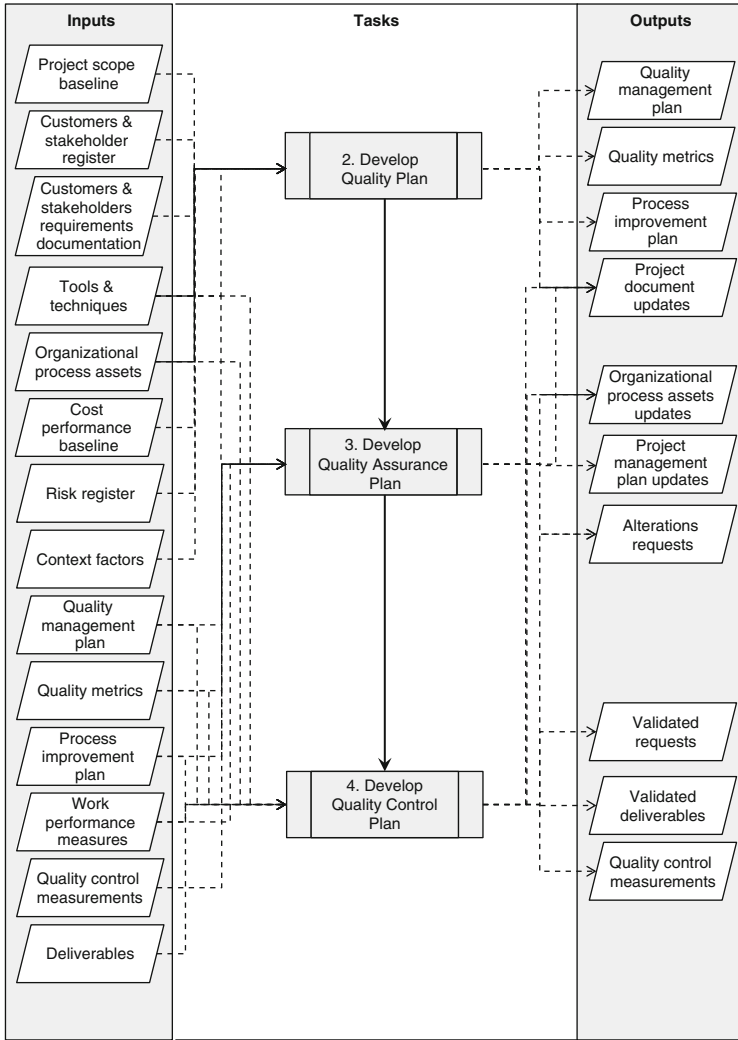


This chapter is concerned with the project management process required to ensure that the “process improvement” project includes all the quality policy and procedures required as well as the customer specifications to complete the project successfully. It describes how the project will ensure the level of quality required by the customer in its deliverables and “process to be improved.” Quality management activities ensure that:

1. The “process to be improved” outcomes are built to meet agreed-upon standards and requirements;
2. Work processes are performed efficiently and as documented;
3. Non-conformances found are identified and appropriate corrective action is taken.

In conformity with the Project Management Body of Knowledge guidelines, the constituent processes of the “Develop Quality Management Plan” the project management process, illustrated in Fig. 13.1, which reflects a structure that mirrors the perspective of the Project Management Institute’s PMBOK Guide, include:

1. *Develop Quality Plan*—This sub-process is concerned with identifying quality requirements and/or standards for the project and the “process to be improved,” understanding how well the “process to be improved” meets its associated customer specifications, and documenting how the project will demonstrate achievement of quality requirements. Its purpose is to build, as precisely as possible, a factual understanding of existing “process to be improved” conditions and problems.
2. *Develop Quality Assurance Plan*—This sub-process is concerned with documenting a set of preventive and systematic activities, focused on processes used in the project, which can be demonstrated to show commitment to delivering and provide confidence that project execution and its deliverables will fulfill specified quality standards and objectives.
3. *Develop Quality Control Plan*—This sub-process is concerned with monitoring and recording results of executing the quality plan activities to assess performance of the “process to be improved” and recommend necessary changes.



