

SQM Process - Tools

Tools

The table below lists the tools recommended for the software quality management process.

√	Tools	References
	<p>Tools to support predicting, measuring, tracking, and analyzing software quality. (L4-21, Ab1, 2)</p> <p>Examples of support tools include:</p> <ul style="list-style-type: none"><input type="checkbox"/> data collection tools,<input type="checkbox"/> database systems,<input type="checkbox"/> spreadsheet programs,<input type="checkbox"/> software life-cycle simulators,<input type="checkbox"/> quantitative analysis tools, and<input type="checkbox"/> code audit tools.	

SQM Process - Training

Training

The table below lists the training recommended for the software quality management process.

√	Training	References
	The individuals implementing and supporting software quality management receive required training to perform their activities. (L4-22, Ab2)	
	The members of the software engineering group and other software-related groups receive required training in software quality management. (L4-22, Ab3)	

SQM Process - Documented Procedures

Documented procedures

The table below lists the software quality management process activities that are recommended to be performed according to a documented procedure.

√	Documented Procedure(s)	References
	The project's software quality plan is developed and maintained according to a documented procedure. (L4-23, A1) [Refer to Level 4 Procedure Checklists for additional information.]	

SQM Process - Measurements

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

√	Measurements	References
	Measurements used for software quality management based on the project's defined software process. (L4-20, C1, 2)	
	Software quality. (L4-26, A2, 1)	
	Software product quality. (L4-26, A2, 4)	
	Measurements used to quantify the characteristics of software product quality. (L4-27, A3, 2)	
	Quality of the project's software products. (L4-29, A4)	
	Quality of the software work products of each software life-cycle stage. (L4-29, A4, 4)	
	Measurements to determine the status of the software quality management activities. (L4-31, M1) Examples of measurements include: <ul style="list-style-type: none"><input type="checkbox"/> The cost of poor quality (based on known quality measurements to whatever degree of accuracy they can be collected).<input type="checkbox"/> The costs for achieving the quality goals.	

SQM 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 software quality management process.

√	Work Products Managed and Controlled	References
	Project's software quality plan. (L4-25, A1, 10)	

SQM Process - Reviews and Audits

Reviews and audits

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

√	Review or Audit	Review Participants	References
	Specialty engineers in areas such as safety and reliability are available to help set the software quality goals and review progress towards the goals. (L4-21, Ab1, 1)	Specialty engineers in areas such as safety and reliability	
	The software quality plan undergoes peer review. (L4-24, A1, 7)	Not specified in CMM	
	The software quality plan is reviewed by affected groups and individuals . (L4-24, A1, 8)	Affected groups and individuals	
	Senior management reviews the software quality plans. (L4-25, A1, 9)	Senior management	
	The software tasks are planned and performed to address the project's software quality goals. At the beginning of a software task, the team performing the task : (L4-29, A4, 1) <ul style="list-style-type: none"> <input type="checkbox"/> Reviews the quality goals for the software product. (L4-29, A4, 1.1) <input type="checkbox"/> Reviews changes made to the process to meet the software quality goals. (L4-29, A4, 1.4) 	Team performing the software task	
	The activities for software quality management are reviewed with senior management on a periodic basis. (L4-31, V1)	Senior management	
	The activities for software quality management are reviewed with the project manager on both a periodic and event-driven basis. (L4-31, V2)	Project manager	
	The software quality assurance group reviews and/or audits the activities and work products for software quality management and reports the results. (L4-32, V3) At a minimum, the reviews and/or audits verify: <ul style="list-style-type: none"> <input type="checkbox"/> The preparation of the project's software quality plan. <input type="checkbox"/> The process for establishing and tracking the software quality goals. 	Software quality assurance group	

SQM Process - Exit Criteria, Continued

General exit criteria, continued

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

√	Condition	References
	<p>When it is determined that the software quality goals conflict (that is, one goal cannot be achieved without compromising another goal), actions are taken to resolve the conflict. (L4-30, A4, 5)</p> <ul style="list-style-type: none"> <input type="checkbox"/> The cost for achieving the software quality goals is analyzed. <input type="checkbox"/> Alternative software quality goals are considered in light of long-term business strategies as well as short-term priorities. <input type="checkbox"/> The customer and end users participate in quality tradeoff decisions, as appropriate. <input type="checkbox"/> The software work products and plans are revised, as appropriate, to reflect the results of the tradeoffs. 	
	The software project's quantitative quality goals for the products are allocated appropriately to the subcontractors delivering software products to the project. (L4-30, A5)	
	The activities for software quality management are reviewed with senior management on a periodic basis. (L4-31, V1)	
	The activities for software quality management are reviewed with the project manager on both a periodic and event-driven basis. (L4-31, V2)	
	The software quality assurance group reviews and/or audits the activities and work products for software quality management and reports the results. (L4-32, V3)	

SQM Process - Exit Criteria, Continued

General exit criteria

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

√	Condition	References
	The project's software quality management activities support the organization's commitment to improve the quality of the software products. (L4-20, C1, 1)	
	The project defines the quality goals for the software products and monitors its progress towards them. (L4-20, C1, 3)	
	An understanding of the software quality needs of the organization, customer, and end users is developed as appropriate. (L4-23, A1, 1)	
	The software quality needs and priorities of the organization, customer, and end user are traceable to the system requirements allocated to software and the software quality goals. (L4-23, A1, 2)	
	The project's software quality plan is the basis for the project's activities for software quality management. (L4-25, A2)	
	Quality goals for the software products and software life-cycle stages are revised as understanding of the products and understanding of the organization's, customer's, and end users' needs evolve. (L4-29, A3, 6)	
	The software tasks are planned and performed to address the project's software quality goals. At the beginning of a software task, the team performing the task: (L4-29, A4, 1) <ul style="list-style-type: none"> <input type="checkbox"/> Reviews the quality goals for the software product. (L4-29, A4, 1.1) <input type="checkbox"/> Reviews changes made to the process to meet the software quality goals. (L4-29, A4, 1.4) 	
	The quality measurements are analyzed and compared to the software quality goals to determine whether the quality goals are satisfied. (L4-30, A4, 3)	
	Appropriate actions, consistent with the software quality plan, are taken to bring the quality measures of the products in line with the software quality goals. (L4-30, A4, 4)	

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SQM 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 software quality management process, continued from the previous page.

