for the software task. (L5-7, A2, 9)		
	Software products. (L5-2, C1, 3)		
	Task schedule. (L5-6, A2, 8)		
	Team assignments. (L5-6, A2, 7)		
	Work products for defect prevention. (L5-15, V3)		

DP Process - Activities

Activities

The table below lists the recommended activities for the defect prevention process.

√	Activities	References
	<p>The software project develops and maintains a plan for its defect prevention activities. (L5-5, A1)</p> <ul style="list-style-type: none"> <input type="checkbox"/> This plan undergoes peer review. (L5-5, A1, 4) 	
	<p>At the beginning of a software task, the members of the team performing the task meet to prepare for the activities of that task and the related defect prevention activities. (L5-6, A2)</p> <p>These kick-off meetings cover:</p> <ul style="list-style-type: none"> <input type="checkbox"/> The software process, standards, procedures, methods, and tools applicable to the task, with an emphasis on recent changes. <input type="checkbox"/> The inputs required and available for the task. <input type="checkbox"/> The outputs to be produced with examples, if available. <input type="checkbox"/> The methods to be used to evaluate the outputs. <input type="checkbox"/> The methods to be used to verify adherence to the software process. <input type="checkbox"/> A list of errors that are commonly made or introduced during the current stage and recommended preventive actions for these errors. <input type="checkbox"/> The team assignments. <input type="checkbox"/> The task schedule. <input type="checkbox"/> The software product quality goals for the task and software project. 	
	<p>Causal analysis meetings are conducted according to a documented procedure. (L5-7, A3)</p> <p>[Refer to Level 5 Procedure Checklists for additional information.]</p>	

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DP Process - Activities, Continued

Activities, continued

The table below lists the recommended activities for the defect prevention process, continued from the previous page.

√	Activities	References
	<p>Each of the teams assigned to coordinate defect prevention activities meets on a periodic basis to review and coordinate implementation of action proposals from the causal analysis meetings. (L5-8, A4)</p> <ul style="list-style-type: none"> <input type="checkbox"/> The teams: <ul style="list-style-type: none"> <input type="checkbox"/> Review the output from the causal analysis meetings and select action proposals that will be addressed. <input type="checkbox"/> Review action proposals that have been assigned to them by other teams coordinating defect prevention activities in the organization and select action proposals that will be addressed. <input type="checkbox"/> Review actions taken by the other teams in the organization to assess whether these actions can be applied to their activities and processes. <input type="checkbox"/> Perform a preliminary analysis of the action proposals and set their priorities. <input type="checkbox"/> Reassign action proposals to teams at another level in the organization, as appropriate. <input type="checkbox"/> Document their rationale for decisions and provide the decision and the rationale to the submitters of the action proposals. <input type="checkbox"/> Assign responsibility for implementing the action items resulting from the action proposals. <ul style="list-style-type: none"> <input type="checkbox"/> Implementation of the action items includes making immediate changes to the activities that are within the purview of the team and arranging for other changes. <input type="checkbox"/> Members of the team usually implement the action items, but, in some cases, the team can arrange for someone else to implement an action item. <input type="checkbox"/> Review results of defect prevention experiments and take actions to incorporate the results of successful experiments into the rest of the project or organization, as appropriate. <input type="checkbox"/> Track the status of the action proposals and action items. 	
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DP Process - Activities, Continued

Activities, continued

The table below lists the recommended activities for the defect prevention process, continued from the previous page.

√	Activities	References
	<i>Activity continued from previous page</i>	
	<ul style="list-style-type: none"> <input type="checkbox"/> Review results of defect prevention experiments and take actions to incorporate the results of successful experiments into the rest of the project or organization, as appropriate. <input type="checkbox"/> Track the status of the action proposals and action items. <input type="checkbox"/> Document software process improvement proposals for the organization's standard software process and the projects' defined software processes as appropriate. <input type="checkbox"/> Review and verify completed action items before they are closed. <input type="checkbox"/> Ensure that significant efforts and successes in preventing defects are recognized. 	
	<p>Defect prevention data are documented and tracked across the teams coordinating defect prevention activities. (L5-11, A5)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Action proposals identified in causal analysis meetings are documented. <input type="checkbox"/> Action items resulting from action proposals are documented. <input type="checkbox"/> The defect prevention data are managed and controlled. 	
	Revisions to the organization's standard software process resulting from defect prevention actions are incorporated according to a documented procedure. (L5-12, A6)	
	Revisions to the project's defined software process resulting from defect prevention actions are incorporated according to a documented procedure. (L5-12, A7)	
	Members of the software engineering group and software-related groups receive feedback on the status and results of the organization's and project's defect prevention activities on a periodic basis. (L5-12, A8)	
	Measurements are made and used to determine the status of the defect prevention activities. (L5-13, M1)	
	The organization's activities for defect prevention are reviewed with senior management on a periodic basis. (L5-14, V1)	

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DP Process - Activities, Continued

Activities, continued

The table below lists the recommended activities for the defect prevention process, continued from the previous page.

√	Activities	References
	The software project's activities for defect prevention are reviewed with the project manager on both a periodic and event-driven basis. (L5-15, V2)	
	The software quality assurance group reviews and/or audits the activities and work products for defect prevention and reports the results. (L5-15, V3)	

DP Process - Outputs

Outputs

The table below lists the recommended outputs produced by the defect prevention process.

√	Output	Org. Output	References
	Action items resulting from action proposals. (L5-11, A5, 2)		
	Action proposals (from the causal analysis meetings). (L5-9, A4, 1)		
	Actual cost of completed defect prevention activities. (L5-15, V1, 6)		
	Commitments for funding, staffing, and other resources for defect prevention. (L5-2, C1, 1)		
	Common causes of defects. (L5-8, A3, 6)		
	Decision(s) (for action proposals). (L5-9, A4, 6)		
	Defect prevention data. (L5-11, A5)		
	Defects. (L5-7, A3, 3)		
	Feedback on the status and results of the organization's and project's defect prevention activities. (L5-12, A8)		
	Frequency distribution of actions in the major action categories. (L5-14, V1, 2)		
	Frequency distribution of defects in the major defect categories. (L5-13, A8, 2)		
	Inputs required and available for the (software) task. (L5-6, A2, 2)		
	List of errors that are commonly made or introduced during the current stage. (L5-6, A2, 6)		
	Long-term plans for funding, staffing, and other resources for defect prevention. (L5-2, C1, 1)		
	Management actions identified as a result of the defect prevention activities. (L5-2, C1, 5)		
	Measurements (to determine the status of defect prevention activities). (L5-13, M1)		
	Methods to be used to evaluate the outputs. (L5-6, A2, 4)		
	Methods to be used to verify adherence to the software process. (L5-6, A2, 5)		

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DP Process - Outputs, Continued

Outputs, continued

The table below lists the recommended outputs produced by the defect prevention process, continued from the previous page.

√	Output	Org. Output	References
	Number of defects uncovered. (L5-7, A3, 1.2)		
	Outputs to be produced with examples, if available. (L5-6, A2, 3)		
	Plan for (the software project's) defect prevention activities. (L5-5, A1) [Refer to Level 5 Standards for additional information regarding this plan.]		
	Priorities (for action proposals). (L5-9, A4, 4)		
	Project management actions identified as a result of the defect prevention activities. (L5-3, C2, 3)		
	Project technical actions identified as a result of the defect prevention activities. (L5-3, C2, 3)		
	Project's software development plan. (L5-3, C2, 1)		
	Projected cost of planned defect prevention activities. (L5-15, V1, 6)		
	Proposed actions to prevent the future occurrence of identified defects and similar defects. (L5-8, A3, 5)		
	Rationale for decisions (about implementing action proposals from the causal analysis meetings). (L5-9, A4, 6)		
	Recommended preventive actions (for errors that are commonly made or introduced during the current stage of a software task). (L5-6, A2, 6)		
	Results (of the SQA group reviews and/or audits of the activities and work products for defect prevention). (L5-15, V3)		
	Results of the (causal analysis) meeting. (L5-8, A3, 7)		
	Results of the defect prevention activities. (L5-2, C1, 4)		

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DP Process - Outputs, Continued

Outputs, continued

The table below lists the recommended outputs produced by the defect prevention process, continued from the previous page.

√	Output	Org. Output	References
	Revisions to the organization's standard software process resulting from defect prevention actions. (L5-12, A6)		
	Revisions to the project's defined software process resulting from defect prevention actions. (L5-12, A7)		
	Root causes (of defects). (L5-7, A3, 3)		
	Schedule of defect prevention activities. (L5-5, A1, 2)		
	Significant innovations to address the major defect categories. (L5-13, A8, 3)		
	Software methods. (L5-6, A2, 1)		
	Software process improvement proposals for the organization's standard software process. (L5-10, A4, 10)		
	Software process improvement proposals for the projects' defined software processes. (L5-10, A4, 10)		
	Software product quality goals for the software project. (L5-7, A2, 9)		
	Software product quality goals for the task. (L5-7, A2, 9)		
	Software products. (L5-7, A3, 1.3)		
	Summary of the effectiveness of and savings attributable to the defect prevention activities. (L5-15, V1, 5)		
	Summary of the major action categories. (L5-14, V1, 2)		
	Summary of the major defect categories. (L5-13, A8, 1)		
	Summary status of the action proposals and action items. (L5-13, A8, 4)		
	Summary status of the proposed, open, and completed action items. (L5-15, V1, 4)		
	Task schedule. (L5-6, A2, 8)		

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DP Process - Outputs, Continued

**Outputs,
continued**

The table below lists the recommended outputs produced by the defect prevention process, continued from the previous page.

√	Output	Org. Output	References
	Team assignments. (L5-6, A2, 7)		
	Technical actions identified as a result of the defect prevention activities. (L5-2, C1, 5)		

DP Process - Exit Criteria

Output-based exit criteria

The CMM recommends that outputs satisfy the states described in the table below to exit the defect prevention process.

√	Output	State	References
	Action items resulting from action proposals	are documented. (L5-11, A5, 2)	
	Action proposals (from the causal analysis meetings)	are selected. (L5-9, A4, 1)	
	Changes to software methods	are covered in kick-off meetings at the beginning of a software task. (L5-6, A2, 1)	
	Commitments for funding, staffing, and other resources for defect prevention	are established. (L5-2, C1, 1)	
	Common causes of defects	<input type="checkbox"/> are identified. (L5-8, A3, 6) <input type="checkbox"/> are documented. (L5-8, A3, 6)	
	Decision(s) (for action proposals)	are provided to the submitters of the action proposals . (L5-9, A4, 6)	
	Defect prevention data	<input type="checkbox"/> are documented. (L5-11, A5) <input type="checkbox"/> are tracked across the teams coordinating defect prevention activities . (L5-11, A5) <input type="checkbox"/> are managed and controlled. (L5-11, A5, 3)	
	Defects	<input type="checkbox"/> are identified. (L5-7, A3, 3) <input type="checkbox"/> are analyzed to determine their root causes. (L5-7, A3, 3) <input type="checkbox"/> are assigned to categories of root causes. (L5-7, A3, 4)	

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DP Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the defect prevention process, continued from the previous page.

√	Output	State	References
	Feedback on the status and results of the organization's and project's defect prevention activities	<ul style="list-style-type: none"> <input type="checkbox"/> is received by members of the software engineering group on a periodic basis. (L5-12, A8) <input type="checkbox"/> is received by members of the software-related groups on a periodic basis. (L5-12, A8) <input type="checkbox"/> provides (L5-12, A8): <ul style="list-style-type: none"> <input type="checkbox"/> A summary of the major defect categories. <input type="checkbox"/> The frequency distribution of defects in the major defect categories. <input type="checkbox"/> Significant innovations and actions taken to address the major defect categories. <input type="checkbox"/> A summary status of the action proposals and action items. 	
	Inputs required and available for the (software) task	are covered in kick-off meetings at the beginning of a software task. (L5-6, A2, 2)	
	List of errors that are commonly made or introduced during the current stage	are covered in kick-off meetings at the beginning of a software task. (L5-6, A2, 6)	
	Long-term plans for funding, staffing, and other resources for defect prevention	are established. (L5-2, C1, 1)	
	Management actions identified as a result of the defect prevention activities	are addressed. (L5-2, C1, 5)	
	Measurements (to determine the status of the defect prevention activities)	<ul style="list-style-type: none"> <input type="checkbox"/> are made. (L5-13, M1) <input type="checkbox"/> are used. (L5-13, M1) 	

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DP Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the defect prevention process, continued from the previous page.

