

# Level 5 Summary

## Overview

---

**Section purpose** The purpose of this section is to provide checklists that provide a summary of the optimizing level (level 5). This section contains three perspectives of a CMM level.

- *Key process area (KPA) specific information:*
  - KPA purpose
  - KPA goals
- *Operational framework information (from a maturity level viewpoint):*
  - Policies
  - Standards
  - Process descriptions
  - Procedures
  - Training
  - Tools
- *Other key process information (from a maturity level viewpoint):*
  - Reviews and audits
  - Work products managed and controlled
  - Measurements

---

**Section overview**

This section contains the following topics.

Topic	Page
Level 5 - KPA Purposes	L5-Summary-2
Level 5 - KPA Goals	L5-Summary-3
Level 5 - Policies	L5-Summary-4
Level 5 - Standards	L5-Summary-5
Level 5 - Process Descriptions	L5-Summary-6
Level 5 - Procedures	L5-Summary-8
Level 5 - Training	L5-Summary-9
Level 5 - Tools	L5-Summary-10
Level 5 - Reviews and Audits	L5-Summary-11
Level 5 - Work Products Managed and Controlled	L5-Summary-16
Level 5 - Measurements	L5-Summary-17

---

## Level 5 - KPA Purposes

### Level 5 KPA purposes

The following table describes the purpose of each key process area in the CMM at level 5.

---

√	KPA	Purpose of KPAs at Level 5
	DP	The purpose of Defect Prevention is to identify the cause of defects and prevent them from recurring. (L5-1)
	TCM	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)
	PCM	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)

---

## Level 5 - KPA Goals

### Level 5 KPA goals

The following table lists the goals that are described in the CMM at level 5 for each key process area.

√	KPA	CMM Goals at Level 5	References
	DP	Defect prevention activities are planned. (L5-2, G1)	
	DP	Common causes of defects are sought out and identified. (L5-2, G2)	
	DP	Common causes of defects are prioritized and systematically eliminated. (L5-2, G3)	
	TCM	Incorporation of technology changes are planned. (L5-18, G1)	
	TCM	New technologies are evaluated to determine their effect on quality and productivity. (L5-18, G2)	
	TCM	Appropriate new technologies are transferred into normal practice across the organization. (L5-18, G3)	
	PCM	Continuous process improvement is planned. (L5-32, G1)	
	PCM	Participation in the organization's software process improvement activities is organization wide. (L5-32, G2)	
	PCM	The organization's standard software process and the projects' defined software processes are improved continuously. (L5-32, G3)	

## Level 5 - Policies

---

**Level 5 policies** The following table lists the recommended policies in the CMM at level 5.

√	KPA	Description	References
	DP	Written policy for defect prevention activities. (L5-2, C1)	
	TCM	Written policy for improving its (the organization's) technology capability. (L5-18, C1)	
	PCM	Written policy for implementing software process improvements. (L5-32, C1)	

---

## Level 5 - Standards

### Level 5 standards

---

The CMM recommends the contents of the following work products at level 5:

√	KPA	Standards at Level 5	References
	DP	Project plan for defect prevention activities. (L5-5, A1)	
	TCM	Plan for technology change management. (L5-23, A1)	
	TCM	Plan for pilot efforts to improve technology. (L5-27, A6)	
	PCM	Software process improvement plan. (L5-38, A4)	

### Reference

Refer to the Level 5 Standards Checklists for additional information regarding the content of each standard.

---

## Level 5 - Process Descriptions

---

### **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)

---

### **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)

---

*Continued on next page*

## Level 5 - Process Descriptions, Continued

---

**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)

---

## Level 5 - Procedures

---

### Reference

Refer to the Level 5 Procedure Checklists for additional information regarding the content of each documented procedure.

---

### Level 5 procedures

The table below lists the activities recommended to be performed according to a documented procedure in the CMM at level 5.