**Fig. 13.1** “Develop Quality Management Plan” process

As the PMBOK Guide indicates, these processes interact with each other and with the processes in the other PDSA “Process Groups.” Each aspect of executing any of these can involve effort from one or more persons or groups of persons based on the project requirements. Each constituent process occurs at least once in every project and occurs in one or more “process improvement” project phases.

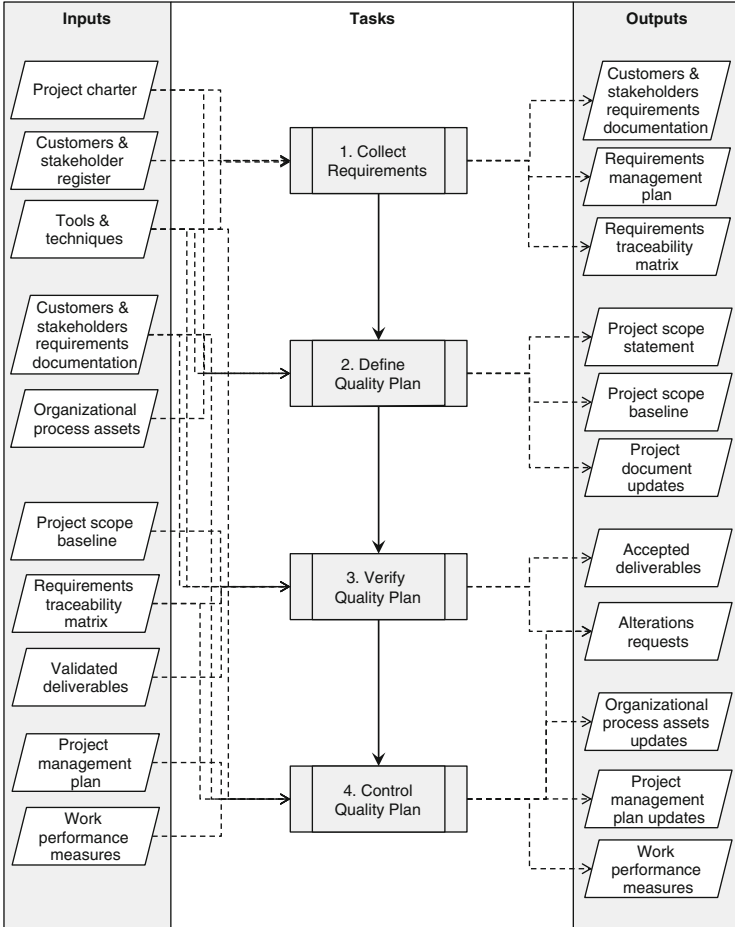


Fig. 13.2 “Perform Planning of ‘Quality Plan’” process

### 13.1 Develop Quality Plan

This is the project management process required to ensure that the project includes all the quality related work to complete the “process improvement” project successfully. It is a key process of the PDSA Plan “Process Group” that elaborates on the characteristics of the “process to be improved” that are described in the project charter.

Managing quality of a “process improvement” project is primarily concerned with defining and controlling quality requirements and/or standards, “Process to be improved” requirements and characteristics, “Process to be improved” acceptance criteria, and what are not included in the project.

The constituent project management processes used during the development of the project quality planning, illustrated in Fig. 13.2, include the following:

1. Collect Requirements
2. Define Quality Plan
3. Verify Quality Plan
4. Control Quality Plan

These four constituent processes interact with each other and with the project management processes in the PDSA “Process Groups.” Each aspect of executing any of these can involve effort from one or more persons, based on the needs of the project. Each aspect occurs at least once in every “process improvement” project and occurs in one or more project phases.

The project management constituent processes utilized to manage project quality plan as well as the supporting tools and techniques, vary by application area and are defined as part of the “process improvement” project life cycle. The approved detailed project quality plan statement must be included in the scope baseline for the “process improvement” project.

As indicated already in a previous section, this baseline scope should be monitored, verified and controlled throughout the lifecycle of the project. Furthermore, performance completion of the “process improvement” project quality plan is measured against the project management plan, while performance completion of the process scope is measured against the requirements of the actual “process to be improved.”