√	Output	State	References
	Quality goals applicable to the software task	are determined by the team performing the software task . (L4-29, A4, 1.2)	
	Quality goals for each software life-cycle stage	<input type="checkbox"/> are defined. (L4-28, A3, 5) <input type="checkbox"/> are documented. (L4-28, A3, 5)	
	Quality goals for the software products	<input type="checkbox"/> are defined by the project. (L4-20, C1, 3) <input type="checkbox"/> are documented in the project's software quality plan. (L4-28, A3, 4)	
	Quality of the project's software products	<input type="checkbox"/> is measured on an event-driven basis. (L4-29, A4) <input type="checkbox"/> is analyzed on an event-driven basis. (L4-29, A4) <input type="checkbox"/> is compared to the products' quantitative quality goals on an event-driven basis. (L4-29, A4)	
	Quality of the software work products of each software life-cycle stage	are measured. (L4-29, A4, 2)	
	Responsibilities for software quality management	<input type="checkbox"/> are defined. (L4-21, C1, 4) <input type="checkbox"/> are assigned to the software engineering group and other software-related groups . (L4-21, C1, 4)	
	Results (of SQA group reviews and/or audits of the activities and work products for software quality management)	are reported. (L4-32, V3)	

SQM 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 software quality management process, continued from the previous page.

√	Output	State	References
	Project's software quality plan	<ul style="list-style-type: none"> <li data-bbox="760 499 1227 583">❑ is developed according to a documented procedure. (L4-23, A1) <li data-bbox="760 596 1227 680">❑ is maintained according to a documented procedure. (L4-23, A1) <li data-bbox="760 693 1227 777">❑ satisfies the quality plans of the organization, as appropriate. (L4-24, A1, 4) <li data-bbox="760 789 1227 915">❑ is based on plans for previous or current projects in the organization, as appropriate. (L4-24, A1, 5) <li data-bbox="760 928 1227 991">❑ is updated at the start of the project. (L4-24, A1, 6) <li data-bbox="760 1003 1227 1066">❑ is updated at major project milestones. (L4-24, A1, 6) <li data-bbox="760 1079 1227 1163">❑ is updated whenever the allocated requirements change significantly. (L4-24, A1, 6) <li data-bbox="760 1176 1227 1239">❑ undergoes peer review. (L4-24, A1, 7) <li data-bbox="760 1251 1227 1314">❑ is reviewed by affected groups and individuals. (L4-24, A1, 8) <li data-bbox="760 1327 1227 1390">❑ is reviewed by senior management. (L4-25, A1, 9) <li data-bbox="760 1402 1227 1465">❑ is managed and controlled. (L4-25, A1, 10) <li data-bbox="760 1478 1227 1541">❑ is available to all affected groups and individuals. (L4-25, A1, 11) 	

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SQM 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 software quality management process, continued from the previous page.

√	Output	State	References
	Numeric values (for each characteristic of software product quality)	<input type="checkbox"/> are measurable. (L4-27, A3, 3) <input type="checkbox"/> are based on the required and desired values. (L4-27, A3, 3) <input type="checkbox"/> are selected as quality goals for the product. (L4-27, A3, 3)	
	Plans to achieve the software quality goals	are identified by the team performing the software task . (L4-29, A4, 1.3)	
	Project's quantitative quality goals for the software products	<input type="checkbox"/> are defined. (L4-27, A3) <input type="checkbox"/> are monitored throughout the software life cycle. (L4-27, A3) <input type="checkbox"/> are revised throughout the software life cycle. (L4-27, A3)	

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SQM Process - Exit Criteria

Output-based exit criteria

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

√	Output	Search Criteria/ Notes	References
	Capability of the project's defined software process to satisfy the software quality goals	<input type="checkbox"/> is assessed. (L4-24, A1, 3) <input type="checkbox"/> is documented. (L4-24, A1, 3)	
	Characteristics of product quality (that describe how well the software product will perform or how well it can be developed and maintained)	are identified. (L4-27, A3, 1)	
	Criteria to enable the groups (the software engineering group and other software-related groups) to determine their success in achieving the quality goals for the software products	are established. (L4-21, C1, 4.1)	
	Measurements (to determine the status of the software quality management activities)	<input type="checkbox"/> are made. (L4-31, M1) <input type="checkbox"/> are used. (L4-31, M1)	
	Measurements used for software quality management	<input type="checkbox"/> are defined. (L4-20, C1, 2) <input type="checkbox"/> are collected. (L4-20, C1, 2) <input type="checkbox"/> are based on the project's defined software process. (L4-20, C1, 2)	
	Measurements used to quantify the characteristics of software product quality	are identified. (L4-27, A3, 2)	

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SQM Process - Outputs, Continued

Outputs, continued

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

√	Output	Org. Output	References
	Quality of the software work products of each software life-cycle stage. (L4-29, A4, 2)		
	Responsibilities for software quality management. (L4-21, C1, 4)		
	Results (of SQA group reviews and/or audits of the activities and work products for software quality management). (L4-32, V3)		
	Results of the quality tradeoff decisions made when software quality goals conflict. (L4-30, A4, 5.3)		

SQM Process - Outputs

Outputs

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

√	Output	Org. Output	References
	Capability of the project's defined software process to satisfy the software quality goals. (L4-24, A1, 3)		
	Characteristics of product quality that describe how well the software product will perform or how well it can be developed and maintained. (L4-27, A3, 1)		
	Criteria to enable the groups (the software engineering group and other software-related groups) to determine their success in achieving the quality goals for the software products. (L4-21, C1, 4.1)		
	Measurements to determine the status of the software quality management activities. (L4-31, M1)		
	Measurements used for software quality management. (L4-20, C1, 2)		
	Measurements used to quantify the characteristics of software product quality. (L4-27, A3, 2)		
	Numeric values (for each characteristic of software product quality). (L4-27, A3, 3)		
	Plans to achieve the software quality goals. (L4-29, A4, 1.3)		
	Project's quantitative quality goals for the software products. (L4-27, A3)		
	Project's software quality plan. (L4-23, A1) [Refer to SPF Standards for additional information regarding the project's software quality plan.]		
	Quality goals applicable to the software task. (L4-29, A4, 1.2)		
	Quality goals for each software life-cycle stage. (L4-28, A3, 5)		
	Quality goals for the software products. (L4-20, C1, 3)		
	Quality of the project's software products. (L4-29, A4)		

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SQM Process - Activities, Continued

Activities, continued

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

√	Activities	References
	Measurements are made and used to determine the status of the software quality management activities. (L4-31, M1)	
	The activities for software quality management are reviewed with senior management on a periodic basis. (L4-31, V1)	
	The activities for software quality management are reviewed with the project manager on both a periodic and event-driven basis. (L4-31, V2)	
	The software quality assurance group reviews and/or audits the activities and work products for software quality management and reports the results. (L4-32, V3) [Refer to SQM Process Reviews and Audits for additional information.]	

