Project Management - CompTIA Project+

Summary

A project is a temporary endeavor that produces a unique product service or result. It has definitive start and finish dates. Project management is the application of tools and techniques to organize the project activities to successfully meet the project goals. A project manager is responsible for project integration and applying the tools and techniques of project management to bring about a successful conclusion to the project.

Organizational structures impact how projects are managed and staffed. The primary structures are functional, matrix, and projectized. The traditional departmental hierarchy in a functional organization provides the project manager with the least authority. The other end of the spectrum is the project-based organization, where resources are organized around projects; in these types of organizations, the project manager has the greatest level of authority to take action and make decisions regarding the project. The matrix organization is a middle ground between the functional organization and the project-based organization.

Programs are a collection or group of related projects that are managed together using coordinated processes and techniques. The collective management of a group of projects can bring about benefits that wouldn't be achievable if the projects were managed separately.

Portfolios are collections of programs, subportfolios, and projects that support strategic business goals or objectives. Portfolios may consist of projects that are not related.

Project selection techniques involve the use of decision models, such as a cost-benefit analysis and expert judgment, to allocate limited resources to the most critical projects.

Project managers are individuals charged with overseeing every aspect of a given project from start to finish. A project manager needs not only technical knowledge of the product or service being produced by the project but also a wide range of general management skills. Key general management skills include leadership, communication, problem-solving, negotiation, organization, and time management.

Project stakeholders are anyone who has a vested interest in the outcomes of the project. Some project stakeholders you will likely encounter include the project sponsor, team members, functional managers, and customers (both internal and external).

A project sponsor is an executive in the organization who has the authority to assign budget and resources to the project. Project sponsors serve as the final decision-makers on the project, sign and approve the project charter, and remove obstacles so the team can perform their work. Project sponsors often act as the project champions as well. They spread enthusiasm for the project and act as cheerleaders regarding its benefits.

The project coordinator assists the project manager with administrative functions. The project scheduler coordinates and updates the project schedule and keeps stakeholders informed of schedule progress. The project manager is responsible for coordinating and managing the project team, communications, scope, risk, budget, and time. They also manage quality assurance and are responsible for the project artifacts. A PMO provides guidelines, templates, and processes for managing the project.

The project request process starts with a high-level scope definition that describes the project objectives, the high-level deliverables, and the reason for the project. It also describes the relationship between the business need and the product or service requested.

Collectively, project management consists of five process groups: Initiating, Planning, Executing, Monitoring and Controlling, and Closing. Each of these process groups consists of individual processes that each have inputs, tools and techniques, and outputs.

Initiation is the formal authorization for the project to begin. It starts with a project request that includes the business case (which in turn includes the purpose or justification for the project) and outlines the high-level scope definition. The output from the Initiating process is the project charter. This document becomes the basis for more-detailed project planning. It should contain the purpose or justification for the project, project goals, project description, high-level requirements, high-level milestones, high-level budget, assumptions, constraints, high-level risks, name of the sponsor, name of the project manager, and criteria for approval.

Planning is the process where many project processes and documents are created, including the work breakdown structure, project schedule, budget,

change management plan, communication plan, and more.

Monitoring and Controlling involves monitoring the performance of the project to ensure that deliverables meet their quality, to make certain risks are in check, to assure changes follow the proper processes, and to control the project costs.

Closing is where the project is accepted and formal sign-off occurs. The final product, service, or result of the project is handed off to other areas of the organization to maintain going forward. Lessons learned are documented here, resources are released to their functional areas, and contracts are closed out.

The project charter provides formal approval for the project to begin and authorizes the project manager to apply resources to the project. The project sponsor is the one who publishes, signs, and approves the project charter.

Scope planning uses the output of the initiating phase, the project charter, to create the scope statement and the scope management plan. The scope management plan documents the process you'll use to prepare the scope statement and WBS, a definition of how the deliverables will be validated, and a description of the process for controlling scope change requests.

The scope statement is the basis for many of the planning processes and future change decisions. It is also the basis for setting the boundaries of the project with the customer and stakeholders. A scope statement includes the product description, key deliverables, success and acceptance criteria, key performance indicators, exclusions, time and cost estimates, assumptions, and constraints.