√	KPA	Documented Procedures	References
	DP	Causal analysis meetings are conducted according to a documented procedure. (L5-7, A3)	
	DP	Revisions to the organization's standard software process resulting from defect prevention actions are incorporated according to a documented procedure. (L5-12, A6)	
	DP	Revisions to the project's defined software process resulting from defect prevention actions are incorporated according to a documented procedure. (L5-12, A7)	
	TCM	Technologies are selected and acquired for the organization and software projects according to a documented procedure. (L5-26, A5)	
	TCM	Appropriate new technologies are incorporated into the organization's standard software process according to a documented procedure. (L5-28, A7)	
	TCM	Appropriate new technologies are incorporated into the projects' defined software processes according to a documented procedure. (L5-28, A8)	
	PCM	The organization develops and maintains a plan for software process improvement according to a documented procedure. (L5-37, A3)	
	PCM	Software process improvement proposals are handled according to a documented procedure. (L5-39, A5)	
	PCM	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)	

---

## Level 5 - Training

**Level 5 training** The table below lists the training recommended in the CMM at level 5.

√	KPA	Training	References
	DP	<b>Members of the software engineering group</b> and other <b>software-related groups</b> receive required training to perform their defect prevention activities. (L5-4, Ab4)	
	TCM	Members of the <b>group responsible for the organization's technology change management activities</b> receive required training to perform these activities. (L5-23, Ab5)	
	PCM	<b>Software managers</b> receive required training in software process improvement. (L5-34, Ab2)	
	PCM	The <b>managers and technical staff of the software engineering group</b> and other <b>software-related groups</b> receive required training in software process improvement. (L5-34, Ab3)	
	PCM	<b>Senior management</b> receives required training in software process improvement. (L5-35, Ab4)	
	PCM	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)	

## Level 5 - Tools

### Level 5 tools

The table below lists the tools recommended in the CMM for level 5.

---

√	KPA	Tools	References
	DP	Tools to support defect prevention activities. (L5-4, Ab3, 4)	
	TCM	Tools to support technology change management. (L5-21, Ab2, 2)	
	PCM	Tools to support process improvement. (L5-34, Ab1, 3)	
	PCM	Support tools to record the desired data (to measure and track the change in software process performance). (L5-43, A8, 2.2)	

---

## Level 5 - Reviews and Audits

### Level 5 reviews and audits

The table below lists the recommended reviews and audits in the CMM at level 5.

√	KPA	Review or Audit	Review Participants	References
	DP	The results of the defect prevention activities are reviewed to ensure the effectiveness of those activities. (L5-2, C1, 4)	<b>Not specified in the CMM</b>	
	DP	The software project's plan for defect prevention activities undergoes peer review. (L5-5, A1, 4)	<b>Not specified in the CMM</b>	
	DP	Each of the <b>teams assigned to coordinate defect prevention activities</b> meets on a periodic basis to review and coordinate implementation of action proposals from the causal analysis meetings. (L5-8, A4)	<b>Teams assigned to coordinate defect prevention activities</b>	
	DP	The <b>teams assigned to coordinate defect prevention activities</b> review the output from the causal analysis meetings and select action proposals that will be addressed. (L5-9, A4, 1)	<b>Teams assigned to coordinate defect prevention activities</b>	
	DP	The <b>teams assigned to coordinate defect prevention activities</b> 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)	<b>Teams assigned to coordinate defect prevention activities</b>	
	DP	The <b>teams assigned to coordinate defect prevention activities</b> 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)	<b>Teams assigned to coordinate defect prevention activities</b>	

*Continued on next page*

## Level 5 - Reviews and Audits, Continued

### Level 5 reviews and audits, continued

The table below lists the recommended reviews and audits in the CMM at level 5, continued from the previous page.

√	KPA	Review or Audit	Review Participants	References
	DP	The <b>teams assigned to coordinate defect prevention activities</b> 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)	<b>Teams assigned to coordinate defect prevention activities</b>	
	DP	The <b>teams assigned to coordinate defect prevention activities</b> review and verify completed action items before they are closed. (L5-10, A4, 11)	<b>Teams assigned to coordinate defect prevention activities</b>	
	DP	The organization's activities for defect prevention are reviewed with <b>senior management</b> on a periodic basis. (L5-14, V1)	<b>Senior management</b>	
	DP	The software project's activities for defect prevention are reviewed with the <b>project manager</b> on both a periodic and event-driven basis. (L5-15, V2)	<b>Project manager</b>	
	DP	The <b>software quality assurance group</b> reviews and/or audits the activities and work products for defect prevention and reports the results. (L5-15, V3)	<b>Software quality assurance group</b>	
	TCM	<b>Senior management</b> helps to establish policies for technology change management and reviews and approves these policies. (L5-19, C3, 1)	<b>Senior management</b>	
	TCM	The organizational plan for technology change management undergoes peer review. (L5-24, A1, 5)	<b>Not specified in CMM</b>	

*Continued on next page*

## Level 5 - Reviews and Audits, Continued

### Level 5 reviews and audits, continued

The table below lists the recommended reviews and audits in the CMM at level 5, continued from the previous page.