SQM Process - Activities, Continued

Activities, continued

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

√	Activities	References
	<p>The quality of the project's software products is measured, analyzed, and compared to the products' quantitative quality goals on an event-driven basis. (L4-29, A4)</p> <ul style="list-style-type: none"> <input type="checkbox"/> The software tasks are planned and performed to address the project's software quality goals. At the beginning of a software task, the team performing the task: <ul style="list-style-type: none"> <input type="checkbox"/> reviews the quality goals for the software product, <input type="checkbox"/> determines the quality goals applicable to the software task, <input type="checkbox"/> identifies its plans to achieve the software quality goals, and <input type="checkbox"/> reviews changes made to the process to meet the software quality goals. <input type="checkbox"/> The quality of the software work products of each software life-cycle stage are measured. <input type="checkbox"/> The quality measurements are analyzed and compared to the software quality goals to determine whether the quality goals are satisfied. <input type="checkbox"/> Appropriate actions, consistent with the software quality plan, are taken to bring the quality measures of the products in line with the software quality goals. <input type="checkbox"/> When it is determined that the software quality goals conflict (that is, one goal cannot be achieved without compromising another goal), actions are taken to resolve the conflict. <ul style="list-style-type: none"> <input type="checkbox"/> The cost for achieving the software quality goals is analyzed. <input type="checkbox"/> Alternative software quality goals are considered in light of long-term business strategies as well as short-term priorities. <input type="checkbox"/> The customer and end users participate in quality tradeoff decisions, as appropriate. <input type="checkbox"/> The software work products and plans are revised, as appropriate, to reflect the results of the tradeoffs. 	
	<p>The software project's quantitative quality goals for the products are allocated appropriately to the subcontractors delivering software products to the project. (L4-30, A5)</p>	

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SQM Process - Activities

Activities

The table below lists the recommended activities for the software quality management process.

√	Activities	References
	The project's software quality plan is developed and maintained according to a documented procedure. (L4-23, A1) [Refer to Level 4 Procedure Checklists for additional information.]	
	The project's software quality plan is the basis for the project's activities for software quality management. (L4-25, A2)	
	<p>The project's quantitative quality goals for the software products are defined, monitored, and revised throughout the software life cycle. (L4-27, A3)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Characteristics of product quality that describe how well the software product will perform or how well it can be developed and maintained are identified. <input type="checkbox"/> The measurements used to quantify the characteristics of software product quality are identified. <input type="checkbox"/> For each characteristic of software product quality, measurable, numeric values, based on the required and desired values, are selected as quality goals for the product. <input type="checkbox"/> Quality goals for the software products are documented in the project's software quality plan. <input type="checkbox"/> Quality goals for each software life-cycle stage are defined and documented. <input type="checkbox"/> Quality goals for the software products and software life-cycle stages are revised as understanding of the products and understanding of the organization's, customer's, and end users' needs evolve. 	

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SQM Process - Inputs, Continued

Inputs, continued

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

√	Input	Org. Input	References
	Quality plans of the organization. (L4-24, A1, 4)		
	Required values (for each characteristic of software product quality). (L4-27, A3, 3)		
	Short-term priorities. (L4-30, A4, 5.2)		
	Significant changes to the allocated requirements. (L4-24, A1, 6)		
	Software plans. (L4-30, A4, 5.4)		
	Software project's quantitative quality goals for the products. (L4-30, A5)		
	Software quality goals. (L4-23, A1, 2)		
	Software quality needs of the customer. (L4-23, A1, 1)		
	Software quality needs of the end users. (L4-23, A1, 1)		
	Software quality needs of the organization. (L4-23, A1, 1)		
	Software quality priorities of the customer. (L4-23, A1, 2)		
	Software quality priorities of the end users. (L4-23, A1, 2)		
	Software quality priorities of the organization. (L4-23, A1, 2)		
	Software work products or work products. (L4-30, A4, 5.4)		
	Subcontractor delivered software products (to the project). (L4-30, A5)		
	System requirements allocated to software or allocated requirements. (L4-23, A1, 2)		

SQM Process - Inputs

Inputs

The table below lists the recommended inputs to the software quality management process.

√	Input	Org. Input	References
	Alternative software quality goals. (L4-30, A4, 5.2)		
	Characteristic(s) of software product quality (that describe how well the software product will perform or how well it can be developed and maintained). (L4-27, A3, 3)		
	Cost for achieving the software quality goals. (L4-30, A4, 5.1)		
	Desired values (for each characteristic of software product quality). (L4-27, A3, 3)		
	Long-term business strategies. (L4-30, A4, 5.2)		
	Plans (software quality) for previous or current projects in the organization. (L4-24, A1, 5)		
	Points in the process where software quality is measured. (L4-26, A2, 1)		
	Products' quantitative quality goals. (L4-29, A4)		
	Project's defined software process. (L4-20, C1, 2)		
	Project's software quality goals. (L4-29, A4, 1)		
	Project's software quality plan or software quality plan. (L4-25, A2) [Refer to Level 4 Standards for additional information regarding the project's software quality plan.]		
	Quality goals for the software life-cycle stages. (L4-29, A3, 6)		
	Quality goals for the software products. (L4-21, C1, 4.1)		
	Quality measurements (of the project's software products). (L4-30, A4, 3)		

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SQM Process - Entry Criteria

Input-based entry criteria

There are no input-based entry criteria in the software quality management process.

General entry criteria

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

√	Condition	References
	The project follows a written organizational policy for managing software quality. (L4-20, C1) [Refer to Level 4 Policies for additional information regarding SQM policy.]	
	Adequate resources and funding are provided for managing the quality of the software products. (L4-21, Ab1)	
	Specialty engineers in areas such as safety and reliability are available to help set the software quality goals and review progress towards the goals. (L4-21, Ab1, 1)	
	Tools to support predicting, measuring, tracking, and analyzing software quality are made available. (L4-21, Ab1, 2)	
	The individuals implementing and supporting software quality management receive required training to perform their activities. (L4-22, Ab2)	
	The members of the software engineering group and other software-related groups receive required training in software quality management. (L4-22, Ab3)	

SQM Process - Roles, Continued

**Roles,
continued**

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

√	Role	Activities Participated in...	Reference
	Subcontractor	The software project's quantitative quality goals for the products are allocated appropriately to the subcontractors delivering software products to the project. (L4-30, A5)	
	Team performing the software task	<p>The software tasks are planned and performed to address the project's software quality goals. At the beginning of a software task, the team performing the task: (L4-29, A4, 1)</p> <ul style="list-style-type: none"> <input type="checkbox"/> reviews the quality goals for the software product, <input type="checkbox"/> determines the quality goals applicable to the software task, <input type="checkbox"/> identifies its plans to achieve the software quality goals, and <input type="checkbox"/> reviews changes made to the process to meet the software quality goals. 	