Requirements describe the characteristics of the deliverables. They might also describe functionality that a deliverable must have or specific conditions a deliverable must meet to satisfy the objective of the project. They are typically conditions that must be met or criteria that the product or service of the project must possess to satisfy the objectives of the project. Requirements quantify and prioritize the wants, needs, and expectations of the project sponsor and stakeholders. They are documented in the scope statement or in a stand-alone requirements document. Requirements categories include business, functional, and non-functional.

The work breakdown structure is created by taking the major deliverables from the scope statement and decomposing them into smaller, more manageable components. The breakdown continues through multiple levels until the components can be estimated and resourced. The lowest level of decomposition is the work package level. The WBS includes all the work required to complete

the project. Any deliverable or work not listed on the WBS is excluded from the project. The WBS is a critical component of project planning. A WBS is the basis for time estimates, cost estimates, and resource assignments.

The WBS dictionary should list every deliverable and each of their components contained in the WBS. It should include a description of the component, code of account identifiers, responsible party, estimates, criteria for acceptance, and any other information that helps clarify the deliverables and work components.

Many steps are involved in schedule planning. Task definition takes the work packages from your WBS and breaks them down into individual tasks that can be estimated and assigned to team members. Sequencing looks at dependencies between tasks. These dependencies can be mandatory, discretionary, internal, or external. A dependent task is either a successor or a predecessor of a linked task.

There are four types of logical relationships: finish-to-start, start-to-start, start-to-finish, and finish-to-finish. Duration estimating is obtained using analogous (also called top-down) estimating, parametric estimating, and expert judgment.

The critical path method (CPM) creates a schedule by determining float time. Float is the difference between the early and late start dates and the early and late finish dates. The critical path is the longest full path on the project.

Duration compression is the technique used to shorten a project schedule to meet a mandated completion date. Crashing shortens task duration by adding more resources to the project. Fast tracking is where two tasks are started in parallel that were previously scheduled to start sequentially.

A project schedule may be displayed as a milestone chart. Milestones mark major project events such as the completion of a key deliverable or project phase. Gantt charts are a common method to display schedule data as well. The completed, approved project schedule becomes the baseline for tracking and reporting project progress.

Quality gates may be added to the schedule to determine whether the work so far is accurate and meets quality standards. Governance gates include client sign-off, management approval, and legislative approval.

All projects require resources. Resources include the human type and physical resources such as material and equipment.

Shared resources work for more than one manager. They may report to both a functional manager and a project manager. If you're working with a shared resource, be certain you have some input into the team member's performance appraisal. Low-quality resources may not have the skills needed to complete the tasks assigned. In the case of low-quality physical resources, look elsewhere.

Resource allocation identifies the type of resources needed, skills sets, and time frames the skills are needed. Resource shortages occur when there aren't enough resources available with the skills needed to perform the task. Resource overallocation occurs when one resource (or set of resources) is scheduled to work on too many tasks at the same time. These tasks may be on the same project or a combination of tasks from different projects and their normal operational work. Benched resources are those who have rolled off one project and are waiting for the next project to begin. These are costly resources to the organization, so work in coordination with other project and functional managers to assign these resources as soon as possible.

Interproject dependencies occur when you need the completed deliverables from one project in order to start work on the next project. Interproject resources contention occurs when resources are scheduled for similar tasks on competing projects and may be unavailable for your project when needed.

Team members might be in-house resources, resources from outside the organization, or *remote resources*. When possible, collocate resources.

A project organization chart is a hierarchical chart that shows the sponsor, project manager, and team members. A RACI chart shows the roles and responsibilities of team members (or it can depict teams or business units). RACI stands for responsible, accountable, consulted, and informed.

All teams progress through five stages of development: forming, storming, norming, performing, and adjourning.

Team-building activities help diverse groups of people work together in an efficient and effective manner. Trust building is an important activity. It takes time to build trust with team members and requires that the project manager demonstrate competence, respect, honesty, integrity, and openness.

Provide feedback to your team members in a timely manner and deal with negative situations as soon as they occur. Removing personnel from the project should be done in coordination with the human resource department.

Rewards and recognition are important motivators for individuals and teams. Be certain the reward is in keeping with the achievement. Also make certain that reward criteria and processes are written down.

