

# **PMI® Authorized PMP® Exam Prep**

# PMI® Authorized PMP® Exam Prep

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# About This Course

If you are taking this course, you probably have some professional exposure to the duties of a project manager, or you may be considering embarking on a career in professional project management. Your ability as a project manager to demonstrate best practices in project management—both on the job and through professional certification—is becoming the standard to compete in today's fast-paced and highly technical workplace. In this course, you will apply the generally recognized practices of project management acknowledged by the Project Management Institute (PMI)<sup>®</sup> to successfully manage projects.

Project managers who have proven skills and experience can find exciting, high-visibility opportunities in a wide range of fields. This course is specifically designed to provide you with the proven, practical body of project management knowledge and skills that you need to demonstrate project management mastery on the job. Additionally, this course can be a significant part of your preparation for the Project Management Professional (PMP)<sup>®</sup> Certification Exam. The skills and knowledge you gain in this course will help you avoid making costly mistakes and increase your competitive edge in the project management profession.

## Course Description

### Target Student

This course is designed for individuals who have on-the-job project management experience regardless of whether their formal job role is project manager, who are not certified project management professionals, and who might or might not have received formal project management training.

The course enables candidates to develop professionally, increase their project management skills, apply a formalized and standards-based approach to project management, and seek career advancement by moving into a formal project manager job role, as well as to apply for Project Management Institute, Inc. (PMI)<sup>®</sup> Project Management Professional (PMP)<sup>®</sup> certification.

### Prerequisites

To ensure your success in this course, you should have experience with basic project management concepts and have some working experience with project management. You can obtain this level of skills and knowledge by taking the following PMI courses:

- Introduction to Project Management
- Project Management Basics
- Introduction to Agile

## Course Objectives

In this course, you will build and manage a team to plan, execute, and complete a project that is aligned to the business environment. You will:

- Create a high-performing team.
- Plan and manage the project.
- Execute and assess the project work.
- Keep the team on track.
- Keep the business environment in mind.

## The PMI CHOICE Home Screen

Logon and access information for your CHOICE environment will be provided with your class experience. The CHOICE platform is your entry point to the CHOICE learning experience, of which this course manual is only one part.

On the CHOICE Home screen, you can access the CHOICE Course screens for your specific courses. Visit the CHOICE Course screen both during and after class to make use of the world of support and instructional resources that make up the CHOICE experience.

Each CHOICE Course screen will give you access to the following resources:

- **Classroom:** A link to your training provider's classroom environment.
- **eBook:** An interactive electronic version of the printed book for your course.
- **Files:** Any course files available to download.
- **Checklists:** Step-by-step procedures and general guidelines you can use as a reference during and after class.
- **Spotlights:** Brief animated videos that enhance and extend the classroom learning experience.
- **Assessment:** Items you can complete for your self-assessment of your level of understanding of the course content.
- Social media resources that enable you to collaborate with others in the learning community using professional communications sites such as LinkedIn or microblogging tools such as Twitter.

Visit your CHOICE Home screen often to connect, communicate, and extend your learning experience!

## How To Use This Book

### As You Learn

This book is divided into lessons and topics, covering a subject or a set of related subjects. In most cases, lessons are arranged in order of increasing proficiency.

The results-oriented topics include relevant and supporting information you need to master the content. Each topic has various types of activities designed to enable you to solidify your understanding of the informational material presented in the course. Information is provided for reference and reflection to facilitate understanding and practice.

Data files for various activities as well as other supporting files for the course are available by download from the CHOICE Course screen. In addition to sample data for the course exercises, the course files may contain media components to enhance your learning and additional reference materials for use both during and after the course.

Checklists of procedures and guidelines can be used during class and as after-class references when you're back on the job and need to refresh your understanding.

At the back of the book, you will find a glossary of the definitions of the terms and concepts used throughout the course. You will also find an index to assist in locating information within the instructional components of the book. In many electronic versions of the book, you can click links on key words in the content to move to the associated glossary definition, and on page references in

the index to move to that term in the content. To return to the previous location in the document after clicking a link, use the appropriate functionality in your PDF viewing software.

## As You Review

Any method of instruction is only as effective as the time and effort you, the student, are willing to invest in it. In addition, some of the information that you learn in class may not be important to you immediately, but it may become important later. For this reason, we encourage you to spend some time reviewing the content of the course after your time in the classroom.

## As a Reference

The organization and layout of this book make it an easy-to-use resource for future reference. Taking advantage of the glossary, index, and table of contents, you can use this book as a first source of definitions, background information, and summaries.

## Course Icons

Watch throughout the material for the following visual cues.

Icon	Description
	A <b>Note</b> provides additional information, guidance, or hints about a topic or task.
	A <b>Caution</b> note makes you aware of places where you need to be particularly careful with your actions, settings, or decisions so that you can be sure to get the desired results of an activity or task.
	<b>Spotlight</b> notes show you where an associated Spotlight is particularly relevant to the content. Access Spotlights from your CHOICE Course screen.
	<b>Checklists</b> provide job aids you can use after class as a reference to perform skills back on the job. Access checklists from your CHOICE Course screen.
	<b>Social</b> notes remind you to check your CHOICE Course screen for opportunities to interact with the CHOICE community using social media.



# 1

# Creating a High-Performing Team

**Lesson Time: 8 hours**

## Lesson Introduction

The success of your project depends on the people involved. The project team members are vital to doing the work of the project efficiently and effectively. The stakeholders connected to the project have the ability to help or hinder a project's success, and therefore need to be kept engaged along the way. A key role of a project manager is the assembling and managing of the project team and any additional stakeholders. High-performing teams have a shared understanding of and commitment to the project, and possess the appropriate training that empowers them to do the work. In this lesson, you will create a high-performing project team.

At the beginning of each lesson, you will see references to how the lesson and topic content maps to the Project Management Professional (PMP®) Examination Content Outline (ECO). The ECO tasks that are addressed in each lesson will be noted next to the lesson objectives.

This lesson addresses tasks from the People domain of the PMP® Exam Content Outline (ECO).

## Lesson Objectives

In this lesson, you will:

- Determine project team member requirements, appraise team skills, and maintain team knowledge transfer. (ECO Tasks 1.2, 1.6)
- Collectively define project ground rules based on context, such as organizational rules and team dynamics. (ECO Task 1.12)
- Determine a negotiation strategy and negotiate project agreements. (ECO Task 1.8)
- Organize around team strengths and support team task accountability. (ECO Task 1.4)
- Ensure team members and stakeholders are adequately trained. (ECO Task 1.5)
- Continually evaluate the effectiveness of virtual team member engagement. (ECO Task 1.11)
- Reach consensus and support the outcome of the parties' agreement. (ECO Task 1.10)

# TOPIC A

## Build a Team

Successful projects require teams to build the required business solution. In this topic, you will explore the processes and practices required to build effective teams.

### PMP Certification

Project Management Professional (PMP)® is the most important industry-recognized certification for project managers. Globally recognized and demanded, the PMP demonstrates that those with this designation have the experience, education, and competency to lead and direct projects. This can be achieved by having the required project management experience and passing an exam, and then maintained by obtaining Professional Development Units (PDUs). This is similar to the Certified Public Accountant (CPA) exam and professional development requirements.

	<b>Note:</b> For a list of additional reference materials to help you prepare for the PMP exam, you can visit <a href="https://www.pmi.org/certifications/types/project-management-pmp/pmp-reference-list">https://www.pmi.org/certifications/types/project-management-pmp/pmp-reference-list</a> .
	<b>Note:</b> To further explore the PDU requirements, you can access the Spotlight on <b>Earning PDUs</b> presentation from the <b>Spotlight</b> tile on the CHOICE Course screen.

### The PMP® Examination Content Outline (ECO)

The Project Management Professional (PMP)® Examination Content Outline (ECO) documents the domains, tasks, and enablers that are addressed on the PMP® certification exam, as well as the percentages of questions allocated to each of the exam domains.

- **Domains** are defined as the high-level knowledge areas that are essential to the practice of project management.
- **Tasks** are the underlying responsibilities of the project manager within each domain area.
- **Enablers** are illustrative examples of the work associated with the task. Enablers are not meant to be an exhaustive list but rather a few examples to help demonstrate what the task encompasses.

To assist you in your preparation for the exam, each lesson topic starts with a list of ECO enablers covered in that topic. Deliverables and tools that are relevant to particular tasks and enablers have also been identified by the PMI® and listed for your reference.

	<b>Note:</b> You can access the PMP® ECO mapping document from the <b>Files</b> tile on the CHOICE Course screen.
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### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Support diversity and inclusion. (ECO 1.2.2)
- Appraise teams' skills. (ECO 1.6.1)
- Determine team member requirements. (ECO 1.6.2)
- Continuously assess and refresh team skills. (ECO 1.6.3)
- Maintain team knowledge and transfer. (ECO 1.6.4)
- Discuss responsibilities within teams. (ECO 2.16.1)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Skills list	RACI matrix
Technology	Pre-assignment tools
Resource schedule	Virtual teams
Rates	
Resource assignment	

## Project Teams

A **project team**\* is a set of individuals who support the **project manager** in performing the work of the **project** to achieve its objectives. The roles of the people on the project team can include:

- Project management staff that performs activities such as budgeting, scheduling, reporting and control, risk management, and project communications. This role may be supported by a PMO.
- Project staff that perform the work to create the project **deliverables**.
- Supporting experts who perform work to develop the project management plan. These roles can include legal, logistics, engineering, testing, and so on.
- User or customer representatives who will provide requirements and accept the project deliverables.
- Sellers that are external companies issued a contract to provide a product or service needed by the project.
- Business partners that are external companies that provide specialized support through a partnership.
- Business partner members that support the business partnership.



**Note:** The members of the project team are also part of the stakeholder group; however, not all stakeholders are part of the project team. Generally, the project team is internal to the organization and actively participates in doing the project work. The stakeholder group is the larger group of people and organizations that can influence, or is affected by, the outcome of a project. For example, fans of the local sports team are stakeholders in the project to build a new sporting arena, but they are not part of the project team.

As a critical part of Project Resource Management, you need to be able to do the following:

- Estimate, acquire, and manage teams of people.
- Estimate the other resources those team members will need to carry out the work.
- Obtain the people.
- Develop the team, improve their competencies, facilitate interactions, and create an effective teaming environment.
- Track team performance, create and execute improvements based on feedback, resolve issues, and manage team personnel changes



**Note:** Glossary definitions for terms indicated in blue italic text with an asterisk are taken from, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute Inc., 2017 and *Agile Practice Guide*, Project Management Institute Inc., 2017.

## Project Team Composition

Project team composition can vary based on organizational culture, location, and scope. Composition refers to the team's makeup and how the team members are brought together

or combined on the team. For example, they can be a dedicated team in which most of the project team members are assigned to work on the project full-time, or they can be part-time team members who work on a project in addition to their regular work. Often, organizations have a mix of these two formats. The project team generally comprises the project manager, project management team, and other individual team members. The individual team members perform project work and might not be involved in the management side of the project. The project team contains people from different groups who possess knowledge on specific subjects or have unique skill sets to carry out project work.

## Project Team Member Requirements

In order for the team to meet its objectives, it will need enough of the relevant skill sets to perform the work and produce the desired results. In most cases it is preferable to avoid single-points-of-failure, where only one resource has a needed skill to perform a particular type of work. One trend is to make use of what are called generalizing specialists, who have a core competency but have general skills in other areas that can be leveraged as needed by the team to support its objectives.

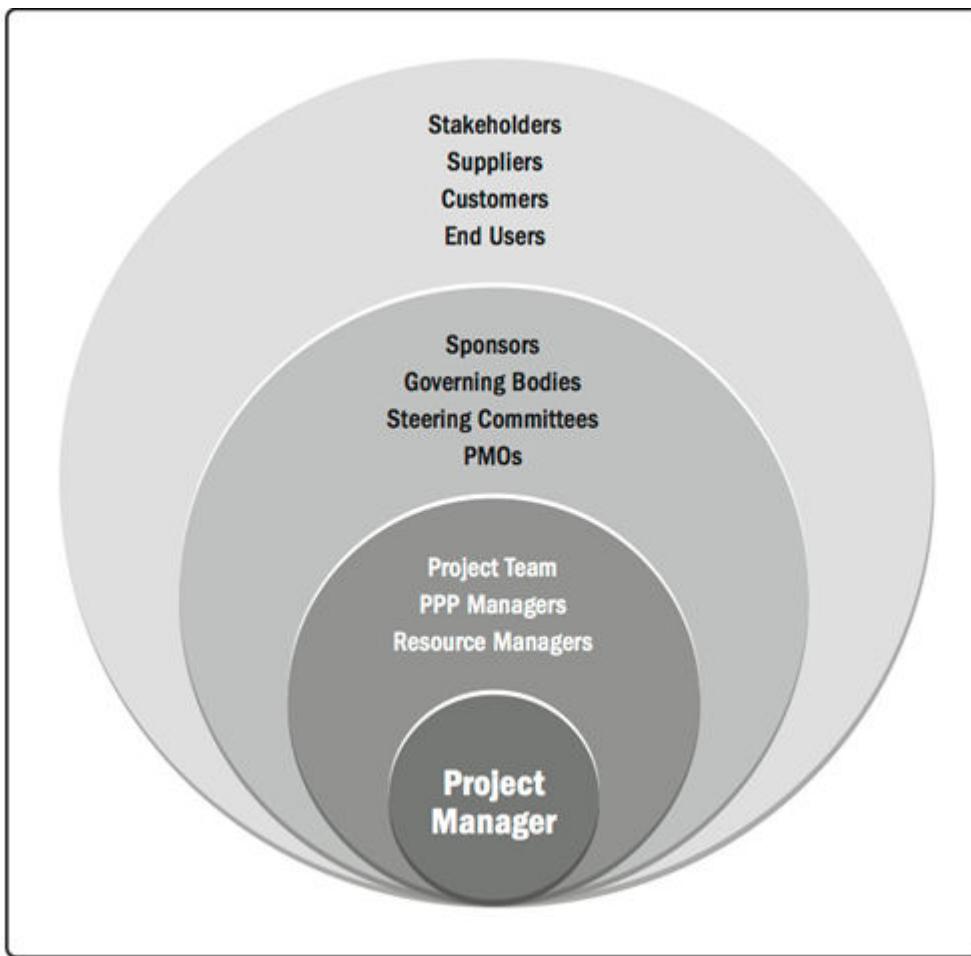
In addition to the team members themselves, you will need to identify the other physical supports that the team members will require to be able to perform (equipment, access rights, etc.). The Plan Resource Management process encompasses both planning for the team members and for the physical resources those team members will require to perform.

## Project Stakeholders

Stakeholders for a project, as the name implies, have a stake in the project and its deliverables. The Project Manager needs to be able to identify the stakeholders, plan stakeholder engagement, manage the stakeholders, and monitor the stakeholder engagement.

A **stakeholder\*** is an individual, group, or organization that may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project, program, or portfolio.

Stakeholders may or may not be actively involved in project work and could affect or be affected by a decision, an activity, or an outcome of a project. Stakeholders take on a variety of roles and responsibilities on a project, and can include members of the project team, customers, end users, and many other individuals and groups of people. Managing stakeholders' influence and engagement throughout the project will have a large impact on a project's outcomes and success.



*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Page 551.*

**Figure 1–1: Stakeholders and the project.**

Stakeholders may have competing interests, needs, priorities, and opinions. They may have conflicting visions for the project's outcomes, so managing them carefully is an important part of the project manager's role. Project managers must identify the internal and external stakeholders of a project as early as possible, learn what their needs are, and secure their participation in defining the project's parameters and success criteria. Although it may be difficult to negotiate a consensus early in the project, it is far less painful and costly than getting to the end of the project only to learn that someone's needs were not met or were misunderstood.

## Stakeholder Identification

Stakeholders should be identified early in the project so that their needs and expectations can be met. They are also the people best able to help the project succeed, as they have a specific interest in the project objectives and its success. It is important to identify project stakeholders regularly and to analyze and document relevant information regarding their interest, involvement, interdependencies, influence, and potential impact on project success.

The identified stakeholder list should be reviewed and modified as needed throughout the project as changes occur. Documents like the Business Case and Benefits Management Plan should describe lists of the stakeholders.

Once created, the communications management plan and stakeholder engagement plans should describe the stakeholders and the planned engagement model. As the project progresses, Change Logs, Issue Logs, or Requirements documents can also unearth additional stakeholders. The

stakeholders lists may be affected by different organizational environment factors. Existing templates and stakeholder lists from previous projects may be useful.

## Skills List

There are a variety of **interpersonal skills**\* that each member of the project team will need to establish and maintain relationships with other people. Although all of the skills are relevant to you and your project team, some of the skills will be more germane at particular times of the project. Regardless of when you use these skills, it's important for you to understand them and how they can be used.

The following table provides a description of skills that will be helpful as you build the project team.

<b>Item</b>	<b>Description</b>
<b>Conflict management</b>	Conflict management involves intervening before a negative result from a conflict can occur. Successfully managing conflicts throughout a project's life cycle can be challenging. As a project manager, you will be the point person for any conflict that arises. You will determine how it will be handled. The goal is to try to increase any positive outcomes of a conflict so it can be viewed as a learning experience.
<b>Cultural awareness</b>	Understanding and being aware of the different cultural viewpoints and beliefs of the individuals on your project team can help reduce miscommunication and misunderstandings.
<b>Decision making</b>	Decision making can be a very important skill to use when working with others to come up with a result. In the business world, decisions are usually produced by a group of individuals. Demonstrating that you have the ability to make decisions will show that you can be a strong advocate in any decision-making process, meeting, or group. Decision making can be broken up into a series of phases, including: <ul style="list-style-type: none"> <li>• Defining the problem</li> <li>• Generating potential solutions</li> <li>• Planning for solution actions</li> <li>• Putting ideas into action</li> <li>• Planning for solution evaluations</li> <li>• Evaluating the outcomes and processes</li> </ul>
<b>Facilitation</b>	Facilitation techniques are skills used to lead or guide an assembled group toward a successful conclusion such as making a decision or finding a solution.
<b>Leadership</b>	The ability to step up and guide others to achieve results. Leadership abilities are gained through experience, building relationships, and taking on initiatives.
Meeting management	The ability to conduct productive meetings efficiently and effectively will be useful when gathering the necessary information for developing the project charter.
<b>Negotiation</b>	Negotiation is an approach used by more than one individual to come to an agreement or resolution. Being able to successfully negotiate will have a huge impact on how you resolve issues and conflicts that arise during the course of a project.

Item	Description
Networking	The interaction between people to expand their knowledge about business topics. It can take place in an organization, industry, or professional environment.
Observation/conversation	A technique that involves watching individuals as they perform their daily tasks in an effort to obtain first-hand knowledge of a situation or how a process is going.
<b>Servant leadership</b>	A type of leadership used in agile and other types of projects, which encourages the self-definition, self-discovery, and self-awareness of team members by listening, <i>coaching</i> , and providing an environment which allows them to grow. Servant leaders facilitate the team's work, remove any work barriers, educate stakeholders on the processes being followed, and celebrate the team's accomplishments.
<b>Team building</b>	Building a strong team can be challenging, but through continuous support and working collaboratively, you can enable a team to work together to solve problems, diffuse interpersonal issues, share information, and tackle project objectives as a unified force. The team mentality is extremely effective and can be a powerful tool in achieving project objectives.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 80

## The RACI Chart

A **RACI chart\*** is a common type of **Responsibility Assignment Matrix (RAM)** that uses responsible, accountable, consult, and inform statuses to define the involvement of stakeholders in project activities. RACI stands for Responsible, Accountable, Consulted, and Informed. The RACI matrix helps identify who is responsible for making decisions and how the people responsible are supported. RACI is generally used to provide clarity on the roles and responsibilities assigned to each project team member. The RACI chart is also called a RASI chart, where "S" stands for "Support."

	Project Manager	Engineering Manager	Quality Assurance Manager	Purchasing Manager	Manufacturing Manager
Create blueprints	A	R	C		C
Manufacture circuit board	I	C	C		A
Test circuit board	I	R	A		R
Order components	C	C	I	A	I
Assemble	I		C		A

R = Responsible    A = Accountable    C = Consulted    I = Informed

**Figure 1–2: A sample RACI chart.**

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 317.