### **13.1.1 Collect Requirements: V.O.P.**

The first step in developing the project management quality plan is to “Collect Process Requirements.” It relates to defining and documenting the “process improvement” project and “process to be improved” features and functions needed to fulfill the “process to be improved” needs and expectations (Voice of the Process—V.O.P.) only. The project’s success is directly influenced by the care taken in capturing and managing these requirements.

The “process to be improved” must meet the requirements of the customers and stakeholders, and the ability of this process to meet these requirements is called Voice of the Process. It is a construct for examining what the “process to be improved” is telling about its inputs and outputs and the resources required to transform the inputs into outputs. Collecting the Voice of the Process is a practice used in process improvement undertakings to capture the process requirements, expectations, and entitlements. This is the subject of the next chapter.

### **13.1.2 Define Quality Plan**

The second step in developing the project management process “Perform Quality Planning” is “Define Quality Plan.” It relates to developing a detailed description of the extent of work and effort of the “process improvement” project and the “process to be improved” from the quality perspective. The preparation of a

detailed project quality plan is critical to project success and builds upon the basic plan of action resulting from the V.O.P. data collection process, the major deliverables, assumptions, and constraints that are documented during project initiation and development of the preliminary project scope.

The project quality plan is used to guide the project team to perform critical oversight activities necessary to avoid rework, concentrate on improvements, and reduce costs by enhancing or avoiding schedule delays. It describes how the project team will implement the quality policy and practices, and the identified V.O.C. and V.O.P. quality requirements for direct and indirect project deliverables. It identifies technical and project management audits that may be scheduled and conducted as a part of the project quality oversight effort.

The project quality plan can reference applicable quality standards and specification documents, and adjunct technical plans having greater quality process and procedural details. Quality standards provide a basis for determining achievement and acceptability of project work and project deliverables. The quality standards used can originate from within an industry, a governing body, an organization, or an individual. When possible, the project quality plan should identify individuals and functions responsible for quality management within the enterprise business. Finally, the project quality plan should specify the procedures and criteria for customer acceptance of project deliverables as indicated by the V.O.C. key needs.

During this “Define Quality Plan” step, the preliminary project scope statement is refined and described with greater specificity as more information on the Voice of the Customer (V.O.P.) and the Voice of the Process (V.O.P.) from the quality perspective about the “process to be improved” and the project is known from the collected data. Existing risks, assumptions, and constraints are analyzed for completeness; and additional risks, assumptions, and constraints are added as necessary. Key tools and techniques used in defining the quality plan include but are not limited to:

1. Expert judgment
2. Process analysis
3. Alternative identification
4. Facilitated workshop

*Expert Judgment*—Expert judgment is often used to analyze the quality related information on the V.O.C. and the V.O.P. needed to develop or refine the project scope statement. Such judgment and expertise is applied to any technical details. Such expertise is provided by any group or individual with specialized knowledge or training in quality process improvement, and is available from many sources, including:

1. Other functions or business units within the enterprise;
2. Consultants;
3. Stakeholders, customers, and sponsors;
4. Professional and technical associations;
5. Industry groups; and
6. Subject matter experts.

*Process Analysis*—Each application area has one or more generally accepted methods for translating high-level process descriptions into tangible deliverables. Process analysis includes techniques such as process breakdown, systems analysis, systems engineering, value engineering, value analysis, and functional analysis.

*Alternatives Identification*—Identifying alternatives is a technique used to generate different approaches to execute and perform the quality work associated with the project.

The key outcomes of the preparation of a detailed project quality plan should be included, but are not limited to:

1. Process Improvement Plan
2. Project quality management plan
3. Project quality performance measures
4. Project quality check lists
5. Improvement plan for the “process to be improved”
6. Project quality objectives baseline

These key outcomes should serve as basis for updating the project management plan through the inclusion of a subsidiary quality management plan and process improvement plan.