√	Output	State	References
	Methods to evaluate the outputs (of a software task)	are covered in kick-off meetings at the beginning of a software task. (L5-6, A2, 4)	
	Methods to verify adherence to the software process	are covered in kick-off meetings at the beginning of a software task. (L5-6, A2, 5)	
	Outputs to be produced with examples, if available	are covered in kick-off meetings at the beginning of a software task. (L5-6, A2, 3)	
	Plan for (the software project's) defect prevention activities	<input type="checkbox"/> is developed by the software project. (L5-5, A1) <input type="checkbox"/> is maintained by the software project. (L5-5, A1) <input type="checkbox"/> undergoes peer review. (L5-5, A1, 4)	
	Priorities (for action proposals)	are set. (L5-9, A4, 4)	
	Project management actions identified as a result of the defect prevention activities	are addressed. (L5-3, C2, 3)	
	Project technical actions identified as a result of the defect prevention activities	are addressed. (L5-3, C2, 3)	
	Project's software development plan	includes defect prevention activities. (L5-3, C2, 1)	
	Proposed actions to prevent the future occurrence of identified defects and similar defects	<input type="checkbox"/> are developed. (L5-8, A3, 5) <input type="checkbox"/> are documented. (L5-8, A3, 5)	
	Rationale for decisions (about implementing action proposals from causal analysis meetings)	<input type="checkbox"/> are documented. (L5-9, A4, 6) <input type="checkbox"/> are provided to the submitters of the action proposals . (L5-9, A4, 6)	

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DP Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the defect prevention process, continued from the previous page.

√	Output	State	References
	Recommended preventive actions (for errors that are commonly made or introduced during the current stage of a software task)	are covered in kick-off meetings at the beginning of a software task. (L5-6, A2, 6)	
	Results (of the SQA group reviews and/or audits of the activities and work products for defect prevention)	are reported. (L5-15, V3)	
	Results of the (causal analysis) meeting	are recorded for use by the organization and other projects. (L5-8, A3, 7)	
	Results of the defect prevention activities	are reviewed to ensure the effectiveness of those activities. (L5-2, C1, 4)	
	Revisions to the organization's standard software process resulting from defect prevention actions	are incorporated according to a documented procedure. (L5-12, A6)	
	Revisions to the project's defined software process resulting from defect prevention actions	are incorporated according to a documented procedure. (L5-12, A7)	
	Root causes (of defects)	are determined. (L5-7, A3, 3)	
	Software methods	are covered in kick-off meetings at the beginning of a software task. (L5-6, A2, 1)	
	Software process improvement proposals for the organization's standard software process	are documented, as appropriate. (L5-10, A4, 10)	

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DP Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the defect prevention process, continued from the previous page.

√	Output	State	References
	Software process improvement proposals for the projects' defined software processes	are documented, as appropriate. (L5-10, A4, 10)	
	Software product quality goals for the software project	are covered in kick-off meetings at the beginning of a software task. (L5-6, A2, 9)	
	Software product quality goals for the task	are covered in kick-off meetings at the beginning of a software task. (L5-7, A2, 9)	
	Task schedule	is covered in kick-off meetings at the beginning of a software task. (L5-7, A2, 8)	
	Team assignments	are covered in kick-off meetings at the beginning of a software task. (L5-6, A2, 7)	
	Technical actions identified as a result of the defect prevention activities	are addressed. (L5-2, C1, 5)	

General exit criteria

The CMM recommends that the conditions described in the table below be satisfied to exit the defect prevention process.

√	Condition	References
	The resources needed are allocated for the (organization's) defect prevention activities. (L5-2, C1, 2)	
	Defect prevention activities are implemented across the organization to improve the software processes and products. (L5-2, C1, 3)	
	The resources needed are allocated for the (project's) defect prevention activities. (L5-3, C2, 2)	
	At the beginning of a software task, the members of the team performing the task meet to prepare for the activities of that task and the related defect prevention activities. (L5-6, A2)	
	Causal analysis meetings are conducted according to a documented procedure. (L5-7, A3)	

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DP Process - Exit Criteria, Continued

General exit criteria, continued

The CMM recommends that the conditions described in the table below be satisfied to exit the defect prevention process, continued from the previous page.

√	Condition	References
	<p>Each of the teams assigned to coordinate defect prevention activities meets on a periodic basis to review and coordinate implementation of action proposals from the causal analysis meetings. (L5-8, A4)</p> <p>The teams:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Review the output from the causal analysis meetings and select action proposals that will be addressed. (L5-9, A4, 1) <input type="checkbox"/> Review action proposals that have been assigned to them by other teams coordinating defect prevention activities in the organization and select action proposals that will be addressed. (L5-9, A4, 2) <input type="checkbox"/> Review actions taken by the other teams in the organization to assess whether these actions can be applied to their activities and processes. (L5-9, A4, 3) <input type="checkbox"/> Perform a preliminary analysis of the action proposals and set their priorities. (L5-9, A4, 4) <input type="checkbox"/> Reassign action proposals to teams at another level in the organization, as appropriate. (L5-9, A4, 5) <input type="checkbox"/> Assign responsibility for implementing the action items resulting from the action proposals. (L5-9, A4, 7) <ul style="list-style-type: none"> <input type="checkbox"/> Implementation of the action items includes making immediate changes to the activities that are within the purview of the team and arranging for other changes. (L5-10, A4, 7.1) <input type="checkbox"/> Members of the team usually implement the action items, but, in some cases, the team can arrange for someone else to implement an action item. (L5-10, A4, 7.2) <input type="checkbox"/> Review results of defect prevention experiments and take actions to incorporate the results of successful experiments into the rest of the project or organization, as appropriate. (L5-10, A4, 8) <input type="checkbox"/> Track the status of the action proposals and action items. (L5-10, A4, 9) <input type="checkbox"/> Review and verify completed action items before they are closed. (L5-10, A4, 11) <input type="checkbox"/> Ensure that significant efforts and successes in preventing defects are recognized. (L5-10, A4, 12) 	

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DP Process - Exit Criteria, Continued

General exit criteria, continued

The CMM recommends that the conditions described in the table below be satisfied to exit the defect prevention process, continued from the previous page.

√	Condition	References
	The organization's activities for defect prevention are reviewed with senior management on a periodic basis. (L5-14, V1)	
	The software project's activities for defect prevention are reviewed with the project manager on both a periodic and event-driven basis. (L5-15, V2)	
	The software quality assurance group reviews and/or audits the activities and work products for defect prevention and reports the results. (L5-15, V3)	

DP Process - Reviews and Audits

Reviews and audits

The table below lists the recommended reviews and audits for the defect prevention process.

√	Review or Audit	Review Participants	References
	The results of the defect prevention activities are reviewed to ensure the effectiveness of those activities. (L5-2, C1, 4)	Not specified in the CMM	
	The (software project's plan for defect prevention activities) undergoes peer review. (L5-5, A1, 4)	Not specified in the CMM	
	Each of the teams assigned to coordinate defect prevention activities meets on a periodic basis to review and coordinate implementation of action proposals from the causal analysis meetings. (L5-8, A4)	Teams assigned to coordinate defect prevention activities	
	The teams assigned to coordinate defect prevention activities review the output from the causal analysis meetings and select action proposals that will be addressed. (L5-9, A4, 1)	Teams assigned to coordinate defect prevention activities	
	The teams assigned to coordinate defect prevention activities review action proposals that have been assigned to them by other teams coordinating defect prevention activities in the organization and select action proposals that will be addressed. (L5-9, A4, 2)	Teams assigned to coordinate defect prevention activities	
	The teams assigned to coordinate defect prevention activities review actions taken by the other teams in the organization to assess whether these actions can be applied to their activities and processes. (L5-9, A4, 3)	Teams assigned to coordinate defect prevention activities	
	The teams assigned to coordinate defect prevention activities review results of defect prevention experiments and take actions to incorporate the results of successful experiments into the rest of the project or organization, as appropriate. (L5-10, A4, 8)	Teams assigned to coordinate defect prevention activities	

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DP Process - Reviews and Audits, Continued

Reviews and audits, continued

The table below lists the recommended reviews and audits for the defect prevention process, continued from the previous page.

√	Review or Audit	Review Participants	References
	The teams assigned to coordinate defect prevention activities review and verify completed action items before they are closed. (L5-10, A4, 11)	Teams assigned to coordinate defect prevention activities	
	The organization's activities for defect prevention are reviewed with senior management on a periodic basis. (L5-14, V1)	Senior management	
	The software project's activities for defect prevention are reviewed with the project manager on both a periodic and event-driven basis. (L5-15, V2)	Project manager	
	<p>The software quality assurance group reviews and/or audits the activities and work products for defect prevention and reports the results. (L5-15, V3)</p> <p>At a minimum, the reviews and/or audits verify that:</p> <ul style="list-style-type: none"> <input type="checkbox"/> The software engineering managers and technical staff are trained for their defect prevention roles. (L5-15, V3, 1) <input type="checkbox"/> The task kick-off meetings and causal analysis meetings are properly conducted. (L5-15, V3, 2) <input type="checkbox"/> The process for reviewing action proposals and implementing action items is followed. (L5-15, V3, 3) 	Software quality assurance group	

DP Process - Work Products Managed and Controlled

Work products managed and controlled

The table below lists the work products that are recommended to be managed and controlled during the defect prevention process.

√	Work Products Managed and Controlled	References
	Defect prevention data. (L5-11, A5, 3)	

DP Process - Measurements

Measurements The table below lists the measurements recommended for the defect prevention process.

√	Measurements	References
	Defect prevention data. (L5-11, A5)	
	Measurements to determine the status of the defect prevention activities. (L5-13, M1) Examples of measurements include: <ul style="list-style-type: none"><li data-bbox="477 617 1214 680">❑ The costs of defect prevention activities (e.g., holding causal analysis meetings and implementing action items.<li data-bbox="477 688 1195 772">❑ The time and cost for identifying the defects and correcting them, compared to the estimated cost of not correcting the defects.<li data-bbox="477 781 1219 844">❑ Profiles measuring the number of action items proposed, open, and completed.<li data-bbox="477 852 1149 915">❑ The number of defects injected in each stage, cumulatively, and over releases of similar products.<li data-bbox="477 924 813 957">❑ The number of defects.	

DP Process - Documented Procedures

Documented procedures

The table below lists the activities for the defect prevention process recommended to be performed according to a documented procedure.

√	Documented Procedure(s)	References
	Causal analysis meetings are conducted according to a documented procedure. (L5-7, A3) [Refer to Level 5 Procedure Checklists for additional information.]	
	Revisions to the organization's standard software process resulting from defect prevention actions are incorporated according to a documented procedure. (L5-12, A6)	
	Revisions to the project's defined software process resulting from defect prevention actions are incorporated according to a documented procedure. (L5-12, A7)	

DP Process - Training

Training

The table below lists the training recommended for the defect prevention process.

√	Training	References
	Members of the software engineering group and other software-related groups receive required training to perform their defect prevention activities. (L5-4, Ab4)	

DP Process - Tools

Tools

The table below lists the tools recommended for the defect prevention process.

√	Tools	References
	Tools to support defect prevention activities. (L5-4, Ab3, 4) Examples of support tools include: <ul style="list-style-type: none"><input type="checkbox"/> statistical analysis tools, and<input type="checkbox"/> database systems.	

Technology Change Management (TCM) Process

TCM Process - Overview

TCM process purpose The purpose of Technology Change Management is to identify new technologies (i.e., tools, methods, and processes) and track them into the organization in an orderly manner. (L5-17)

TCM process description Technology Change Management involves identifying, selecting, and evaluating new technologies, and incorporating effective technologies into the organization. The objective is to improve software quality, increase productivity, and decrease the cycle time for product development.

The organization establishes a group (such as a software engineering process group or a technology support group) that works with the software projects to introduce and evaluate new technologies and manage changes to existing technologies. Particular emphasis is placed on technology changes that are likely to improve the capability of the organization's standard software process (as described in the Organization Process Definition key process area).

By maintaining an awareness of software-related technology innovations and systematically evaluating and experimenting with them, the organization selects appropriate technologies to improve the quality of its software and the productivity of its software activities. Pilot efforts are performed to assess new and unproven technologies before they are incorporated into normal practice. With appropriate sponsorship of the organization's management, the selected technologies are incorporated into the organization's standard software process and current projects, as appropriate.

Changes to the organization's standard software process (as described in the Organization Process Definition key process area) and the projects' defined software processes (as described in the Integrated Software Management key process area) resulting from these technology changes are handled as described in the Process Change Management key process area. (L5-17)

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TCM Process - Overview, Continued

Section overview

The table below contains a description and the location of each checklist for this key process area.

Checklist	Description	Page
Roles	List of roles participating in process activities.	L5-Process-37
Entry Criteria	Description of when the process can start.	L5-Process-44
Inputs	Description of the work products used by the process.	L5-Process-46
Activities	Description of the activities of the process.	L5-Process-48
Outputs	Description of the work products produced by the process.	L5-Process-52
Exit Criteria	Description of when the process is complete.	L5-Process-57
Reviews and Audits	List of reviews and audits.	L5-Process-69
Work Products Managed and Controlled	List of work products to be managed and controlled.	L5-Process-71
Measurements	Description of process measurements.	L5-Process-72
Documented Procedures	List of the activities to be completed according to a documented procedure.	L5-Process-73
Training	List of training.	L5-Process-74
Tools	List of tools.	L5-Process-75

TCM Process - Roles

Roles

The table below lists the roles and the activities in which they participate in the technology change management process.