SQM Process - Roles, Continued

Roles, continued

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

√	Role	Activities Participated in...	Reference
	Software engineering group or Members of the software engineering group	<ul style="list-style-type: none"> <li data-bbox="683 468 1219 615">❑ Responsibilities for software quality management are defined and assigned to the software engineering group and other software-related groups. (L4-21, C1, 4) <li data-bbox="683 625 1219 772">❑ Criteria are established to enable the groups to determine their success in achieving the quality goals for the software products. (L4-21, C1, 4.1) <li data-bbox="683 783 1219 930">❑ The members of the software engineering group and other software-related groups receive required training in software quality management. (L4-22, Ab3) 	
	Software-related groups or Members of the software-related groups	<ul style="list-style-type: none"> <li data-bbox="683 951 1219 1098">❑ Responsibilities for software quality management are defined and assigned to the software engineering group and other software-related groups. (L4-21, C1, 4) <li data-bbox="683 1108 1219 1255">❑ Criteria are established to enable the groups to determine their success in achieving the quality goals for the software products. (L4-21, C1, 4.1) <li data-bbox="683 1266 1219 1413">❑ The members of the software engineering group and other software-related groups receive required training in software quality management. (L4-22, Ab3) 	
	Specialty engineers in areas such as safety and reliability	Specialty engineers in areas such as safety and reliability are available to help set the software quality goals and review progress towards the goals. (L4-21, Ab1, 1)	
	Software quality assurance (SQA) group	The software quality assurance group reviews and/or audits the activities and work products for software quality management and reports the results. (L4-32, V3)	

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SQM Process - Roles

Roles

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

√	Role	Activities Participated in...	Reference
	Affected groups	<input type="checkbox"/> The software quality plan is reviewed by affected groups and individuals. (L4-24, A1, 8) <input type="checkbox"/> The software quality plan is available to all affected groups and individuals. (L4-25, A1, 11)	
	Affected individuals	<input type="checkbox"/> The software quality plan is reviewed by affected groups and individuals . (L4-24, A1, 8) <input type="checkbox"/> The software quality plan is available to all affected groups and individuals . (L4-25, A1, 11)	
	Customer	The customer and end users participate in quality tradeoff decisions, as appropriate. (L4-30, A4, 5.3)	
	End users	The customer and end users participate in quality tradeoff decisions, as appropriate. (L4-30, A4, 5.3)	
	Individuals implementing and supporting software quality management	The individuals implementing and supporting software quality management receive required training to perform their activities. (L4-22, Ab2)	
	Project manager	The activities for software quality management are reviewed with the project manager on both a periodic and event-driven basis. (L4-31, V2)	
	Senior management	<input type="checkbox"/> Senior management reviews the software quality plans. (L4-25, A1, 9) <input type="checkbox"/> The activities for software quality management are reviewed with senior management on a periodic basis. (L4-31, V1)	

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SQM 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.	L4-Process-33
Entry Criteria	Description of when the process can start.	L4-Process-36
Inputs	Description of the work products used by the process.	L4-Process-37
Activities	Description of the activities of the process.	L4-Process-39
Outputs	Description of the work products produced by the process.	L4-Process-42
Exit Criteria	Description of when the process is complete.	L4-Process-44
Reviews and Audits	List of reviews and audits.	L4-Process-50
Work Products Managed and Controlled	List of work products to be managed and controlled.	L4-Process-51
Measurements	Description of process measurements.	L4-Process-52
Documented Procedures	List of the activities to be completed according to a documented procedure.	L4-Process-53
Training	List of training.	L4-Process-54
Tools	List of tools.	L4-Process-55

Software Quality Management (SQM) Process

SQM Process - Overview

SQM process purpose The purpose of Software Quality Management is to develop a quantitative understanding of the quality of the project's software products and achieve specific quality goals. (L4-19)

SQM process description Software Quality Management involves defining quality goals for the software products, establishing plans to achieve these goals, and monitoring and adjusting the software plans, software work products, activities, and quality goals to satisfy the needs and desires of the customer and end user for high quality products.

The practices of Software Quality Management build on the practices of the Integrated Software Management and Software Product Engineering key process areas, which establish and implement the project's defined software process, and the Quantitative Process Management key process area, which establishes a quantitative understanding of the ability of the project's defined software process to achieve the desired results.

Quantitative goals are established for the software products based on the needs of the organization, the customer, and the end users. So that these goals may be achieved, the organization establishes strategies and plans, and the project specifically adjusts its defined software process, to accomplish the quality goals. (L4-19)

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QPM Process - Tools

Tools

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

√	Tools	References
	Tools to support quantitative process management. (L4-5, Ab2, 3) Examples of support tools include: <ul style="list-style-type: none"><input type="checkbox"/> software source code analyzers,<input type="checkbox"/> automated test coverage analyzers,<input type="checkbox"/> database systems,<input type="checkbox"/> quantitative analysis packages, and<input type="checkbox"/> problem tracking packages.	
	Organization's software process database. (L4-10, A4, 9)	

QPM Process - Training

Training

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

√	Training	References
	The individuals implementing or supporting quantitative process management receive required training to perform these activities. (L4-6, Ab4)	
	The members of the software engineering group and other software-related groups receive orientation on the goals and value of quantitative process management. (L4-6, Ab5)	

QPM Process - Documented Procedures

Documented procedures

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

√	Documented Procedure(s)	References
	The software project's plan for quantitative process management is developed according to a documented procedure. (L4-6, A1) [Refer to Level 4 Procedure Checklists for additional information.]	
	The measurement data used to control the project's defined software process quantitatively are collected according to a documented procedure. (L4-9, A4) [Refer to Level 4 Procedure Checklists for additional information.]	
	The project's defined software process is analyzed and brought under quantitative control according to a documented procedure. (L4-10, A5) [Refer to Level 4 Procedure Checklists for additional information.]	
	The process capability baseline for the organization's standard software process is established and maintained according to a documented procedure. (L4-13, A7) [Refer to Level 4 Procedure Checklists for additional information.]	