Conflict will occur on nearly all projects. The common techniques for conflict resolution include smoothing, forcing, compromising, confronting, avoiding, and negotiating. Confronting, also known as problem-solving, is the technique project managers should use.

Project kickoff meetings introduce the team members and stakeholders to each other and describe the goals and objectives of the project. They are typically held after the project charter is signed.

Cost estimating is performed after the schedule is created and the resources for the project have been determined. You can use several techniques to create project estimates. Analogous or top-down estimates use expert judgment and historical data to provide a high-level estimate for the entire project, a phase of the project, or a deliverable. Parametric estimating uses a mathematical model to create the estimates and, in its simplest form, multiplies the duration of the project task by the resource rate to determine an estimate. The bottom-up method creates the project estimate by adding up the individual estimates from each work package. Three-point estimates are the average of the most likely, optimistic, and pessimistic estimates.

Cost estimates are used to make up the project budget. The project budget is established by using the organization's chart of accounts and then documenting work effort, duration, equipment and material costs, and any other costs that may be incurred during the course of the project. The cost baseline is the total approved expected cost for the project and is used for forecasting and tracking expenditures throughout the project.

Risk planning involves identifying potential risk events that could occur during the project, determining their probability of occurrence, and determining their impact on the project. Probability is always expressed as a number between 0.0 and 1.0. Risk response plans should be developed for those risks that have a high probability of occurrence, have a significant impact on the project if they occur, or have an overall risk score that is high.

It's important to communicate the risks and response plans to the stakeholders throughout the remainder of the project. If you're working on a project with a long timeline, periodically perform the risk processes again to determine whether your risks are still valid and identify new risks.

Most project managers spend the majority of their time in the act of communicating. Communication is performed using the sender-message-receiver model. Communications planning is a process where you determine who needs what types of communication, when, and in what format, and how that communication will be disseminated. The network communication model shows the lines of communication that exist between any number of project participants. Listening is another important communication skill for any project manager.

There are many methods of communicating including meetings (which can take many forms including in person, virtual, and more), email, fax, video conferencing, voice conferencing, text messages, instant messages, face-to-face, printed media, and social media.

Factors that can influence communication methods include language barriers, time zone or geographical factors, technological factors, cultural differences, interorganizational and intraorganizational differences, and personal preferences. You'll want to build rapport and solid relationships with your team members so that you can overcome any of these factors that may be influencing communication. Stakeholders sometimes have their own needs in regards to communication requirements including frequency of communication, level of report detail, types of communication, and confidentiality constraints. It's also important to tailor your communication style to the preferences of your stakeholders.

As we discussed earlier in the lesson, things change. Changes come about for many reasons and may take the form of corrective actions, preventive actions, and defect repairs. An integrated change control system manages change requests, determines the global impacts of a change, and updates all impacted portions of the project plan when a change is made. Typically, a change control board is established to review and either approve, deny, or delay change requests.

Integrated change control looks at the overall impact of change and manages updates across all elements of the project plan. Scope change control includes understanding the impact of a scope change, taking appropriate action, and managing a process to review and approve or reject requests for scope changes.

Organizational changes can bring about impacts to your projects as well as the organization itself. Internal reorganizations, mergers and acquisitions, and outsourcing can all bring about changes to the project.

The procurement processes are used when you are purchasing goods or services for the project outside of the organization. You might use an RFI, RFQ, RFP, or PO to procure your goods and services. Sometimes, you may also use resources from other parts of the organization that require formal agreements regarding their use such as an MOU.

Several methodologies are available to manage a project. The Agile methodology involves continuous requirements gathering, is iterative in nature, and is highly interactive. It consists of self-forming and self-directing teams.

This lesson covered a lot of ground, starting with charts, a valuable project management tool. Histograms are a type of bar chart that displays data distributed over time. They are easy to construct and understand. Fishbone charts are also called Ishikawa diagrams and are a cause-and-effect diagram. A Pareto chart is a histogram that rank-orders the most important data by their frequency over time. A run chart displays data observed or collected over time as plots on a line. A scatter diagram plots two numerical variables on a chart to determine whether there is a correlation between them. The closer these variables are to each other, the closer the variables are related to each other. This relationship is typically analyzed to prove or disprove cause-and-effect relationships. Scatter diagrams are also known as correlation charts.