√	Roles	Activities Participated in...	Reference
	Affected managers	The plan for technology change management is reviewed by the affected managers . (L5-24, A1, 6)	
	Group responsible for the organization's technology change management activities	<ul style="list-style-type: none"> <li data-bbox="682 567 1218 682">❑ The group responsible for the organization's technology change management activities coordinates and helps to (L5-20, Ab1, 2): <ul style="list-style-type: none"> <li data-bbox="730 693 1218 756">❑ explore potential areas for applying new technology; <li data-bbox="730 766 1218 829">❑ select and plan for new technologies; <li data-bbox="730 840 1218 903">❑ acquire, install, and customize new technologies; <li data-bbox="730 913 1218 1029">❑ communicate and coordinate with related research and development activities within the organization; and <li data-bbox="730 1039 1218 1134">❑ communicate with the technology suppliers on problems and enhancements. <li data-bbox="682 1144 1218 1375">❑ Experienced staff members with expertise in specialized areas are available to this group responsible for the organization's technology change management activities to help in evaluating, planning, and supporting initiatives for technology change management. (L5-21, Ab2, 1) <li data-bbox="682 1386 1218 1533">❑ Members of the group responsible for the organization's technology change management activities receive required training to perform these activities. (L5-23, Ab5) <li data-bbox="682 1543 1218 1690">❑ The group responsible for the organization's technology change management activities works with the software projects in identifying areas of technology change. (L5-24, A2) 	
<i>Role continued on next page</i>			

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TCM Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the technology change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
<i>Role continued from previous page</i>			
	Group responsible for the organization's technology change management activities, continued	<ul style="list-style-type: none"> <li data-bbox="682 510 1218 604">❑ The group responsible for the organization's technology change management activities: (L5-24, A2) <li data-bbox="730 611 1218 674">❑ Solicits suggestions for technology changes. <li data-bbox="730 680 1218 800">❑ Identifies available new technologies that may be appropriate to the organization's and projects' needs. <ul style="list-style-type: none"> <li data-bbox="779 806 1218 957">❑ A periodic search is made to identify commercially available technologies that meet identified and anticipated needs. <li data-bbox="779 963 1218 1083">❑ Systematic efforts are made to maintain awareness of leading relevant technical work and trends of new technologies. <li data-bbox="779 1089 1218 1241">❑ Systematic efforts are made to review the technologies used externally and to compare these technologies to those used within the organization. <li data-bbox="779 1247 1218 1430">❑ Areas where new technologies have been used successfully are identified, and data and documentation of experience with using them are collected and reviewed. <li data-bbox="730 1436 1218 1556">❑ Evaluates new technologies to determine their applicability to the organization's and projects' current and future needs. 	
<i>Role continued on next page</i>			

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TCM Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the technology change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
<i>Role continued from previous page</i>			
	Group responsible for the organization's technology change management activities, continued	<input type="checkbox"/> The group responsible for the organization's technology change management systematically analyzes the organization's standard software process to identify areas that need or could benefit from new technology. (L5-25, A4) The group responsible for the organization's technology change management activities: (L5-25, A4) <ul style="list-style-type: none"> <input type="checkbox"/> Analyzes the organization's standard software process to determine areas where new technologies would be most helpful. <input type="checkbox"/> Identifies helpful technology changes and determines the economics of those changes. <input type="checkbox"/> Defines the relationship of the identified technology to the organization's standard software process. <input type="checkbox"/> Defines the expected outcomes of the technology change qualitatively and quantitatively, as appropriate. <input type="checkbox"/> Determines the need for piloting each potential technology change. <input type="checkbox"/> Determines the priority of the candidate new technologies. <input type="checkbox"/> Documents results of the analysis activities. 	
<i>Role continued on next page</i>			

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TCM Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the technology change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	<i>Role continued from previous page</i>		
	Group responsible for the organization's technology change management activities, continued	<ul style="list-style-type: none"> <input type="checkbox"/> The requirements and plans are reviewed by the managers of the affected groups and the group responsible for technology change management activities. (L5-26, A5, 4.4) <input type="checkbox"/> The group responsible for technology change management activities provides consultation and assistance to the project implementing the pilot effort (for improving technology). (L5-27, A6, 4) 	
	Managers of the affected groups	<ul style="list-style-type: none"> <input type="checkbox"/> The requirements and plans are reviewed by the managers of the affected groups and the group responsible for technology change management activities. (L5-26, A5, 4.4) <input type="checkbox"/> The plan for conducting the pilot effort is reviewed and approved by the managers of the affected groups. (L5-27, A6, 3) 	
	Organization's managers	<ul style="list-style-type: none"> <input type="checkbox"/> Senior management coordinates with the organization's managers in defining their goals and approaches for accomplishing the organization's strategy. (L5-19, C2, 3) <input type="checkbox"/> Senior management coordinates with the organization's managers to secure the managers' and staff's support and participation. (L5-20, C3, 4.2) 	

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TCM Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the technology change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	Senior management	<ul style="list-style-type: none"> <li data-bbox="682 468 1209 556">❑ Senior management sponsors the organization's activities for technology change management. (L5-19, C2) <li data-bbox="682 562 998 594">Senior management: <li data-bbox="682 604 1193 751">❑ Helps to define a strategy that addresses the organization's goals for product quality, productivity, and cycle time for product development. <li data-bbox="682 762 1193 888">❑ Helps to define a strategy that addresses the customer's and end users' needs and desires, as appropriate. <li data-bbox="682 898 1209 1014">❑ Coordinates with the organization's managers in defining their goals and approaches for accomplishing the organization's strategy. <li data-bbox="682 1024 1209 1140">❑ Makes a commitment to the effort for technology change management that is visible throughout the organization. <li data-bbox="682 1150 1209 1245">❑ Establishes long-term plans and commitments for funding, staffing, and other resources. 	
<i>Role continued on next page</i>			

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TCM Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the technology change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
<i>Role continued from previous page</i>			
	Senior management, continued	<ul style="list-style-type: none"> <li data-bbox="683 510 1170 600">❑ Senior management oversees the organization's technology change management activities. (L5-19, C3) <li data-bbox="732 611 992 642">Senior management: <li data-bbox="732 653 1179 768">❑ Helps to establish policies for technology change management and reviews and approves these policies. <li data-bbox="732 779 1203 842">❑ Allocates resources for technology change management activities. <li data-bbox="732 852 1179 968">❑ Helps relate organizational strategies and objectives to strategies for technology change management. <li data-bbox="732 978 1219 1073">❑ Participates in establishing the plans for technology change management. <ul style="list-style-type: none"> <li data-bbox="781 1083 1203 1230">❑ Senior management coordinates requirements and issues for technology change management at all appropriate levels of the organization. <li data-bbox="781 1241 1211 1388">❑ Senior management coordinates with the organization's managers to secure the managers' and staff's support and participation. <li data-bbox="683 1398 1211 1514">❑ The organization's activities for technology change management are reviewed with senior management on a periodic basis. (L5-29, V1) 	

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TCM Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the technology change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	Software manager	Software managers and technical staff are kept informed of new technologies. (L5-25, A3)	
	Software quality assurance (SQA) group	The software quality assurance group reviews and/or audits the activities and work products for technology change management and reports the results. (L5-29, V2)	
	Staff	<ul style="list-style-type: none"> <input type="checkbox"/> Senior management coordinates with the organization's managers to secure the managers' and staff's support and participation. (L5-20, C3, 4.2) <input type="checkbox"/> Experienced staff members with expertise in specialized areas are available to this group to help in evaluating, planning, and supporting initiatives for technology change management. (L5-21, Ab2, 1) <input type="checkbox"/> Software managers and technical staff are kept informed of new technologies. (L5-25, A3) 	
	Technology suppliers	The group responsible for the organization's technology change management activities coordinates and helps to communicate with the technology suppliers on problems and enhancements. (L5-21, Ab1, 2.5)	

TCM Process - Entry Criteria

Input-based entry criteria

The CMM recommends that inputs satisfy the states described in the table below before entering the technology change management process.

√	Input	State	References
	Data on the software processes	are available to support analyses performed to evaluate and select technology changes. (L5-22, Ab4)	
	Data on the software work products	are available to support analyses performed to evaluate and select technology changes. (L5-22, Ab4)	
	Needs of the organization (current and future)	<input type="checkbox"/> are identified. (L5-24, A2, 2.1) <input type="checkbox"/> are anticipated. (L5-24, A2, 2.1)	
	Needs of the projects (current and future)	<input type="checkbox"/> are identified. (L5-24, A2, 2.1) <input type="checkbox"/> are anticipated. (L5-24, A2, 2.1)	
	Selection criteria to identify the highest potential benefits (for selecting technologies)	<input type="checkbox"/> are predefined. (L5-26, A5, 3) <input type="checkbox"/> are approved. (L5-26, A5, 3)	

General entry criteria

The CMM recommends that the conditions described in the table below be satisfied before entering the technology change management process.

√	Condition	References
	The organization follows a written policy for improving its technology capability. (L5-18, C1) [Refer to Level 5 Policies for additional information regarding TCM policy.]	
	Senior management sponsors the organization's activities for technology change management. (L5-19, C2)	
	A group responsible for the organization's technology change management activities exists. (L5-20, Ab1) <input type="checkbox"/> The group is either part of the group responsible for the organization's software process activities (e.g., software engineering process group) or its activities are closely coordinated with that group. (L5-20, Ab1, 1)	
	Adequate resources and funding are provided to establish and staff a group responsible for the organization's technology change management activities. (L5-21, Ab2)	

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TCM Process - Entry Criteria, Continued

General entry criteria, continued

The CMM recommends that the conditions described in the table below be satisfied before entering the technology change management process, continued from the previous page.

√	Condition	References
	Experienced staff members with expertise in specialized areas are available to this group (responsible for the organization's technology change management activities) to help in evaluating, planning, and supporting initiatives for technology change management. (L5-21, Ab2, 1)	
	Tools to support technology change management are made available. (L5-21, Ab2, 2)	
	Support exists for collecting and analyzing data needed to evaluate technology changes. (L5-21, Ab3) This support includes the ability to: <ul style="list-style-type: none"> <input type="checkbox"/> Record selected process and product data automatically. <input type="checkbox"/> Support data analysis. <input type="checkbox"/> Display selected data. 	
	Members of the group responsible for the organization's technology change management activities receive required training to perform these activities. (L5-23, Ab5)	

TCM Process - Inputs

Inputs

The table below lists the recommended inputs to the technology change management process.

√	Input	Org. Input	References
	Advanced technologies. (L5-27, A6, 1)		
	Customer's needs and desires. (L5-19, C2, 2)		
	Data on the software processes. (L5-22, Ab4)		
	Data on the software work products. (L5-22, Ab4)		
	End users' needs and desires. (L5-19, C2, 2)		
	Information on advanced technologies already in use in parts of the organization. (L5-25, A3, 2)		
	Information on new technologies. (L5-25, A3, 1)		
	Information on the status of technologies being transferred into the organization. (L5-25, A3, 3)		
	Issues for technology change management. (L5-20, C3, 4.1)		
	Needs of the organization (current and future). (L5-24, A1, 4)		
	Needs of the projects (current and future). (L5-24, A1, 4)		
	New technology. (L5-20, Ab1, 2.1)		
	Objectives for technology change management. (L5-19, C1, 2)		
	Organization's goals for cycle time for product development. (L5-19, C2, 1)		
	Organization's goals for product quality. (L5-19, C2, 1)		
	Organization's goals for productivity. (L5-19, C2, 1)		
	Organization's standard software process. (L5-23, A1, 2)		
	Plans for technology change management. (L5-23, A1) [Refer to Level 5 Standards for additional information regarding this plan.]		

Continued on next page

TCM Process - Inputs, Continued

Inputs, continued

The table below lists the recommended inputs to the technology change management process, continued from the previous page.

√	Input	Org. Input	References
	Potential technology changes. (L5-26, A4, 5)		
	Requirements for technology change management. (L5-20, C3, 4.1)		
	Revisions to the plans for technology change management. (L5-29, V1, 4)		
	Selection criteria (for selecting technologies) to identify the highest potential benefits. (L5-26, A5, 3)		
	Suggestions for technology changes. (L5-24, A2, 1)		
	Technologies used externally (to the organization). (L5-25, A2, 2.3)		
	Technologies used within the organization. (L5-25, A2, 2.3)		
	Technology changes. (L5-21, Ab3)		
	Untried technologies. (L5-27, A6, 1)		

TCM Process - Activities

Activities

The table below lists the recommended activities for the technology change management process.