**Note:** For more information, check out the Spotlight on **RACI Chart Creation** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Team Skill Appraisal

Assessments of the team members and the team holistically enable the team to identify its strengths and weaknesses, and to help assess opportunities for improvement, build trust, and establish communications mechanisms. These may help to better identify:

- Team preferences
- Aspirations
- Information processing and organization
- Decision making processes
- Interactions with other team members

## Pre-Assignment Tools

There are a number of tools and techniques to support skills appraisals. These may include:

- Attitudinal surveys
- Specific assessments
- Structured interviews
- Ability tests
- Focus groups

## Diversity and Inclusion

Project managers are often asked to work on projects with a global scope, or at least a broadly diverse project team, with members from different cultural backgrounds, industry experiences, or who even speak in different languages. The project team may adopt a project "team language" that is different from their native language. The project manager should seek to create an environment that takes advantage of this diversity and builds a team climate of mutual trust. Team development objectives might include:

- Improving team knowledge and skills to reduce cost and time and improve quality.
- Improving trust to raise team morale, reduce conflict, and improve teamwork.
- Creating a collaborative culture to improve individual and team performance and facilitate cross-training and mentoring.
- Empowering the team to participate in decision making and own the solutions they create.



**Note:** Tuckman's Stages of Group Development is detailed in the lesson titled "Keeping the Team on Track."

## Resource Management Plan

Part of your project team's resource management plan will include a resource schedule. The **Resource Management Plan**\* is a component of the project management plan that describes how project resources are acquired, allocated, monitored, and controlled. The resource management plan might encompass the following:

- Identification of resources
- Acquisition of resources
- Roles and responsibilities
  - Roles—The function of the person in the project.

- Authority—Rights to use resources, make decisions, accept deliverables, etc.
- Responsibility—Assigned duties to be performed.
- Competence—Skills and capacities required to complete the desired activities.
- Project Organization Chart—Defines the project team members and their reporting relationships.
- **Team resource management**—Guidance on the lifecycle of the team resources; how they are defined, staffed, managed, and eventually released.
- Training strategies and requirements.
- Team development methods to be used.
- Resource controls for the management of physical resources to support the team.
- Recognition Plan—How team members are rewarded and recognized.



**Note:** In the *PMBOK Guide - Sixth Edition*, resource management was revised to include both types of resources: physical and team (or human).

As the project manager and team estimate activity resources, they will produce a **resource calendar** that identifies the following:

- Working days, shifts, hours, weekends, and holidays
- Physical resource availability
- When and for how long resources will be available during the project
- Attributes such as skills, experience levels, and geographies

## Virtual Teams

Many project teams now are virtual teams with multiple members that are not co-located. **Virtual teams**\* are defined as a group of people with a shared goal who fulfill their roles with little or no time spent meeting face-to-face. This creates opportunities for finding team members with greater skills, at lower costs, and allows a project to forego relocation expenses.

Virtualization does create challenges for managing communications and enabling effective team performance. Virtual teams can leverage technology solutions to facilitate face-to-face communications, store and share files, create threaded discussions and wikis, and manage the team's calendar. Agile tools allow for the publishing and sharing of team task boards, burndown charts, and other information radiators to improve visibility and promote collaboration. **Information radiator** is the generic term for visual displays that are placed in a highly visible location so everyone can quickly see the latest information.

**Virtual teams**\* are groups of people with a shared goal who fulfill their roles with little or no time spent meeting face-to-face. Often, members of a virtual team are distributed across multiple locations. Some virtual teams have occasional physical meetings, while others may never meet face-to-face. Virtual team building is more difficult, for a number of reasons.

- Bonding and team identity can be hard to create when team members are geographically dispersed because finding ways to provide a sense of team spirit and cooperation may be difficult.
- Communication and information sharing needs to rely on various forms of technology because teams cannot meet face-to-face. However, managing electronic collaboration so that everyone on the team can reliably transmit and access information from one another can be challenging.
- Because roles, reporting, and performance can be harder to track on a dispersed team, individual contributions may be overlooked.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 333.



**Note:** To further explore how to manage virtual teams, you can access the Spotlight on **Virtual Teams** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Project Responsibilities within the Team

Defining the responsibilities within the project team depends on a number of factors. Some teams explicitly define and delegate individual and team responsibilities, where others may self-organize and the members of the team determine who will perform which work.

Identifying a suitable resource to perform a responsibility might be based on the following:

- **Experience:** Does the team member have the relevant experience to carry out the activity?
- **Knowledge:** Does the team member have relevant information about the customer need, prior implementations, and the nuances of this project?
- **Skills:** Does the team member have the relevant skills?
- **Attitude:** Does the team member have the ability to collaborate with the other team members?
- **International factors:** Consider team member location, time zone, and communications needs.

During a new team formation, you should have a discussion with the team about the project's goals and objectives, the responsibilities of the project team, and the expected alignment of the responsibilities against team roles and skills.

In a more agile approach, the teams will self-organize by assessing the work requirements and deciding how and who will perform the work to help meet the team's objectives. More traditional approaches may involve assignments of work activities to specific team members as part of an overall work breakdown structure. Open communications and effective collaboration are critical regardless of the specific project management method chosen.

## Rates

The project manager is responsible for project budget and disbursements. Resource requirements should be met using the most cost-effective resource given the needs of the project, resource availability, and other factors.

## Resource Assignment

The project manager is expected to document the team members assigned to the project, their roles and responsibilities, and may include a project team directory, project organization charts, and project schedules.

These assignments make up an important part of the project management plan.

## Guidelines to Continuously Assess and Refresh Team Skills to Meet Project Needs



**Note:** All of the Guidelines for this lesson are available as checklists from the **Checklist** tile on the CHOICE Course screen.

When a project first commences, the project manager must have a certain level of awareness of the knowledge, skills, attributes, and experience needed by the project team to carry out the work and produce the project's deliverables.

As the project progresses, the project team and the project manager should gain a better understanding of customer needs and team capabilities to identify gaps in the team's skill set.

The project manager needs to coordinate frequent checks for these gaps, and identify appropriate mechanisms to close those gaps. These may include:

- The identification of new resources needed.
- Training requirements to enable the team to develop the missing skill sets.
- Identification of knowledge gaps that require additional engagement with the customer to assess needs and modify plans and deliverables as needed.

## Guidelines to Maintain Team Knowledge Transfer

A major project challenge is managing knowledge sharing among team members, especially on virtual teams.

- A core objective is to facilitate collaboration and promote visibility among the team.
- As part of developing a team charter, the team should determine methods for facilitating knowledge sharing, including frequency of updates, version control, and supporting tools and the team's agreed approach to their utilization.
- Agile practices refer to these as information radiators, with the goal being to create more seamless visibility into project status across the stakeholder community.

## ACTIVITY 1–1

### Building a Team

#### Scenario

You are the newly assigned project manager in charge of a major software migration, which will require the updating of more than 7,000 laptops across employees in five states. Due to unique circumstances regarding this particular migration, a technician will need to visit each machine, configure settings, download and install updates, and run a series of validation exercises to confirm a successful migration. One of the first things you'll need to do is identify the team members.

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1. Brainstorm the key skills that you will want in the members of this team.
  
  2. You want to be able to validate that a proposed team member has the key skills you are looking for. What types of techniques might you be able to use to assess whether the team member would be a good fit?
  
  3. You wish to establish a resource schedule for the project. What types of information should you include?
-

# TOPIC B

## Define Team Ground Rules

In order for the team to perform effectively, they need to collectively define project ground rules based on context, such as organizational rules and team dynamics.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Collectively define ground rules.
- Communicate ground rules with team members. (ECO 1.12.1)
- Establish an environment that fosters adherence to ground rules. (ECO 1.12.2)
- Manage and rectify ground rule violations. (ECO 1.12.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<i>Deliverables</i>	<i>Tools</i>
Team charter	Negotiation skills
Team norms	Conflict management
	Brainstorming
	Ethics

### Team Charter

The **team charter** is a document that enables the team to establish its values, agreements, and practices as it performs its work together. A good team charter should include:

- The team's shared values.
- Guidelines for team communications and the use of tools.
- How the team makes decisions.
- How the team resolves conflicts when disagreements arise.
- How and when the team meets.
- Other team agreements (such as shared hours, improvement activities).

Ideally the charter should be produced by the team, or at least with the team's active participation. The team charter can and should be reviewed and updated as needed on a periodic basis.

### Ground Rules

Ground rules are defined as setting clear expectations regarding the code of conduct for team members. Ground rules include all actions that are considered acceptable and unacceptable in the project management context.

Part of the purpose of a team charter is to produce a set of shared ground rules about the expected behaviors of the team members. By committing to a clearly defined set of ground rules, the team sets expectations for performance, decreases the risk of confusion, and improves performance. High performance teams need to have visibility into each other's work, clear rules on expectations and communications, and how to handle conflicts among the team members when they inevitably occur. By establishing clear ground rules up front, the team sets expectations for itself, and provides itself a tool to maintain and norm its performance.

## An Environment that Fosters Adherence to Ground Rules

The project manager seeks to create an environment where the teams can perform effectively and build trust. Ground rules contribute to these ends by enabling the team to take ownership of its rules, set expectations for itself around how the team will operate together, and establish effective mechanisms to handle conflicts that will inevitably occur. Key objectives here include facilitating effective team collaboration, promoting visibility of work and progress, and enabling the team to self-organize and self-manage as much as practicable.

## Negotiation Skills

Negotiation describes discussion that a team might have aimed at reaching agreement. In any performing team, there will be negotiations required, on roles and responsibilities, priorities, assignments, and deliverables. All team members should develop good skills in negotiation among themselves and with other stakeholders as required.

## Communication Between Internal and External Team Members

The team will need to have regular communications with stakeholders outside the team. In many cases, the project team may have dependencies with other external teams, and collaboration will be required in order to ensure effective expectations-management among the various stakeholders. Part of an effective team charter may include communications protocols inside the team (team meetings, shared calendars, etc.) as well as periodic communication with external stakeholders to generate feedback, manage dependencies, and ensure alignment.

## Team Norms

The goal of the team charter is to establish team norms, or expected behaviors of the team. By taking the time to establish these norms at the beginning of the project, the team is more likely to be able to handle challenges as the project progresses. These norms should include:

- Meetings
- Communications approaches
- Managing conflict
- Shared values
- Decision-making

## Conflict Management

Inevitably, teams will come into conflict over any number of issues: scheduling, responsibilities, estimates of effort, and many other potential issues. One of the more compelling benefits of a team charter is the ability to anticipate that these situations will occur during the project, and to establish mechanisms for the team up front for how they will address these in a way that allows the team to resolve its issues and proceed. While teams would prefer to make decisions by consensus, this doesn't always happen, and the team should be prepared to acknowledge when disagreements occur and how they will work through them.

Conflict management is the application of one or more strategies for dealing with disagreements that may be detrimental to team performance. Effective conflict management can lead to improved understanding, performance, and productivity. Conversely, ineffective or nonexistent conflict management can lead to destructive behavior, animosity, poor performance, and reduced productivity—all of which threaten successful completion of the project's deliverables. There are certain conflict resolution methods and the need to follow a particular method includes the intensity and importance of the conflict, the time given to resolve the conflict, the positions of the conflicting parties, and the motivation to resolve conflicts on a short-term or long-term basis.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 348-349.

## Brainstorming

Many techniques can be useful for helping a team identify and prioritize options for how to address ground rules issues. A common technique is brainstorming, where a facilitator works with the team to identify a series of potential solutions to a given problem, and then performs various types of analysis to assist the team in selecting the most appropriate alternatives.

## Code of Ethics and Professional Conduct

The PMI® *Code of Ethics and Professional Conduct* describes the ethical and professional behavior expectations of any individual working as a project management professional. There are many values that PMI expects a project manager to have while interacting with anyone related to a project. The following have been identified as important: responsibility, respect, fairness, and honesty.



**Note:** For more information and to read the official document, go to <https://www.pmi.org/-/media/pmi/documents/public/pdf/ethics/pmi-code-of-ethics.pdf>.

Teams should adopt a similar set of ethics that sets expectations among the team members for honesty, integrity, and commitment to supporting the team's objectives in an ethical manner.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 3.

## Guidelines to Manage and Rectify Ground Rule Violations

When the team establishes its charter, it sets expectations for the ground rules about how the team is to operate, and what methods will be used to handle conflicts that occur.

- If there are violations of the team's ground rules, the team and the project manager should assess opportunities for remediation, or if the violation is so serious as to contemplate the removal and replacement of an offending team member.
- The team should continue to focus on its core values in these circumstances, including accountability, shared expectations, and transparency where appropriate.

## ACTIVITY 1–2

### Defining Team Ground Rules

#### Scenario

You are forming the team for the migration project, and you want to help the team begin working through establishing its norms and defining how they will work together to accomplish the project objectives. You organize an initial team meeting.

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1. The team decides it should produce a team charter, but is unsure of exactly what it should cover. What are some of the key areas that a good team charter should include?
  
  2. The team realizes that it will regularly require interaction with other stakeholders who are not part of the team. What are some of the key considerations for interaction with them?
  
  3. Many of the team members have had poor previous experiences working in project teams due to lack of trust, politics, and lack of a healthy team culture. How can you as the project manager create a healthy environment for your teams to perform successfully?
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# TOPIC C

## Negotiate Project Agreements

Now that the team has been assembled, you might need to facilitate negotiations to reach an agreement about the project objectives.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Analyze the bounds of the negotiations for agreement. (ECO 1.8.1)
- Assess priorities and determine ultimate objective(s). (ECO 1.8.2)
- Verify objective(s) of the agreement is met. (ECO 1.8.3)
- Participate in agreement negotiations. (ECO 1.8.4)
- Determine a negotiation strategy (ECO 1.8.5)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Service Level Agreement	Negotiation skills
Performance report	Expert judgment
Resource calendars	Lessons learned
Go-Live Blackouts	

### Negotiations

Negotiations are discussions that are aimed at reaching an agreement. As part of an external procurement, it may specify the rights, obligations, and terms of a purchase in order to facilitate a mutual agreement prior to signing a contract. While an external negotiation should be led by a member of the procurement team authorized to sign contracts, the project manager and project team members may be present to assist as needed.

Negotiations exist to ensure mutual understanding and agreement prior to entering a contract, which will define legal obligations between the parties. These agreement documents will vary but often include:

- A statement of work or major deliverables
- A schedule with milestones and dates
- Performance reporting expectations
- Pricing and payment terms
- Inspection, quality requirements, and acceptance criteria
- Warranty and future support
- Incentives or Penalties
- Insurance and Performance Bonds
- Subcontractor approvals
- Terms and Conditions
- Change Request handling
- Termination clauses and Dispute Resolution

If the project is part of a larger program, the structure of the agreement should reference the program goals, objectives, and desired outcomes, and the role of this project as part of the larger program context. It may inherit many of the components from the larger program agreements.

## Service Level Agreements

**Service Level Agreements (SLAs)\*** are defined as a contract between a service provider (internal or external) and the end user that describes the level of service expected from the service provider. These can incorporate expectations for service utility (functional performance) and service warranty (including availability, speed, security, continuity, and other usability expectations).

SLAs govern a service after a project is delivered and define the expected level of performance. Ideally, effective SLAs should reflect business-driven metrics, including such things as transaction processing, customer satisfaction, etc.

## Prioritization Techniques to Determine Objectives

One of the important features in agile approaches is the maintenance and management of the **product backlog**. The product backlog is owned by the customer—in Scrum through the role of the Product Owner—and reflects not only a list of desired capabilities, written as User Stories, but also that the list is prioritized, with the highest business value and highest business risk things listed first. Project managers may be asked to help the customer prioritize this list, and may use a number of techniques to assist them in this work.

Prioritization techniques include:

- **Kano model**—Identifying certain features or capabilities as Basic, Performance, or Excitement helps in the prioritization of which capabilities are truly must-have, what features may create meaningful competitive differentiators, etc.
- **MoSCoW (MSCW) analysis**—Categorize features as Must Have, Should Have, Could Have, and Won’t Have (for now). Helps customers organize their thinking about what are truly must-have capabilities, and enables identification of a Minimum Viable Product (MVP).
- **Paired Comparison Analysis**—Looking at each pair of stories and prioritizing one over the others.
- **100 Points Method**—Each stakeholder is given 100 points and can multi-vote their points across all the stories, which then give a weighted priority when combined.

## Performance Report

Part of the negotiation is defining how project performance will be captured and reported. Example metrics might include:

- Percentage of work completed
- Quality and technical performance metrics
- Start and finish of scheduled activities
- Change requests
- Defects
- Actual costs and durations

**Work performance data\*** is defined as the raw observations and measurements identified during activities being performed to carry out the project work. Work performance data is integrated and contextualized in reports that should:

- Generate decisions
- Raise issues, actions, and awareness

Agile projects may also include stories completed and accepted, progress through a product backlog, and team delivery of stories against iteration plans.

## Expert Judgment

Many of the project management processes use ***expert judgment*** as a key input. As part of negotiating a project agreement, the project manager needs to identify relevant subject matter expertise that can be used during the project to help assess needs, identify potential solutions and approaches, and ensure understanding of the larger project context.

## Negotiation Strategy

Negotiations for the exact parameters of a contract are generally driven by the procurement manager, and the project manager and project teams may be engaged as part of the negotiations. In a traditional project approach, one important objective is a clear designation of the project's intended deliverables and how they will be measured and compensated. In a more agile approach, the exact deliverables will be variable as the customer modifies, adds, and reprioritizes items in their product backlog, and so clearly delineated ways to ensure agreed performance levels must be defined.

## Resource Calendars

The ***resource calendar*** identifies working days, shifts, and when specific resources are made available to the project. The calendar will be used to determine which resources (people, equipment, material, etc.) are available during a planned activity period and should be taken into account when estimating project activities. The calendar may also identify key resource attributes such as skills and experience levels to ascertain if the resources with the proper skills to carry out certain types of work will be available during different aspects of the project.

## Lessons Learned

An effective project team should regularly review its performance and identify lessons learned and identify specific improvements that will increase the team's overall efficiency and effectiveness. The ***lessons-learned register*\*** is a project document used to record knowledge gained during a project so that it can be used in the current project and entered into the lessons learned repository. Having this register can improve the team's project performance and potentially that of other teams, and other projects as well. Agile teams schedule a ceremony called a retrospective at the end of each iteration to identify potential issues, identify potential solutions, and improve the processes the team uses to improve its overall performance.

## Go Live Black-Out Times

When a project's deliverables are handed over for implementation, the organization often establishes a set of black-out times where other changes to their systems are suspended to reduce risks as a solution is released to customers.

If the project is run in a traditional fashion, go live will occur at the end of the project timeline, and black-out times may be negotiated in advance based on the overall project schedule and timeline.

In an agile approach, there may be a number of releases of aspects of the solution over the project's timeline, and black-out times (if needed) will be negotiated as the project approaches a release threshold.

## Guidelines to Participate in Negotiations

While negotiations of a contract are generally handled by the procurement manager, project managers and project team members will often be engaged throughout the negotiations process. At various points the project team may be able to suggest or identify:

- Deliverables and milestones
- Risks and issues
- Expert judgment about problem definition and solution approaches
- Practices for how the project will be operated (traditional waterfall, Agile, etc.)
- Resource requirements

## Project Agreement Objectives

An important part of the project agreement is clarity on how the respective parties will report on and verify that the objectives of the project are met.

In a traditional project, each deliverable is identified and objective acceptance criteria for each are identified.

In an agile project, since the actual deliverables will vary as the product backlog is added to, reprioritized, and so forth, each story needs to have clearly defined acceptance criteria approved by the customer. The project may also specify a Definition of Done for the project, releases, iterations, and user stories.

# ACTIVITY 1–3

## Negotiating Project Agreements

### Scenario

You have been asked to help negotiate terms and conditions for creating a website for a client. While they have outlined a few of the basic needs of the project, they have yet to formalize any of the core deliverables.

1. What are the main sections of a deliverables agreement? What are the key components you would expect to see in each section?
  
2. The client has a long list of requirements, and you wish to help them prioritize their needs to help identify a Minimum Viable Product and to provide a basis for organizing the work in a backlog. What are some of the techniques you could use to help them?
  
3. The customer was hoping that the project team would get their requirements for the website, go and build it, and then bring it back ready to go when it's finished. You counsel them that getting much more frequent feedback is critical to ensure customer satisfaction and to help identify and prioritize different requirements that may emerge during the project. What techniques could the team use to maintain effective customer engagement?