Dashboards visually display the status of the most important elements of a project. They are typically used by executives in the organization, as they can see the most up-to-date project information at a glance.

Status meetings and status reports are important communication tools to keep stakeholders informed of project status. Meeting agendas should be sent a few days before the meeting so that participants know what to expect or can read materials ahead of time. Meeting minutes should be distributed shortly after the meeting occurs.

The issue log should be regularly updated to reflect new issues and to document the status of ongoing issues. The issue log should be reviewed at the status meetings. Action item lists should also be updated and reviewed at the status meetings.

Knowledge management tools such as intranet sites, wiki pages, and collaboration tools are useful for creating, updating, storing, and archiving project documents. It's important to keep documents up to date and to also make certain you are working with the latest version of the document.

Key performance indicators (KPIs) are a measurable value that shows whether the project is reaching its intended goals. KPIs should be measurable and applicable to the project. Key performance parameters (KPPs) are measurable values for operational or performance goals associated with systems. Balanced score cards are another strategic management tool used to determine whether the organizational goals are being achieved.

Project closeout should be performed when the project ends or when it's killed or cancelled. The Closing process group is the most often skipped on projects because project managers and team members are anxious to move on to their next assignments. It's important to take the time to perform the steps in the Closing process phase so that you can obtain sign-off on the project, turn over the product to the organization, release project resources, close out the contract, document lessons learned, and create a final project report.

Four types of project endings encompass the majority of reasons a project comes to an end. They are addition, starvation, integration, and extinction.

Closing out procurements involves completing and settling the terms of the contract and documenting its acceptance. Product verification occurs here that determines whether the work was completed accurately and satisfactorily.

Administrative closure activities involve gathering and centralizing all the project documents, performing the lessons learned review, and writing the final project report.

Perhaps the most important element of project closure is the lessons learned document. This entails identifying where things went wrong, what things went well, and the alternatives you considered during the course of the project. Lessons learned are an extremely useful reference for future projects regarding what worked and what didn't, for estimating techniques, for establishing templates, and more.

The project close report is distributed to the stakeholders and includes several elements, including the project's goal, the statement of acceptance, a summary of costs and schedule data, and lessons learned data.

Exam Essentials

- **Be able to define a project.** A project brings about a unique product, service, or result and has definite beginning and ending dates.
- **Be able to identify the difference between a project and ongoing operations.** A project is a temporary endeavor to create a unique product or service. Operational work is ongoing and repetitive.
- **Be able to define a program and a portfolio.** A program is a group of related projects managed to gain benefits that couldn't be realized if they were managed independently. Portfolios are collections of programs, subportfolios, and projects that support strategic business goals or objectives. Programs and projects within the portfolio may not be related to one another.
- **Name the three types of organizational structures.** The three types of organizational structures are functional, matrix, and projectized structures. Matrix organizations may be structured as a strong matrix, weak matrix, or balanced matrix organization.
- **Be able to define the role of a project manager.** A project manager's core function is project integration. A project manager leads the project team and oversees all the work required to complete the project goals to the satisfaction of the stakeholders.
- **Be able to identify the most common project selection methods.** The most common project selection methods are benefit measurement methods such as cost-benefit analysis, scoring models, payback period, and economic models (which include discounted cash flows, NPV, and IRR), as well as expert judgment.
- **Understand what skills are needed to manage a project beyond technical knowledge of the product.** Key general management skills include leadership, communication, problem-solving, negotiation, organization, and time management.