√	Activities	References
	The organization develops and maintains a plan for technology change management. (L5-23, A1)	
	<p>The group responsible for the organization's technology change management activities works with the software projects in identifying areas of technology change. (L5-24, A2)</p> <p>This group:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Solicits suggestions for technology changes. <input type="checkbox"/> Identifies available new technologies that may be appropriate to the organization's and projects' needs. <ul style="list-style-type: none"> <input type="checkbox"/> A periodic search is made to identify commercially available technologies that meet identified and anticipated needs. <input type="checkbox"/> Systematic efforts are made to maintain awareness of leading relevant technical work and trends of new technologies. <input type="checkbox"/> Systematic efforts are made to review the technologies used externally and to compare these technologies to those used within the organization. <input type="checkbox"/> Areas where new technologies have been used successfully are identified, and data and documentation of experience with using them are collected and reviewed. <input type="checkbox"/> Evaluates new technologies to determine their applicability to the organization's and projects' current and future needs. 	
	<p>Software managers and technical staff are kept informed of new technologies. (L5-25, A3)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Information on new technologies is disseminated as appropriate. <input type="checkbox"/> Information on advanced technologies already in use in parts of the organization is disseminated as appropriate. <input type="checkbox"/> Information on the status of technologies being transferred into the organization is disseminated as appropriate. 	

Continued on next page

TCM Process - Activities, Continued

Activities, continued

The table below lists the recommended activities for the technology change management process, continued from the previous page.

√	Activities	References
	<p>The group responsible for the organization's technology change management systematically analyzes the organization's standard software process to identify areas that need or could benefit from new technology. (L5-25, A4)</p> <p>This group:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Analyzes the organization's standard software process to determine areas where new technologies would be most helpful. <input type="checkbox"/> Identifies helpful technology changes and determines the economics of those changes. <input type="checkbox"/> Defines the relationship of the identified technology to the organization's standard software process. <input type="checkbox"/> Defines the expected outcomes of the technology change qualitatively and quantitatively, as appropriate. <input type="checkbox"/> Determines the need for piloting each potential technology change. <input type="checkbox"/> Determines the priority of the candidate new technologies. <input type="checkbox"/> Documents results of the analysis activities. 	
	<p>Technologies are selected and acquired for the organization and software projects according to a documented procedure. (L5-26, A5)</p> <p>[Refer to Level 5 Procedure Checklists for additional information.]</p>	

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TCM Process - Activities, Continued

Activities, continued

The table below lists the recommended activities for the technology change management process, continued from the previous page.

√	Activities	References
	<p>Pilot efforts for improving technology are conducted, where appropriate, before a new technology is introduced into normal practice. (L5-27, A6)</p> <ul style="list-style-type: none"> <input type="checkbox"/> These pilot efforts are conducted to determine the feasibility and economics of untried or advanced technologies. <input type="checkbox"/> The plans for the pilot effort are documented. <input type="checkbox"/> The plan for conducting the pilot effort is reviewed and approved by the managers of the affected groups. <input type="checkbox"/> The group responsible for technology change management activities provides consultation and assistance to the project implementing the pilot effort. <input type="checkbox"/> The pilot effort is performed in an environment that is relevant to the development or maintenance environment. <input type="checkbox"/> The results of the pilot effort are collected, analyzed, and documented. <ul style="list-style-type: none"> <input type="checkbox"/> Lessons learned and problems encountered during the effort are documented. <input type="checkbox"/> The benefits and impacts of broader use in the organization are estimated. The uncertainty in these estimates is assessed. <input type="checkbox"/> A decision is made whether to terminate the effort, proceed with broad-scale implementation of the technology, or replan and continue the pilot effort. 	
	<p>Appropriate new technologies are incorporated into the organization's standard software process according to a documented procedure. (L5-28, A7)</p>	
	<p>Appropriate new technologies are incorporated into the projects' defined software processes according to a documented procedure. (L5-28, A8)</p>	
	<p>Measurements are made and used to determine the status of the organization's activities for technology change management. (L5-28, M1)</p>	
	<p>The organization's activities for technology change management are reviewed with senior management on a periodic basis. (L5-29, V1) [Refer to TCM Process Reviews and Audits for additional information.]</p>	

Continued on next page

TCM Process - Activities, Continued

Activities, continued

The table below lists the recommended activities for the technology change management process, continued from the previous page.

√	Activities	References
	The software quality assurance group reviews and/or audits the activities and work products for technology change management and reports the results. (L5-29, V2) [Refer to TCM Process Reviews and Audits for additional information.]	

TCM Process - Outputs

Outputs

The table below lists the recommended outputs produced by the technology change management process.

√	Output	Org. Output	References
	Approach for introducing new technologies to address specific needs of the organization and projects. (L5-24, A1, 4)		
	Approaches for accomplishing the organization's strategy. (L5-19, C2, 3)		
	Approaches for assessing unproven candidate technologies. (L5-24, A1, 4.6)		
	Approaches for identifying opportunities for technology changes. (L5-24, A1, 4.2)		
	Areas of technology change. (L5-24, A2)		
	Areas that need or could benefit from new technology. (L5-25, A4)		
	Areas where new technologies have been used successfully. (L5-25, A2, 2.4)		
	Areas where new technologies would be most helpful. (L5-25, A4, 1)		
	Available new technologies that may be appropriate to the organization's and projects' needs. (L5-24, A2, 2)		
	Benefits of (a new technology's) broader use in the organization (based on the results of the pilot efforts for improving technology). (L5-28, A6, 6.2)		
	Candidate technologies. (L5-24, A1, 4.3)		
	Commercially available technologies that meet identified and anticipated needs. (L5-24, A2, 2.1)		
	Commitment to the effort for technology change management. (L5-19, C2, 4)		
	Commitments for funding, staffing, and other resources (for technology change management activities). (L5-19, C2, 5)		
	Data needed to evaluate technology changes. (L5-21, Ab3)		
	Data of experience (with using new technologies in areas where they have been used successfully). (L5-25, A2, 2.4)		

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TCM Process - Outputs, Continued

Outputs, continued

The table below lists the recommended outputs produced by the technology change management process, continued from the previous page.

√	Output	Org. Output	References
	Decision whether to terminate the effort (pilot effort for improving technology), proceed with broad-scale implementation of the technology, or replan and continue the pilot effort. (L5-28, A6, 6.3)		
	Documentation of experience (with using new technologies in areas where they have been used successfully). (L5-25, A2, 2.4)		
	Enhancements (to technology). (L5-21, Ab1, 2.5)		
	Evaluation criteria for the pilot effort. (L5-27, A6, 2.1)		
	Expected life span for replacement/upgrade. (L5-26, A5, 4.1)		
	Expected outcomes of the technology change. (L5-26, A4, 4)		
	Goals for accomplishing the organization's strategy. (L5-19, C2, 3)		
	Impacts of (a new technology's) broader use in the organization (based on the results of the pilot efforts for improving technology). (L5-28, A6, 6.2)		
	Information on advanced technologies already in use in parts of the organization. (L5-25, A3, 2)		
	Information on new technologies. (L5-25, A3, 1)		
	Information on the status of technologies being transferred into the organization. (L5-25, A3, 3)		
	Lessons learned encountered during the (pilot) effort. (L5-27, A6, 6.1)		
	Life span for the planned technologies (from introduction to replacement). (L5-24, A1, 4.4)		
	Long-term plans for funding, staffing, and other resources. (L5-19, C2, 5)		

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TCM Process - Outputs, Continued

Outputs, continued

The table below lists the recommended outputs produced by the technology change management process, continued from the previous page.

√	Output	Org. Output	References
	Long-term technical strategy (for automating and improving the organization's standard software process and enhancing the organization's market position). (L5-23, A1, 2)		
	Make/buy tradeoff studies (for introducing new technology). (L5-24, A1, 4.5)		
	Measurements to determine the status of the organization's activities for technology change management. (L5-28, M1)		
	Need for piloting each potential technology change. (L5-26, A4, 5)		
	Needed strategy changes. (L5-29, V1, 2)		
	New technologies. (L5-21, Ab1, 2.2)		
	Objectives for technology change management. (L5-18, C1, 1)		
	Objectives for the pilot effort. (L5-27, A6, 2.1)		
	Organization's standard software process. (L5-28, A7)		
	Organizational objectives. (L5-20, C3, 3)		
	Organizational strategies. (L5-20, C3, 3)		
	Plan for conducting the pilot effort. (L5-27, A6, 2) [Refer to Level 5 Standards for additional information regarding this plan.]		
	Plan for technology change management. (L5-19, C1, 2) [Refer to Level 5 Standards for additional information regarding this plan.]		
	Planned technologies. (L5-24, A1, 4.3)		
	Plans for the selected technology changes. (L5-26, A5, 4)		
	Potential areas for applying new technology. (L5-20, Ab1, 2.1)		
	Priority of the candidate new technologies. (L5-26, A4, 6)		

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TCM Process - Outputs, Continued

Outputs, continued

The table below lists the recommended outputs produced by the technology change management process, continued from the previous page.

√	Output	Org. Output	References
	Problems encountered during the (pilot) effort. (L5-27, A6, 6.1)		
	Problems (with technology). (L5-21, Ab1, 2.5)		
	Process areas that are potential areas for technology changes. (L5-24, A1, 4.1)		
	Process data (selected). (L5-22, Ab3, 1)		
	Product data (selected). (L5-22, Ab3, 1)		
	Projects' defined software processes. (L5-28, A8)		
	Relationship of the identified technology to the organization's standard software process. (L5-25, A4, 3)		
	Requests for the acquisition of new technologies. (L5-26, A5, 1)		
	Requirements for the selected technology changes. (L5-26, A5, 4)		
	Results (of the software quality assurance group reviews and/or audits of the activities and work products for technology change management). (L5-29, V2)		
	Results of the analysis activities (for performing systematic analysis of the organization's standard software process to identify areas that need or could benefit from new technology). (L5-26, A4, 7)		
	Results of the pilot effort (for improving technology). (L5-27, A6, 6)		
	Strategies for technology change management. (L5-20, C3, 3)		
	Strategy that addresses the customer's and end users' needs and desires. (L5-19, C2, 2)		
	Strategy that addresses the organization's goals for product quality, productivity, and cycle time for product development. (L5-19, C2, 1)		

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TCM Process - Outputs, Continued

Outputs, continued

The table below lists the recommended outputs produced by the technology change management process, continued from the previous page.

√	Output	Org. Output	References
	Technologies with projected expenses above a predefined level. (L5-26, A5, 1.1)		
	Technologies. (L5-26, A5)		
	Technology changes. (L5-22, Ab4)		
	Tradeoff studies (to determine whether the technology should be developed internally or procured externally). (L5-26, A5, 4.2)		
	Uncertainty in the estimates of benefits of (a new technology's) broader use in the organization (based on the results of the pilot efforts for improving technology). (L5-28, A6, 6.2)		
	Uncertainty in the estimates of impacts of (a new technology's) broader use in the organization (based on the results of the pilot efforts for improving technology). (L5-28, A6, 6.2)		

TCM Process - Exit Criteria

Output-based exit criteria

The CMM recommends that outputs satisfy the states described in the table below to exit the technology change management process.

√	Output	State	References
	Approaches for accomplishing the organization's strategy	are defined by coordination between the organization's managers and senior management . (L5-19, C2, 3)	
	Areas of technology change	are identified by the group responsible for the organization's technology change management activities working with the software projects. (L5-24, A2)	
	Areas that need or could benefit from new technology	are identified by the group responsible for the organization's technology change management by systematically analyzing the organization's standard software process. (L5-25, A4)	
	Areas where new technologies have been used successfully	are identified by the group responsible for the organization's technology change management activities . (L5-25, A2, 2.4)	
	Areas where new technologies would be most helpful	are determined by the group responsible for the organization's technology change management by analyzing the organization's standard software process. (L5-25, A4, 1)	
	Available new technologies that may be appropriate to the organization's and projects' needs	are identified by the group responsible for the organization's technology change management activities . (L5-24, A2, 2)	
	Benefits of (a new technology's) broader use in the organization (based on the results of the pilot efforts for improving technology)	are estimated. (L5-28, A6, 6.2)	
	Commercially available technologies that meet identified and anticipated needs	are identified by a periodic search by the group responsible for the organization's technology change management activities . (L5-24, A2, 2.1)	

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TCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the technology change management process, continued from the previous page.

√	Output	State	References
	Commitment to the effort for technology change management	<input type="checkbox"/> is made by senior management . (L5-19, C2, 4) <input type="checkbox"/> is visible throughout the organization. (L5-19, C2, 4)	
	Commitments for funding, staffing, and other resources	are established by senior management . (L5-19, C2, 5)	
	Data of experience (in areas where new technologies have been used successfully)	<input type="checkbox"/> are collected by the group responsible for the organization's technology change management activities . (L5-25, A2, 2.4) <input type="checkbox"/> are reviewed by the group responsible for the organization's technology change management activities . (L5-25, A2, 2.4)	
	Decision whether to terminate the effort (pilot effort for improving technology), proceed with broad-scale implementation of the technology, or replan and continue the pilot effort	is made. (L5-28, A6, 6.3)	
	Documentation of experience (in areas where new technologies have been used successfully)	<input type="checkbox"/> is collected by the group responsible for the organization's technology change management activities . (L5-25, A2, 2.4) <input type="checkbox"/> is reviewed by the group responsible for the organization's technology change management activities . (L5-25, A2, 2.4)	

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TCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the technology change management process, continued from the previous page.