The process improvement plan builds on the plan of action obtained from a V.O.P. data collection process and must include the following activities, which will be performed to actually improve the “process to be improved”:

1. Identify and Quantify Assignable Causes of Variations
2. Explore Cause-and-Effect Relationship
3. Verify identified assignable causes
4. Generate Improvement Solutions
5. Assess Risk and Pilot Solution(s)
6. Devise Controls Measures

### **13.1.3 Verify Quality Plan**

The third step in developing the project management process “Perform Quality Planning” is “Verify Quality Plan.” It relates to formalizing acceptance of the relevant and identified quality standards and requirements. Verifying the project quality plan includes reviewing the “process to be improved” deliverables to ensure that each is completed satisfactorily and taking into account the identified V.O.C. key needs. If the project is terminated early, the project quality plan, through the project scope verification process, should establish and document the level and extent of completion.

Quality plan verification is performed through inspection. Inspection comprises activities such as measuring the performance level of the “process to be improved” outcomes, examining, and verifying to determine whether work and deliverables

meet quality standards and “process to be improved” acceptance criteria. Inspections are sometimes called gate reviews, process reviews, audits, and walkthroughs. In some application areas, these different terms have narrow and specific meanings.

Quality plan verification differs from quality control in that quality plan verification is primarily concerned with acceptance of the “process to be improved” deliverables, while quality control is primarily concerned with correctness of the “process to be improved” deliverables and meeting the quality requirements specified for the deliverables. Quality control is generally performed before scope verification, but these two processes can be performed in parallel.

The “Verify Quality Plan” project management process also documents those completed “process to be improved” deliverables that have been formally accepted. Through the “Verify Scope” project management process, those completed deliverables that have not been formally accepted are documented, along with the reasons for non-acceptance.

### 13.1.4 Control Quality Plan

The last step in developing the project management process “Perform Quality Planning” is “Control Quality Plan.” It relates to monitoring the status of the performance of the “process to be improved” outcomes and controlling their alterations. Controlling the project quality plan ensures that all requested alterations and recommended corrective actions on the “process to be improved” outcomes are taken into account and processed. The “control quality plan” is also used to manage the actual alterations of the “process to be improved” quality related outcomes when they occur and is integrated with the other control processes. Uncontrolled alterations of the project are often referred to as process creep, hope creep, effort creep, or feature creep.

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## 13.2 Develop Quality Assurance Plan

This is the project management process for documenting a set of preventive and systematic activities, focused on processes used in the project, which can be demonstrated to show commitment to delivering and provide confidence that project execution and its deliverables will fulfill specified quality standards and objectives. Quality standards include project processes and product goals.

It represents the proactive side of the “Develop Quality Management Plan” process. It effectively selects, defines, prepares, integrates, coordinates and documents all subsidiary assurance plans into one document in order to:

1. Prevent quality problems from occurring.
2. Ensure appropriate quality standards and operational definitions will be used effectively to produce quality project deliverables.

The project quality assurance plan is the primary source of information that documents how assurance of quality on the project execution and its deliverables will be demonstrated, monitored and controlled. The project quality assurance plan can be either summary level, broadly framed or highly detailed based on the requirements of the project.

In any case, the quality assurance plan is a composite document containing the information related to the quality control activities. It schedules the reviews and audits<sup>1</sup> that will be used for assessing the processes used in the project to achieve the project goals and to produce project quality deliverables. Planning the project “Quality Assurance Plan” is highlighted by the following activities:

1. Define the quality goals for the processes
2. Identify all relevant organizational process assets
3. Define the roles and responsibilities of “quality assurance” activities
4. Identify the tasks and activities for “Quality Control”

### **13.2.1 Define the Quality Goals for the Processes**

The first step in planning the quality assurance plan is to define the quality goals for the processes to be used by the “process improvement” project. These goals must be described with greater specificity because more information about the enterprise business intended strategic goals, the voice of the customer and the voice of the process are known. The project team might also set a standard to define the goals. If possible, the quality assurance plan can also describe the quality goals in terms of performance measures. This will ultimately help to measure the performance of the processes. Processes have two sets of quality goals:

1. To produce outcomes which do meet the identified CTXs. Ideally, each and every unit of process outcome should meet the identified CTXs.
2. To operate in a stable and predictable manner. Each process should be in a state of “statistical control.”

These goals may be directly related to the costs of producing the process outcomes.