- **Be able to define a project manager.** The project manager manages the team, communication, scope, risk, budget, and time. They also manage quality assurance and are responsible for the project artifacts.
- **Be able to define a project sponsor.** A project sponsor is an executive in the organization who has the authority to allocate dollars and resources to the project. The sponsor approves funding, the project charter, the project baseline, and high-level requirements. They have final decision-makingauthority for the project, help with marketing the benefits of the project, remove roadblocks for the team, and participate in business case justification.
- **Be able to define project stakeholders.** A stakeholder is anyone who has a vested interest in the project and has something to gain or lose from the project. Stakeholders include the sponsor, project manager, project team members, functional managers, customers, team members, and others with an interest in the project.
- **Be able to define a project coordinator.** Project coordinators assist the project manager with cross-functional coordination, documentation, administrative support, time and resource scheduling, and quality checks.
- **Be able to define a scheduler.** The scheduler is responsible for developing and maintaining the project schedule, communicating timeline and changes, reporting on schedule performance, and obtaining the status of work performed from team members.
- **Be able to define the project team.** The project team contributes expertise to the project, works on deliverables according to the schedule, estimates task durations, estimates costs, and estimates dependencies.
- **Be able to define the project management office.** The PMO provides guidance to project managers and helps present a consistent, reliable approach to managing projects across the organization. PMOs are responsible for maintaining standards, processes, procedures, and templates.

- **Be able to define the Initiating phase.** Initiation authorizes the project to begin.

- **Be able to define the Planning phase.** This process is where most project documents and processes are created, including the schedule, work breakdown structure, budget, communication plan, procurement plan, and more. These documents are used as the foundation for managing the project throughout the remaining processes.
- **Be able to define the Executing phase.** The work of the project is performed in the Executing process. This is where the deliverables are produced.
- **Be able to define the Monitoring and Controlling phase.** This process monitors and controls the work, deliverables, and outputs of the project to determine whether there are variances from the project plan. Corrective actions are taken during this process to get the project back on course. Risks, issues, quality assurance, changes, and budget are among the elements of the project monitored during this process.
- **Be able to define the Closing phase.** Closing is where the product, service, or result of the project is accepted and formal sign-off occurs. Lessons learned are documented, resources are released, and contracts are closed out.
- **Be able to describe a project charter and list the key components.** A project charter provides formal approval for the project to begin and authorizes the project manager to apply resources to the project. The key components are the purpose or justification for the project, project goals and objectives, project description, key deliverables, high-level list of requirements, high-level milestones, high-level budget, high-level assumptions, high-level constraints, high-level list of risks, name of the sponsor, name of the project manager, and criteria for project approval.

- **Describe the purpose of a scope management plan.** A scope management plan documents the procedures for preparing the scope statement and WBS, defines how the deliverables will be verified, and describes the process for controlling scope change requests.
- **Understand the purpose of the scope statement.** The scope statement is the basis of the agreement between the project and the customer

concerning what comprises the work of the project. It defines the deliverables and success criteria that will meet those objectives.

- **Be able to list the components of a scope statement.** A scope statement includes a project description, acceptance criteria, key deliverables, exclusions from scope, assumptions, and constraints. It could also contain a high-level time and cost estimate to complete the project.
- **Be able to define requirements.** Requirements describe the characteristics of the deliverables, or functionality that a deliverable must have, or specific conditions a deliverable must meet to satisfy the objective of the project.
- **Know how to define and create a work breakdown structure.** The WBS is a deliverable-oriented hierarchy that describes the work required to complete the project. The WBS is a multilevel diagram that starts with the project, includes the major deliverables, and decomposes the major deliverables into smaller units of work to the point where time and cost estimates can be provided and resources assigned.
- **Understand the levels in a WBS.** The highest level of the WBS is the project name. The major deliverables, project phases, or subprojects make up the next level. The number of levels in a WBS will vary by project; however, the lowest level of the WBS is a work package.
- **Describe a WBS dictionary.** The WBS dictionary describes each of the deliverables and their components and includes a code of accounts identifier, estimates, resources, criteria for acceptance, and any other information that helps clarify the deliverables.

- **Describe the sequencing process.** Sequencing is the process of identifying dependency relationships between the project activities and scheduling activities in the proper order.
- **Name the two major relationships between dependent tasks.** A predecessor is a task that exists on a path with another task and occurs before the task in question. A successor is a task that exists on a common path with another task and occurs after the task in question.