# TOPIC D

## Empower Team Members and Stakeholders

Project managers need to get a feel for their teams, identify and organize around team strengths, and set up systems to ensure the teams are accountable for their tasks.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Organize around team strengths. (ECO 1.4.1)
- Support team task accountability. (ECO 1.4.2)
- Evaluate demonstration of task accountability. (ECO 1.4.3)
- Determine and bestow level(s) of decision-making authority. (ECO 1.4.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<i>Deliverables</i>	<i>Tools</i>
Decisions	Team decision-making tools
Estimates	Fist of Five
	Roman voting
	Polling
	Planning poker
	Dot voting
	Retrospective

### Team Strengths

All teams require certain skills and competences in order to carry out their work and produce their deliverables. When forming teams, it is critical to understand the needed competencies and to ensure the team members have those. As teams progress, they develop key strengths that the project manager can leverage to improve overall team performance, as well as challenges that the team will need to identify and overcome for better performance.

As part of developing an overall view of project risks, a technique like a ***SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis*** might be used to identify team strengths and weaknesses that may be addressed during the project.



**Figure 1–3: SWOT analysis.**

## Team Decision-Making Tools

All project teams are tasked with making decisions about activities, risks, estimates, and many other challenges. Part of forming a team is identifying how the team will make decisions together, and how they will handle conflict resolution when disagreements arise. Keep in mind that disagreements and conflicts will present themselves; it's just a matter of when.

As the initial Team Charter is produced, the team needs to address decision making and conflict resolution. For example, it may be highly desirable to seek consensus, but the team may want to identify how they will respond when consensus can't be reached; for example, by deciding in advance to take the highest estimate if there are persistent disagreements.

## Estimates

Estimating tasks should be performed by the people doing the work; they are the ones closest to it, and have the best knowledge of the risks, level of effort, and potential pitfalls associated with the task.

Traditional project managers use hours of effort to identify the length of time a task will take, often with some caveats. Three-point estimates, which estimate the best case, normal case, and worst case timescales, might be used to provide a clearer sense of the level of uncertainty and to set expectations appropriately.

Agile projects tend to avoid using absolute time estimates as the level of uncertainty in the work is often high. Instead, a relative measure like Story Point estimating is used.

Story Point estimating can be helpful as an integrated assessment of risk, innovation, and pure effort involved in carrying out a particular task because it allows for not knowing everything that's needed to know to provide a precise time estimate. In addition, this technique allows the team to have a useful benchmark for the overall level of effort and the customer to have a meaningful sense of how much work the team can perform in an iteration.

## Team Task Accountability

Effective project managers generally encourage the team members themselves to "self-organize" for them to determine the work that must be done in order to meet an objective, to identify how to perform that work, and who should perform it.

While there are certain natural dependencies that may drive the order of performing some of the work, many of the other tasks can be performed in a number of orders. One of the benefits of agile approaches is that the team makes commitments to perform certain work and deliver certain results within a given iteration, and the customer and project manager empower the team to determine how and when the work is performed and by whom.

Regardless, it is critical to have visibility on who is performing which tasks and when to ensure effective collaboration and use of team resources. This may be tracked and managed as part of a large project schedule or more simply on team task boards that facilitate collaboration and promote visibility across the team.

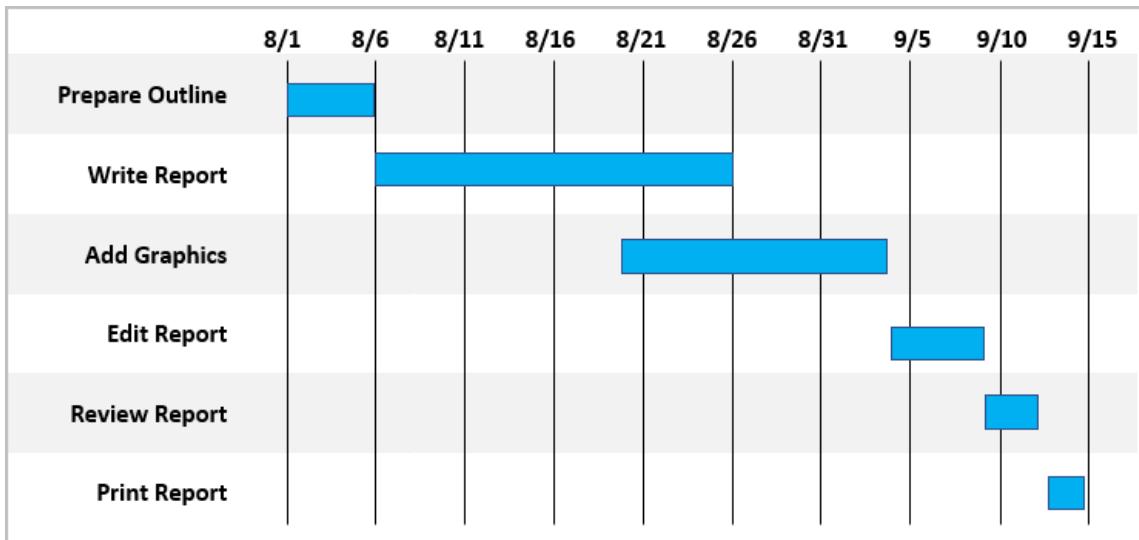


Figure 1–4: A sample Gantt chart.

## Guidelines to Evaluate Demonstration of Task Accountability

The project manager should determine how task accountability will be tracked and managed. As part of developing a Work Breakdown Structure (WBS), tasks to produce the deliverables should be identified, preferably by the team members who will be performing the work. When a WBS dictionary (or work package) is produced, each of the relevant tasks and assignees to produce the deliverable is identified, tracked, and managed.

In a more agile approach, task identification and tracking is generally handled by the team themselves as part of iteration planning. Generally, each of the committed user stories for that iteration are decomposed into the required tasks, which then are tracked and managed by the team using an information radiator like a Kanban or task board. As work is pulled in for execution, the team member takes ownership of the tasks and works to complete them. The entire team is accountable for ensuring that all of the work required in the iteration is performed to deliver the committed stories for that iteration.

## Retrospective

Continual improvement has long been an objective in all aspects of business, but much of the time operational work, firefighting, and other reactive activities have crowded out the opportunity for teams to seek real improvements in their processes and practices. Agile practices like Scrum have popularized a ceremony called a Retrospective, which is time specifically set aside for the team to reflect on its performance and practices, identify and solve problems, and identify specific proposed improvements for how the team works together.

There are literally hundreds of different methods and techniques for running a retrospective, but they generally follow a model like this.

- **Set the Stage**—Do some kind of check-in activities to engage the team.
- **Gather and Share Data**— Team Performance metrics, Earned Value Analysis, etc.
- **Generate Insights**—What’s working? Where are challenges? Problem Analysis.
- **Make Decisions**—Agree on 1-2 improvements/changes to try in the subsequent iteration.
- **Close**—New Information, Appreciation, and Thank-Yous.

## Guidelines to Determine and Bestow Levels of Decision-Making Authority

In general, it is good management practice for decisions to be made at the “right” level. Therefore, project managers should defer appropriate decisions to the team, while maintaining control and visibility into the overall plan and progress.

- Tasks should be identified, planned, and managed as much as possible by the team members themselves. They are the ones closest to the work and will have the best visibility into what needs to be done to perform the work and deliver the needed results.
- Estimates should be done by the teams performing the work. Especially in teams where a number of different people are sharing the overall workload, not every team member can perform a certain amount of work in the same time. Using relative estimates helps the team focus on the rough overall level of work without getting too precise on the exact number of hours it will take; hour estimates may differ widely based on risk, the level of innovation required, and who will actually be performing that work and their relative skills and experience.
- Empower the teams to drive their own improvement. Techniques like retrospectives emphasize that it is important for project success for the teams to set aside time for their own continual improvement. The efficiencies teams develop by doing continual improvement far outweigh the time set aside to do it.

# ACTIVITY 1–4

## Empowering Team Members and Stakeholders

## Scenario

The project to produce a website is staffed by an experienced team, but the individual team members have not worked together on a project before.

1. During team formation, the team may want to discuss how they will make decisions, and how they may need to deal with conflicts along the way. Describe how you would facilitate this discussion, and how you might capture the team's decisions in the team charter.
  2. The team wishes to use Agile Story Points to estimate effort. Given that this is a new team, how would you help them to facilitate benchmarking so they can estimate effectively?
  3. What tools can the project team use to facilitate collaboration and promote visibility?
  4. Your team plans to have a retrospective at the end of each iteration to identify potential improvements in how the team is collaborating. While there are many, many techniques for running retrospectives, what are some of the key activities common in many retrospectives?

# TOPIC E

## Train Team Members and Stakeholders

Another key objective of the project manager is to make sure team members and stakeholders are adequately trained. Team members may need to be trained in different aspects of the project, the customer environment, and the solution approach. Users, customers, and other stakeholders will require training and other knowledge transfer to ensure successful onboarding of the solution, and this is a critical component of the overall organizational change management work required to ensure customer readiness.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Determine required competencies and elements of training. (ECO 1.5.1)
- Determine training options based on training needs. (ECO 1.5.2)
- Allocate resources for training. (ECO 1.5.3)
- Ensure training occurs.
- Measure training outcomes. (ECO 1.5.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Training and mentoring plan	Training gap analysis
Training cost estimates	Training
Training calendar	Pairing and mentoring
Training assessment	
Certifications	

### Required Competencies

The first aspect of developing and executing a training plan is to identify the required competencies that the stakeholder will require. This may consist of knowledge, skills, and other attributes that will be required to ensure that the customer is ready, willing, and able to use the solution to carry out customer work and achieve intended customer benefits.

Different families of stakeholders may have substantially different needs for training. Some will be direct users of the solution while others may be using the solution (or various reports or dashboards) to oversee the work.

Team members themselves may require specific training on the customer's business, culture, desired outcomes, and the project's context in order to prepare themselves to successfully contribute to the project's outcomes. Understanding the needed competencies is a prerequisite to considering what elements of training might need to be provided.

### Elements of Training

**Training** is an activity in which team members acquire new or enhanced skills, knowledge, or attitudes. Training may be provided to teams, small groups, or individuals and can cover management, technical, or administrative topics. It can range from a multi-day, formal workshop in

a classroom to a five-minute, informal on-the-job training demonstration at the employee's desk. It may be formulated to provide generic skills, or customized to provide a specific skill set that is unique to the project. Training should be made available to team members as soon as the need becomes apparent.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 342.

Training can be delivered in many ways. While not an exhaustive list, some training delivery models include:

- Instructor-led classroom
- Virtual classroom
- Self-paced e-learning
- Document reviews
- Interactive simulations
- On-the-job training

Not all stakeholders have the same learning needs, and the constraints of the project and access to the stakeholders may be important in driving which types of learning delivery models are most appropriate.

## Guidelines to Determine Required Competencies

To determine the required competencies and training needed, you need to answer the following questions:

- What knowledge will be required for this stakeholder to perform as expected with the new solution?
- What skills or hands-on experience are needed to learn and be able to demonstrate readiness to carry out work using the solution?
- What level of buy-in to the solution has been given by the stakeholder, and what aspects of the training need to be employed to help develop support for the solution?
- What modalities of training should be offered, and what are the relative costs of different approaches?

## Training and Mentoring Plan

An important part of the overall project plan and timeline is developing a training and mentoring plan. Because training should be done as close to the point of solution use as possible, careful planning should be done to ensure customer readiness to use the solution effectively. Scheduling will be critical to avoid delaying the overall solution deployment while making sure that the customer has the knowledge and skills required to use the new solution.

Your training and mentoring plan will include a number of the following areas. You may need others as needed for your specific project.

### Training Gap Analysis

Based on your project's stakeholder analysis, you will need to assess current skills, the needed skills based on the project's deliverables, and the changes this will make to customer workflows and roles. The results of the gap analysis should enable you to identify any missing knowledge, skills, or required attributes that may be subject to training and development to ensure stakeholder readiness.

### Training Needs

Virtually all projects result in changes to business processes, roles and responsibilities, and the knowledge, skills, and attributes that customer stakeholders will need in order to fully leverage the new capabilities. In addition, team members themselves may require training, for example, in order

to be brought up to speed on a project's current status, or to get a detailed understanding of the customer environment and culture and how to operate successfully in supporting the customer.

A training plan can be developed for team members who need to improve their competency levels or who may need to obtain certifications that will benefit the project. The plan should include discussion of the competencies required for the project, what competency gaps have been identified, and the training options that are available. It should also explain the resources required, how the training outcomes will be evaluated, and how/when competency gaps will be reassessed.

## Training Options

The following table describes some of the different vehicles you can use in supporting training delivery.

<b>Option</b>	<b>Description</b>
Virtual Instructor-led training	Live online instructor-led training through a virtual meeting or virtual training environment. Simulated hands-on labs are often made available this way as well.
Self-paced e-learning	E-learning content made available to the students online and generally consumed using a browser, which might include rich-media video, simulated lab exercises, etc. One of the benefits of a self-paced approach is scalability of the solution to a large number of potential students.
Document reviews	For certain types of simple knowledge transfer, sharing relevant documents may be sufficient.

## Training Cost Estimates

Costs associated with training project staff and customer stakeholders should be taken into account as part of the overall schedule and budget for the project. These costs may include:

- Content creation and editing costs
- Content hosting and delivery costs
- Instructional costs
- Courseware printing and distribution
- Venue costs (including potential use of equipment)
- Logistics costs (A/V, lunch, etc.)

## Training Calendar

As a subset to the overall project schedule, the project manager will need to publish and support a specific calendar of training dates and locations. The schedule will need to be published to the customer stakeholders and a mechanism created for registration, the sending of confirmation and reminder messages, and the ability to provide class rosters and capture signatures to confirm stakeholder attendance.

Training is often an activity taking place toward the end of your project timeline, or at the least prior to introduction of the initial Minimum Viable Product. Scheduling and delivery of training, as well as the preparation of the training content, is often close to (if not on) the project's critical path, so great care must be taken in managing the rollout of the training to avoid delaying the project's delivery timeline.

## Pairing and Mentoring

In many cases, initial training may not be sufficient to ensure that the required knowledge and skills are translated to the customer. In many cases, this can be alleviated by pairing customer stakeholders together, to enable them to reinforce one another as they are learning the skills. It may also be appropriate to offer more explicit mentoring support from an instructor or other subject matter expert to enable the customers to ask questions, provide feedback, and ensure their ability to transition the necessary skills.

To foster team building within a project team, a project manager might ask each of the veteran employees on the team to partner with a less experienced team member, offering coaching as needed and sharing knowledge, information, and expertise. Working collaboratively toward a shared goal is a great way for team members to help each other reach a higher level of performance.

While training focuses on building individual skills to be used in the present, mentoring helps develop well-rounded individuals for the future through long-term professional relationships between novice and experienced employees. These relationships can be informal, ad hoc ones created by the individuals themselves, or might be formally established by the organization, who intentionally pairs the participants.

## Baseline and Post-Training Assessments

You can measure the efficacy of training in helping to create the desired knowledge and skills in the stakeholders. One technique for doing this is baselining, where attendees are provided a pre-assessment to measure pre-existing skills, then a post-assessment after the training is completed to demonstrate the new levels of competence.

## Guidelines to Ensure Training Occurs

Scheduling and resourcing the training is only the first step. Some other actions might include:

- Create awareness among the stakeholders about available training.
- Be sure to create invitations to attend the training.
- Engage with customer management to obtain their buy-in and commitment for their employees to attend the training programs.
- When people register to attend the training, they should receive a registration confirmation notice and a reminder prior to the training event to ensure they have not forgotten.
- Rosters should be created for each delivery of the training, and signatures captured to confirm attendance and participation in any pre- or post-assessments.

## Certifications

In some cases it may be justifiable to have attendees gain, or attempt to gain, an industry certification as a demonstration of the knowledge and skills gained during the training. This may involve taking a hosted certification examination, which generally will test both a student's knowledge as well as certain developed skills. Many of these exams can be administered directly with the training, and others may require going to a test center to take the examination under the view of a proctor. Yet other exams are delivered online using a webcam-based proctor.

Industry credentials are more portable and may be more desirable for the certification holder as this demonstrates their knowledge and skills to a wider audience for future employment opportunities.

## Measure Training Outcomes

Training is ultimately measured in the ability of the stakeholders to perform the work needed and generate the intended results for their business. While methods such as post-assessments or certifications are useful in measuring the successful knowledge and skills transfer activities, highly

effective training outcome measures are often done in the workplace, where performance and use of the knowledge are assessed as the stakeholder performs the work, and where necessary remediation can be performed to support knowledge retention and business value achieved.

## ACTIVITY 1–5

### Training Team Members and Stakeholders

#### Scenario

Your project is to produce a software solution for a branch of the U.S. military. Each branch has a distinct culture, and as part of successful engagement with the client's stakeholders, team members need to be provided awareness training on the client's background, mission, culture, and expectations.

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1. What types of options do you have for producing effective onboarding training? How might you deliver it? How critical is it to provide this training early to the team?
  
  2. Training on the software solution needs to be offered to more than 200 customer stakeholders; fortunately, their needs are relatively similar, so only one set of training materials needs to be produced. The client has people at four sites, and will need to have hands-on practice in using the solution. What are some of the key areas of focus in planning this training initiative?
-

# TOPIC F

## Engage and Support Virtual Teams

Modern projects almost without fail create the need to work with and manage virtual teams. In this topic, you will look at how to stand up and help your virtual team become effective and high-performance, and to continually evaluate the effectiveness of virtual team member engagement.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Examine virtual team member needs. (ECO 1.11.1)
- Investigate alternatives for virtual team member engagement. (ECO 1.11.2)
- Implement options for virtual team member engagement. (ECO 1.11.3)
- Continually evaluate effectiveness of virtual team member engagement. (ECO 1.11.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Collaboration technology	Communication
Engagement assessments	Communication plan
Calendar tools	Variance analysis
	PM Powers

### Collaboration Technology

When many managers think about virtual teams, they quickly begin to think about the use of collaboration technologies. While technologies to enable team planning, collaboration, and communications will be important, they are not a substitute for good team planning activities true for any team. For example, the team will want to establish its team charter to lay out the following:

- Shared work hours
- How the team makes decisions
- How the team manages conflicts
- Core team values

The previous list is just some of the items that might be addressed in the team charter. Choices the team makes about team values, such as transparency, will have substantial implications for collaboration technology; not only which technologies the team uses, but how they use the tools together to achieve their ends.

There are a number of different collaboration tools common in projects with virtual teams, including:

- Shared task boards and burndown/burnup charts to promote visibility.
- Shared messaging and chat boards to enable quick ad hoc communications.
- Knowledge repositories to store shared documents.
- Video-conferencing tools to create more opportunity for face-to-face collaboration.

Any combination of these types of tools can be useful, if your team has decided how to use the tools to help the team promote visibility and enable collaboration.

## **Virtual Team Member Needs**

Virtual team members need what all team members need: a shared goal, a clear purpose, and clarity on their role and what is expected of them. Because the team is not co-located, project managers of virtual teams will spend a substantial amount of their time "knocking down virtual walls" to ensure the teams are able to effectively collaborate and operate as a team, and not just a series of isolated individuals.

## **Alternatives for Virtual Team Member Engagement**

Managing engagement with virtual team members requires persistence and a focus on good team dynamics, especially transparency, accountability, and active attention to effective communications. Teams have been demonstrated to communicate better face-to-face, and there is lots of evidence of the criticality of being able to assess body language and tone of voice to ensure that team members have bought into the approaches they are using together to solve problems. Investment in and active use of videoconferencing tools enable team meetings to more fully integrate all aspects of the team and to ensure that the team members are committed to their solution approaches.

Another key area is visibility into work and work status. Even a small team will have trouble aligning its work activities unless effective tools are implemented to collaborate and promote visibility. Many tools enable the use of Kanban-style boards to visualize the work to do, to track (and limit) work-in-progress, and to note when work activities are completed and objectives have been met. While the technologies can certainly support your team's endeavors, how the team uses the tools and how well the tools' use reflects the team's values and priorities is critical. For example, if the team doesn't commit to keeping the information on a task board current, it's always out of date, people can't make decisions or pull work based on what the board says, thus defeating a lot of the purpose.

## **Communication**

While it's trite to say that communications is key, it clearly is. Successful teams get to be successful by working together to execute work, solve problems, and produce solutions. In a virtual team, the need for effective communications is even greater due to the lack of opportunity for osmotic learning from just being around your other team members.