√	Output	State	References
	Enhancements (to technology)	are communicated to the technology suppliers (with coordination and help from the group responsible for the organization's technology change management activities). (L5-21, Ab1, 2.5)	
	Expected life span for replacement/upgrade	is estimated, where practical. (L5-26, A5, 4.1)	
	Expected outcomes of the technology change	<input type="checkbox"/> are defined qualitatively by the group responsible for the organization's technology change management , as appropriate. (L5-26, A4, 4) <input type="checkbox"/> are defined quantitatively by the group responsible for the organization's technology change management , as appropriate. (L5-26, A4, 4)	
	Goals for accomplishing the organization's strategy	are defined by senior management coordinating with the organization's managers . (L5-19, C2, 3)	
	Impacts of (a new technology's) broader use in the organization (based on the results of the pilot efforts for improving technology)	are estimated. (L5-28, A6, 6.2)	
	Information on advanced technologies already in use in parts of the organization	is disseminated as appropriate. (L5-25, A3, 2)	
	Information on new technologies	is disseminated as appropriate. (L5-25, A3, 1)	

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TCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the technology change management process, continued from the previous page.

√	Output	State	References
	Information on the status of technologies being transferred into the organization	is disseminated as appropriate. (L5-25, A3, 3)	
	Lessons learned that are encountered during the (pilot) effort	are documented. (L5-27, A6, 6.1)	
	Life span for the planned technologies (from introduction to replacement)	is estimated, where appropriate. (L5-24, A1, 4.4)	
	Long-term plans for funding, staffing, and other resources (for technology change management activities)	are established by senior management . (L5-19, C2, 5)	
	Long-term technical strategy (for automating and improving the organization's standard software process and enhancing the organization's market position)	is defined in the plan for technology change management. (L5-23, A1, 2)	
	Make/buy tradeoff studies (for introducing new technology)	are documented. (L5-24, A1, 4.5)	
	Measurements (to determine the status of the organization's activities for technology change management)	<input type="checkbox"/> are made. (L5-28, M1) <input type="checkbox"/> are used. (L5-28, M1)	
	Need for piloting each potential technology change	is determined by the group responsible for the organization's technology change management . (L5-26, A4, 5)	

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TCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the technology change management process, continued from the previous page.

√	Output	State	References
	Needed strategy changes	are identified in periodic reviews with senior management . (L5-29, V1, 2)	
	New technologies	<ul style="list-style-type: none"> <input type="checkbox"/> are selected (with coordination and help from the group responsible for the organization's technology change management activities). (L5-21, Ab1, 2.2) <input type="checkbox"/> are planned (with coordination and help from the group responsible for the organization's technology change management activities). (L5-21, Ab1, 2.2) <input type="checkbox"/> are acquired (with coordination and help from the group responsible for the organization's technology change management activities). (L5-21, Ab1, 2.3) <input type="checkbox"/> are installed (with coordination and help from the group responsible for the organization's technology change management activities). (L5-21, Ab1, 2.3) <input type="checkbox"/> are customized (with coordination and help from the group responsible for the organization's technology change management activities). (L5-21, Ab1, 2.3) 	
	Objectives for technology change management	<ul style="list-style-type: none"> <input type="checkbox"/> are established. (L5-18, C1, 1) <input type="checkbox"/> are documented. (L5-18, C1, 1) 	
	Organization's standard software process	has incorporated appropriate new technologies according to a documented procedure. (L5-28, A7)	

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TCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the technology change management process, continued from the previous page.

√	Output	State	References
	Organizational objectives	are related to strategies for technology change management (with senior management's help). (L5-20, C3, 3)	
	Organizational strategies	are related to strategies for technology change management (with senior management's help). (L5-20, C3, 3)	
	Plan for conducting the pilot effort (for improving technology)	<input type="checkbox"/> is documented. (L5-27, A6, 2) <input type="checkbox"/> is reviewed by the managers of the affected groups . (L5-27, A6, 3) <input type="checkbox"/> is approved by the managers of the affected groups . (L5-27, A6, 3)	
	Plan for technology change management	<input type="checkbox"/> is documented. (L5-19, C1, 2) <input type="checkbox"/> addresses the objectives for technology change management. (L5-19, C1, 2) <input type="checkbox"/> is established (with senior management participation). (L5-20, C3, 4) <input type="checkbox"/> is developed by the organization. (L5-23, A1) <input type="checkbox"/> is maintained by the organization. (L5-23, A1) <input type="checkbox"/> undergoes peer review. (L5-24, A1, 5) <input type="checkbox"/> is reviewed by the affected managers . (L5-24, A1, 6)	

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TCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the technology change management process, continued from the previous page.

√	Output	State	References
	Plans for the selected technology changes	<input type="checkbox"/> are defined. (L5-26, A5, 4) <input type="checkbox"/> are documented. (L5-26, A5, 4) <input type="checkbox"/> are estimated. (L5-26, A5, 4.1) <input type="checkbox"/> provide for installing the new technology on a pilot basis to determine its effectiveness and economic benefits. (L5-26, A5, 4.3) <input type="checkbox"/> are reviewed by the managers of the affected groups and the group responsible for technology change management activities . (L5-26, A5, 4.4)	
	Potential areas for applying new technology	are explored (with coordination and help from the group responsible for the organization's technology change management activities). (L5-20, Ab1, 2.1)	
	Priority of the candidate new technologies	is determined by the group responsible for the organization's technology change management . (L5-26, A4, 6)	
	Problems (with technology)	are communicated to the technology suppliers (with coordination and help from the group responsible for the organization's technology change management activities). (L5-21, Ab1, 2.5)	
	Problems encountered during the (pilot) effort	are documented. (L5-27, A6, 6.1)	
	Projects' defined software processes	have incorporated appropriate new technologies according to a documented procedure. (L5-28, A8)	
	Relationship of the identified technology to the organization's standard software process	is defined by the group responsible for the organization's technology change management . (L5-25, A4, 3)	

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TCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the technology change management process, continued from the previous page.

√	Output	State	References
	Requests for the acquisition of new technologies	are documented. (L5-26, A5, 1)	
	Requirements for the selected technology changes	<input type="checkbox"/> are defined. (L5-26, A5, 4) <input type="checkbox"/> are documented. (L5-26, A5, 4) <input type="checkbox"/> are reviewed by the managers of the affected groups and the group responsible for technology change management activities. (L5-26, A5, 4.4)	
	Results (of the software quality assurance group reviews and/or audits of the activities and work products for technology change management)	are reported. (L5-29, V2)	
	Results of the analysis activities (from the systematic analysis of the organization's standard software process to identify areas that need or could benefit from new technology)	are documented by the group responsible for the organization's technology change management. (L5-26, A4, 7)	
	Results of the pilot effort (for improving technology)	<input type="checkbox"/> are collected. (L5-27, A6, 6) <input type="checkbox"/> are analyzed. (L5-27, A6, 6) <input type="checkbox"/> are documented. (L5-27, A6, 6)	
	Strategies for technology change management	are related to organizational strategies and objectives (with senior management's help). (L5-20, C3, 3)	

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TCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the technology change management process, continued from the previous page.

√	Output	State	References
	Strategy that addresses the customer's and end users' needs and desires	is defined (with senior management's help), as appropriate. (L5-19, C2, 2)	
	Strategy that addresses the organization's goals for product quality, productivity, and cycle time for product development	is defined (with senior management's help). (L5-19, C2, 1)	
	Technologies	<input type="checkbox"/> are selected for the organization and software projects according to a documented procedure. (L5-26, A5) <input type="checkbox"/> are acquired for the organization and software projects according to a documented procedure. (L5-26, A5)	
	Technologies with projected expenses above a predefined level	have management approval. (L5-26, A5, 1.1)	
	Technology changes	are identified by the group responsible for the organization's technology change management . (L5-25, A4, 2)	
	Tradeoff studies (to determine whether the technology should be developed internally or procured externally)	<input type="checkbox"/> are documented, where appropriate. (L5-26, A5, 4.2) <input type="checkbox"/> are performed, where appropriate. (L5-26, A5, 4.2) <input type="checkbox"/> are reviewed, where appropriate. (L5-26, A5, 4.2)	

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TCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the technology change management process, continued from the previous page.

√	Output	State	References
	Uncertainty in the estimates of benefits of (a new technology's) broader use in the organization (based on the results of the pilot efforts for improving technology)	is assessed. (L5-28, A6, 6.2)	
	Uncertainty in the estimates of impacts of (a new technology's) broader use in the organization (based on the results of the pilot efforts for improving technology)	is assessed. (L5-28, A6, 6.2)	

General exit criteria

The CMM recommends that the conditions described in the table below be satisfied to exit the technology change management process.

√	Condition	References
	Senior management allocates resources for technology change management activities. (L5-19, C3, 2)	
	Senior management coordinates requirements and issues for technology change management at all appropriate levels of the organization. (L5-20, C3, 4.1)	
	Senior management coordinates with the organization's managers to secure the managers' and staff's support and participation. (L5-20, C3, 4.2)	

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TCM Process - Exit Criteria, Continued

General exit criteria, continued

The CMM recommends that the conditions described in the table below be satisfied to exit the technology change management process, continued from the previous page.

√	Condition	References
	<p>The group responsible for the organization's technology change management activities coordinates and helps to (L5-20, Ab1, 2):</p> <ul style="list-style-type: none"> <input type="checkbox"/> explore potential areas for applying new technology; <input type="checkbox"/> select and plan for new technologies; <input type="checkbox"/> acquire, install, and customize new technologies; <input type="checkbox"/> communicate and coordinate with related research and development activities within the organization; and <input type="checkbox"/> communicate with the technology suppliers on problems and enhancements. 	
	<p>The group responsible for the organization's technology change management activities solicits suggestions for technology changes. (L5-24, A2, 1)</p>	
	<p>Systematic efforts are made to maintain awareness of leading relevant technical work and trends of new technologies. (L5-25, A2, 2.2)</p>	
	<p>Systematic efforts are made to review the technologies used externally and to compare these technologies to those used within the organization. (L5-25, A2, 2.3)</p>	
	<p>The group responsible for the organization's technology change management activities evaluates new technologies to determine their applicability to the organization's and projects' current and future needs. (L5-25, A2, 3)</p>	
	<p>Software managers and technical staff are kept informed of new technologies. (L5-25, A3)</p>	
	<p>The group responsible for the organization's technology change management systematically analyzes the organization's standard software process to identify areas that need or could benefit from new technology. (L5-25, A4)</p> <ul style="list-style-type: none"> <input type="checkbox"/> This group identifies helpful technology changes and determines the economics of those changes. (L5-25, A4, 2) 	
	<p>Preliminary cost/benefit analyses are performed for the potential technology changes. (L5-26, A5, 2)</p>	

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TCM Process - Exit Criteria, Continued

General exit criteria, continued

The CMM recommends that the conditions described in the table below be satisfied to exit the technology change management process, continued from the previous page.

√	Condition	References
	Predefined and approved selection criteria are used to identify the highest potential benefits (when selecting and acquiring technologies). (L5-26, A5, 3)	
	<p>Pilot efforts for improving technology are conducted, where appropriate, before a new technology is introduced into normal practice. (L5-27, A6)</p> <ul style="list-style-type: none"> <input type="checkbox"/> These pilot efforts are conducted to determine the feasibility and economics of untried or advanced technologies. (L5-27, A6, 1) <input type="checkbox"/> The group responsible for technology change management activities provides consultation and assistance to the project implementing the pilot effort. (L5-27, A6, 4) <input type="checkbox"/> The pilot effort is performed in an environment that is relevant to the development or maintenance environment. (L5-27, A6, 5) 	
	The organization's activities for technology change management are reviewed with senior management on a periodic basis. (L5-29, V1)	
	The software quality assurance group reviews and/or audits the activities and work products for technology change management and reports the results. (L5-29, V2)	

TCM Process - Reviews and Audits

Reviews and audits

The table below lists the recommended reviews and audits for the technology change management process.

√	Review or Audit	Review Participants	References
	Senior management helps to establish policies for technology change management and reviews and approves these policies. (L5-19, C3, 1)	Senior management	
	The organizational plan for technology change management undergoes peer review. (L5-24, A1, 5)	Not specified in CMM	
	The organizational plan for technology change management is reviewed by the affected managers . (L5-24, A1, 6)	Affected managers	
	Systematic efforts are made to review the technologies used externally and to compare these technologies to those used within the organization. (L5-25, A2, 2.3)	Group responsible for the organization's technology change management activities	
	Areas where new technologies have been used successfully are identified, and data and documentation of experience with using them are collected and reviewed. (L5-25, A2, 2.4)	Group responsible for the organization's technology change management activities	
	Where appropriate, tradeoff studies are performed, reviewed, and documented to determine whether the technology should be developed internally or procured externally. (L5-26, A5, 4.2)	Not specified in CMM	
	The requirements and plans (for selected technology changes) are reviewed by the managers of the affected groups and the group responsible for technology change management activities . (L5-26, A5, 4.4)	Managers of the affected groups Group responsible for technology change management activities	

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TCM Process - Reviews and Audits, Continued

Reviews and audits, continued

The table below lists the recommended reviews and audits for the technology change management process, continued from the previous page.