### **13.2.2 Identify All Relevant Organizational Process Assets**

The second step in planning the quality assurance plan is to identify all organizational process assets, which have references to any of the processes to be used in the

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<sup>1</sup> A quality audit is a structured, independent review to determine whether project activities comply with organizational and project policies, processes, and procedures. The objective of a quality audit is to identify missing, inefficient or ineffective policies, processes, and procedures in use on the project. The subsequent effort to correct these deficiencies should result in a reduced cost of quality and an increase in sponsor or customer acceptance of the project’s product. Quality audits may be scheduled or random and may be conducted by internal or external auditors.



project. The organizational process assets include formal and informal policies, procedures, plans, and guidelines whose effects can influence the processes to be used in the “process improvement” project. These subsidiary process assets are related to the quality standards of several business components and how they are related to each other in achieving the collective qualitative objective.

The quality level that a “process improvement” project can achieve depends upon the efficiency and efficacy of the organizational process assets available. The “garbage in”—“garbage out” philosophy works very well here. Hence, in developing the quality assurance plan, it is very important that the project team understand the various processes to be used in the project. This can be done through process analysis. This analysis examines problems experienced, constraints experienced, and non-value-added activities identified during operation of the selected processes to be used in the project. The inputs and outputs of each selected process should be well defined. The controls that are in place to ensure the quality of these inputs and outputs should be analyzed. This helps in understanding where and why a process can go wrong and also assists in addressing those areas in the respective procedures. This information also helps to determine the different types of reviews and audits to be performed and how often they will be performed during the project lifecycle.

### **13.2.3 Define Roles and Responsibilities of “Quality Assurance” Activities**

The third step in planning the quality assurance plan is to define the organization and the roles and responsibilities of the “quality assurance” activities that will be undertaken during the project lifecycle. It should include a clear definition of the reporting system for the outcome of the quality reviews and audits.

### **13.2.4 Identify Tasks and Activities for “Quality Control”**

The third step in planning the quality assurance plan is to identify the task and activities of the quality control team. The quality assurance plan should clearly explain the inspections and testing procedures for quality control, their frequencies and how they will be conducted at the various stages of the project lifecycle. Generally, identify the task and activities of the quality control team will include, but are not limited to:

1. Reviewing project plans to ensure that the project abide by the defined processes.
2. Reviewing project to ensure that the performance of its outcomes according to the specified plans.
3. Endorsement of deviations from the identified standard processes and procedures.
4. Assessing the improvement of the identified processes.

The project manager and a quality manager within the enterprise business should fix a detailed timetable for all scheduled reviews and audits. This schedule should also be documented in the quality assurance plan.

Thus, the entire process of quality control is documented within the quality assurance plan. For any future reference, this could be used as a practical evidence of total quality control.

The key outputs of planning the project quality assurance include, but are not limited to:

1. *Organizational process assets updates*: Elements of the organizational process assets that may be updated include but are not limited to the quality standards.
2. *Alteration requests*: Quality improvement includes taking action to increase the effectiveness and/or efficiency of the policies, processes, and procedures of the performing enterprise business. Alteration requests are created and used to allow full consideration of the recommended enhancements. Alteration requests can be used to take corrective action or preventative action or to perform defect repair.
3. *Project management plan updates*: Elements of the project management plan that may be updated include but are not limited to:
  - Quality management plan,
  - Schedule management plan, and
  - Cost management plan.

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## 13.3 Develop Quality Control Plan