Part of an effective team charter is to make decisions as a team about how, when, and why you communicate with one another, and what the shared expectations are. This may include shared work hours for scheduling team meetings, how the team is expected to use and not use tools like threaded discussion groups, shared document repositories, and even webcams.

A team that has made a commitment to itself to manage communications effectively will experiment on how to use the tools in the most effective way; the emphasis must be on the results the team is getting. Good retrospectives often focus on specific ways the team can improve communication, collaboration, and the use of their tools to improve visibility.

## **Engagement Assessments**

When a team is first engaged, care should be taken to identify team members who will be able to successfully form a coherent working team and work together to achieve the team's objectives. While all teams need people with certain subject matter expertise and capabilities, effective teamwork, collaboration, and communications are disproportionately important in whether the team will be able to perform effectively.

As new members may join the team over time, the team itself will need to go through the process of re-forming, storming as necessary to produce a new set of team norms, and then begin the process of continual improvement as the team strives for greater efficiency and effectiveness.

## Communication Plan

In the same way the project manager establishes a communications plan for engaging with other project stakeholders, a communications plan for the team itself should be created and executed. This may include:

- When the team meets. Do they hold daily standup meetings? Grooming meetings to clean their backlogs? Sprint Planning meetings? Sprint Reviews? Retrospectives?
- How do team members update status on team task boards and/or burndown charts?
- How often do team members update their work status?
- What are the team's shared hours?
- What are their preferred communications approaches? Chat channels? Phone? E-mail? Shared task boards?

Effective project managers should plan for initial communications expectations for the team, and then encourage the team to adopt its own practices and experiment with ways to drive iterative improvements to their communications approaches. Again, the objective is effective collaboration and broad, accurate visibility across all of the relevant stakeholders.

## Conflict Management

Detailed in a later lesson, the Tuckman ladder describes a set of stages teams often go through as they find their way to higher performance. The Tuckman ladder stages includes: Forming, Storming, Norming, Performing, and eventually, Adjourning.

Effective teams have to go through these stages and may find themselves returning to one or more stages at different times in a project. In order to help a team become high-performing, members have to go through the stage of Storming in which people disagree on how best to handle certain problems and resolve their differences. This enables them to create a set of team norms that can help the team better manage itself as they execute the project. Conflicts on any good team are inevitable, especially if you have good people who are committed and doing their best. Strong, innovative people **will** disagree from time to time.

Effective team charters can help a project manager work with the team to anticipate and solve different types of problems. By anticipating situations where the team will likely have disagreements, you can make certain decisions in advance for how to handle conflicts when they arise. For example, disagreements tend to arise when estimating work, so you can decide to take the higher estimate when the team can't come to consensus.

## Guidelines to Implement Options for Virtual Team Member Engagement

Key guidelines for implementing effective virtual teams include:

- Focus on collaboration and team norms **before** focusing too much on tools. Have them figure out how and why they need to communicate and collaborate with one other, then look at how technologies and tools can help.
- Recognize that team formation in a virtual environment is difficult, so it's critical to reinforce the teams' mutual commitments, achievements, and opportunities.
- Virtual teams will require a significant amount of feedback and reinforcement of the team goals and objectives, or it will quickly devolve to individual behavior and performance instead of the team's shared goals.
- When possible, provide opportunities for the virtual team members to meet in person, build relationships, have fun together, and nurture their shared commitment to the project's goals.

## Calendar Tools

Shared calendars are available in many tools to help team members plan meetings, coordinate feedback, and improve visibility into project goals and activity status. In general, timeboxing meetings improve focus, encourage the team to set clear agendas and objectives, and help with keeping the work on track. As part of team formation, the team should make decisions about how best to manage its calendars with an overall goal of promoting visibility among the team and the other relevant stakeholders.

## Variance Analysis

**Variance**\* is defined as a quantifiable deviation, departure, or divergence away from a known baseline or expected value. The project manager may produce variance analysis of different kinds as the team carries out its work. This may include:

- Accuracy of team estimates
- Delivery in a sprint or by an established milestone
- Team performance against targets—perhaps measured by story points completed or successful burndown during an iteration.

Results of a variance analysis may be shared with the team as part of a retrospective, and may serve as the basis for problem solving, identification of lessons learned, and proposed experiments to improve team performance in subsequent iterations.

## Powers of a PM

Nowhere is the work of a project manager more critical than in coordinating the effort of a virtual team. Virtual teams must go through a formation stage like any other team, and will need to progress through some level of storming and norming to become a high-performance team. Because virtual teams are not co-located, there is always a risk that individual team members will become isolated from the rest of the team, and that the team itself will shy away from making real shared commitments together to instead focus on execution of activities. Statements such as "I did what I was supposed to do" demonstrate individuals focusing on their own accomplishments.

The cultural underpinnings of a successful virtual team can be inculcated or instilled in the team from the beginning, starting with the creation and implementation of their team charter. Eventually these beliefs are reinforced by the selection of appropriate tools and the adoption of certain behavior patterns that reinforce collaboration and promote visibility.

None of this should be taken for granted. Project managers of virtual teams must reinforce team goals over individual performance, and enable teams to self-organize and grow accountable for the deliverables.

## Guidelines to Continually Evaluate the Effectiveness of Virtual Team Member Engagement

To evaluate the effectiveness of virtual team member engagement:

- Track the progress of your teams as they carry out the work and produce deliverables.
  - Is the team prioritizing communications and visibility for the other team members?
  - Listen for blockers or other potential issues that team members may be uncomfortable discussing.
  - Look for clues in body language or tone of voice that indicate potential unshared concerns.
- Ensure meetings like daily standups are not just status updates, but value commitments from the team to itself.
  - Is the team on track?

- Is there anything that may compromise the team's objectives this iteration?
- Encourage project managers or agile coaches to step back from the group to ensure that the team is actually recommitting to itself each day that they are on track to meet their goals.
- Use videoconferencing tools.
  - A picture (and body language) is really worth a thousand words.
  - Connecting face-to-face with team members on a daily basis is important to reinforce progress or raise issues and attack them before they can compromise the team's goals.
- Timebox your meetings. All the best practices of effective meetings apply.
  - Have a clear agenda, objectives, and an approach to running the meeting.
  - Identify the attendees who are needed to meet the objectives, the outputs, and action items for the team.
  - Adjourn promptly when done.

## ACTIVITY 1–6

### Engaging and Supporting Virtual Teams

#### Scenario

Your team for the military software project is not co-located. Due to resource requirements and availability, you have three clusters of team members; one in Washington DC, one in eastern North Carolina, and one in Kansas City, Missouri. Nonetheless, the customer expects the team to work effectively and collaboratively to meet their needs.

1. Your team immediately begins exploring potential tools and technologies they can use to manage the project and its deliverables. What should the team consider before making decisions about virtual tool supports?
  
2. What are some of the tooling alternatives the team could use to facilitate collaboration and communications?
  
3. Your team has been progressing on the project for a month now. The team is generally performing well, but you are looking to challenge them to identify areas where they can improve their collaboration and improve visibility. What are some areas you may want to monitor to ensure your teams remain engaged and collaborative?

# TOPIC G

## Build Shared Understanding about a Project

One of the first goals in onboarding a team for a project is to ensure that they reach consensus and support the outcome of the parties' agreement.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Survey all parties to reach consensus. (ECO 1.10.2)
- Support outcome of parties' agreement. (ECO 1.10.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Vision	Charter
XP Metaphor	Project Plan
Product box exercise	Kick-off meeting
	Brainstorming
	T-shaped skills

### Vision

A vision is a desired end-state, often described as a set of desired objectives and outcomes. When a new project is commenced, it is critical to have a clear vision of the desired end objectives.

Depending on how well defined the deliverables of the project are, a more traditional waterfall approach or a more agile approach may be adopted. The more agile the approach, the more likely it is that the specific components of the solution are not clearly understood and subject to change. The project vision should be sufficiently immutable to serve as the “north star” for the project; the various components may change or adapt, but the vision should be reasonably consistent.

Many projects may begin with the creation of a vision statement. This may describe the product or solution, intended users or consumers of the solution, key desired objectives, differentiators from competitive approaches, key features and benefits, etc.

### Project Charter

A **project charter**\* is a document issued by the project initiator or sponsor that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities. The project initiator or sponsor is a person who provides resources and support for the project and is accountable for enabling the project's success. An effective project charter conveys why the project is being initiated and what the project's outcomes will be, ensures that you have support for the project, and gives you the authority to apply resources to project activities.



**Note:** The project charter doesn't need to be a lengthy document, and it can be informal or formal. In addition, the project charter is the only document that never changes throughout the project.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 75-81.

The project charter establishes the relationship between the requesting organization and the project performing organization. In the context of an external project, the initial agreement will be typically provided in a formal contract. The charter validates alignment of the project to the organizational strategy but is not considered part of the contract. For internal projects, a charter should still be used to ensure proper delivery.

The project charter formally initiates the project. Ideally the project manager is selected while the charter is being developed and can be developed by the sponsor or the project manager, but always prior to project planning. Early engagement between the sponsor and project manager ensures understanding of project purpose and objectives and desired stakeholder benefits. By providing a charter, the organization explicitly permits the creation of the project and the allocation of resources to it that will enable the project manager to plan, execute, and control the project.

The charter ensures that the stakeholders have a common understanding of the project's key milestones, deliverables, and roles and responsibilities.

A project charter may include the following high-level information on the project:

- Purpose
- Measurable project objectives and related success criteria
- High-level requirements
- High-level project description, boundaries, and key deliverables
- Overall project risk
- Summary milestone schedules
- Pre-approved financial resources
- Key stakeholders list
- Project approval requirements
- Project exit criteria
- Assigned project manager and responsibility/authority level
- Name and authority of the project sponsor

## Project Overview Statement

In some industries and organizations, a project overview statement may be used to communicate enterprise-wide the intent and vision of the project. The statement may serve as a draft for the project charter or as a summary of the charter to distribute. Brevity and clarity are key. The statement should be less than a page, typically capturing the project's objective, problem or opportunity, and criteria for success.

With authorization via a project charter or approved project overview statement, the assigned project manager can begin the activities of project planning. This will be described in more detail later in the course, but may range from a detailed project plan broken out into a work breakdown structure with specific activities, dependencies, milestones, and dates assigned in advance to a simple prioritized backlog of initial user stories based on the customer's initial understanding of what is needed to accomplish their desired objectives.

## Agile Ceremonies

Agile practices such as **Scrum**\* use ceremonies to establish a cadence of meetings to assist the team in preparing and progressing the project. The **Scrum Master**\* is the coach of the development team and process owner in the Scrum framework.

The four most commonly described ceremonies are described in the following table.

Ceremony	Description
<b>Sprint Planning</b>	A collaborative event in Scrum in which the Scrum team plans the work for the current sprint. In other words, a meeting that facilitates communication and collaboration between a customer (referred to in Scrum as a <b>Product Owner</b> ) and the project team. The Sprint Planning meeting facilitates agreements on small goals for a team to complete during a short, defined period of time, generally referred to as a Sprint or iteration. A <b>Sprint*</b> is time boxed between 1-4 weeks to facilitate planning, improve the quality of estimation, and set a consistent cadence for the team and the product owner.
<b>Daily Standup</b> (also called <i>Daily Scrum</i> )	A short 10-15 minute meeting held each day for the team to reaffirm commitment to its objectives for the iteration and to surface any potential blockers to its ability to meet the iteration goals. Generally, the meeting is done standing in a circle, and is not a status meeting, but a meeting for the team to coordinate today's work amongst themselves.
<b>Sprint Review</b> (also called a Demo)	A review at the end of each iteration with the Product Owner and other customer stakeholders to review the progress of the product, get early feedback, and where the Product Owner reviews and accepts the stories delivered in that iteration.
<b>Sprint Retrospective</b>	A meeting of the team members facilitated by the Scrum Master for the team to identify its own improvements. Where a Sprint review reviews the product and identified improvements, the retrospective reviews the team's processes and practices and is used to identify ways the team can improve its performance, collaboration, etc.

Other meetings are sometimes held as well, for initial user story writing, refinement of the backlog, and as sidebars for any particular needs members of the team may have to engage with one another during the project.

Reference: Project Management Institute, *Agile Practice Guide*, Project Management Institute, Inc., 2017.

## Kickoff Meeting

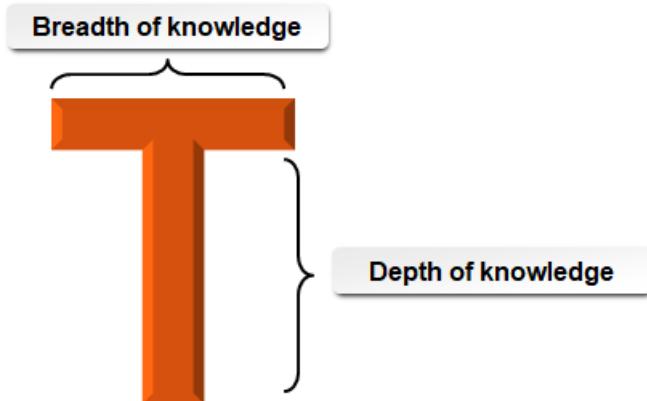
Project teams may have one or a number of project kickoff meetings. These meetings seek to establish project context, assist in team formation, and ensure proper alignment to the overall project vision. Activities during kickoff may include:

- Defining a vision statement
- Defining a team charter
- Assisting the customer/Product Owner with user story writing, estimation of effort, prioritization planning, and production of an initial product backlog

Establishing other initial startup activities that will be required, often called Sprint 0. These may include team onboarding, credentialing, establishing environments and supporting communications tools, and a number of other activities that ensure the teams are in place and ready to work on iteration objectives.

## T-Shaped Skills

Agile teams often invest in becoming more cross-functional. **T-shaped\*** refers to a person with one deep area of specialization and broad ability in the rest of the skills required by the team. By leveraging all of the team members to help accomplish the team goals, the team improves its efficiency and is more likely to achieve the objective.



**Figure 1-5: T-shaped skills.**

## Iteration Planning

Iteration, or Sprint, planning is one of the core agile ceremonies, used in Scrum, XP, and many other agile approaches. Agile breaks the project timeline into small 1-4 week **iterations\***. The team will work together with the customer representative (called the Product Owner in Scrum) to do the following:

- Review the highest prioritized **user stories\*** which are the key outcomes the customer wants the solution to provide.
- Ask questions.
- Come to agreement on which stories the team forecasts it will complete in the iteration.

Once the team and the Product Owner have agreed on the stories for that iteration, the team then performs its own task decomposition to determine what activities will need to be performed by the team in order to deliver on the iteration objectives. These are often organized and tracked using a task board.

## Task Boards

### Task Boards

**Task boards** are used to visualize the work and enable the team and other stakeholders to track their progress as work is performed during the iteration. The goal is to use the board to promote visibility and limit the amount of work in progress (WIP). Examples of task boards include Kanban boards, to-do lists, procedure checklists, and Scrum boards. A **Kanban board\*** is a visualization tool that enables improvements to the flow of work by making bottlenecks and work quantities visible.

Reference: Project Management Institute, *Agile Practice Guide*, Project Management Institute, Inc., 2017.

To Do	Work in Progress (WIP)	Done
Item A Estimate: 4	Item C Estimate: 6	Item B Estimate: 8 Actual: 8
Item D Estimate: 2	Item F Estimate: 18	
Item E Estimate: 8	Item J Estimate: 1 Unplanned	
Item G Estimate: 20		

Figure 1–6: An example of a task board.

## Consensus

Project teams frequently have to work together to make decisions about different aspects of the project, including estimates of effort, tasks to produce certain deliverables, approaches for problem solving, and myriad other issues. In order to assist them in trying to achieve consensus where possible, and to coordinate conflict identification and resolution when needed, there are a number of techniques a project manager or Agile coach can use.

Some common techniques to reach consensus include:

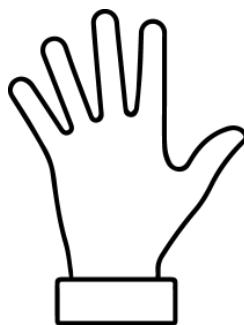
- Fist of Five Technique
- Roman Voting
- Polling
- Dot Voting

## Fist of Five Technique

One of these techniques for building consensus is called Fist of Five. As a team is discussing an issue, a facilitator can call for the team to vote on its level of agreement or disagreement with the team's conclusions. A fist (or 0 fingers) is a strong statement of disagreement and will require adjudication. An open hand showing five fingers means agreement with the team's conclusions. The rest of the scale would be:

- 4 fingers might show general agreement with minor questions.
- 3 fingers might show abdication—willing to go along with the group but noncommittal.
- 2 fingers might show general disagreement but the questions at hand are relatively minor.
- 1 might be almost as strong a disagreement as a fist.

Leveraging your teams charter and working agreements, the facilitator then works with the teams to try to address any disagreements that remain.



Five fingers = Agree



Fist = Disagree

*Figure 1-7: An example of the Fist of Five technique.*

## Roman Voting

A simpler version of check-in than Fist of Five is Roman voting. In a Roman vote, people vote either thumbs up (agreement) or thumbs down (disagreement). If anyone is thumbs down on the approach, the facilitator then will work to try to identify and enable the team to try to address the objections.

## Polling

Another technique is simple polling of the team members to assess their point of view on an issue. If the team is unanimous, a decision has been reached and the team moves on. If objections are raised, then the facilitator works to surface the objection and tries to help the team work to solve the problem.

## Dot Voting

At different times the team may choose to brainstorm a list of something: a list of risks, reports, activities, etc. At that point it may be useful to help prioritize the list. One technique to prioritize any list is called dot voting. In dot voting, each stakeholder is given a number of sticky dots; the number should be sufficient to help produce spread in the results. Each stakeholder can then vote with the sticky dots based on the weight they believe should be provided to that list item. Each person may multi-vote; that is, if they have 10 dots, they could put all 10 on one list item, 1 dot on each of 10 list items, or any combination in between. Based on the number of dots each item receives, an overall priority can be identified.

## Estimation Techniques

Agile teams generally do not use absolute estimates to predict the level of work involved in a task; too much of the work is innovative and dependent on a number of factors, including risk, complexity, and labor. Instead, agile teams tend to use a relative estimation approach that takes all factors into account and uses a relative sizing method to help assess the overall effort. A couple of popular methods include:

- **T-Shirt Sizing:** S, M, L, XL, XXL based on the combination of risk, complexity, and labor.
- **Modified Fibonacci Sequence:** 1, 2, 3, 5, 8, 13, 20, 40, 100, ∞ based on the same factors. These are often referred to as **story points**; they are unit-less and attempt to capture the overall impact of the work.

Each of these approaches establishes a benchmark based on a known level of work and then compares against the benchmark when sizing new efforts. So if the benchmark is 5 points, an effort that is a bit larger than that might be scored with 8 points.

## Planning Poker

A technique used to perform these estimates is called planning poker. In planning poker, a user story is presented to the team, there is conversation among the team members and with the customer (Product Owner in Scrum), and when the team has asked its questions, the facilitator (Scrum Master or Agile coach) asks the team to use a card deck (generally with the modified Fibonacci numbers) to vote for the number of points to assign to the story.

If there are disagreements, the facilitator will coordinate a discussion and try to help the team to either come to consensus on the point totals or leverage their team charter to delineate how to manage any sustained disagreements. This is repeated for several of the stories at the top of the backlog to ensure they are ready for inclusion in an iteration (or Sprint).



**Note:** For more information, check out the Spotlight on **Planning Poker** presentation from the **Spotlight** tile on the CHOICE Course screen.

## XP Metaphor

A common Extreme Programming (XP) technique describes a common vision of how a program works, which is called the Metaphor. Metaphors should be simple and non-technical, enabling a broad array of stakeholders to understand the overarching approach that is being taken to provide a capability or solve a problem.

## Product Box Exercise

Another technique used to explain an overarching solution is called a **product box exercise**. In this exercise, the stakeholders try to describe aspects of a solution in the same way a marketer might describe product features and benefits on a box. This exercise can help the teams better understand the different types of users of a solution, their priorities and likes/dislikes, key aspects of the solution that drive the most critical value aspects of the solution, etc.