√	Review or Audit	Review Participants	References
	The plan for conducting the pilot effort is reviewed and approved by the managers of the affected groups . (L5-27, A6, 3)	Managers of the affected groups	
	The organization's activities for technology change management are reviewed with senior management on a periodic basis. (L5-29, V1) These reviews: <input type="checkbox"/> Summarize the activities for technology change management. <input type="checkbox"/> Identify needed strategy changes. <input type="checkbox"/> Result in the resolution of issues. <input type="checkbox"/> Result in the approval of revisions to the plans for technology change management, as appropriate.	Senior management	
	The software quality assurance group reviews and/or audits the activities and work products for technology change management and reports the results. (L5-29, V2) At a minimum, the reviews and/or audits verify: <input type="checkbox"/> The plans for technology change management. <input type="checkbox"/> The process for selecting, procuring, and installing new technologies.	Software quality assurance group	

TCM Process - Work Products Managed and Controlled

**Work products
managed and
controlled**

There are no work products that are recommended to be managed and controlled during the technology change management process.

TCM Process - Measurements

Measurements The table below lists the measurements recommended for the technology change management process.

√	Measurements	References
	Data of experience with using (new technologies that have been used successfully). (L5-25, A2, 2.4)	
	Measurements to determine the status of the organization's activities for technology change management. (L5-28, M1) Examples of measurements include: <ul style="list-style-type: none"><li data-bbox="472 646 1154 709"><input type="checkbox"/> The overall technology change activity, including number, type, and size of changes.<li data-bbox="472 720 1154 783"><input type="checkbox"/> The effect of implementing the technology change, compared to the goals.	

TCM Process - Documented Procedures

Documented procedures

The table below lists the activities in the technology change management process recommended to be performed according to a documented procedure.

√	Documented Procedure(s)	References
	Technologies are selected and acquired for the organization and software projects according to a documented procedure. (L5-26, A5) [Refer to Level 5 Procedure Checklists for additional information.]	
	Appropriate new technologies are incorporated into the organization's standard software process according to a documented procedure. (L5-28, A7)	
	Appropriate new technologies are incorporated into the projects' defined software processes according to a documented procedure. (L5-28, A8)	

TCM Process - Training

Training

The table below lists the training recommended for the technology change management process.

√	Training	References
	Members of the group responsible for the organization's technology change management activities receive required training to perform these activities. (L5-23, Ab5)	

TCM Process - Tools

Tools

The table below lists the tools recommended for the technology change management process.

√	Tools	References
	Tools to support technology change management are made available. (L5-21, Ab2, 2) Examples of support tools include: <ul style="list-style-type: none"><input type="checkbox"/> workstations,<input type="checkbox"/> database programs, and<input type="checkbox"/> subscriptions to on-line technology databases.	

Process Change Management (PCM) Process

PCM Process - Overview

PCM process purpose The purpose of Process Change Management is to continually improve the software processes used in the organization with the intent of improving software quality, increasing productivity, and decreasing the cycle time for product development. (L5-31)

PCM process description Process Change Management involves defining process improvement goals and, with senior management sponsorship, proactively and systematically identifying, evaluating, and implementing improvements to the organization's standard software process and the projects' defined software processes on a continuous basis.

Training and incentive programs are established to enable and encourage everyone in the organization to participate in process improvement activities. Improvement opportunities are identified and evaluated for potential payback to the organization. Pilot efforts are performed to assess process changes before they are incorporated into normal practice.

When software process improvements are approved for normal practice, the organization's standard software process and the projects' defined software processes are revised as appropriate. The practices for revising the organization's standard software process are found in the Organization Process Definition key process area, and the practices for revising the projects' defined software processes are found in the Integrated Software Management key process area. (L5-31)

Continued on next page

PCM Process - Overview, Continued

Section overview

The table below contains a description and the location of each checklist for this key process area.

Checklist	Description	Page
Roles	List of roles participating in process activities.	L5-Process-79
Entry Criteria	Description of when the process can start.	L5-Process-85
Inputs	Description of the work products used by the process.	L5-Process-87
Activities	Description of the activities of the process.	L5-Process-88
Outputs	Description of the work products produced by the process.	L5-Process-91
Exit Criteria	Description of when the process is complete.	L5-Process-95
Reviews and Audits	List of reviews and audits.	L5-Process-104
Work Products Managed and Controlled	List of work products to be managed and controlled.	L5-Process-107
Measurements	Description of process measurements.	L5-Process-108
Documented Procedures	List of the activities to be completed according to a documented procedure.	L5-Process-109
Training	List of training.	L5-Process-110
Tools	List of tools.	L5-Process-111

PCM Process - Roles

Roles

The table below lists the roles and the activities in which they participate in the process change management process.

√	Role	Activities Participated in...	Reference
	Administrative personnel	Administrative personnel are included in oversight and review of the software process improvement activities. (L5-38, A4, 6.2)	
	Experienced individuals who have expertise in defining and analyzing software processes	Experienced individuals who have expertise in defining and analyzing software processes are available to help the organization in its process improvement activities. (L5-34, Ab1, 2)	

Continued on next page

PCM Process - Roles, Continued

**Roles,
continued**

The table below lists the roles and the activities in which they participate in the process change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	<p>Group responsible for the organization's software process activities (e.g., software engineering process group)</p>	<ul style="list-style-type: none"> <li data-bbox="682 468 1193 646">❑ The group responsible for the organization's software process activities (e.g., software engineering process group) coordinates the software process improvement activities. (L5-36, A2) <li data-bbox="730 657 1209 1812"> <ul style="list-style-type: none"> <li data-bbox="738 657 1209 877">❑ The group responsible for the organization's software process activities (e.g., software engineering process group): <li data-bbox="779 783 1209 877">❑ Defines organizational goals and measurement plans for software process performance. <li data-bbox="779 888 1209 1003">❑ Reviews the organizational goals for process performance with senior management for their endorsement. <li data-bbox="779 1014 1209 1192">❑ Participates in the effort to define the organization's training needs for process improvement and supports the development and presentation of training course materials. <li data-bbox="779 1203 1209 1318">❑ Defines and maintains the procedures for handling process improvement proposals. <li data-bbox="779 1329 1209 1444">❑ Reviews software process improvement proposals and coordinates the actions for these proposals. <li data-bbox="779 1455 1209 1612">❑ Tracks status, accomplishments, and participation in the process improvement activities and periodically reports the results to senior management. <li data-bbox="779 1623 1209 1717">❑ Coordinates and tracks changes to the organization's standard software process. <li data-bbox="779 1728 1209 1812">❑ Defines, establishes, and maintains the process improvement records. 	

Continued on next page

PCM Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the process change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	Group that defines and maintains the affected process descriptions	The plans (for process improvement team activities) are approved by the managers of the affected groups and the group that defines and maintains the affected process descriptions . (L5-41, A6, 3)	
	Individuals responsible for implementing the software processes	The strategy for collecting data to measure and track the change in software process performance is agreed to by the individuals responsible for implementing the software processes affected by the change . (L5-43, A8, 2.1)	
	Management	Software process changes that are judged to have a major impact on product quality or productivity or that will significantly alter satisfaction of the customer and end users are reviewed and approved by appropriate management before they are implemented. (L5-41, A5, 9)	
	Managers	<ul style="list-style-type: none"> <input type="checkbox"/> All of the organization's staff and managers are expected to participate in improving the software processes. (L5-32, C1, 3) <input type="checkbox"/> The software process improvement plan is reviewed by the affected managers. (L5-37, A3, 3) <input type="checkbox"/> The plans (for process improvement team activities) are approved by the managers of the affected groups and the group that defines and maintains the affected process descriptions. (L5-41, A6, 3) 	
	Managers of software-related groups	The managers and technical staff of the software engineering group and other software-related groups receive required training in software process improvement. (L5-34, Ab3)	
	Managers of the software engineering group	The managers and technical staff of the software engineering group and other software-related groups receive required training in software process improvement. (L5-34, Ab3)	

Continued on next page

PCM Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the process change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	Members of the organization	<ul style="list-style-type: none"> <li data-bbox="683 470 1218 617">❑ A software process improvement program is established which empowers the members of the organization to improve the processes of the organization. (L5-35, A1) <li data-bbox="683 625 1218 743">❑ Members of the organization actively participate in teams to develop software process improvements for assigned process areas. (L5-41, A6) 	
	Senior management	<ul style="list-style-type: none"> <li data-bbox="683 764 1218 848">❑ Senior management sponsors the organization's activities for software process improvement. (L5-32, C2) <li data-bbox="683 856 1218 1625">❑ Senior management: <ul style="list-style-type: none"> <li data-bbox="776 907 1218 991">❑ Establishes the organization's long-term goals and plans for process improvement. <li data-bbox="776 999 1218 1062">❑ Allocates resources for process improvement activities. <li data-bbox="776 1071 1218 1251">❑ Coordinates with the software managers to ensure they have reasonable, yet aggressive, process improvement goals and effective process improvement plans to meet these goals. <li data-bbox="776 1260 1218 1323">❑ Monitors process improvement performance against goals. <li data-bbox="776 1331 1218 1415">❑ Maintains a consistent priority focus on process improvement in the face of product crises. <li data-bbox="776 1423 1218 1520">❑ Ensures that process improvement issues are promptly resolved. <li data-bbox="776 1528 1218 1625">❑ Rewards employee participation in the process improvement activities. <li data-bbox="683 1633 1218 1730">❑ Senior management receives required training in software process improvement. (L5-35, Ab4) 	
<i>Role continued on next page</i>			

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PCM Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the process change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	Senior management, continued	<ul style="list-style-type: none"> <li data-bbox="683 468 1219 674">❑ The group responsible for the organization's software process activities (e.g., software engineering process group) reviews the organizational goals for process performance with senior management for their endorsement. (L5-36, A2, 2) <li data-bbox="683 684 1219 919">❑ The group responsible for the organization's software process activities (e.g., software engineering process group) tracks status, accomplishments, and participation in the process improvement activities and periodically reports the results to senior management. (L5-36, A2, 6) <li data-bbox="683 930 1219 1045">❑ The activities for software process improvement are reviewed with senior management on a periodic basis. (L5-46, V1) 	
	Software managers	<ul style="list-style-type: none"> <li data-bbox="683 1066 1219 1241">❑ Senior management coordinates with the software managers to ensure they have reasonable, yet aggressive, process improvement goals and effective process improvement plans to meet these goals. (L5-33, C2, 3) <li data-bbox="683 1251 1219 1339">❑ Software managers receive required training in software process improvement. (L5-34, Ab2) <li data-bbox="683 1350 1219 1497">❑ Software managers and technical staff receive feedback on the status and results of the software process improvement activities on an event-driven basis. (L5-44, A10) 	
	Software quality assurance (SQA) group	The software quality assurance group reviews and/or audits the activities and work products for software process improvement and reports the results. (L5-46, V2)	

Continued on next page

PCM Process - Roles, Continued

Roles, continued

The table below lists the roles and the activities in which they participate in the process change management process, continued from the previous page.

√	Role	Activities Participated in...	Reference
	Staff	<ul style="list-style-type: none"> <input type="checkbox"/> All of the organization's staff and managers are expected to participate in improving the software processes. (L5-32, C1, 3) <input type="checkbox"/> Software managers and technical staff receive feedback on the status and results of the software process improvement activities on an event-driven basis. (L5-44, A10) 	
	Submitters of the software process improvement proposals	<p>Submitters of the software process improvement proposals receive: (L5-41, A5, 11)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Prompt acknowledgment of their proposals. <input type="checkbox"/> Notification of the disposition of their proposals. 	
	Team responsible for implementation (of software process improvement actions)	Software process improvement actions that require a substantial effort are assigned to a team responsible for implementation . (L5-40, A5, 6)	
	Technical staff of software-related groups	The managers and technical staff of the software engineering group and other software-related groups receive required training in software process improvement. (L5-34, Ab3)	
	Technical staff of the software engineering group	The managers and technical staff of the software engineering group and other software-related groups receive required training in software process improvement. (L5-34, Ab3)	

PCM Process - Entry Criteria

Input-based entry criteria

The CMM recommends that inputs satisfy the states described in the table below before entering the process change management process.

√	Input	State	References
	Organizational goals for software process improvement	<input type="checkbox"/> are quantitative. (L5-32, C1, 1) <input type="checkbox"/> are measurable. (L5-32, C1, 1)	
	Software process improvement proposal	is submitted. (L5-39, A5, 1)	

General entry criteria

The CMM recommends that the conditions described in the table below be satisfied before entering the process change management process.