QPM Process - Measurements

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

√	Measurements	References
	<p>Measurements to determine the status of the activities for quantitative process management. (L4-15, M1)</p> <p>Examples of measurements include:</p> <ul style="list-style-type: none"><li data-bbox="475 575 1227 638">❑ The cost over time for the quantitative process management activities, compared to the plan.<li data-bbox="475 646 1227 827">❑ The accomplishment of schedule milestones for quantitative process management activities, compared to the approved plan (e.g., establishing the process measurements to be used on the project, determining how the process data will be collected, and collecting the process data).	

QPM 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 quantitative process management process.

√	Work Products Managed and Controlled	References
	Project's quantitative process management plan. (L4-7, A1, 4)	
	Process performance baseline for the software project. (L4-12, A5, 9)	
	Process capability baseline for the organization's standard software process. (L4-14, A7, 5)	

QPM Process - Reviews and Audits, Continued

Reviews and audits, continued

The table below lists the recommended reviews and audits for the quantitative process 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 quantitative process management and reports the results. (L4-16, V3)</p> <p>At a minimum, the reviews and/or audits verify that:</p> <ul style="list-style-type: none"> <input type="checkbox"/> The plans for the quantitative process management activities are followed. <input type="checkbox"/> The procedures for quantitative process management are followed. <input type="checkbox"/> The collection and analysis of quantitative process management data are performed as required, including verification that: <ul style="list-style-type: none"> <input type="checkbox"/> the needed data exist, <input type="checkbox"/> the needed data are collected, <input type="checkbox"/> the data collected are needed, <input type="checkbox"/> the data collected support the goals and objectives of the organization's measurement program, <input type="checkbox"/> the cost of collecting the data is justified by the usefulness of the data, <input type="checkbox"/> the data are collected at the correct point in the software life cycle, <input type="checkbox"/> the data are accurate and correct, <input type="checkbox"/> the data are timely, and <input type="checkbox"/> the confidentiality of the data is properly protected. 	<p>Software quality assurance group</p>	

QPM Process - Reviews and Audits

Reviews and audits

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

√	Review or Audit	Review Participants	References
	The project's quantitative process management plan undergoes peer review. (L4-7, A1, 2)	Not specified in the CMM	
	The project's quantitative process management plan is reviewed by the group responsible for the organization's software process activities (e.g., the software engineering process group) . (L4-7, A1, 3)	Group responsible for the organization's software process activities (e.g., the software engineering process group)	
	The results of the data analysis are reviewed with those affected by the data before they are reported to anyone else. (L4-12, A6, 1)	Not specified in the CMM	
	The activities for quantitative process management are reviewed with senior management on a periodic basis. (L4-15, V1)	Senior management	
	The software project's activities for quantitative process management are reviewed with the project manager on both a periodic and event-driven basis. (L4-16, V2)	Project manager	

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QPM Process - Exit Criteria, Continued

General exit criteria, continued

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

√	Condition	References
	<p>The strategy for the data collection and the quantitative analyses to be performed are determined based on the project's defined software process. (L4-8, A3)</p> <p>The attributes of the project's defined software process that are considered include:</p> <ul style="list-style-type: none"> <input type="checkbox"/> The tasks, the activities, and their relationships to each other. <input type="checkbox"/> The software work products and their relationships to each other and to the project's defined software process. <input type="checkbox"/> The process control points and data collection points. 	
	The project's defined software process is analyzed and brought under quantitative control according to a documented procedure. (L4-10, A5)	
	The software managers, software task leaders, and senior management receive regular reports appropriate for their needs. (L4-12, A6, 2)	
	The software quality assurance group receives regular reports (documenting the results of the software project's quantitative process management activities) appropriate to its needs. (L4-12, A6, 3)	
	The project manager, senior managers, software managers, and software task leaders receive specialized reports (documenting the results of the software project's quantitative process management activities) on request. (L4-12, A6, 4)	
	Process capability trends for the organization's standard software process are examined to predict likely problems or opportunities for improvements. (L4-13, A7, 4)	
	The activities for quantitative process management are reviewed with senior management on a periodic basis. (L4-15, V1)	
	The software project's activities for quantitative process management are reviewed with the project manager on both a periodic and event-driven basis. (L4-16, V2)	
	The software quality assurance group reviews and/or audits the activities and work products for quantitative process management and reports the results. (L4-16, V3)	

QPM 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 quantitative process management process, continued from the previous page.

√	Output	State	References
	Reports documenting the results of the software project's quantitative process management activities	<input type="checkbox"/> are prepared. (L4-12, A6) <input type="checkbox"/> are distributed. (L4-12, A6)	
	Results of software quality assurance group reviews and/or audits of the activities and work products for quantitative process management	are reported. (L4-16, V3)	
	Results of the data analysis	are reviewed with those affected by the data before they are reported to anyone else. (L4-12, A6, 1)	
	Strategy for the data collection and the quantitative analyses to be performed	are determined based on the project's defined software process. (L4-8, A3)	

General Exit Criteria

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

√	Condition	References
	Each project implements a documented plan to bring the project's defined software process under quantitative control. (L4-2, C1, 1)	
	The process capability baseline for the organization's standard software process is used by the software projects in establishing their process performance goals. (L4-4, C2, 2)	
	The software project's quantitative process management activities are performed in accordance with the project's quantitative process management plan. (L4-7, A2)	

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QPM 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 quantitative process management process, continued from the previous page.

√	Output	State	References
	Project's software process data	as summarized in its process performance baseline, are recorded in the organization's software process database. (L4-13, A7, 1)	
	Project's quantitative process management plan	<ul style="list-style-type: none"> <li data-bbox="760 625 1198 716">❑ is developed according to a documented procedure. (L4-6, A1) <li data-bbox="760 724 1227 1360">❑ is based on: (L4-6, A1, 1) <ul style="list-style-type: none"> <li data-bbox="808 766 1182 888">❑ the organization's strategic goals for product quality, productivity, and product development cycle time; <li data-bbox="808 896 1143 957">❑ the organization's measurement program; <li data-bbox="808 966 1187 1026">❑ the organization's standard software process; <li data-bbox="808 1035 1179 1157">❑ the project's goals for the software product's quality, productivity, and product development cycle time; <li data-bbox="808 1165 1222 1266">❑ the measured performance of other projects' defined software processes; and <li data-bbox="808 1274 1170 1360">❑ the description of the project's defined software process. <li data-bbox="760 1369 1187 1430">❑ undergoes peer review. (L4-7, A1, 2) <li data-bbox="760 1438 1208 1619">❑ is reviewed by the group responsible for the organization's software process activities (e.g., the software engineering process group). (L4-7, A1, 3) <li data-bbox="760 1627 1214 1688">❑ is managed and controlled. (L4-7, A1, 4) 	

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QPM 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 quantitative process management process, continued from the previous page.