## Brainstorming

**Brainstorming** is a simple technique used to generate a list of ideas; it should be led by a facilitator and the group tends to be a group of stakeholders, team members, or subject matter experts. After quickly generating a list of alternatives, the group performs analysis of the alternatives and generally chooses a particular one for action. The list can be prioritized by combining brainstorming with dot voting to quickly have the team assess a list of alternatives, then quickly decide which ones to focus upon.

## Guidelines to Reach Consensus and Support the Outcome of the Parties' Agreement

The techniques covered in this topic are useful in helping your teams assess alternatives and make decisions. Some specific guidelines include:

- Having a team charter is enormously helpful here as it may specify how a team chooses to handle certain scenarios and disagreements when they arise. For example, where team members disagree about the number of story points to estimate for a particular user story, the team charter may designate that the team will use the higher estimate, or that majority vote rules.
- In general, it is preferable to seek consensus among the team where possible, and to recognize that sometimes it will not be possible.

- For those times when consensus is not possible, it is helpful to have an agreed approach in advance.

## ACTIVITY 1–7

### Building a Shared Understanding about a Project

#### Scenario

Your newly formed migration team is reviewing the documentation that is available about the project. The available documentation is pretty underwhelming; you have a general vision statement to migrate all of the laptops with the new software, and a deadline date by which all of the work needs to be done. That's about it.

1. To ensure you have the necessary buy-in, commitment, and resources required to make the project a success, you offer to assist them in creating a formal project charter. What should be included, and who should sign it?
  
2. You have decided due to the rapidly changing nature of the project's requirements that you wish to run this project using an agile approach such as Scrum. Your team is unfamiliar with the agile ceremonies and wants you to explain what they are and how they work. What are the agile ceremonies that need to be included?
  
3. As your team is unfamiliar with agile, they are also unfamiliar with some of the agile practices for achieving agreement, estimation of effort, and creating a shared vision of the solution they are trying to produce. What are some methods for achieving agreement?
  
4. What are some techniques for estimation?
  
5. What are some techniques for establishing a shared vision?

## Summary

In this lesson, you learned about the importance of assembling the project team and building a shared understanding of the project to be completed. By empowering the team and providing the necessary training, you enable the team to be accountable and promote a collaborative and cohesive project team.

The learning goals for this lesson were:

- Determine project team member requirements, appraise team skills, and maintain team knowledge transfer.
- Collectively define project ground rules based on context, such as organizational rules and team dynamics.
- Determine a negotiation strategy and negotiate project agreements.
- Organize around team strengths and support team task accountability.
- Ensure team members and stakeholders are adequately trained.
- Continually evaluate the effectiveness of virtual team member engagement.
- Reach consensus and support the outcome of the parties' agreement.

**Why do you think it's important to identify and document the project stakeholders?**

**Share a situation when you were required to communicate a difficult message about the project to its sponsor or a top-level executive. What approach and communication method did you take?**



**Note:** Check your CHOICE Course screen for opportunities to interact with your classmates, peers, and the larger CHOICE online community about the topics covered in this course or other topics you are interested in. From the Course screen you can also access available resources for a more continuous learning experience.

# 2

# Starting the Project

**Lesson Time:** 10 hours

## Lesson Introduction

Now that you've assembled a high-performing, engaged, and empowered project team, you are ready to get started with the planning of the project. Planning includes all aspects of a project including budget, schedule, scope, quality, project activities, procurement, and closure. At the beginning of the project, you also need to determine the project methodology or method that is appropriate for the project. In this lesson, you will plan the work of the project.

This lesson addresses tasks from the Process domain of the PMP® Exam Content Outline (ECO).

## Lesson Objectives

In this lesson, you will:

- Assess project needs, complexity, and magnitude to determine the appropriate project methodology/methods and practices. (ECO Task 2.13)
- Plan and manage the scope. (ECO Task 2.8)
- Plan and manage the budget and resources. (ECO Task 2.5)
- Plan, prepare, modify, and manage the project schedule based on methodology. (ECO Task 2.6)
- Plan and manage the quality of products and deliverables. (ECO Task 2.7)
- Integrate project planning activities. (ECO Tasks 1.12, 2.9, 3.1)
- Plan and manage procurement strategy. (ECO Task 2.11)
- Establish the project governance structure. (ECO Task 2.14)
- Plan and manage project/phase closure. (ECO Task 2.17)

# TOPIC A

## Determine Appropriate Project Methodology/Methods and Practices

There is no one way to manage every project. Knowing and understanding project management best practices is one part of the equation. Determining and applying the most appropriate methodology and practices to your project is another part.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Assess project needs, complexity, and magnitude. (ECO 2.13.1)
- Recommend project execution strategy (e.g., contracting, finance). (ECO 2.13.2)
- Recommend a project methodology/approach (e.g., predictive, agile, hybrid). (ECO 2.13.3)
- Use iterative, incremental practices throughout the project life cycle. (ECO 2.13.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<i>Deliverables</i>	<i>Tools</i>
Create survey	Expert judgement
Project business case / needs document	Meetings
Project Overview Statement	Focus groups
Project Implementation Plan	Workshops
Agile practice guidelines	Create SMART objectives Knowledge of classic PM and agile practice Project Integration

### Project Methodologies, Methods, and Practices

The best approach to manage your project depends on the resources, timelines, stakeholders, industry, the project work, and many other factors. Every project and situation requires its own assessment of what is best. In a broad stroke, here are the three major methods of project management.

#### Agile

A more modern approach wherein the team works collaboratively with the customer to determine the project needs, quickly building outputs based on those assumptions, getting feedback, and continuing forward or adapting as much as needed. The coordination of the customer and the team drives the project forward. The aim is to deliver value by regularly confirming and incorporating input.

#### Predictive / Plan Driven

A more traditional approach wherein as much as possible, the project needs, requirements, and constraints are understood, and plans are developed accordingly. Those plans drive the project forward. The more well planned out, the more predictive and controlled the project is.

## Hybrid

Another option is to incorporate components of both approaches. This may be done by utilizing a particular strategy or technique for a certain need. This may also be accomplished by blending the various approaches concurrently on the project. Or the project may switch approaches based on need, changing work requirements, or circumstances.

## Business Case and Business Needs Documents

A **business case** is a documented economic feasibility study used to establish the validity of the benefits of a selected component lacking sufficient definition. It is used as a basis for the authorization of further project management activities. A business needs document is a related, higher-level deliverable that may be written prior to the formal business case. The business needs document expresses the goal—what needs to be created or what needs to be performed—while the business case explains the justification, feasibility, and return on investment involved in pursuing that goal.

## Project Implementation Plan

Project deliverables may be delivered all at once at the end of the project. Project outputs are delivered throughout the project. When those outputs are delivered is one part of the equation. The other is how the outputs may be:

- Implemented in a new business environment
- Implemented in an existing business environment
- Transitioned into a live environment
- Decommissioning or removing old systems, processes, or materials
- Ensuring training and knowledge transfer is complete or satisfactory

Plans must be in place to ensure minimal disruption and address concerns relative to the project and business environment. Project Implementation Plans should consider all stakeholders, schedules, risks, budgets, and quality standards.

## Assessment of Project Needs, Complexity, and Magnitude

As mentioned, which approach is best suited for your project is dependent on many factors. Project managers must assess the needs, complexity, and magnitude of the work, but also the expectations of stakeholders.

<b>Methodology</b>	<b>Best Suited For</b>	<b>Examples</b>
<b>Agile</b>	<ul style="list-style-type: none"> <li>• Projects where changes are relatively easy and waste is not costly.</li> <li>• Projects in a complex environment where the end product is not fully known and user feedback is very valuable.</li> </ul>	Software projects or projects based on intellectual property and research.
<b>Predictive/Plan Driven</b>	<ul style="list-style-type: none"> <li>• Projects where changes are expensive due to scrap and waste.</li> <li>• Projects where predictability and coordinated timing is important.</li> </ul>	Construction projects or projects that have many physical assets or have similar projects that have been completed in the past.

<b>Methodology</b>	<b>Best Suited For</b>	<b>Examples</b>
<b>Iterative</b>	<ul style="list-style-type: none"> <li>Projects with dynamic requirements and activities are repeated until they are deemed correct.</li> </ul>	Projects where learning and correction is expected to eventually get to the ideal solution.
<b>Incremental</b>	<ul style="list-style-type: none"> <li>Projects with dynamic requirements, as well as frequent small deliveries.</li> <li>Projects where speed to deliver small increments is a major goal.</li> </ul>	Projects where customers or business is wanting or expecting to see outputs or partial outputs early and often.
<b>Hybrid</b>	<ul style="list-style-type: none"> <li>Projects or phases where there are some costs to changes.</li> <li>Projects where stakeholders are interested in another method, but not comfortable to fully adopt one method.</li> </ul>	Projects with a mix of resources and experience levels or projects seeking or willing to learn new methods or techniques.



**Note:** For more information, check out the Spotlight on **When to Apply Agile Methodologies** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Progressive Elaboration

**Progressive elaboration\*** is the iterative process of increasing the level of detail in a project management plan as greater amounts of information and more accurate estimates become available. At the beginning of a project, very little is known. As planning progresses, more details become evident, and by the time the project plan is complete, the project may be fully understood. However, often during execution of the plan, even more details evolve.

## Types of Life Cycles

According to the *Agile Practice Guide*®, there are two major types of **project life cycles**: predictive and adaptive. For further refinement, the adaptive life cycle includes Iterative, Incremental, and Agile. All of these life cycle types are explained in the following sections.



**Note:** Developed by PMI® and the Agile Alliance, the *Agile Practice Guide* provides detailed guidance for applying agile approaches to projects. It is an excellent resource for PMP® certification candidates, and is available from [marketplace.pmi.org](http://marketplace.pmi.org).

## Predictive Life Cycles

A ***predictive life cycle*\*** is a form of project life cycle in which the project scope, time, and cost are determined in the early phases of the life cycle. In other words, in a predictive life cycle, you determine project scope, time, and cost as early in the project as possible. This is a preferred cycle to use when project outcomes are well understood and known, such as enhancements to an established

product. Predictive cycles are formal and enable the project team to stay focused on each phase of the project before having to move forward into the next phase.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 19.

## Iterative Life Cycles

An ***iterative life cycle***\* is a project life cycle where the project scope is generally determined early in the project life cycle, but time and cost estimates are routinely modified as the project team's understanding of the product increases. Iterations develop the product through a series of repeated cycles, while increments successively add to the functionality of the product.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 19.

Achieving the project objectives via iterations is best accomplished when leveraging the learning and successes—as well as failures—from the previous iterations. By capturing and applying the lessons learned at the end of each iteration, typically in the form of a retrospective session, teams can improve, grow, and become more efficient with every iteration. Continuous improvement and driving towards the optimal solution also necessitates engagement from all stakeholders. Frequent and meaningful feedback from all involved in the project enable the product evolution across iterations.

## Incremental Life Cycles

An ***incremental life cycle***\* is an adaptive project life cycle in which the deliverable is produced through a series of iterations that successively add functionality within a predetermined time frame. The deliverable contains the necessary and sufficient capability to be considered complete only after the final iteration.

Both types of life cycles include project phases that are intentionally placed and repeated as the team's understanding of the deliverables is developed and understood. In most cases, the team will work with a high-level vision because the deliverables will be defined up front and developed with more detail and characteristics as the project moves through each phase. This cycle can be helpful in environments that are uncertain and undefined. For example, when developing a brand new product, the high-level vision for the product exists, but all the details such as limitations, size, and functions, will be discovered and identified as each phase is completed (such as progressive elaboration). This life cycle is also beneficial when managing a changing objective and scope or when partial delivery of the objectives provides value.

Usually, the sequence of the phases defined by most project life cycles involves some type of handoff or deliverable. Most often, deliverables from one phase are approved before work begins on the next phase. For example, design specifications are approved and handed off before the design phase begins. However, a subsequent phase may begin before approval is gained on the deliverables of a previous phase if the risks are considered acceptable. It helps the project management team plan work to a greater level of detail as the project progresses.

This cycle is like an extension or corollary of the overlapping relationship, but in this case the same phase repeats itself multiple times—once in every iteration.

## Agile Life Cycles

***Agile life cycles***\* are iterative or incremental and also can be referred to as change-driven or adaptive. They work well in environments with high levels of change and ongoing stakeholder involvement in a project. This is similar to iterative and incremental life cycles, but at a much more rapid pace. It is used in a highly flexible, interactive, adaptive organization where project outcomes are realized while the project work is being completed, and not at the beginning of the project. This

method is used when dealing with a rapidly changing environment, scope and requirements are difficult to define in advance, and small incremental deliverables have value to stakeholders.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 19.

## Hybrid Methodologies

Many organizations are using hybrid methodologies and approaches, which combine some elements from both predictive (waterfall) and adaptive (agile) approaches. In these combined approaches, the organizations are still using shorter delivery time frames, iterative product releases, and involving stakeholders regularly, but they tend to do more in-depth planning and requirements gathering up front. As a project manager, you must help the sponsor and team decide which approach is the best match for your business objectives.

## ACTIVITY 2–1

### Determining the Appropriate Project Methodology

#### Scenario

You are brought in as a project management consultant due to your wonderful grasp of the various project management methodologies and approaches.

1. The organization presents you with four projects. They seek your recommendation for which project management method is best suited for each. In questions 2 through 5, identify the appropriate method.
  - Agile
  - Predictive/Plan Driven
  - Iterative
  - Incremental
2. The capital project is one the organization has performed many times in the past for other cities. The objective is to replace all the old metal pipes under the city streets. Which method would you recommend?
3. The software project is one where there are many features and functions that must be updated, as well as more learned from community feedback. The objective is to roll out features to get user feedback and drive the priorities for potential future releases in the project. Which method would you recommend?
4. The employees in the organization are eager for small perks to be released based on a new company-wide initiative to boost morale. The objective is to deliver small bits of value on their way to the larger goal of higher employee satisfaction. Which method would you recommend?
5. The marketing project is one the organization is using to raise awareness of their new software and services. The objective is to keep repeating various marketing techniques and after a while focus on the methods or tools that appear to have the largest impact. Which method would you recommend?

6. You are asked to advise on a project to update all the bathrooms in a three-story office building with new high tech and water efficient equipment. Which life cycle type makes the most sense for this project?

- Predictive life cycle
  - Incremental life cycle
  - Iterative life cycle
  - Adaptive life cycle
-

# TOPIC B

## Plan and Manage Scope

The project team must complete work in order to achieve project outcomes. What that work is, what must be done, guiding that work, ensuring the work is done, and setting criteria as to what “done” is, so it can be properly validated are all elements the project team must plan for and manage throughout the project. There is a lot of work involved in managing the effort and the scope of the project.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Determine and prioritize requirements. (ECO 2.8.1)
- Break down scope and define acceptance criteria (definition of done). (ECO 2.8.2)
- Build work packages/do some work.
- Monitor, reprioritize and validate scope. (ECO 2.8.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Requirements Register	Agile estimating
Work performance reports	Product backlog
Traceability matrix	Document change requests
	Update Requirements document
	Update product backlog
	Update project management plan

### Scope Management Plan

A **scope management plan**\* is a component of the project management plan or program management plan that describes how the **project scope** will be defined, developed, monitored, controlled, and validated. As a project manager, you will reference the project charter and any subsidiary plans of the project management plan when developing the scope management plan. Another factor you must consider during the development is whether or not any environmental factors are pertinent to the project.

The scope management plan provides guidance to you on how you'll manage scope-related activities that range from collecting requirements, writing the scope statement, to breaking down the work that needs to be done.



**Note:** **Scope creep**\* is known as the uncontrolled expansion to product or project scope without adjustments to time, cost, and resources.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 134-135

### Scope Management Tools and Techniques

Tools and techniques are used to help develop the scope management plan.

Tools & Techniques	Description
Expert judgment	You can use internal and external experts that have experience in similar projects. These individuals can be consulted when you are ready to put the plan together.
Alternatives analysis	This data analysis technique is used to identify different ways of collecting requirements, elaborating the project and product scope, creating the product, and validating and controlling the scope. This analysis can have an influence on the scope management plan.
Meetings	Meetings are held with any team member who will be involved with the creation of the scope management plan.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 136.

## Project Requirements

**Project requirements** are the agreed-upon conditions or capabilities of a product, service, or outcome that the project is designed to satisfy. Requirements are the determined and documented needs and expected project outcomes and expectations of the project customer, sponsor, and stakeholders. Some high-level requirements may already be documented and in the project charter, but as the project manager, you must verify that all requirements are determined and documented during this process. Requirements create the foundation for building the WBS, and are verified regularly during the project execution process.

For example, some of the requirements for a new house might include the square footage of each room; the type of counter tops needed in the kitchen and each bathroom; a central vacuuming system; and the size and materials used for a deck.

Any project will have many requirements, and it is important to determine the requirements early in the project. Throughout the life of the project, the requirements may change. Stakeholders might add new requirements during the project—sometimes even during project execution—as well as changing others.



**Note:** Product requirements are generally industry specific and therefore are not addressed in the *PMBOK® Guide*.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 138.

## Elicitation Techniques

There are numerous tools and techniques that you can use to elicit the project requirements from stakeholders. The following sections will address some of the common techniques.

**Document analysis** is a technique used to gain project requirements from current documentation evaluation. This method can be used to derive new project requirements from existing documentation such as business plans, service agreements, marketing materials, current process diagrams, application software documentation, and more.

**Focus groups\*** are an elicitation technique that brings together pre-qualified stakeholders and subject matter experts to learn about their expectations and attitudes about a proposed product, service, or result. Focus groups can be small events or discussions that are designed to be less structured and more for information-sharing sessions within a small group of people. Project managers will use focus groups to bring together SMEs and other stakeholders to gain further information and clarification on specific project requirements. These events are typically conducted by a trained moderator who will propose pre-selected questions and keep the discussions on track.

with the selected theme. For example, a focus group might be used to gather customer feedback for a product that is scheduled to be updated.

**Questionnaires\*** are written sets of questions designed to quickly accumulate information from a large number of respondents. They typically target a specific area or subject. This technique is useful when the group is varied and located in multiple locations. The results of the questionnaires and surveys can be sent out and returned quickly and the results can be analyzed in a timely manner. In most cases, the results will be used to conduct a statistical analysis and used by decision makers to prioritize, categorize, and determine requirements. For example, you might survey users of a banking application to see how they are using the system.

**Benchmarking\*** is the comparison of actual or planned products, processes, and practices to those of comparable organizations to identify best practices, generate ideas for improvement, and provide a basis for measuring performance. This technique can be helpful in determining a project's requirements by comparing current requirements against a proven or best practice standard within the same professional field or product area. A benchmark can be used to measure performance and to generate ideas for project requirements.

An **interview\*** is a formal or informal approach to elicit information from stakeholders by talking with them directly. Through discussion, you can record any pertinent information you need for your project requirements. With this information, you can further identify and define specific project outcome features and functions. For example, an interview might be helpful when you need to get specific feedback from an end user of a product or service to find out what is useful and what is not.

Decision-making techniques are used by a group to reach a decision. This technique is an assessment process that can have multiple alternatives and can lead to many outcomes. After all alternatives and outcomes have been discussed, the group votes to reach a group decision. The following table describes the different voting methods that can be used.

Method	Outcome
<b>Unanimity*</b>	Agreement by everyone in the group on a single course of action.
<b>Majority</b>	The majority represents more than 50% of the group's ideas. This is a good method to use with large groups, but it can be difficult with extremely large groups with a wide diversity in views about a subject.
<b>Plurality*</b>	Decisions made by the largest block in group, even if a majority is not achieved.
<b>Autocratic</b>	Using this method, one person makes the decision. In most cases, this person will consider the larger group's ideas and decisions, and will then make his or her decision based on the best decision.

Techniques can be used to help guide a group in determining project requirements. There are a number of techniques used based on the needs of the project manager and the participants.

Technique	Description
<b>Mind mapping*</b>	A technique used to consolidate ideas created through individual brainstorming sessions into a single map to reflect commonality and differences in understanding and to generate new ideas.
<b>Affinity diagram*</b>	A technique that allows large numbers of ideas to be classified into groups for review and analysis.



**Note:** Data representation techniques are graphic representations or other methods used to convey data and information. You will see other data representation techniques throughout this course.

**Observations**, also referred to as **job shadowing**, is a technique used to gain knowledge of a specific job role, task, or function in order to understand and determine project requirements. This technique allows decision makers to directly observe a job when a job or task is complex and detailed and cannot be described easily. For example, for a product assembly improvement project, project team members might observe the actual assembling of the product in a manufacturing plant to better understand a process and determine project requirements.