√	Condition	References
	The organization follows a written policy for implementing software process improvements. (L5-32, C1) [Refer to Level 5 Policies for additional information regarding PCM policy.]	
	Senior management sponsors the organization's activities for software process improvement. (L5-32, C2)	
	Adequate resources and funding are provided for software process improvement activities. (L5-33, Ab1)	
	Resources are allocated to: (L5-33, Ab1, 1) <ul style="list-style-type: none"> <input type="checkbox"/> Lead, guide, and support the process improvement activities. <input type="checkbox"/> Maintain the process improvement records. <input type="checkbox"/> Develop, control, and disseminate process changes. <input type="checkbox"/> Establish and operate the administrative and human resources functions to conduct the communications, motivation, and recognition activities needed to maintain a high level of employee participation. 	
	Experienced individuals who have expertise in defining and analyzing software processes are available to help the organization in its process improvement activities. (L5-34, Ab1, 2)	
	Tools to support process improvement are made available. (L5-34, Ab1, 3)	
	Software managers receive required training in software process improvement. (L5-34, Ab2)	

Continued on next page

PCM Process - Entry Criteria, Continued

**General entry
criteria,
continued**

The CMM recommends that the conditions described in the table below be satisfied before entering the process change management process, continued from the previous page.

√	Condition	References
	The managers and technical staff of the software engineering group and other software-related groups receive required training in software process improvement. (L5-34, Ab3)	
	Senior management receives required training in software process improvement. (L5-35, Ab4)	

PCM Process - Inputs

Inputs

The table below lists the inputs to the process change management process.

√	Input	Org. Input	References
	Customer satisfaction indicators. (L5-37, A3, 1.2)		
	Expected needs. (L5-43, A8, 4)		
	Long-term goals for software process improvement. (L5-38, A4, 3)		
	Long-term goals for software process performance. (L5-38, A4, 3)		
	Organization's business plans. (L5-37, A3, 1.1)		
	Organization's strategic operating plans. (L5-37, A3, 1.1)		
	Organizational goals for software process improvement. (L5-32, C1, 1)		
	Plan for software process improvement. (L5-37, A3) [Refer to Level 5 Standards for additional information regarding this plan.]		
	Process improvement goals. (L5-33, C2, 4)		
	Process improvement records. (L5, 33, Ab1, 1.2)		
	Short-term goals for software process improvement. (L5-38, A4, 3)		
	Short-term goals for software process performance. (L5-38, A4, 3)		
	Software process improvement issues. (L5-33, C2, 6)		
	Software process improvement proposal. (L5-36, A2, 4)		

PCM Process - Activities

Activities

The table below lists the recommended activities for the process change management process.

√	Activities	References
	A software process improvement program is established which empowers the members of the organization to improve the processes of the organization. (L5-35, A1)	
	The group responsible for the organization's software process activities (e.g., software engineering process group) coordinates the software process improvement activities. (L5-36, A2)	
	The organization develops and maintains a plan for software process improvement according to a documented procedure. (L5-37, A3) [Refer to Level 5 Procedure Checklists for additional information.]	
	The software process improvement activities are performed in accordance with the software process improvement plan. (L5-38, A4)	
	Software process improvement proposals are handled according to a documented procedure. (L5-39, A5) [Refer to Level 5 Procedure Checklists for additional information.]	
	Members of the organization actively participate in teams to develop software process improvements for assigned process areas. (L5-41, A6) <input type="checkbox"/> Each of these process improvement teams is funded and the activities are planned and scheduled. <input type="checkbox"/> Goals are established for each process improvement effort; where possible, these goals are defined quantitatively. <input type="checkbox"/> The plans are approved by the managers of the affected groups and the group that defines and maintains the affected process descriptions .	

Continued on next page

PCM Process - Activities, Continued

Activities, continued

The table below lists the recommended activities for the process change management process, continued from the previous page.

√	Activities	References
	<p>Where appropriate, the software process improvements are installed on a pilot basis to determine their benefits and effectiveness before they are introduced into normal practice. (L5-42, A7)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Adjustments to the proposed process improvement are made and documented during the pilot effort to optimize its implementation. <input type="checkbox"/> Lessons learned and problems encountered are documented. <input type="checkbox"/> The benefits, risks, and impacts of the process improvement's broader use in the organization are estimated, and the uncertainty in these estimates is assessed. <input type="checkbox"/> A decision is made whether to terminate the effort, proceed with broad-scale implementation of the improvement, or replan and continue the pilot effort. 	
	<p>When the decision is made to transfer a software process improvement into normal practice, the improvement is implemented according to a documented procedure. (L5-42, A8)</p> <p>[Refer to Level 5 Procedure Checklists for additional information.]</p>	
	<p>Records of software process improvement activities are maintained. (L5-43, A9)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Information about the initiation, status, and implementation of software process improvement proposals is maintained. <input type="checkbox"/> Ready access is provided to the software process improvement records. <input type="checkbox"/> Historical data are maintained and reports are produced on software process improvements. 	
	<p>Software managers and technical staff receive feedback on the status and results of the software process improvement activities on an event-driven basis. (L5-44, A10)</p>	
	<p>Measurements are made and used to determine the status of the software process improvement activities. (L5-45, M1)</p>	

Continued on next page

PCM Process - Activities, Continued

Activities, continued

The table below lists the recommended activities for the process change management process, continued from the previous page.

√	Activities	References
	The activities for software process improvement are reviewed with senior management on a periodic basis. (L5-46, V1) [Refer to PCM Process Reviews and Audits for additional information.]	
	The software quality assurance group reviews and/or audits the activities and work products for software process improvement and reports the results. (L5-46, V2) [Refer to PCM Process Reviews and Audits for additional information.]	

PCM Process - Outputs

Outputs

The table below lists the recommended outputs produced by the process change management process.

√	Output	Org. Output	References
	Accomplishments of the process improvement activities. (L5-36, A2, 6)		
	Adjustments to the proposed process improvement. (L5-42, A7, 1)		
	Benefits of each software process improvement. (L5-40, A5, 3)		
	Change in software process performance. (L5-43, A8, 2)		
	Changes to the organization's standard software process. (L5-36, A2, 7)		
	Changes to the projects' defined software processes. (L5-47, V2, 4)		
	Decision rationale (for deciding whether to implement the software process improvement proposal). (L5-39, A5, 2)		
	Decision to transfer a software process improvement into normal practice. (L5-42, A8)		
	Decision whether to implement each software process improvement proposal. (L5-39, A5, 2)		
	Decision whether to terminate the (pilot) effort, proceed with broad-scale implementation of the improvement, or replan and continue the pilot effort. (L5-42, A7, 4)		
	Expected benefits of each software process improvement proposal. (L5-40, A5, 3)		
	Feedback on the status and results of the software process improvement activities. (L5-44, A10)		
	Focus on high-priority software process improvement proposals. (L5-40, A5, 4.1)		
	Goals for each process improvement effort. (L5-41, A6, 2)		
	Highest priority process areas for improvement. (L5-38, A4, 2)		

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PCM Process - Outputs, Continued

Outputs, continued

The table below lists the recommended outputs produced by the process change management process, continued from the previous page.

√	Output	Org. Output	References
	Historical data on software process improvements. (L5-44, A9, 3)		
	Impacts of each software process improvement. (L5-42, A7, 3)		
	Information about the implementation of software process improvement proposals. (L5-44, A9, 1)		
	Information about the initiation of software process improvement proposals. (L5-44, A9, 1)		
	Information about the status of software process improvement proposals. (L5-44, A9, 1)		
	Lessons learned (from piloting software process improvements). (L5-42, A7, 2)		
	Measurement plans for software process performance. (L5-36, A2, 1)		
	Measurements (to determine the status of the software process improvement activities). (L5-45, M1)		
	Needed goal changes. (L5-46, V1, 3)		
	Notification of the disposition of software process improvement proposals. (L5-41, A5, 11.2)		
	Organization's long-term goals for process improvement. (L5-33, C2, 1)		
	Organization's long-term plans for process improvement. (L5-33, C2, 1)		
	Organization's training needs for process improvement. (L5-36, A2, 3)		
	Organizational goals for software process performance. (L5-36, A2, 1)		
	Organizational plan for software process improvement. (L5-37, A3)		
	Plans for process improvement team activities. (L5-41, A6, 1)		

Continued on next page

PCM Process - Outputs, Continued

Outputs, continued

The table below lists the recommended outputs produced by the process change management process, continued from the previous page.

√	Output	Org. Output	References
	Priority of software process improvement proposals selected for implementation. (L5-40, A5, 4)		
	Problems encountered (when pilot testing software process improvements). (L5-42, A7, 2)		
	Process changes. (L5-33, Ab1, 1.3)		
	Process improvement goals. (L5-33, C2, 3)		
	Process improvement plans to meet these (process improvement) goals. (L5-33, C2, 3)		
	Process measurements. (L5-47, V2, 3)		
	Prompt acknowledgment of submitted software process improvement proposals. (L5-41, A5, 11.1)		
	Records of software process improvement. (L5-36, A2, 8)		
	Reports on software process improvements. (L5-44, A9, 3)		
	Results (of software quality assurance group reviews and/or audits of the activities and work products for software process improvement). (L5-46, V2)		
	Results of tracking status, accomplishments, and participation in the process improvement activities (from the group responsible for the organization's software process activities, e.g., software engineering process group). (L5-36, A2, 6)		
	Revisions to the plan for software process improvement. (L5-46, V1, 5)		
	Risks of each software process improvement. (L5-42, A7, 3)		
	Software process improvement. (L5-42, A8)		

Continued on next page

PCM Process - Outputs, Continued

Outputs, continued

The table below lists the recommended outputs produced by the process change management process, continued from the previous page.

√	Output	Org. Output	References
	Status of each software process improvement proposal. (L5-41, A5, 7)		
	Status of the process improvement activities. (L5-36, A2, 6)		
	Strategy for collecting data to measure and track the change in software process performance. (L5-43, A8, 2)		
	Summary of the major software process improvement activities. (L5-44, A10, 1)		
	Summary status of the software process improvement proposals that are submitted, open, and completed. (L5-44, A10, 3)		
	Training course materials. (L5-36, A2, 3)		
	Training courses. (L5-43, A8, 3)		
	Uncertainty in the estimate of the benefits of each software process improvement proposal. (L5-42, A7, 3)		
	Uncertainty in the estimate of the impacts of each software process improvement proposal. (L5-42, A7, 3)		
	Uncertainty in the estimate of the risks of each software process improvement proposal. (L5-42, A7, 3)		

PCM Process - Exit Criteria

Output-based exit criteria

The CMM recommends that outputs satisfy the states described in the table below to exit the process change management process.

√	Output	State	References
	Accomplishments of the process improvement activities	are tracked by the group responsible for the organization's software process activities, e.g., software engineering process group. (L5-36, A2, 6)	
	Adjustments to the proposed process improvement	<input type="checkbox"/> are made during the pilot effort to optimize its implementation. (L5-42, A7, 1) <input type="checkbox"/> are documented during the pilot effort to optimize its implementation. (L5-42, A7, 1)	
	Benefits of each software process improvement	<input type="checkbox"/> are determined, where appropriate, (by installing the improvements) on a pilot basis before they are introduced into normal practice. (L5-42, A7) <input type="checkbox"/> are estimated (for broader use in the organization based on pilot testing). (L5-42, A7, 3)	

Continued on next page

PCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the process change management process, continued from the previous page.

√	Output	State	References
	Changes to the organization's standard software process or software process changes	<ul style="list-style-type: none"> <li data-bbox="760 468 1211 646">❑ are coordinated by the group responsible for the organization's software process activities, e.g., software engineering process group. (L5-36, A2, 7) <li data-bbox="760 657 1211 835">❑ are tracked by the group responsible for the organization's software process activities, e.g., software engineering process group. L5-36, A2, 7) <li data-bbox="760 846 1211 1108">❑ that are judged to have a major impact on product quality or productivity or that will significantly alter satisfaction of the customer and end users are reviewed and approved by appropriate management before they are implemented. (L5-41, A5, 9) <li data-bbox="760 1119 1211 1213">❑ are incorporated into the organization's standard software process. (L5-43, A8, 5) <li data-bbox="760 1224 1211 1308">❑ are incorporated into the projects' defined software processes. (L5-43, A8, 6) 	
	Decision rationale (for deciding whether to implement the software process improvement proposal)	is documented. (L5-39, A5, 2)	
	Decision whether to implement each software process improvement proposal	is made. (L5-39, A5, 2)	

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PCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the process change management process, continued from the previous page.

√	Output	State	References
	Decision whether to terminate the (pilot) effort, proceed with broad-scale implementation of the improvement, or replan and continue the pilot effort	is made. (L5-42, A7, 4)	
	Expected benefits of each software process improvement proposal	are determined. (L5-40, A5, 3)	
	Feedback on the status and results of the software process improvement activities	<input type="checkbox"/> is received by software managers and technical staff on an event-driven basis. (L5-44, A10) <input type="checkbox"/> provides a summary of the major software process improvement activities. (L5-44, A10, 1) <input type="checkbox"/> provides significant innovations and actions taken to address software process improvement. (L5-44, A10, 2) <input type="checkbox"/> provides a summary status of the software process improvement proposals that are submitted, open, and completed. (L5-44, A10, 3)	
	Focus on high-priority software process improvement proposals	is maintained. (L5-40, A5, 4.1)	
	Goals for each process improvement effort	<input type="checkbox"/> are established. (L5-41, A6, 2) <input type="checkbox"/> are defined quantitatively, where possible. (L5-41, A6, 2)	
	Historical data on software process improvements	are maintained. (L5-44, A9, 3)	

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PCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the process change management process, continued from the previous page.