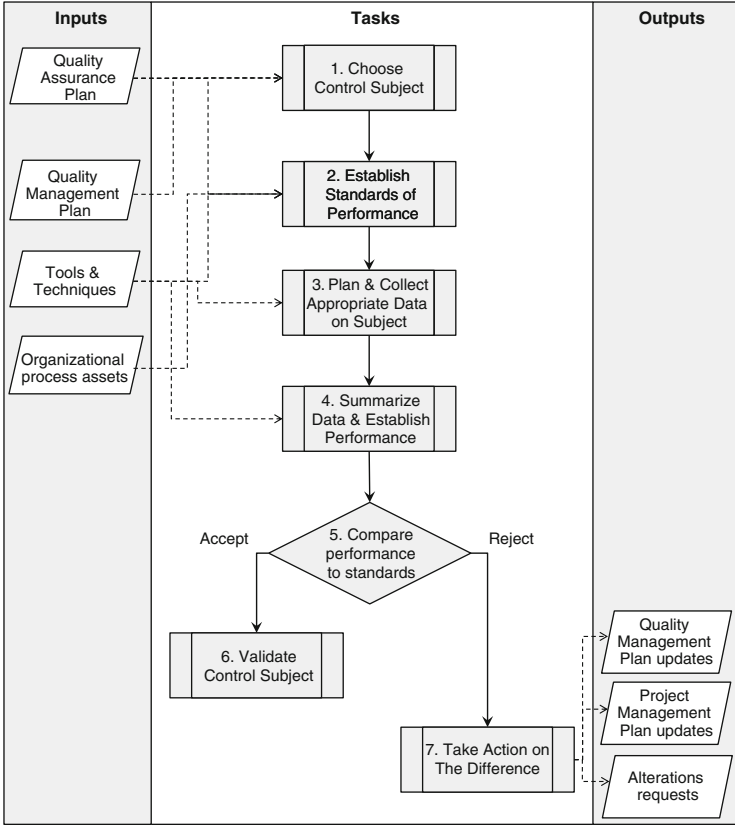
This is the project management process for planning a set of systematic observation techniques and activities, focused on outcomes of the project (i.e., project deliverables and project management processes used to produce the outcomes), to monitor and record results of executing the quality assurance plan in order to:

1. Assess performance of the “process improvement” project and “process to be improved” outcomes; and
2. Recommend necessary alterations to the project objectives and/or “process to be improved” goals.

“Develop Quality Control Plan” process represents the reactive side of the “Develop Quality Management Plan” process. The set of preventive and systematic activities documented in the quality assurance plan must be performed throughout the project lifecycle using the “Quality Control Process.” A generic form of the Quality Control Process is shown in Fig. 13.3.

### 13.3.1 Choose Control Subject

The first step of the “Quality Control Process” is “Choose the Control Subject”—Each feature of the “process to be improved” outcomes documented in the quality



**Fig. 13.3** The quality control process

assurance plan is a control subject; a center around which the quality control process is built. Control subjects are derived from the collected and identified CTXs.

### 13.3.2 Establish Standard of Performance

The second step of the “Quality Control Process” is “Establish Standard of Performance”—It relates to collecting the standards of performance (“process to be improved” goals as well as its outcomes goals) documented in the quality assurance plan. For each control subject it is necessary to know its standard of performance.

### **13.3.3 Plan and Collect Appropriate Data**

The third step of the “Quality Control Process” is “Plan and Collect Appropriate Data” on the chosen “Control subject”—It relates to establishing the means of collecting the V.O.P and the project data, and collecting these data through inspection and testing, as illustrated in the previous sections of this chapter, in order to determine the actual performance of the “process to be improved” or the quality level of characteristics of its outcomes.

### **13.3.4 Summarize Data and Establish Actual Performance**

The fourth step of the “Quality Control Process” is “Summarize Data and Establish Actual Performance” of the chosen “Control subject”—It relates to:

1. Providing answer to the questions: “what can be learned from the collected data?” and “Does the process conform to its quality goals?” The answer to this question is an understanding and a summary of the collected data in some meaningful graphical formats as indicated in a previous section.
2. Determining the actual “process to be improved” capabilities and performance indices.

### **13.3.5 Compare Actual Performance to Standards**

The fifth step of the “Quality Control Process” is “Compare Actual Performance to Standards”—The act of comparing the actual performance of the chosen “Control subject” to standards is often seen as the role of the quality control function with the enterprise business called on to carry out any or all of the following activities:

1. Compare the actual quality performance to the quality goal.
2. Interpret the observed difference; determine if there is conformance to the goal.
3. Decide on the action to be taken.
4. Stimulate corrective action.

### **13.3.6 Validate Control Subject**

The sixth step of the “Quality Control Process” is “Validate Control Subject”—It relates to acceptance decisions from the quality control results, which will indicate how well the chosen “Control subject” has achieved quality assurance specifications and project quality objectives.