**Facilitated workshops** are organized working sessions held by project managers to determine what a project's requirements are and to get all stakeholders together to agree on the project's outcomes. There are different types of workshops used depending on the industry you are working in:

- **Joint application design/development (JAD)** workshops bring SMEs and the development team together to discuss and improve on the software development process.
- **Quality function deployment (QFD)** workshops are commonly used in the manufacturing field to determine new product development requirements.
- User stories are descriptions of the desired features and project requirements that stakeholders provide during facilitated workshops. These user stories can be used later to validate a stakeholder's goal and as motivation for a requirement.

A **context diagram**\* is a visual depiction of the product scope showing a business system (process, equipment, computer system, etc.), and how people and other systems (actors) interact with it. The diagram includes the business process, equipment, or computer system and what roles interact with those systems. The diagrams depict specific business and actor inputs to the business system, as well as the business and actor outputs of the system.

Business Context Diagram Sample

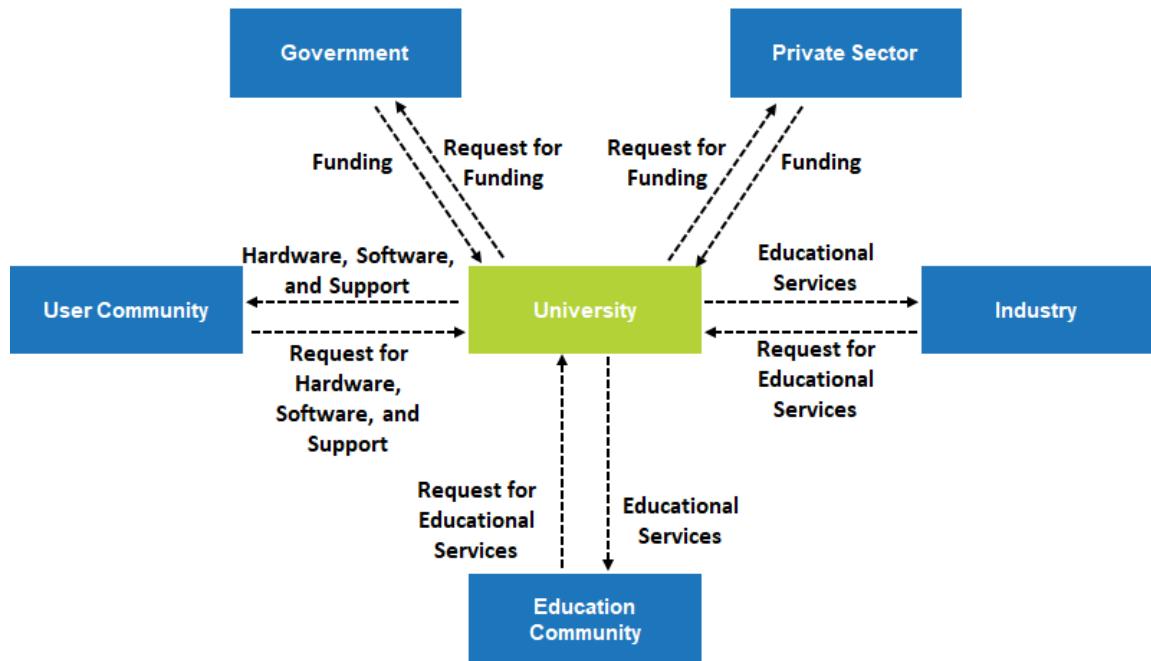


Figure 2-1: A context diagram example.

**Prototypes**\* is a method of obtaining early feedback on requirements by providing a working model of the expected product before actually building it. The prototype can be used for evaluation and experimentation by project stakeholders and other team members. The results of the evaluation can then be analyzed and assembled into a prioritized list of redesign ideas for the prototype, or a detailed list of project requirements. This process can be cyclical with many prototype revisions until the project requirements are determined.

**Storyboarding** is a prototyping method that can use visuals or images to illustrate a process or represent a project outcome. Storyboards are useful to illustrate how a product, service, or application will function or operate when it is complete. For example, in software development, a storyboard might be used to show how a customer service application will function from a user's perspective by showing the results of each option available within the application.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 142-147.

## Requirements Documentation

**Requirements documentation**\* is a description of how individual requirements meet the business need for the project. The documentation is composed of all the individual requirements needed for a project to meet the business' and stakeholders' needs. The composition of the documents will vary depending on the specific needs of a project, so the range can be from very detailed and categorized, to a simple list of high-level requirements. Requirements documentation can include any or all of the following components:

- Business requirements: High-level needs of an organization.
  - Business and project objectives for traceability.
  - Business rules for the performing organization.
  - Guiding principles of the organization.
- Stakeholder requirements: Needs that come directly from a project stakeholder.
  - Impacts to other organizational areas.
  - Impacts to other entities inside or outside the performing organization.
  - Stakeholder communications and reporting requirements.
- Solution requirements: Any feature, function, product, service, or result of a project.
  - Functional requirements focus on the behaviors of the product such as actions, processes, and data.
  - Nonfunctional requirements are any conditions that must be present for the outcome to be successful such as security, reliability, and safety.
- Transition and readiness requirements: Temporary capabilities necessary for project work to get done.
  - Support and training requirements.
  - Reporting requirements.
- Project requirements: High-level requirements that the overall project must meet. These can be actions, processes, or any other condition of the project.
  - Levels of service, performance, safety, compliance, and so on.
  - Acceptance criteria.
- Quality requirements: Any condition that the outcomes of a project are validated against.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 147-148.

## Requirements Management Plan

The **requirements management plan**\* is a component of the project or program management plan that describes how requirements will be analyzed, documented, and managed. This plan provides guidance on how the process of collecting requirements will be managed. The details of the collect requirements process will be covered in the next topic.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 137.

## Components of a Project Requirements Management Plan

Components of the requirements management plan require project managers to choose the most effective relationships to aid in the project's success and document this approach in the plan. These components include:

- How requirements activities will be planned, tracked, and reported.
- Configuration management activities such as how changes to the requirements will be initiated; how impacts will be analyzed; how they will be traced, tracked, and reported; and what authorization level is required to approve these changes.
- Requirements prioritization process, which defines how project requirements will be analyzed and prioritized.
- Metrics that will be used and the rationale for using them.
- Traceability structure stating which requirement attributes will be captured on the traceability matrix, the forward and backward chain of traceability, and the categorization of requirements.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 137.

## Requirements Traceability Matrix

The **requirements traceability matrix**\* is a grid that links product requirements from their origin to the deliverables that satisfy them. The purpose of this matrix is to justify each requirement determined and to link it directly to the business and project objectives. This matrix can be used to track the progress of requirements throughout the project life cycle and to verify that the requirements have been met once the project closes out. It can also be helpful to manage a project's scope and any proposed changes to the scope.

There are a number of tracing requirements used when creating the traceability matrix:

- Business needs, opportunities, goals, and objectives.
- Project objectives.
- Project scope and WBS deliverables.
- Product design.
- Product development.
- Test strategy and test scenarios.
- High-level requirements to more detailed requirements.
- Work package mapping.
- Stakeholder reference, so you can track each individual requirement to a stakeholder.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 148-149.

REQUIREMENTS TRACEABILITY MATRIX						
Project Name:	234 West Adams	Business Needs, Opportunities, Goals, Objectives	Project Objectives	WBS Deliverables	Inspection	Additional Comments
Project Manager:	John Wilson					
Project Description:	New house build for Andrews family					
ID	Requirements Description					
001	1-car garage	Standard single family house spec	Quality	Garage	Yes	
002	3 bedrooms	Standard single family house spec	Quality	Living space	Yes	
003	1.5 bathrooms	Standard single family house spec	Quality	Living space	Yes	
004	Landscaping	Standard single family house spec	Quality	Landscaping		
005	Driveway	Standard single family house spec	Quality	Driveway		
006	Pass all inspections the first time	Quality	Quality	Inspection		
007	Donated materials	Financial	Cost	Materials		
008	Volunteer labor	Financial-reduce cost to build	Cost	Labor		
009	Fundraising from participating organizations	Financial	Cost	Financial		
010	Mortgage of \$75,000 at 3% interest	Financial	Cost	Financial		
011	PMP-certified project manager on each project	Project success	Quality	Quality		
012	Licensed plumber and electrician on each project	Pass inspection	Quality	Plumbing and Electric work		
013	Building inspector provides ongoing inspections	Pass inspection	Quality	Quality		
014						
015						
016						

Figure 2-2: An example of a requirements traceability matrix.

## Guidelines for Collecting Project Requirements



**Note:** All of the Guidelines for this lesson are available as checklists from the **Checklist** tile on the CHOICE Course screen.

Guidelines for collecting project requirements are as follows:

- Review the scope management plan for clarity as to how project teams will determine which type of requirements need to be collected for the project.
- Review the requirements management plan for the processes that will be used throughout the collect requirements process to define and document the stakeholder needs.
- Review the stakeholder engagement plan to understand stakeholder communication requirements and the level of stakeholder engagement in order to assess and adapt to the level of stakeholder participation in requirements activities.
- Review the project charter for the high-level description of the product, service, or result so that detailed requirements can be developed.
- Review the stakeholder register to identify stakeholders who can provide information on the requirements.
- Use tools and techniques such as interviews, focus groups, facilitated workshops, interpersonal and team skills, decision-making techniques, questionnaires and surveys, observations, prototypes, benchmarking, context diagrams, and document analysis to collect requirements for the project.
- Document the requirements and create a requirements traceability matrix.

## Project Scope Statement

The **project scope statement**\* is the description of the project scope, major deliverables, assumptions, and constraints. Stakeholders and other project members can refer to the scope statement when scope development needs to be verified against the scope baseline, updated, or changed during the course of a project.

A project scope statement will be different for every project, but as stated in the *PMBOK® Guide*, it may include any, or all, of the following components:

- Project scope description: Progressively elaborates the characteristics of the product, service, or result described in the project charter and requirements documentation.
- **Acceptance criteria:** A set of conditions that is required to be met before deliverables are accepted.
- Deliverable: Any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project. This also includes ancillary results such as project management reports and documentation.
- Project exclusion: Generally identifies what is excluded from the project. Explicitly stating what is out of scope for the project helps to manage stakeholders' expectations.
- Constraints: Limiting factors that affect the execution of a project or process.
- Assumptions: Factors in the planning process that are considered to be true, real, or certain, without proof or demonstration. Also describes the potential impact of those factors if they prove to be false.

## Project Scope Statement vs. Project Charter

The project charter and project scope statement are similar, but contain different levels of detail. The project charter includes more high-level project objectives and goals, whereas the project scope statement is a detailed listing that focuses on the actual outcomes of the project.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 154-155.

## Scope Tools and Techniques

The tools and techniques used in defining scope are described in the following table.

Tools & Techniques	Description
<b>Expert judgment*</b>	In this process, expert judgment is often used to analyze the information needed to develop the project scope statement. Such judgment and expertise can be applied to any technical detail.
Alternatives analysis	This data analysis technique is used to develop as many potential options as possible to identify different approaches to execute and perform the work of the project.
<b>Multi-criteria decision analysis*</b>	A decision-making technique used to analyze ideas to ultimately evaluate and prioritize (by ranking) the ideas to assist in defining the project scope.
Facilitation	Encouraging the key players to participate in facilitated workshops can help to reach a cross-functional and common understanding of the project objectives and their limits.
Product analysis	For projects that have a product as a deliverable, product analysis is a tool that generally means asking questions about a product and forming answers to describe the use, characteristics, and other relevant aspects of what is going to be manufactured.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 153.

## Product Analysis

**Product analysis\*** is a tool to define scope that generally means asking questions about a product and forming answers to describe the use, characteristics, and other relevant aspects of what is going to be manufactured. This method is typically used for projects that have a product as a deliverable. Depending on the specific product, a number of analysis methods can be used such as product breakdown, systems analysis, requirements analysis, systems engineering, value engineering, and value analysis. For example, if your product was a camera, you would analyze all components of that product such as lens, battery, camera body, and user interface to help generate the scope.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 153.

## Guidelines to Develop a Project Scope Statement

You can use the following guidelines when creating the scope statement for your project:

- Review the scope management plan for the activities for developing, monitoring, and controlling the project scope.
- Review the project charter for the high-level project description, product characteristic, and project approval requirements.
- Review the requirements documentation to select the requirements that will be included in the project.
- Review the OPAs such as policies, procedures, template for a project scope statement, project files from previous projects, and lessons learned from previous phases or projects.
- Use tools and techniques such as expert judgment, product analysis, alternatives analysis, and facilitated workshops to define the project scope.
- Document the project scope statement and update any project documents, as needed.

## WBS

The **work breakdown structure (WBS)**\* is a hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables. A WBS defines the total scope of work required to complete the project. The deliverables and their component sub-deliverables are represented on the WBS in levels of descending order.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 156-157.

The WBS shown in the following figure is a specialized approach known as DMAIC (Define, Measure, Analyze, Improve, and Control). This approach is commonly used in Six Sigma types of projects.

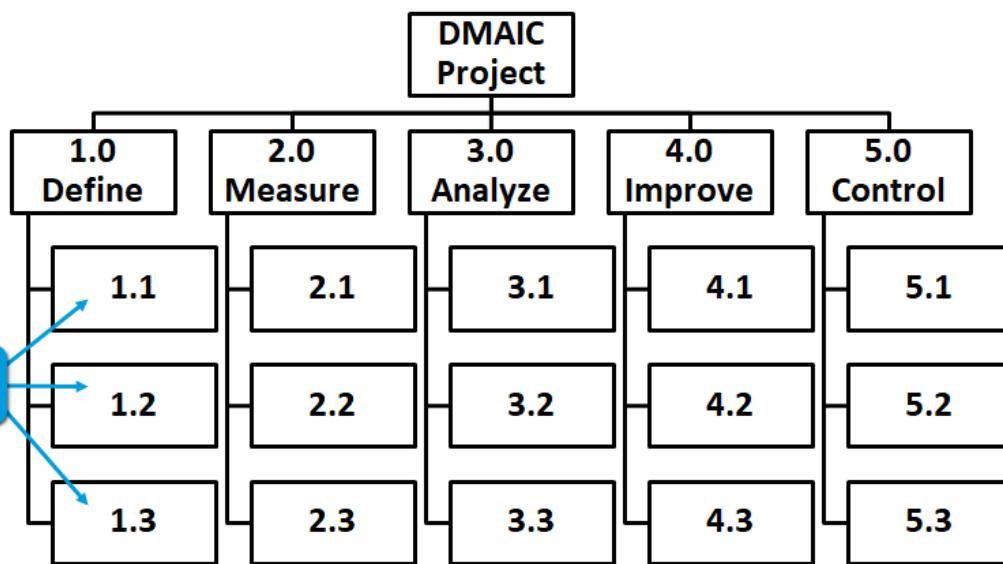


Figure 2-3: A WBS example.



**Note:** Large projects will sometimes have more than one WBS to represent different phases of the project or level of detail.

## Work Packages

The work defined at the lowest level of the work breakdown structure for which cost and duration are estimated and managed is called a **work package**\*. A work package must describe a deliverable that can be adequately scheduled, budgeted, and assigned to an individual person or group. An important distinction to be made here is that the "work" referred to in a WBS is actually the products or deliverables that are a result of an individual work package, not necessarily the work itself. Each level of the WBS breaks down the work into more and more layers until the work package is at a level that can be assigned, estimated for cost and duration, and tracked individually. The goal is to eventually roll up each work package into the level above within the WBS hierarchy to gain the overall time and budget requirements.

## WBS Dictionary

The **WBS dictionary**\* is a document that provides detailed deliverable, activity, and scheduling information about each component in the work breakdown structure. The document can be used as a reference when assigning and researching individual WBS component information.

The WBS dictionary can include any of the following:

- Code of account identifier

- Description of work
- Assumptions and constraints
- Responsible organization
- Schedule milestones
- Associated schedule activities
- Resources required to complete the work
- Cost estimations
- Quality requirements
- Acceptance criteria
- Technical references
- Agreement information



**Note:** The WBS dictionary might be a virtual "document" in which the information and components listed here are not contained in a single location.

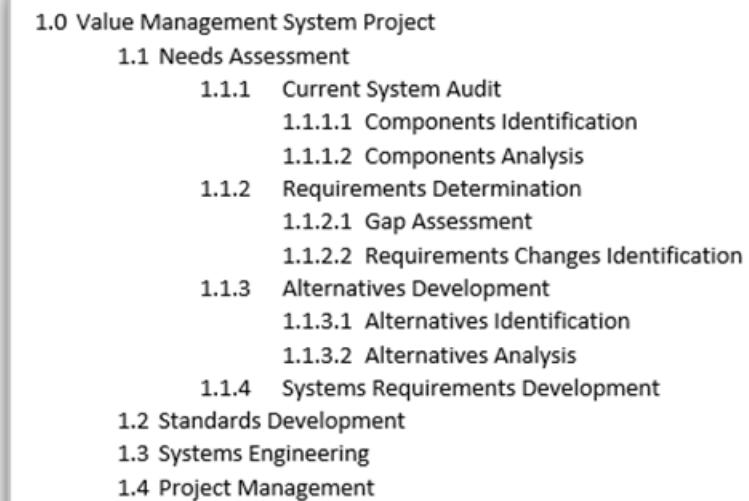
Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 162.

## Decomposition

**Decomposition\*** is a technique used for dividing and subdividing the project scope and project deliverables into smaller, more manageable parts. The work package is the smallest chunk from the WBS, which includes the to-do activities, so you can apply duration and estimated cost. The level of decomposition is based on specific project needs and the level of granularity needed to manage the project effectively. There are a number of steps involved in the decomposition process:

- Identify the deliverables and the work tasks necessary to accomplish the deliverable.
- Structure and organize the WBS.
- Decompose high-level WBS scope components into low-level components.
- Develop and assign a unique identification code to each component.
- Review the decomposition of work packages and verify that they align with the project requirements.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 158-161.



*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Page 158.*

**Figure 2–4: Sample WBS decomposed to the work package level.**

## Control Accounts

A **control account**\* is a management control point where scope, budget, actual cost, and schedule are integrated and compared to earned value for performance measurement. Control points are tracked by finance to verify that costs are within budget. These accounts associated with different work packages within the WBS can be tracked and verified against the earned value of a project to check performance. Work packages will be assigned to a control account and the work will be managed within that account throughout the project. Control accounts may contain more than one work package, but each work package should be assigned to only one control account.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 161.

## Planning Packages

A **planning package**\* is a WBS component below the control account with known work content but without detailed schedule activities. In other words, a placeholder for work that is yet to be determined by a requirement. It is placed within the control account but does not have specific activities applied. The planning package work can be anything that must be designated within the control account, but does not have a cost or a budget applied yet.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 161.

## Code of Accounts

A **code of accounts**\* is a numbering system used to uniquely identify each component of the WBS. A code of accounts system allows project managers to more easily track individual WBS components by using a **unique identification code**, which is especially helpful in the areas of performance, reporting, and cost.

For example, a school district requires its schools to comply with a uniform code of accounts so that it can easily record, track, and document specific types of revenues and expenditures in every school. The code of accounts could be shown as Function/Category/Program. If functions include

administrative salaries (30), teacher salaries (31), and consultants' fees (32); categories include para-professional expenditures (100) and professional expenditures (101); programs include regular instructional (411), special education (417), and languages (419), then the fee paid to a consultant leading a teacher training workshop in special education services would be coded 32/101/417.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 701.

## Scope Baseline

The **scope baseline**\* is the approved version of a scope statement, WBS, and its associated WBS dictionary, that can be changed using formal change control procedures and is used as a basis for comparison to actual results. With these approved versions, the scope baseline for a specific project can be incorporated into the project management plan. This is the baseline that you are monitoring and measuring against throughout the project. If the data collected does not align with the scope baseline, then action may need to be taken depending on the variance.

A scope baseline may include any of the following components:

- Project scope statement
- WBS
- Work package
- Planning package
- WBS dictionary

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 161-162.