√	Output	State	References
	Impacts of each software process improvement	are estimated (for broader use in the organization based on pilot testing). (L5-42, A7, 3).	
	Information about the implementation of software process improvement proposals	is maintained. (L5-44, A9, 1)	
	Information about the initiation of software process improvement proposals	is maintained. (L5-44, A9, 1)	
	Information about the status of software process improvement proposals	is maintained. (L5-44, A9, 1)	
	Lessons learned (from piloting software process improvements)	are documented. (L5-42, A7, 2)	
	Measurement plans for software process performance	are defined by the group responsible for the organization's software process activities (e.g., software engineering process group) . (L5-36, A2, 1)	
	Measurements (to determine the status of the software process improvement activities)	are made. (L5-45, M1) are used. (L5-45, M1)	
	Needed goal changes	are identified (during periodic senior management reviews of the activities for software process improvement). (L5-46, V1, 3)	

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PCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the process change management process, continued from the previous page.

√	Output	State	References
	Notification of the disposition of software process improvement proposals	is received by submitters of the software process improvement proposals . (L5-41, A5, 11.2)	
	Organization's long-term goals for process improvement	are established by senior management . (L5-33, C2, 1)	
	Organization's long-term plans for process improvement	are established by senior management . (L5-33, C2, 1)	
	Organization's training needs for process improvement	are defined with the participation of the group responsible for the organization's software process activities (e.g., software engineering process group) . (L5-36, A2, 3)	
	Organizational goals for software process performance	<input type="checkbox"/> are defined by the group responsible for the organization's software process activities (e.g., software engineering process group) . (L5-36, A2, 1) <input type="checkbox"/> are reviewed with senior management for their endorsement. (L5-36, A2, 2)	
	Organizational plan for software process improvement	<input type="checkbox"/> is developed according to a documented procedure. (L5-37, A3) <input type="checkbox"/> is maintained according to a documented procedure. (L5-37, A3) <input type="checkbox"/> undergoes peer review. (L5-37, A3, 2) <input type="checkbox"/> is reviewed by the affected managers . (L5-37, A3, 3) <input type="checkbox"/> is managed and controlled. (L5-37, A3, 4)	

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PCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the process change management process, continued from the previous page.

√	Output	State	References
	Plans for process improvement team activities	are approved by the managers of the affected groups and the group that defines and maintains the affected process descriptions. (L5-41, A6, 3)	
	Priority of software process improvement proposals selected for implementation	is determined. (L5-40, A5, 4)	
	Problems encountered (when pilot testing software process improvements)	are documented. (L5-42, A7, 2)	
	Process improvement goals	are reasonable, yet aggressive. (L5-33, C2, 3)	
	Process improvement plans to meet these (process improvement) goals	are effective. (L5-33, C2, 3)	
	Prompt acknowledgment of submitted software process improvement proposals	is received by submitters of the software process improvement proposals. (L5-41, A5, 11.1)	
	Records of software process improvement	<input type="checkbox"/> are defined, <input type="checkbox"/> are established, and <input type="checkbox"/> are maintained by the group responsible for the organization's software process activities, e.g., software engineering process group. (L5-36, A2, 8) <input type="checkbox"/> are readily accessible. (L5-44, A9, 2)	
	Reports on software process improvements	are produced. (L5-44, A9, 3)	

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PCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the process change management process, continued from the previous page.

√	Output	State	References
	Results (of software quality assurance group reviews and/or audits of the activities and work products for software process improvement)	are reported. (L5-46, V2)	
	Results of tracking status, accomplishments, and participation in the process improvement activities	are periodically reported to senior management (by the group responsible for the organization's software process activities e.g., software engineering process group). (L5-36, A2, 6)	
	Revisions to the plan for software process improvement	are approved (during periodic senior management reviews of the activities for software process improvement), as appropriate. (L5-46, V1, 5)	
	Risks of each software process improvement	are estimated (for broader use in the organization based on pilot testing). (L5-42, A7, 3)	
	Software process improvement	is implemented according to a documented procedure. (L5-42, A8)	
	Status of each software process improvement proposal	is tracked. (L5-41, A5, 7)	
	Status of the process improvement activities	is tracked by the group responsible for the organization's software process activities, e.g., software engineering process group . (L5-36, A2, 6)	

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PCM Process - Exit Criteria, Continued

Output-based exit criteria, continued

The CMM recommends that outputs satisfy the states described in the table below to exit the process change management process, continued from the previous page.

√	Output	State	References
	Strategy for collecting data to measure and track the change in software process performance (from transferring a software process improvement into normal practice)	<input type="checkbox"/> is documented. (L5-43, A8, 2) <input type="checkbox"/> is reviewed. (L5-43, A8, 2) <input type="checkbox"/> is agreed to by the individuals responsible for implementing the software processes affected by the change. (L5-43, A8, 2.1)	
	Training course materials	<input type="checkbox"/> development is supported by the group responsible for the organization's software process activities (e.g., software engineering process group). (L5-36, A2, 3) <input type="checkbox"/> presentation is supported by the group responsible for the organization's software process activities (e.g., software engineering process group). (L5-36, A2, 3)	
	Training courses	are updated to reflect the current software process. (L5-43, A8, 3)	
	Uncertainty in the estimate of the benefits of each software process improvement proposal	is assessed. (L5-42, A7, 3)	
	Uncertainty in the estimate of the impacts of each software process improvement proposal	is assessed. (L5-42, A7, 3)	
	Uncertainty in the estimate of the risks of each software process improvement proposal	is assessed. (L5-42, A7, 3)	

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PCM Process - Exit Criteria, Continued

General exit criteria

The CMM recommends that the conditions described in the table below be satisfied to exit the process change management process.

√	Condition	References
	The organization has quantitative, measurable goals for software process improvement and tracks performance against these goals. (L5-32, C1, 1)	
	A software process improvement program is established which empowers the members of the organization to improve the processes of the organization. (L5-35, A1)	
	The group responsible for the organization's software process activities (e.g., software engineering process group) coordinates the software process improvement activities. (L5-36, A2)	
	The software process improvement activities are performed in accordance with the software process improvement plan. (L5-38, A4)	
	Software process improvement proposals are handled according to a documented procedure. (L5-39, A5)	
	Each software process improvement proposal is evaluated; a decision is made whether to implement the proposal, and the decision rationale is documented. (L5-39, A5, 2)	
	Software process improvement proposals for which the response has been unusually long are identified and acted upon. (L5-41, A5, 8)	
	Each of the process improvement teams is funded and the activities are planned and scheduled. (L5-41, A6, 1)	
	Training courses are updated to reflect the current software process, and training is provided before installing the process change for general use. (L5-43, A8, 3)	
	Consultation support, appropriate to the expected needs, is established before installing the process change for broad-scale use and is continued as needed. (L5-43, A8, 4)	

PCM Process - Reviews and Audits

Reviews and audits

The table below lists the recommended reviews and audits for the process change management process.

√	Review or Audit	Review Participants	References
	The group responsible for the organization's software process activities (e.g., software engineering process group) reviews the organizational goals for process performance with senior management for their endorsement. (L5-36, A2, 2)	Group responsible for the organization's software process activities (e.g., software engineering process group) Senior management	
	The group responsible for the organization's software process activities (e.g., software engineering process group) reviews software process improvement proposals and coordinates the actions for these proposals. (L5-36, A2, 5)	Group responsible for the organization's software process activities (e.g., software engineering process group)	
	The software process improvement plan undergoes peer review. (L5-37, A3, 2)	Not specified in the CMM	
	The software process improvement plan is reviewed by the affected managers . (L5-37, A3, 3)	Affected managers	
	Software process changes that are judged to have a major impact on product quality or productivity or that will significantly alter satisfaction of the customer and end users are reviewed and approved by appropriate management before they are implemented. (L5-41, A5, 9)	Management	
	Completed software process improvement actions are reviewed, verified, and approved before they are closed. (L5-41, A5, 10)	Not specified in the CMM	
	The strategy for collecting data to measure and track the change in software process performance is documented, reviewed, and agreed to. (L5-43, A8, 2)	Not specified in the CMM	

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PCM Process - Reviews and Audits, Continued

Reviews and audits, continued

The table below lists the recommended reviews and audits for the process change management process, continued from the previous page.

√	Review or Audit	Review Participants	References
	<p>The activities for software process improvement are reviewed with senior management on a periodic basis. (L5-46, V1)</p> <p>These reviews are held to:</p> <ul style="list-style-type: none"><input type="checkbox"/> Summarize participation in the process improvement activities.<input type="checkbox"/> Assess process performance.<input type="checkbox"/> Identify needed goal changes.<input type="checkbox"/> Resolve issues.<input type="checkbox"/> Approve revisions to the software process improvement plan as appropriate.	Senior management	

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PCM Process - Reviews and Audits, Continued

Reviews and audits, continued

The table below lists the recommended reviews and audits for the process change management process, continued from the previous page.

√	Review or Audit	Review Participants	References
	<p>The software quality assurance group reviews and/or audits the activities and work products for software process improvement and reports the results. (L5-46, V2)</p> <p>At a minimum, the reviews and/or audits verify:</p> <ul style="list-style-type: none"> <input type="checkbox"/> The preparation of the organization's software process improvement plan. <input type="checkbox"/> The process of initiating, submitting, reviewing, approving, and planning implementation of software process improvement proposals. <input type="checkbox"/> The degree to which the process measurements conform to the software process descriptions and reflect actual performance. <input type="checkbox"/> The process for documenting, reviewing, approving, controlling, and disseminating changes to the organization's standard software process and projects' defined software processes. <input type="checkbox"/> The degree to which software process improvement activities are consistently measured and tracked. <input type="checkbox"/> The degree to which actual software process improvement performance achieves the plans and goals. 	<p>Software quality assurance group</p>	

PCM Process - Work Products Managed and Controlled

Work products managed and controlled

The table below lists the work products recommended to be managed and controlled during the process change management process.

√	Work Products Managed and Controlled	References
	Software process improvement plan. (L5-37, A3, 4)	

PCM Process - Measurements

Measurements The table below lists the measurements recommended for the process change management process.

√	Measurements	References
	<p>Measurements to determine the status of the software process improvement activities. (L5-45, M1)</p> <p>Examples of measurements include:</p> <ul style="list-style-type: none"> <input type="checkbox"/> The number of software process improvement proposals submitted and implemented for each process area. <input type="checkbox"/> The number of software process improvement proposals submitted by each of the projects, groups, and departments. <input type="checkbox"/> The number and types of awards and recognitions received by each of the projects, groups, and departments. <input type="checkbox"/> The response time for handling software process improvement proposals. <input type="checkbox"/> The percentage of software process improvement proposals accepted per reporting period. <input type="checkbox"/> The overall change activity, including number, type, and size of changes. <input type="checkbox"/> The effect of implementing each process improvement compared to its defined goals. <input type="checkbox"/> Overall performance of the organization's and project's processes, including effectiveness, quality, and productivity compared to their defined goals. <input type="checkbox"/> Overall productivity and software quality trends for each project. <input type="checkbox"/> Process measurements that relate to the indicators of the customer's satisfaction. 	

PCM Process - Documented Procedures

Documented procedures

The table below lists activities in the process change management process recommended to be performed according to a documented procedure.

√	Documented Procedure(s)	References
	The organization develops and maintains a plan for software process improvement according to a documented procedure. (L5-37, A3) [Refer to Level 5 Procedure Checklists for additional information.]	
	Software process improvement proposals are handled according to a documented procedure. (L5-39, A5) [Refer to Level 5 Procedure Checklists for additional information.]	
	When the decision is made to transfer a software process improvement into normal practice, the improvement is implemented according to a documented procedure. (L5-42, A8) [Refer to Level 5 Procedure Checklists for additional information.]	

PCM Process - Training

Training

The table below lists the training recommended for the process change management process.

√	Training	References
	Software managers receive required training in software process improvement. (L5-34, Ab2)	
	The managers and technical staff of the software engineering group and other software-related groups receive required training in software process improvement. (L5-34, Ab3)	
	Senior management receives required training in software process improvement. (L5-35, Ab4)	
	Training courses are updated to reflect the current software process, and training is provided before installing the process change for general use. (L5-43, A8, 3)	

PCM Process - Tools

Tools

The table below lists the tools recommended for the process change management process.

√	Tools	References
	Tools to support process improvement. (L5-34, Ab1, 3) Examples of support tools include: <ul style="list-style-type: none"><input type="checkbox"/> statistical analysis tools,<input type="checkbox"/> database systems,<input type="checkbox"/> process automation tools, and<input type="checkbox"/> process modeling tools.	
	Support tools to record the desired data (to measure and track the change in software process performance). (L5-43, A8, 2.2)	