√	Output	State	References
	Process capability baseline of the organization's standard software process	<input type="checkbox"/> is established according to a documented procedure. (L4-13, A7) <input type="checkbox"/> is maintained according to a documented procedure. (L4-13, A7) <input type="checkbox"/> is documented. (L4-13, A7, 3) <input type="checkbox"/> is managed and controlled. (L4-14, A7, 5)	
	Process control points at which (each measurement that is used to control the project's defined software process quantitatively) will be collected	are defined. (L4-9, A4, 2)	
	Projects' measurements of process performance	are analyzed to establish and maintain a process capability baseline for the organization's standard software process. (L4-3, C2, 1)	
	Project's process performance baseline	<input type="checkbox"/> is established. (L4-11, A5, 5) <input type="checkbox"/> is managed and controlled. (L4-12, A5, 9) <input type="checkbox"/> is incorporated, as appropriate, into the process capability baseline for the organization's standard software process. (L4-13, A7, 2) <input type="checkbox"/> (new) is established for a software project substantially different from past projects as part of tailoring the organization's standard software process. (L4-14, A7, 6)	
	Project's process performance goals	are established. (L4-4, C2, 2)	

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QPM 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 quantitative process management process, continued from the previous page.

√	Output	State	References
	Measurement data used to control the project's defined software process quantitatively	<ul style="list-style-type: none"> <li data-bbox="760 499 1214 583">❑ are collected according to a documented procedure. (L4-9, A4) <li data-bbox="760 600 1214 716">❑ support the organization's and the software project's measurement goals and objectives. (L4-9, A4, 1) <li data-bbox="760 732 1214 758">❑ are defined. (L4-9, A4, 2) <li data-bbox="760 774 1214 911">❑ are chosen from the entire software life cycle (e.g., both the development and post-development stages). (L4-9, A4, 3) <li data-bbox="760 928 1214 1043">❑ cover the properties of the key software process activities and major software work products. (L4-10, A4, 4) <li data-bbox="760 1060 1214 1197">❑ are uniformly collected across the software projects when the data relate to the organization's standard software process. (L4-10, A4, 5) <li data-bbox="760 1213 1214 1308">❑ are a natural result of the software activities where possible. (L4-10, A4, 6) <li data-bbox="760 1325 1214 1398">❑ are selected to support predefined analysis activities. (L4-10, A4, 7) <li data-bbox="760 1415 1214 1488">❑ are independently assessed for validity. (L4-10, A4, 8) <li data-bbox="760 1505 1214 1579">❑ are stored in the organization's software process database as appropriate. (L4-10, A4, 9) 	
	Measurements (to determine the status of the activities for quantitative process management)	<ul style="list-style-type: none"> <li data-bbox="760 1598 1214 1623">❑ are made. (L4-15, M1) <li data-bbox="760 1640 1214 1665">❑ are used. (L4-15, M1) 	

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QPM Process - Exit Criteria

Output-based exit criteria

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

√	Output	State	References
	Acceptable limits for each measurement	<input type="checkbox"/> are defined. (L4-11, A5, 5) <input type="checkbox"/> have baselines established when the project's defined software process is controlled quantitatively. (L4-12, A5, 8.3)	
	Actual measurement data	have baselines established when the project's defined software process is controlled quantitatively. (L4-12, A5, 8.2)	
	Actual values of each measurement	are compared to the expected values of the mean and variance. (L4-11, A5, 6)	
	Changes to the organization's standard software process	<input type="checkbox"/> are tracked. (L4-15, A7, 7) <input type="checkbox"/> are analyzed to assess their effects on the process capability baseline. (L4-15, A7, 7)	
	Data for selected process measurements or Measurement data on the process activities throughout the project's defined software process	<input type="checkbox"/> are identified. (L4-11, A5, 2) <input type="checkbox"/> are collected. (L4-11, A5, 2) <input type="checkbox"/> are analyzed. (L4-11, A5, 2) <input type="checkbox"/> appropriately characterize the process they represent. (L4-11, A5, 3)	
	Definitions of measurement data (used to control the project's defined software process quantitatively)	<input type="checkbox"/> are defined. (L4-9, A4, 2) <input type="checkbox"/> have baselines established when the project's defined software process is controlled quantitatively. (L4-12, A5, 8.1)	
	Expected values (for mean for each measurement)	are specified for each measurement. (L4-11, A5, 4)	
	Expected values (for variance for each measurement)	are specified for each measurement. (L4-11, A5, 4)	
	Intended use and analysis of each measurement	is defined. (L4-9, A4, 2)	

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QPM Process - Outputs, Continued

Outputs, continued

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

√	Output	Org. Output	References
	Process control points at which (each measurement that is used to control the project's defined software process quantitatively) will be collected. (L4-9, A4, 2)		
	Projects' measurements of process performance. (L4-3, C2, 1)		
	Project's process performance baseline. (L4-11, A5, 5)		
	Project's process performance goals. (L4-4, C2, 2)		
	Project's software process data. (L4-13, A7, 1)		
	Project's quantitative process management plan. (L4-6, A1)		
	Quantitative process management data. (L4-16, V3, 3)		
	Reports documenting the results of the software project's quantitative process management activities. (L4-12, A6)		
	Results of software quality assurance group reviews and/or audits of the activities and work products for quantitative process management. (L4-16, V3)		
	Results of the data analysis. (L4-12, A6, 1)		
	Schedule for quantitative process management activities to be performed. (L4-8, A2, 4)		
	Strategy for the data collection and the quantitative analyses to be performed. (L4-8, A3)		