## Guidelines to Create a WBS

Guidelines to creating a WBS are as follows:

- Review the scope management plan that specifies how to create the WBS from the detailed project scope statement and how the WBS will be maintained and approved.
- Review the project scope statement for a description of the requirements that need to be satisfied and the work that will be excluded from the scope. Include a list and description of the specific internal or external restrictions or limitations that may affect the execution of the project.
- Review the requirements documentation to understand what needs to be produced as the result of the project and what needs to be done to deliver the project and its final products.
- Review the Enterprise Environmental Factors (EEFs) such as industry-specific WBS standards (such as ISO) that are relevant to the nature of the project and that may serve as external reference sources for creating the WBS.
- Review Organizational Process Assets (OPAs) such as policies, procedures, template for the WBS, project files from previous projects, and lessons learned from previous projects.
- Use tools and techniques such as decomposition to divide and subdivide the project scope into smaller, more manageable parts.
- Use expert judgment to analyze the information needed to decompose the project requirements into smaller component parts to create an effective WBS.
- Include notes on work products that may be delivered incrementally.
- Document the scope baseline and update any project documents, as needed.

## Product and Iteration Backlogs

The work and activities from the work breakdown structure (WBS) or similar processes can be placed in backlogs. A product backlog is essentially a list of all the expected work to deliver the product. A project's product backlog changes throughout the project. Product backlog items (PBI) drop off when work is completed. PBIs are edited and clarified as more is known or as product

requirements may change. PBIs are continually added as necessary when more work must be done. As such, grooming and refining the product backlog is an ongoing exercise, typically scheduled in weekly or monthly intervals. The product backlog grooming also orders the items based on priority and other criteria.

To better manage the vast amount of work that must be completed, teams set up iterations with its own backlog based on items from the product backlog. In an Iteration Backlog, the team determines what items from the product backlog can conceivably be completed within that time period based on the team's capacity. Hence, teams must estimate the effort size of the work and understand the priorities of the business.

## User Stories

Projects are to deliver value. To retain focus on what the value is to the user, teams can use user stories. User stories aim to frame the need or desire of who is to benefit from the work of the team.

Typically, the value is described in a template such as "As a [user name or persona], I want to [objective or intent], so that I can [why the objective brings value]." There are many variations of the sentence. As long as the sentence encapsulates the value to be created, you have a story. Framing the user's desire as a story rather than a detailed requirement or specification enables the team to focus more on what the user actually values over simply delivering to a specification.

## Tools and Techniques for Verifying the Scope

The following tools, techniques, and approaches can be used to verify the scope.

<b>Tool and Technique</b>	<b>Description</b>
<b>Definition of Done (DoD)*</b>	A team's checklist of all the criteria required to be met so that a deliverable can be considered ready for customer use.
<b>Definition of Ready (DoR)*</b>	A team's checklist for a user-centric requirement that has all the information the team needs to be able to begin working on it.
<b>Acceptance Criteria*</b>	A set of conditions that is required to be met before deliverables are accepted.
<b>Validate Scope*</b>	The process of formalizing acceptance of the completed project deliverables. This usually involves reviewing the deliverables with the project customer or sponsor to ensure that they are satisfied with the final deliverable and securing their formal acceptance for the completeness of the deliverable.
<b>Iteration Reviews</b>	At or near the conclusion of a timeboxed iteration, the project team shares and demonstrates all the work produced during the iteration with the business and other stakeholders.
<b>Variance Analysis*</b>	A technique for determining the cause and degree of difference between the baseline and actual performance. Any variances must be analyzed to determine whether they are acceptable or they merit corrective action to keep the performance within specifications.
<b>Trend Analysis*</b>	An analytical technique that uses mathematical models to forecast future outcomes based on historical results. Review the project performance over time to determine if it indicates improvement or deterioration.

Glossary definitions are taken from Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017 and Project Management Institute, *Agile Practice Guide*, Project Management Institute, Inc., 2017.

## ACTIVITY 2–2

### Planning and Managing Scope

#### Scenario

A new project has been chartered. You are the project manager. The scope of the project may be larger than any project you have worked on in the past. In this activity, you begin to get your arms around the scope and requirements of the project.

1. Why is it important to properly manage the scope of your project?
  
2. What are some techniques you could use to elicit project requirements? (Choose four.)
  - Document analysis
  - Project Management Plan
  - Observations
  - Work breakdown structure
  - Interviews
  - Questionnaires
  
3. You and the project team draft a project scope statement. Which of the following is commonly part of the project scope statement? (Choose two.)
  - Scope creep
  - Acceptance criteria
  - Budget
  - Scope description
  - Schedule
  
4. You are creating a scope statement which includes only the smallest collection of features that can be included in a product for customers to consider it functional. What product approach are you using?
  - Release Planning
  - Progressive Elaboration
  - Minimum Viable Product
  - Horizon Planning

5. The project team decomposes the scope of the project to create a WBS. The work packages in the WBS have a dictionary with information and referenceable details. What type of details might be in a WBS dictionary for items on the WBS?
  6. As the project team decomposes the work in the WBS, they begin to populate product backlog. When must the team have the product backlog finished?
    - By the first phase of the project.
    - By the first iteration.
    - By the time the business signs off on the project scope statement.
    - The product backlog is a living artifact that is finished at the end of the product.
  7. To capture the business and end user needs and the value desired, user stories are often used to populate a product backlog. If the project seeks to make it easier for company employees to submit travel expense reports, how could you write a user story based on this need? You may use the template "As a *[user name or persona]*, I want to *[objective or intent]*, so that I can *[why the objective brings value]*."
-

# TOPIC C

## Plan and Manage Budget and Resources

Without proper management of project costs, expenses can get out of control quickly. You must be prepared to make adjustments and apply the correct costs to resources, activities, and services that align with your budget. The cost management plan helps you plan, react to, and update project costs when issues or changes arise throughout the life cycle of a project.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Estimate budgetary needs. (ECO 2.5.1)
- Anticipate future budget challenges. (ECO 2.5.2)
- Monitor budget variations and work with governance process. (ECO 2.5.3)
- Plan and manage resources. (ECO 2.5.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Cost baseline	Estimating techniques: Three Point, Analogous, Parametric
Management reserve	T-Shirt sizing
Resource management plan	Planning poker
Change requests	Review organization data
Cost forecasts	Meetings
Risk analysis	Leverage PMIS Understand change control Use velocity data and analysis Throughput analysis Cost Variance EVM, EAC Features accepted vs feature remaining

### Cost Estimates

Estimating costs consists of developing an approximation of the cost for each activity in the project. That cost should include direct labor, materials, equipment, facilities, services, information technology, **contingency reserves\***, and indirect costs. Logical estimates provide a basis for making sound decisions about projects, and they establish baselines against which the success of the projects can later be measured.

Common tools and techniques used to estimate costs include the following.

<b>Tools &amp; Techniques</b>	<b>Description</b>
Expert judgment	Variables such as labor costs, material costs, inflation, and risk factors can influence cost estimates. Expert judgment along with historical information will provide an insight on the information related to prior similar projects.
<b>Analogous estimating*</b>	Uses the cost of a previous project with similar scope or activities to predict the cost of future activities.
<b>Parametric estimating*</b>	Relies on the statistical relationship that exists between historical information and variables so as to arrive at an estimate for parameters such as duration and cost.
<b>Bottom-up estimating*</b>	Estimates the cost of individual activities then "rolls up" to higher levels.
<b>Three-point estimating*</b>	Incorporates three types of estimates into a singular cost estimate scenario: most likely, optimistic, and pessimistic.

## Advantages and Disadvantages of Estimating Techniques

There are benefits and drawbacks to using different estimating techniques.

<b>Estimating Technique</b>	<b>Advantages</b>	<b>Disadvantages</b>
Analogous estimating	Can ensure no work is inadvertently omitted from work estimates.	Can sometimes be difficult for lower-level managers to apportion cost estimates.
Bottom-up estimating	Is accurate and gives lower-level managers more responsibility.	May be time consuming and can be used only after the WBS has been well-defined.
Parametric estimating	Is not time consuming.	May be inaccurate, depending on the integrity of the historical information used.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 200-202.

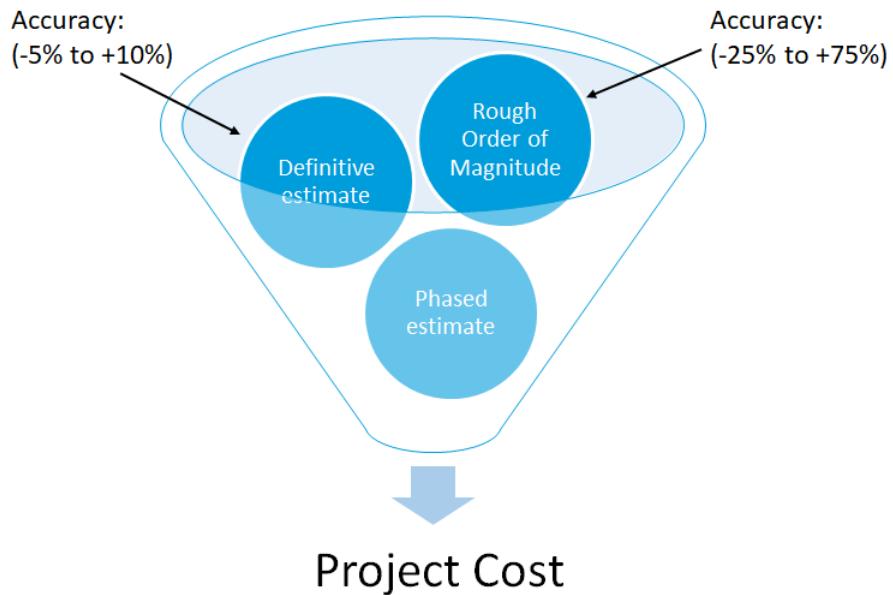
## Common Estimate Types

This table describes some common estimate types and their associated degrees of accuracy.

<b>Estimate Type</b>	<b>Degree of Accuracy</b>
Rough Order of Magnitude (ROM)	Generally made early in the project. Developed without basis of detailed data and often based on high-level historical data, expert judgment, or a costing model. Accuracy: -25% to +75%.
Definitive estimate (or "control" or "detailed")	Based on detailed information about the project work. Developed by estimating the cost for each work package in the WBS. Accuracy: -5% to +10%.
Phased estimate (or "rolling wave" or "moving window")	Allows the use of a less-detailed estimate (perhaps ROM) for some later parts of the work, whereas work that must be done earlier in the project life cycle is estimated more accurately (perhaps at the definitive level).

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 241.

	<b>Note:</b> The ROM estimate is frequently based on experience or sometimes just instinct. It is not meant to be more than a starting point in the cost estimating process.
---	--



**Figure 2–5: Common types of estimates.**

## Governance

Governance, as applied to cost estimates, can be described as managing project phases. A different type of cost estimate and level of accuracy may be required for different phases of the project life cycle. A cost estimating method might be chosen due to:

- Software availability
- Team member experience
- Project life cycle phase
- Time constraints
- Project definition
- Personal preference

	<b>Note:</b> Governance will be covered in detail in another topic.
---	---

## Lessons-Learned Register

Lessons learned from earlier in the project can be applied to later work, to take advantage of knowledge previously acquired. Experiences gleaned from previous projects is also an important component of the budgeting process. Lessons-Learned registers contain valuable information about cost-estimating successes and shortcomings that can be used to develop cost estimates for activities and work packages in similar projects.

## Guidelines to Estimate Costs

Accurately estimating project costs will avoid overruns and unforeseen expenditures. Making good cost estimates will help you to create a strong cost baseline, which will ultimately be used for measuring project cost performance. Here are some guidelines for estimating costs:

- When possible, the cost figures that go into the cost estimates for individual work packages should be provided by those who will actually provide the resources. As always, it is the people who will do the work, provide the service, or supply the material that can best estimate what the associated costs will be. It is the project manager's responsibility to compile these cost figures into realistic estimates.
- For some projects, though, the project manager will be solely responsible for generating the cost estimates.
- Even in such cases, the project manager may want to do a reality check with the resource supplier to make sure no incorrect assumptions have been made.
- Gather any relevant input information that may help you prepare the estimates such as estimating publications and resource rates.
- Determine which estimating technique to use.
- Look for alternative costing options such as using stock components versus custom-made, stretching the duration of an activity to eliminate overtime charges, leasing versus purchasing of capital equipment, and outsourcing as opposed to handling the work in-house.
- Determine the units of measure that will be used.
- Consider possible risks that may impact cost.
- Ensure that all cost estimates are assigned to the appropriate account, according to the chart of accounts.
- Make sure your cost estimates include the following key elements:
  - Estimated costs for all resources that will be charged to the project. Use the WBS and resource requirements document to develop the estimates.
  - The level of estimate (degree of certainty).
  - A list of assumptions made when developing the estimates.

## ACTIVITY 2–3

### Estimating Project Costs

#### Data File

C:\ATPPMP1Data\Getting Started with the Project\Public Meeting Estimate.docx

#### Scenario

You recently were hired as a project manager for a company that builds and operates large shopping centers around the United States. Your company is planning a large mall in your town, and part of the town's approval process consists of a public meeting where the project will be presented to the community. You have been asked by your project sponsor to estimate the cost of that public meeting work package.

Public meetings for other shopping centers have cost approximately \$30,000, and your sponsor has asked that you not exceed this amount. Your estimate must include direct labor and overhead costs (burdened rate) for each in-house staff resource. The standard hourly burdened rate for in-house staff is averaged to a flat \$80.

There are five activities associated with the public meeting, and you have estimated the components of each activity in the data file, Public Meeting Estimate document.



**Note:** Activities may vary slightly if the software vendor has issued digital updates. Your instructor will notify you of any changes.

1. Which estimating technique was used to come up with the \$30,000 figure for the public meeting work package?
  
2. Open the Public Meeting Estimate document and refer to it as you work through the remaining questions.
  - a) Navigate to File Explorer and browse to C:\ATPPMP1Data\Getting Started with the Project.
  - b) Open **Public Meeting Estimate.docx**.
  
3. What is the estimated cost of the Conduct Planning Meetings work package?
  
4. What technique did you use to estimate the cost of the Conduct Planning Meetings activity? Why is this technique beneficial?
  
5. Which estimating technique was used for the Arrange Staffing activity?

6. Using the information in the Public Meeting Estimate document, estimate the cost of each of the activities.
  7. What is your total estimate for the Public Meeting work package?
  8. What is the degree of certainty of your cost estimate now?
  9. Do you need to take any action regarding the sponsor's target of \$30,000? If so, what action should you take?
- 
10. Compare your public meeting estimates to C:\ATPPMP1Data\Getting Started with the Project\Solutions\Public Meeting Estimate Solution.docx.

## Budget Estimates

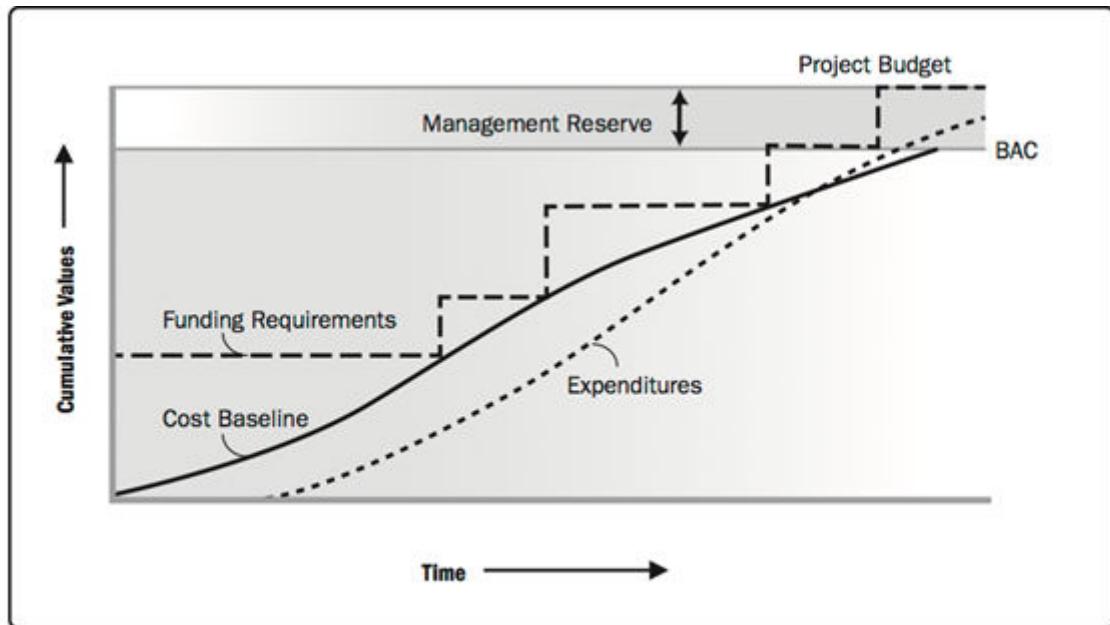
Estimating the project budget is the process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline. This budget contains all the funding needed to complete the project as defined in the scope baseline and the project schedule. The project cost performance is then measured against this cost baseline.

## Cost Baseline

A **cost baseline**\* is the approved version of the time-phased project budget, excluding any **management reserves**\*, which can be changed only through formal change control procedures and is used as a basis for comparison to actual results. It is developed by adding the estimated costs of project components by period.

The cost baseline typically includes a budget contingency to accommodate the risk of incurring identifiable, but not normally occurring, costs within the defined scope. Cost baselines will vary from project to project, depending on each project's unique budget and schedule.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 254-255.



*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Page 255.*

**Figure 2–6: Cost baseline.**



**Note:** Once the baseline is established, the cost becomes a commitment from the project manager's perspective. The project manager should try to closely match the project's committed funds to the baseline, from a timing perspective.

## Guidelines for Estimating Cost Baseline

You can estimate a cost baseline to assist in the monitoring and measuring of cost performance throughout the project life cycle. You can use the following guidelines to estimate the cost baseline:

- Gather the inputs you will need to establish the baseline, such as the WBS, the project schedule, the cost estimates, and the risk management plan.
- Use the project schedule to determine when work will take place.
- Using one of the methods for assigning costs, allocate funds for each work package for the time period in which it will take place.
- Consider adding a contingency reserve to accommodate the risk of incurring extra expenses.
- Avoid adding contingency reserves for work packages with low risk values.
- Total the costs for each time period.
- Plot the costs for each period on a chart to create an S-curve of the baseline.
- Publish and distribute the cost baseline to the appropriate project stakeholders.

## Project Budgeting Components

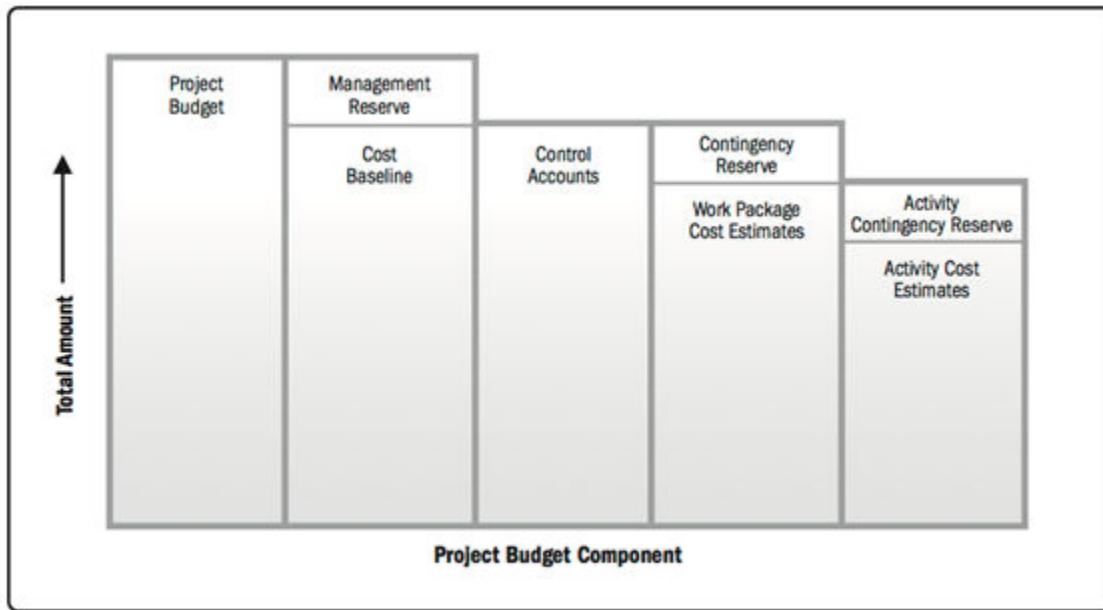
The project budget consists of a number of components, as shown in the following figure. The budget is built from right to left, starting with the cost estimate for an activity. If appropriate, a contingency reserve is added to allow for risk associated with that activity. (For example, in building the foundation for a house, a weather-related risk could increase the cost of digging the foundation if excavating equipment must be rented for an unscheduled second day.)