√	KPA	Review or Audit	Review Participants	References
	TCM	The organizational plan for technology change management is reviewed by the <b>affected managers</b> . (L5-24, A1, 6)	<b>Affected managers</b>	
	TCM	The <b>group responsible for the organization's technology change management activities</b> works with the software projects in identifying areas of technology changes.  <input type="checkbox"/> 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)	<b>Group responsible for the organization's technology change management activities</b>	
	TCM	The <b>group responsible for the organization's technology change management activities</b> works with the software projects in identifying areas of technology changes.  <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. (L5-25, A2, 2.4)	<b>Group responsible for the organization's technology change management activities</b>	
	TCM	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)	<b>Not specified in CMM</b>	
	TCM	The requirements and plans (for selected technology changes) are reviewed by the <b>managers of the affected groups</b> and the <b>group responsible for technology change management activities</b> . (L5-26, A5, 4.4)	<b>Managers of the affected groups</b> <b>Group responsible for technology change management activities</b>	

*Continued on next page*

## Level 5 - Reviews and Audits, Continued

### Level 5 reviews and audits, continued

The table below lists the recommended reviews and audits in the CMM at level 5, continued from the previous page.

√	KPA	Review or Audit	Review Participants	References
	TCM	The plan for conducting the pilot effort is reviewed and approved by the <b>managers of the affected groups</b> . (L5-27, A6, 3)	<b>Managers of the affected groups</b>	
	TCM	The organization's activities for technology change management are reviewed with <b>senior management</b> on a periodic basis. (L5-29, V1)	<b>Senior management</b>	
	TCM	The <b>software quality assurance group</b> reviews and/or audits the activities and work products for technology change management and reports the results. (L5-29, V2)	<b>Software quality assurance group</b>	
	PCM	The <b>group responsible for the organization's software process activities (e.g., software engineering process group)</b> reviews the organizational goals for process performance with <b>senior management</b> for their endorsement. (L5-36, A2, 2)	<b>Software engineering process group</b> <b>Senior management</b>	
	PCM	The <b>group responsible for the organization's software process activities (e.g., software engineering process group)</b> reviews software process improvement proposals and coordinates the actions for these proposals. (L5-36, A2, 5)	<b>Software engineering process group</b>	
	PCM	The software process improvement plan undergoes peer review. (L5-37, A3, 2)	<b>Not specified in the CMM</b>	
	PCM	The software process improvement plan is reviewed by the <b>affected managers</b> . (L5-37, A3, 3)	<b>Affected managers</b>	

*Continued on next page*

## Level 5 - Reviews and Audits, Continued

### Level 5 reviews and audits, continued

The table below lists the recommended reviews and audits in the CMM at level 5, continued from the previous page.

√	KPA	Review or Audit	Review Participants	References
	PCM	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 <b>management</b> before they are implemented. (L5-41, A5, 9)	<b>Management</b>	
	PCM	Completed software process improvement actions are reviewed, verified, and approved before they are closed. (L5-41, A5, 10)	<b>Not specified in the CMM</b>	
	PCM	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)	<b>Not specified in the CMM</b>	
	PCM	The activities for software process improvement are reviewed with <b>senior management</b> on a periodic basis. (L5-46, V1)	<b>Senior management</b>	
	PCM	The <b>software quality assurance group</b> reviews and/or audits the activities and work products for software process improvement and reports the results. (L5-46, V2)	<b>Software quality assurance group</b>	

## Level 5 - Work Products Managed and Controlled

---

### Level 5 work products managed and controlled

The table below lists the work products that are recommended to be managed and controlled in the CMM at level 5.

√	KPA	Work Products Managed and Controlled	References
	DP	Defect prevention data. (L5-11, A5, 3)	
	TCM	There are no work products that are managed and controlled during the technology change management process.	
	PCM	Software process improvement plan. (L5-37, A3, 4)	

---

## Level 5 - Measurements

### Level 5 measurements

The table below describes the recommended measurements in the CMM at level 5.

√	KPA	Description	References
	DP	Defect prevention data. (L5-11, A5)	
	DP	Measurements to determine the status of the defect prevention activities. (L5-13, M1)	
	TCM	Data of experience with using (new technologies that have been used successfully). (L5-25, A2, 2.4)	
	TCM	Measurements to determine the status of the organization's activities for technology change management. (L5-28, M1)	
	PCM	Measurements to determine the status of the software process improvement activities. (L5-45, M1)	