QPM Process - Outputs

Outputs

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

√	Output	Org. Output	References
	Acceptable limits for each measurement. (L4-11, A5, 5)		
	Actual measurement data. (L4-12, A5, 8.2)		
	Actual values of each measurement. (L4-11, A5, 6)		
	Changes to the organization's standard software process. (L4-15, A7, 7)		
	Data collection points. (L4-9, A3, 3)		
	Data for selected process measurements or measurement data on the process activities throughout the project's defined software process. (L4-5, Ab3)		
	Data for selected product measurements. (L4-5, Ab3)		
	Definitions of measurement data (used to control the project's defined software process quantitatively). (L4-9, A4, 2)		
	Expected values for mean (for each measurement). (L4-11, A5, 4)		
	Expected values for variance (for each measurement). (L4-11, A5, 4)		
	Goals of the quantitative process management activities. (L4-7, A2, 1)		
	Intended use and analysis of each measurement. (L4-9, A4, 2)		
	Measurement data used to control the project's defined software process quantitatively. (L4-9, A4)		
	Measurements (to determine the status of the quantitative process management activities). (L4-15, M1)		
	Objectives of the quantitative process management activities. (L4-7, A2, 1)		
	Process capability baseline of the organization's standard software process. (L4-3, C2, 1)		

Continued on next page

QPM Process - Activities, Continued

Activities, continued

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

√	Activities	References
	The software project's activities for quantitative process management are reviewed with the project manager on both a periodic and event-driven basis. (L4-16, V2)	
	The software quality assurance group reviews and/or audits the activities and work products for quantitative process management and reports the results. (L4-16, V3) [Refer to QPM Process Reviews and Audits for additional information.]	

QPM Process - Activities

Activities

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

√	Activities	References
	The software project's plan for quantitative process management is developed according to a documented procedure. (L4-6, A1) [Refer to Level 4 Procedure Checklists for additional information.]	
	The software project's quantitative process management activities are performed in accordance with the project's quantitative process management plan. (L4-7, A2)	
	The strategy for the data collection and the quantitative analyses to be performed are determined based on the project's defined software process. (L4-8, A3)	
	The measurement data used to control the project's defined software process quantitatively are collected according to a documented procedure. (L4-9, A4) [Refer to Level 4 Procedure Checklists for additional information.]	
	The project's defined software process is analyzed and brought under quantitative control according to a documented procedure. (L4-10, A5) [Refer to Level 4 Procedure Checklists for additional information.]	
	Reports documenting the results of the software project's quantitative process management activities are prepared and distributed. (L4-12, A6)	
	The process capability baseline for the organization's standard software process is established and maintained according to a documented procedure. (L4-13, A7) [Refer to Level 4 Procedure Checklists for additional information.]	
	Measurements are made and used to determine the status of the activities for quantitative process management. (L4-15, M1)	
	The activities for quantitative process management are reviewed with senior management on a periodic basis. (L4-15, V1)	

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QPM Process - Inputs, Continued

Inputs, continued

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

√	Input	Org. Input	References
	Process capability trends for the organization's standard software process. (L4-13, A7, 4)		
	Project's defined software process. (L4-2, C1)		
	Project's goals for product development cycle time. (L4-7, A1, 1.4)		
	Project's goals for software product's quality. (L4-7, A1, 1.4)		
	Project's goals for productivity. (L4-7, A1, 1.4)		
	Project's measurement of process performance. (L4-3, C2, 1)		
	Project's quantitative process management plan. (L4-2, C1, 1)		
	Schedule for quantitative process management activities to be performed. (L4-8, A2, 4)		
	Sensitive data relating to individuals' performance. (L4-3, C1, 2)		
	Software project's measurement goals. (L4-9, A4, 1)		
	Software project's measurement objectives. (L4-9, A4, 1)		

QPM Process - Inputs

Inputs

The table below lists the recommended inputs to the quantitative process management process.

√	Input	Org. Input	References
	Actual process performance. (L4-12, A5, 7)		
	Defined acceptable limits for each measurement. (L4-12, A5, 7)		
	Description of the project's defined software process. (L4-7, A1, 1.6)		
	Expected mean values for each measurement. (L4-11, A5, 6)		
	Expected variance values for each measurement. (L4-11, A5, 6)		
	Goals of the organization's measurement program. (L4-17, V3, 3.4)		
	Goals of the quantitative process management activities. (L4-7, A2, 1)		
	Measured performance of other projects' defined software processes. (L4-7, A1, 1.5)		
	Objectives of the organization's measurement program. (L4-17, V3, 3.4)		
	Objectives of the quantitative process management activities. (L4-7, A2, 1)		
	Organization's measurement goals. (L4-9, A4, 1)		
	Organization's measurement objectives. (L4-9, A4, 1)		
	Organization's standard software process. (L4-7, A1, 1.3)		
	Organization's strategic goals for product development cycle time. (L4-6, A1, 1.1)		
	Organization's strategic goals for product quality. (L4-6, A1, 1.1)		
	Organization's strategic goals for productivity. (L4-6, A1, 1.1)		
	Process capability baseline of the organization's standard software process. (L4-3, C2, 1)		

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QPM Process - Entry Criteria, Continued

**General entry
criteria,
continued**

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

√	Condition	References
	The individuals implementing or supporting quantitative process management receive required training to perform these activities. (L4-6, Ab4)	
	The members of the software engineering group and other software-related groups receive orientation on the goals and value of quantitative process management. (L4-6, Ab5)	

QPM Process - Entry Criteria

Input-based entry criteria

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

√	Input	State	References
	Project's quantitative process management plan	is documented. (L4-2, C1, 1)	
	Sensitive data relating to individuals' performance	<input type="checkbox"/> are protected. (L4-3, C1, 2) <input type="checkbox"/> (access to) is appropriately controlled. (L4-3, C1, 2)	

General entry criteria

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

√	Condition	References
	The project follows a written organizational policy for measuring and quantitatively controlling the performance of the project's defined software process. (L4-2, C1) [Refer to Level 4 Policies for additional information regarding QPM policy.]	
	The organization follows a written policy for analyzing the process capability of the organization's standard software process. (L4-3, C2) [Refer to Level 4 Policies for additional information regarding QPM policy.]	
	<p>A group that is responsible for coordinating the quantitative process management activities for the organization exists. (L4-4, Ab1)</p> <input type="checkbox"/> The group that is responsible for coordinating the quantitative process management activities for the organization 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. (L4-4, Ab1, 1)	
	Adequate resources and funding are provided for the quantitative process management activities. (L4-4, Ab2)	
	An organization-wide measurement program exists. (L4-5, Ab2, 2)	
	Tools to support quantitative process management are made available. (L4-5, Ab2, 3)	
	Support exists for collecting, recording, and analyzing data for selected process and product measurements. (L4-5, Ab3)	

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QPM Process - Roles, Continued