- **Name the four types of logical relationships.** The four types of logical relationships are finish-to-start, start-to-start, start-to-finish, and finish-to-finish.
- **Know and understand the three most commonly used techniques to estimate activity duration.** Expert judgment relies on the knowledge of someone familiar with the tasks. Analogous or top-down estimating bases the estimate on similar activities from a previous project. Parametric estimates are quantitatively based estimates that typically calculate the rate times the quantity.
- **Define the purpose of CPM.** CPM calculates the longest full path in the project. This path controls the finish date of the project. Any delay to a critical path task will delay the completion date of the project.
- **Explain a network diagram.** A network diagram is used to depict project activities and the interrelationships and dependencies among these activities.
- **Name the three most common ways project schedules are displayed.** Project schedules are typically displayed as milestone charts, PERT network diagrams, or Gantt charts; a Gantt chart is a type of bar chart.
- **Define quality gates and governance gates.** Quality gates are used to check the work, and governance gates are used as client sign-offs, management approvals, and legislative approvals.

- **Understand the definition of resources.** Resources can be human resources or physical resources. They are used to complete the work of the project. Resources include these categories: shared resources, dedicated resources, low-quality resources, in-house resources, benched resources, and remote resources.
- **Define resource allocation.** Resource allocation is identifying resource availability and skill sets and assigning them to project tasks.
- **Define resource overallocation and resource shortage.** Resource overallocation occurs when resources are assigned too many tasks within

a given time frame. Resource shortage occurs when there are not enough resources with the required skills or abilities to complete the tasks.

- **Define interproject dependencies and interproject resource contention.** Interproject dependencies occur when one project must complete its deliverables before another project can begin. Interproject resource contention occurs when resources are assigned to more than one project resulting in timing and availability conflict.
- **Define a RACI chart and define the acronym.** This is a matrix-based chart that shows the resource role and responsibility level for the work product. RACI stands for responsible, accountable, consulted, and informed.
- **Name the five stages of team development.** They are forming, storming, norming, performing, and adjourning.
- **Describe team building and trust building.** Team building consists of activities that help diverse groups of people work together in an efficient and effective manner. Trust building involves building trust with the project manager and among team members. This takes time and is accomplished by being true to your word and having the team's best interests at heart.
- **Name the conflict-resolution techniques and the technique that is best for project managers.** They are smoothing, forcing, compromising, confronting, avoiding, and negotiating. Confronting is also known as problem-solving and is the technique project managers should use.
- **State the purpose of a project kickoff meeting.** The project kickoff meeting is a way to formally introduce all project team members, to review the goals and the deliverables for the project, to discuss roles and responsibilities, and to review stakeholder expectations.

- **Know the difference between analogous, parametric, and bottom-up estimating techniques.** Analogous, or top-down, estimates use expert judgment and historical data to provide a high-level estimate for the entire project, a phase of the project, or a deliverable. Parametric estimates use a mathematical model to create the estimates. The bottom-up method starts at the lowest level of the WBS and calculates the cost of each item

within the work packages to obtain a total cost for the project or deliverable.

- **Name the two discretionary funding allocations a project may receive.** The two types of discretionary funding are a contingency reserve and a management reserve. Contingency reserves are monies set aside to cover the cost of possible adverse events. Management reserves are set aside by upper management and are used to cover future situations that can't be predicted during project planning.
- **Explain the purpose of a cost baseline.** The cost baseline is the total approved, expected cost for the project. It's used in the Executing and Monitoring and Controlling processes to monitor the performance of the project budget throughout the project.
- **Explain the risk identification process.** Risk identification is the process of identifying and documenting the potential risk events that may occur on the project.
- **Explain the purpose of risk analysis.** Risk analysis evaluates the severity of the impact to the project and the probability that the risk will actually occur.
- **Explain the purpose of risk response planning.** Risk response planning is the process of reviewing the list of potential risks impacting the project to determine what, if any, action should be taken and then documenting it in a response plan.
- **Name the negative risk response strategies.** The negative risk response strategies are avoid, transfer, mitigate, and accept.
- **Name the positive risk response strategies.** The positive risk response strategies are exploit, share, enhance, and accept.

- **Describe the importance of communications planning.** Communications planning is the key to project success. It involves determining who needs information, what type, when, in what format, and the frequency of the communication.

- **Describe meeting types.** Meetings include kickoffs, virtual, in person, scheduled, impromptu, and closure meetings.
- **Describe communication methods.** Communication methods include meetings, email, fax, instant messaging, video conferencing, voice conferencing, face-to-face, text message, distribution of printed media, and social media.
- **Describe the factors influencing communication methods.** Language barriers, time zones/ geographical factors, technological factors, cultural differences, interorganizational differences, intraorganizational differences, personal preferences, rapport building/relationship building, content of message, criticality factors, and specific stakeholder communication requirements.
- **Name the common communication triggers on any project.** Audits, project planning, project change, risk register updates, milestones, schedule changes, task initiation/completion, stakeholder changes, gate reviews, business continuity response, incident response, and resource changes.