### 13.3.7 Take Action on the Difference

The last step of the “Quality Control Process” is “Take Action on the Difference.” It relates to actuate alterations which restores conformance with quality goals. This step is popularly known as “troubleshooting” or “firefighting.” It involves rework decisions, process adjustments decisions, and quality improvement decisions.

1. *Rework Decisions*—In contrast to the previously mentioned acceptance decisions, quality control results may also indicate the need for deliverable rework, that is, the additional work needed to enable a defective or nonconforming observed characteristic of the process outcomes or project deliverable to become compliant with quality specifications.
2. *Process Adjustments*—Quality control results may indicate a process that is hindering the achievement of expected project quality objectives. The questionable process must be examined and activity steps adjusted to make the process more aligned with the project or quality of deliverable needs.
3. *Quality Improvements*—Quality control results will provide an indication of need for quality improvement. Improvement areas (e.g., process, materials, skill, etc.) can be identified for the current “process improvement” project and for, and quality improvement solutions can be implemented.

The decision to issue corrective or preventive actions is to ensure that the observed defect (i.e., non-conformance to quality requirements as specified in the quality assurance plan) are repaired and brought into compliance with quality assurance requirements or specifications. Two situations should be distinguished:

4. The quality control process is well designed to eliminate sporadic nonconformance due to “assignable causes” of variations in the process under consideration. The focus here is on finding “What has changed.” Sometimes the causes are not obvious, so the main obstacle to the corrective action is diagnosis. The diagnosis makes use of methods and tools such as:
  - Autopsies to determine with precision the symptoms exhibited by the process under consideration and its outcomes.
  - Comparison of outcomes of the process under consideration made before and after the occurrence of “assignable causes” of variation to see what has changed; also
  - Comparison of good and bad process outcomes made since the occurrence of “assignable causes” of variation began.
  - Comparison of process data before and after the occurrence of “assignable causes” of variation began to see what process conditions have changed.
  - Reconstruction of the chronology, which consists of logging on a time scale (of hours, days, etc.): (1) the events which took place in the process before and after the occurrence of “assignable causes” of variation, that is, rotation of shifts, new employees on the job, maintenance actions, etc., and (2) the time-related process outcomes information; that is, date codes, cycle time for processing, waiting time, move dates, etc.

- Analysis of the resulting collected data usually sheds a good deal of light on the validity of the various theories of causes. Certain theories are denied. Other theories survive to be tested further.
  - Operating personnel who lack the training needed to conduct such diagnoses may be forced to shut down the process and request assistance from specialists, the maintenance department, etc. They may also run the process under consideration “as is” in order to meet schedules and thereby risk failure to meet the quality goals.
5. The quality control process is not well designed to deal with the area of unacceptable level of variations, which occur beyond the specification limits. The process improvement methodology must be fully applied.

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### 13.4 Conclusion

As shown above, quality control management involves measuring project quality expectations against project actual quality results. Every project team member has quality control responsibility. In turn, the project manager must ensure that team members have sufficient knowledge and skill to properly apply quality control methods to evaluate outcomes of the project (i.e., projects include deliverables and project management results, such as cost and schedule performance). In some enterprise businesses, this activity is assigned to a dedicated quality control team that contributes quality control expertise across all projects. Nevertheless, each project manager still retains the responsibility for making adjustments based on quality control results.

The key outputs of performing a quality control at any stage of the project lifecycle include, but are not limited to:

1. *Quality Control Collected Data*—Quality control collected data are the documented results of quality control activities in the format specified during quality planning.
2. *Validated Alterations*—Any altered or repaired control subjects are inspected and will be either accepted or rejected before notification of the decision is provided. Rejected control subjects may require rework.
3. *Validated Deliverables*—A goal of quality control is to determine the correctness of deliverables. The results of the execution quality control processes are validated deliverables.
4. *Organization Process Assets Updates*—Elements of the organizational process assets that may be updated as a result of execution of quality control processes.
5. *Alterations Requests*—If the recommended corrective or preventive actions or a defect repair requires an alteration to the project management plan, an alteration request should be initiated accordingly.