Roles, continued

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

√	Role	Activities Participated in...	Reference
	Software task leaders	<ul style="list-style-type: none"> <li data-bbox="683 468 1203 674">❑ The software managers, software task leaders, and senior management receive regular reports (documenting the results of the software project's quantitative process management activities) appropriate for their needs. (L4-12, A6, 2) <li data-bbox="683 684 1203 884">❑ The project manager, senior managers, software managers, and software task leaders receive specialized reports (documenting the results of the software project's quantitative process management activities) on request. (L4-12, A6, 4) 	
	Task leaders of other software-related groups	The managers and task leaders of the software engineering groups and other software-related groups perform the project's quantitative process management activities. (L4-4, Ab2, 1)	
	Task leaders of the software engineering groups	The managers and task leaders of the software engineering groups and other software-related groups perform the project's quantitative process management activities. (L4-4, Ab2, 1)	

QPM Process - Roles, Continued

Roles, continued

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

√	Role	Activities Participated in...	Reference
	Software manager	<ul style="list-style-type: none"> <li data-bbox="682 468 1218 678">❑ The software managers, software task leaders, and senior management receive regular reports (documenting the results of the software project's quantitative process management activities) appropriate for their needs. (L4-12, A6, 2) <li data-bbox="682 688 1218 888">❑ The project manager, senior managers, software managers, and software task leaders receive specialized reports (documenting the results of the software project's quantitative process management activities) on request. (L4-12, A6, 4) 	
	Software-related groups or Members of software-related groups	The members of the software engineering group and other software-related groups receive orientation on the goals and value of quantitative process management. (L4-6, Ab5)	
	Software quality assurance (SQA) group	<ul style="list-style-type: none"> <li data-bbox="682 1113 1218 1291">❑ The software quality assurance group receives regular reports (documenting the results of the software project's quantitative process management activities) appropriate to its needs. (L4-12, A6, 3) <li data-bbox="682 1302 1218 1440">❑ The software quality assurance group reviews and/or audits the activities and work products for quantitative process management and reports the results. (L4-16, V3) 	

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QPM Process - Roles, Continued

Roles, continued

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

√	Role	Activities Participated in...	Reference
	Project manager	<p>The project manager, senior managers, software managers, and software task leaders receive specialized reports (documenting the results of the software project's quantitative process management activities) on request. (L4-12, A6, 4)</p> <p>The software project's activities for quantitative process management are reviewed with the project manager on both a periodic and event-driven basis. (L4-16, V2)</p>	
	Senior management	<ul style="list-style-type: none"> <input type="checkbox"/> The software managers, software task leaders, and senior management receive regular reports (documenting the results of the software project's quantitative process management activities) appropriate for their needs. (L4-12, A6, 2) <input type="checkbox"/> The activities for quantitative process management are reviewed with senior management on a periodic basis. (L4-15, V1) 	
	Senior manager	<p>The project manager, senior managers, software managers, and software task leaders receive specialized reports (documenting the results of the software project's quantitative process management activities) on request. (L4-12, A6, 4)</p>	
	Software engineering group or Members of the software engineering group	<p>The members of the software engineering group and other software-related groups receive orientation on the goals and value of quantitative process management. (L4-6, Ab5)</p>	

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QPM Process - Roles

Roles

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

√	Role	Activities Participated in...	Reference
	Group responsible for the organization's software process activities (e.g., software engineering process group)	<ul style="list-style-type: none"> <li data-bbox="685 470 1218 764">❑ The (group that is responsible for coordinating the quantitative process management activities for the organization) 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. (L4-4, Ab1, 1) <li data-bbox="685 772 1218 974">❑ The project's quantitative process management plan is reviewed by the group responsible for the organization's software process activities (e.g., the software engineering process group). (L4-7, A1, 3) 	
	Group responsible for coordinating the quantitative process management activities for the organization	The group that is responsible for coordinating the quantitative process management activities for the organization 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. (L4-4, Ab1, 1)	
	Individuals implementing or supporting quantitative process management	The individuals implementing or supporting quantitative process management receive required training to perform these activities. (L4-6, Ab4)	
	Managers of software-related groups	The managers and task leaders of the software engineering groups and other software-related groups perform the project's quantitative process management activities. (L4-4, Ab2, 1)	
	Managers of the software engineering groups	The managers and task leaders of the software engineering groups and other software-related groups perform the project's quantitative process management activities. (L4-4, Ab2, 1)	

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QPM 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.	L4-Process-5
Entry Criteria	Description of when the process can start.	L4-Process-9
Inputs	Description of the work products used by the process.	L4-Process-11
Activities	Description of the activities of the process.	L4-Process-13
Outputs	Description of the work products produced by the process.	L4-Process-15
Exit Criteria	Description of when the process is complete.	L4-Process-17
Reviews and Audits	List of reviews and audits.	L4-Process-23
Work Products Managed and Controlled	List of work products to be managed and controlled.	L4-Process-25
Measurements	Description of process measurements.	L4-Process-26
Documented Procedures	List of the activities to be completed according to a documented procedure.	L4-Process-27
Training	List of training.	L4-Process-28
Tools	List of tools.	L4-Process-29

Quantitative Process Management (QPM) Process

QPM Process - Overview

QPM process purpose	The purpose of Quantitative Process Management is to control the process performance of the software project quantitatively. Software process performance represents the actual results achieved from following a software process. (L4-1)
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QPM process description	Quantitative Process Management involves establishing goals for the performance of the project's defined software process, which is described in the Integrated Software Management key process area, taking measurements of the process performance, analyzing these measurements, and making adjustments to maintain process performance within acceptable limits. When the process performance is stabilized within acceptable limits, the project's defined software process, the associated measurements, and the acceptable limits for the measurements are established as a baseline and used to control process performance quantitatively.
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The organization collects process performance data from the software projects and uses these data to characterize the process capability (i.e., the process performance a new project can expect to attain) of the organization's standard software process, which is described in the Organization Process Definition key process area. Process capability describes the range of expected results from following a software process (i.e., the most likely outcomes that are expected from the next software project the organization undertakes). These process capability data are, in turn, used by the software projects to establish and revise their process performance goals and to analyze the performance of the projects' defined software processes. (L4-1)

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Level 4 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 4.
 - Criteria that an organization can use to evaluate its software processes to determine if they are consistent with the CMM at level 4.
 - Information that can be used to develop software processes that are consistent with the CMM at level 4.
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In this section This section contains checklists for the following key process areas:

Key Process Area	See Page
Quantitative Process Management	L4-Process-3
Software Quality Management	L4-Process-31