- **Describe the project management plan.** The project management plan is the final, approved, documented plan that's used in the Executing and Monitoring and Controlling phases to measure project progress.
- **Describe the elements of a change management process.** The elements of a change management process include identifying and documenting the change (using templates and a change log), evaluating the impact, obtaining approval from the CCB, implementing the change, validating the change, updating the project management plan documents, and communicating as needed.
- **Explain the purpose of a CCB.** The change control board reviews, approves, denies, or delays change requests.
- **Be able to name the types of common project changes.** The types of project changes include timeline, funding, risk events, requirements, quality, resource, and scope changes.

- **Be able to name the types of organizational change.** The types of organizational change include business merger, acquisition, demerger, split, business process change, internal reorganization, relocation, and outsourcing.
- **Be able to describe make-or-buy analysis.** Make-or-buy analysis is performed in order to determine the cost-effectiveness of either making or buying the goods and services you need for the project.
- **Be able to name the types of contracts.** The contract types include fixed-price, costreimbursable, and time and materials.
- **Be able to name the types of vendor-centric documents.** The types of vendor documents include nondisclosure agreements, cease-and-desist letter, letters of intent, statements of work, memoranda of understanding, service level agreements, purchase orders, and warranties.
- **Describe the Agile methodology.** Agile is an iterative approach to managing projects that readily adapts to new and changing requirements. It provides for continuous requirements gathering and continuous feedback. Agile teams are self-organized and self-directed.
- **Describe the three primary roles of Agile project management teams.** The product owner is the voice of the customer, and they determine the backlog (also known as user stories) and prioritize the backlog. The Scrum master removes obstacles that stand in the way of the team performing its role and provides education on the Agile process. The project team works on backlog items during the sprint and participates in the daily standups.
- **Name the basic aspects of the Agile methodology.** Agile uses daily standups, also called Scrum meetings, to assess progress. Sprint planning occurs at the beginning of each sprint to determine which backlog items to work on. A retrospective meeting is held at the end of the sprint to determine what work was completed and to perform a lessons-learned session on the sprint. Burn-down charts are used to visually display work progress during the sprint.

- **Be able to explain a histogram.** A histogram displays data distributed over time. It is a type of bar chart.
- **Be able to explain a fishbone diagram.** A fishbone diagram is a cause-and-effect diagram, also known as an Ishikawa diagram.
- **Be able to explain a Pareto chart.** A Pareto chart is a histogram that rank-orders data by frequency over time.
- **Be able to explain a run chart.** A run chart displays data as plots on a timeline.
- **Be able to explain a scatter diagram.** A scatter diagram displays the relationship between two numerical variables and determines whether they are related to each other. It can also be used to prove or disprove cause-and-effect relationships. Scatter diagrams are also known as correlation charts.
- **Name the knowledge management tools used for project documents.** The tools include intranet sites, Internet sites, wiki pages, vendor knowledge bases, and collaboration tools.
- **Name the three performance measurement tools.** They are key performance indicators (KPIs), key performance parameters (KPPs), and balanced score cards.
- **Be able to describe a status report.** A status report describes the progress of the project to date and usually includes information on scope, cost, and budget.
- **Name the types of project centric documents.** They include issue log, status report, dashboard information, action items, meeting agenda, and meeting minutes.
- **Name the four reasons for project endings.** They are addition, starvation, integration, and extinction.
- **Understand the steps involved in closing a project.** The steps include obtaining sign-off and acceptance, transferring the product to the organization, releasing project resources, closing out contracts, documenting lessons learned, and creating the project closeout report.

- **Explain the purpose of obtaining formal customer or stakeholder sign-off.** The formal sign-off documents that the customer accepts the project work and that the project meets the defined requirements. It also signals the official closure of the project and the transfer of the final product of the project to the organization.
- **Describe lessons learned.** Lessons learned describe the successes and failures of the project.