The activities are then rolled up to the work package level, and another contingency reserve is added if there is a risk to the work package that did not exist at the activity level. (There might be a risk of

the foundation cracking, in which case contingency would be added to patch the cracks.) At this point, the control account for each work package would have been created.

All of the work package estimates are then rolled up to create the cost baseline for the project. The sponsor might add a management reserve to account for unknown-unknowns, or unnamed risks that could not be identified at the activity or work package level. This results in the budget for the project.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 254-255.



*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 255.

**Figure 2-7: Project budget components.**

## Budget Challenges

Ideally, a budget is set during project planning and does not change. However, most projects do not exist in a perfect world and one of several things can happen to pose a challenge to the project manager:

- New or changed project requirements, which can be based on data collected by the organization regarding how the organization intends to use the project's deliverables.
- New risks, or changes to the probabilities or impacts of existing risks.
- Changes to cost estimates resulting from economic factors, procurement contract modifications, resource costs, etc.

When any of these things occur, one or more of the following must change:

- The project budget.
- The project cost.
- The project schedule.
- The scope.

If the budget remains fixed and additional funds are not available, then the project must change.

## Funding Limit Reconciliation

**Funding limit reconciliation\*** is the process of comparing the planned expenditure of project funds against any limits on the commitment of funds for the project to identify any variances between the funding limits and the planned expenditures. Most budgets are created on the premise of steady incoming and outgoing flows. Large, sporadic expenditures are usually incompatible with organizational operations. Therefore, funding limits are often in place to regulate the outgoing capital flow and to protect against over-spending. Budgets must be reconciled with such limits. This will affect the scheduling of project work and possibly reshuffle WBS work packages entirely. The schedule, in turn, can affect the distribution or acquisition of resources.

For example, customers set funding limits for large projects based on internal considerations such as when their fiscal years begin and end, and how healthy their cash flows are. A customer who wants to spread the costs of a project over two quarters might authorize \$250,000 in spending during Quarter 1 and \$350,000 during Quarter 2. In response, the project manager would need to align the resources, schedules, and activities so that the project work does not exceed those limits on funding.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 253.

## Guidelines to Anticipate Future Budget Challenges

While you cannot plan for all eventualities, here are a few guidelines to help you plan for future budget challenges:

- Keep the stakeholder register current and be aware of changes to project requirements if new stakeholders are added to the project.
- Monitor risks frequently to look for new risks and changes to existing ones.
- Monitor the performance of suppliers and vendors.
- Monitor all changes to the project and follow the Change Management System to try to keep them within budget.

## Guidelines to Determine a Budget

To determine a project budget effectively:

- Review the **cost management plan\*** for information on how project costs will be managed and controlled, and the method used and level of accuracy for estimating activity cost.
- Review the resource management plan for staffing attributes, personnel rates, and reward and recognition information.
- Review the scope baseline for the project scope statement, WBS, and WBS dictionary.
- Check the project schedule for type, quantity, and duration of resources needed for project activities.
- Review the risk register to consider any risks that may impact cost estimation.
- Review the OPAs that can influence this process such as cost estimating policies, cost estimating template, historical information, and lessons learned.
- Use tools and techniques such as **cost aggregation\***, reserve analysis, expert judgment, historical information, and funding limit reconciliation to determine a budget for the project.
- Document the project budget and create a cost baseline.
- Understand project funding requirements. This includes ensuring that project expenses are not incurred faster than project income is received.
- Update project documents, as needed.

# ACTIVITY 2–4

## Estimating the Cost Baseline

### Scenario

You are ready to move forward with the Public Meeting work package for the shopping center project. The Director of Finance is ready to allocate project funds but is interested in your cash flow. Before creating the cash flow document, you review your notes from a recent meeting:

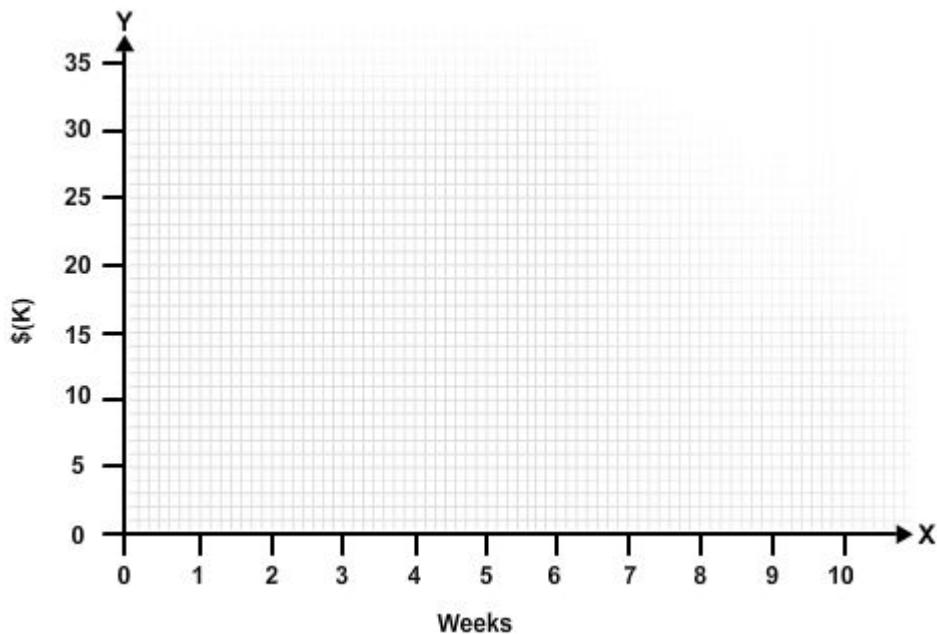
- Staffing arrangements must be made.
- Contracts for the venue must be completed.
- The location should be selected early in the process and the staffing should happen shortly after the location is secured.
- Five weeks before the event, a promotional newspaper ad will be purchased. Subsequent ads will be placed in the final week before the meeting.
- Planned meetings will be scheduled over the next 10 weeks. The first meeting will happen right away and another in the fourth week. The remaining meetings will occur at two-week intervals until the event.
- A food budget that covers lunch in the first meeting and the third meeting must be set.
- The project schedule is 10 weeks.
- The cost of holding the event is \$3,000.

- 1. Do you have all the necessary inputs to establish a cost baseline?**
  
  
  
- 2. What cost assignment method will you choose to allocate funds? Why?**
  
  
  
- 3. What are the weekly cost estimates for the activities in the Public Meeting work package? Use the following table to estimate the costs per week, rounding to the nearest thousand.**

1.1.4.2		Total Budgeted Cost (K)	Week									
Public Meeting			1	2	3	4	5	6	7	8	9	10
Conduct Planning Meetings	10											
Arrange Location	5											
Arrange Staffing	7											
Publicize Event	8											
Hold Event	3											
<b>Total</b>	<b>33</b>											
Cumulative												

- 4. Compare your completed cost table to C:\ATPPMP1Data\Getting Started with the Project\Solutions\Completed Costs Per Week.docx.**

5. Will you include a contingency amount?
6. How will you plot the estimates to create an S-curve? Use the graph to plot your results. Cost (in terms of thousands) is plotted on the Y-axis and time (in terms of weeks) on the X-axis.



7. Compare your completed S-curve to C:\ATPPMP1Data\Getting Started with the Project\Solutions\Completed Graph.docx.
  8. Close all open files.
-

# TOPIC D

## Plan and Manage Schedule

The project schedule in its most basic form is simply a representation of how long a project takes to complete. It includes a number of components, including the activities that will be performed to execute the project scope, the duration of each activity, and how the activities are related to each other.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Estimate project tasks (milestones, dependencies, story points). (ECO 2.6.1)
- Utilize benchmarks and historical data. (ECO 2.6.2)
- Prepare schedule based on methodology. (ECO 2.6.3)
- Measure ongoing progress based on methodology. (ECO 2.6.4)
- Modify schedule, as needed, based on methodology. (ECO 2.6.5)
- Coordinate with other projects and other operations. (ECO 2.6.6)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Activity cost estimates	Top Down Estimating; Expert, Analogous, Parametric
Activity duration estimates	Bottom Up Estimating: Roll up WBS packages
Task estimates	T-Shirt sizing
Story estimates	Estimating using Fibonacci sequences
Feature estimates	Story points
Updated documents	Relative estimating
Backlog	Affinity estimates
Velocity data	PMIS
Project schedule	Process assets
Release plan	Backlog management
Product Roadmaps	Release planning
Earned Value	Iteration planning
Updated schedule	Burn down / up charts
Updated release plan	Cumulative flow diagrams
Updated product backlog	Throughput analysis
Network diagram	Velocity analysis
Planning meetings	Retrospectives
Negotiations	Review work produced Backlog reprioritization

<i>Deliverables</i>	<i>Tools</i>
	Scaling projects
	Meetings
	Procurement negotiations

## Project Schedule

The **project schedule**\* is an output of a schedule model that presents linked activities with planned dates, durations, milestones, and resources. This visual presentation can include the project team's plan for starting and finishing activities on specific dates and in a certain sequence. The schedule also specifies planned dates for meeting project milestones. With its supporting detail, the schedule is the main output of the develop schedule process. The purpose of the project schedule is to coordinate activities into a master plan in order to complete the project objectives on time. It is also used to track schedule performance and to keep upper management and project stakeholders informed about project status.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 205-207.

## Benchmarks and Historical Data

**Benchmarking**\* in the context of scheduling is the comparison of a project schedule to a schedule for a similar product or service produced elsewhere. For example, if a widget can be designed in six months by other companies, your design for a comparable widget should not take a year. Benchmarks can be useful in the initial stage of scheduling, to help assess the feasibility of a project. Historical data, on the other hand, can come from other projects completed within an organization for which detailed information is available. Such data is very useful when scheduling phases or individual activities of a project. It provides a good “starting point” for how long something should take, prior to detailed analysis.



**Note:** Activities will be discussed shortly.

## Schedule Management Plan

A **schedule management plan**\* is a component of the project or program management plan that establishes the criteria and the activities for developing, monitoring, and controlling the schedule. It describes how activities will be defined and progressively elaborated, and identifies a scheduling method and scheduling tool that will be used for a project. It also determines the format of the schedule and establishes criteria for developing, monitoring, and controlling the project schedule.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 181-182.

The schedule management plan can document the following decisions for the project.

<i>Component</i>	<i>Description</i>
Project schedule model	The project schedule model is the methodology and tool that will be used to develop the project schedule. Maintenance of the project schedule describes how to update the status and record the progress of the project during the project execution.

<b>Component</b>	<b>Description</b>
Accuracy	Level of accuracy is the acceptable range used to determine realistic activity duration estimates, and may include an amount for risk contingency.
Units	Units of measure are defined for each resource such as staff hours, days, and weeks.
Organizational procedures links	The WBS is used as the framework for the schedule management plan so that there is consistency with the estimates and resulting schedules.
Control thresholds	Control thresholds are the defined variance thresholds for monitoring schedule performance before action is taken. Expressed as percentage deviations from the baseline plan; for example, 10% behind schedule or 15% ahead of schedule.
Rules	This includes the rules of performance measurement; for example, Earned Value Management (EVM) rules: <ul style="list-style-type: none"> <li>• Rules for establishing percent complete.</li> <li>• Control accounts where progress and schedule will be measured.</li> <li>• Earned value measurement techniques.</li> <li>• Schedule performance measurements such as schedule variance (SV) and schedule performance index (SPI).</li> </ul>
Reporting	Reporting formats define frequency and formats for schedule-related reports.
Process descriptions	Process descriptions describe how the schedule management processes are documented.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 182.

## Schedule Management Considerations for Agile/Adaptive Environments

Although a final completion date may be scheduled in an agile/adaptive approach, activities throughout the project tend to use iterative scheduling with a backlog or on-demand scheduling. This allows priorities to be adjusted as the project environment evolves.

The agile approach uses short cycles for work, review, and adaptations or adjustments. The rapid feedback about the approach and deliverables received becomes the basis for iterative scheduling and on-demand pull-based scheduling.

Processes involved in Project Schedule Management include:

- Plan Schedule Management
- Define Activities
- Sequence Activities
- Estimate Activity Durations
- Develop Schedule
- Control Schedule

### Iterative Scheduling with a Backlog

This method uses progressive elaboration (rolling wave) techniques to develop and schedule activities in a specified time window, often two weeks, based on requirements defined in user stories. The stories are prioritized and selected based on how long each will take and then the highest priority is constructed first, allowing a team to deliver business value early and incrementally.

Remaining stories are added to the backlog and will be constructed in subsequent time cycles based on their priority. A benefit of this scheduling approach is that it allows changes/adaptations during the entire project, but it does not work well with activities that have complex dependency relationships.

### On-Demand Scheduling

This method does not use traditional schedules at all, but rather has team members "pull" work from a queue as their availability allows. Based on Kanban and *Lean* methodologies, this approach also provides incremental business value, while leveling out the work of the team members. It works best when work can be divided into relatively equal amounts, but also does not work well with activities that have complex dependency relationships.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 177-178.

## Guidelines to Develop a Schedule Management Plan

Guidelines to developing a schedule management plan are as follows:

- Review the project management plan for information to develop the schedule such as the scope baseline and other scheduling-related information such as risk decisions.
- Review the project charter for a summary, high-level milestone schedule for the project, and for who will approve the project schedule.
- Review the EEFs such as organizational culture and structure, resource availability and skills, use of project management software, published commercial information, and organizational work authorization systems.
- Review the OPAs such as monitoring and reporting tools; historical information; lessons learned; schedule control tools; existing schedule control-related policies, procedures, and guidelines; templates; project closure guidelines; change control procedures; and risk control procedures.
- Use tools and techniques such as expert judgment and historical information to give the project team advice on schedule development and management from previous similar projects.
- Use meetings to develop the schedule management plan.
- Document the schedule management plan for the project.

## Project Activities

An *activity*\* is a distinct, scheduled portion of work performed during the course of a project. Activities lay the foundation for estimating, scheduling, executing, monitoring, and controlling the project work. The characteristics of an activity are:

- It has an expected duration. (How long will it take?)
- It consumes budget or human resources. (Who will do the work?)
- It has a performance-based name. (What is being accomplished?)

Work packages from the WBS can be broken into smaller components called activities. Activities do not appear on the WBS. They are documented separately in an *activity list*\*. Additionally, they may be entered in the project schedule or documented in an individual's own work plans.

For example, a work package named "reserve conference room" might be broken down into the following activities:

- Determine budget
- Determine size requirement
- Determine date needed
- Identify possible room alternatives
- Select room
- Call to reserve room

- File confirmation when received

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 183.

## Activity vs. Task

Although the words "activity" and "task" may be interchangeable in common usage and in many organizations, "activity" is the approved terminology in the *PMBOK® Guide*. One of your goals as a professional project manager seeking certification should be to align your language with the language used in the *PMBOK® Guide* whenever possible.

Use the word "activity" to refer to the components of work performed during the course of a project. Use the word "task" sparingly, typically only in reference to brands of *project management software* such as Microsoft® Project or, informally, in relation to other work that you need to do.

## Features

Features can be used to group related functionality together that delivers business value. The activities and efforts—including work such as documentation, bug fixes, testing, quality/defect repairs to correct current functionality—to deliver capability that can be estimated, tracked, and managed as a set.

Scheduling aligned to features ensures associated work is coordinated. Estimating features gives a view of when blocks of functionality can be released to the business and end users. Progress can be measured based on the features accepted by the business compared to the features remaining.

## Milestones

A *milestone*\* is a significant point or event in a project, program, or portfolio. Milestones have no duration and trigger a reporting requirement or require sponsor or customer approval before proceeding with the project. Milestones serve as markers and are defined by the project manager, customer, or both.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 186.

## Guidelines for Estimating Project Activities

To estimate activities for a project:

- Review the schedule management plan for information on the level of detail needed to manage the project work.
- Review the scope baseline for the WBS, deliverables, assumptions and constraints.
- Review the EEFs such as organizational culture and structure, published commercial information, and project management information systems.
- Review the OPAs such as lessons learned, standardized processes, templates and organizational policies, and procedures and guidelines for scheduling.
- Analyze and decompose each work package of the WBS into activities (if desired) that will be required to produce the deliverable:
  - Conduct brainstorming sessions with the project team to ensure that no required activities are overlooked.
  - Consult the scope statement to ensure that activities will enable you to meet the project objectives.
  - Consult subject matter experts (SMEs) about unfamiliar material.
  - Evaluate all constraints and assumptions for their possible impact on activity definition.

- Once you have decomposed each work package into activities, evaluate your activity list:
  - Ensure that the descriptions accurately reflect the actions to be performed.
  - Verify that the activity descriptions are as specific as possible. For example, if the desired outcome is a revised user manual, describe the activity as "revise user manual," rather than "produce new user manual."
  - Confirm that the activities listed for each work package are necessary and sufficient for satisfactory completion of the deliverable.
  - Verify that the list is organized as an extension of the WBS.

## ACTIVITY 2–5

### Creating an Activity List and a Milestone List

#### Data Files

C:\ATPPMP1Data\Getting Started with the Project\Milestone List.docx

C:\ATPPMP1Data\Getting Started with the Project\Activity List.docx

#### Scenario

You work for a small development company that builds homes for low-income families. The home-build program's purpose is to build a two- or three-bedroom home for each qualifying family. Under the sponsorship of Linda Michaels, your company is getting ready to build a new home for the Andrews family. The family has qualified for the home-build program and is the next family on the home list. You have been assigned to manage this project. Each new build project is named by the address and the next available lot is located at 234 West Adams Street.

There are a number of activities that must be completed for the 234 West Adams project. You must define the activities for the build, record them in an activity list, and then determine the milestones for the project activities. In this activity, you will focus on the activities that are required to complete the framing work package, which includes the framing from floor to roof and the garage as well as installing doors, windows, drywall, and trim. First, you'll create a high-level milestone list for the framing work package, and then you'll create the framing activity list.

**1. The first step in creating an activity list is to gather your resource materials.**

**Which items will be helpful in creating your list? (Choose three.)**

- The WBS
- Cost-benefit analysis
- The scope statement
- Activity lists from similar projects

**2. Create a milestone list for the 234 West Adams building project.**

- a) Open C:\ATPPMP1Data\Getting Started with the Project\Milestone List.docx.
- b) Brainstorm some of the high-level milestones for the entire build project.
- c) Enter each milestone and record if it is mandatory or optional for the project.

**3. Save the file as *My Milestone List.docx* and close it.**

**4. Create an activity list for the framing work package.**

- a) Open C:\ATPPMP1Data\Getting Started with the Project\Activity List.docx.
- b) Using the information in the scenario, brainstorm the possible activities for the framing work package.
- c) In the **Activity** column, enter the framing activities.

Throughout the lesson, you will complete the other columns in the Framing Activity List table. For now, it's enough to create the list of activities.

**5. Save the file as *My Activity List.docx* and leave it open for the next activity.**

6. You are creating your activity list, but only for the next two portions of the project. The rest of the work you are leaving at the work package level. What approach are you using?

- Predictive life cycle
  - Brainstorming
  - Bottom up
  - Progressive elaboration
- 

## Activity Dependency

An **activity dependency** is a logical relationship that exists between two project activities. The relationship indicates whether the start of an activity is contingent upon an event or input from outside the activity. Activity dependencies determine the precedence relationships. For example, an architect has designed a residence and has a vision for the room layouts. However, he will not be able to assess the functionality of the design until the builders have framed in the structure with walls, windows, and a roof. Once the structure is in place, he will be able to reassess the plans to determine if modifications are necessary.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 191-192.

### Types of Activity Dependencies

Activity dependencies can be categorized as either mandatory or discretionary, and they can be either internal or external. Activity dependencies categories include the following:

- A **mandatory dependency**\* is a relationship that is contractually required or inherent in the nature of the work. They are referred to as hard logic or hard dependencies, where there is no way around this sequence. For example, the sidewalk form must be built before the concrete can be poured.
- A **discretionary dependency**\* is a relationship that is established based on knowledge of best practices within a particular application area or an aspect of the project where a specific sequence is desired. They are also called soft logic. They are not necessary and can be modified as the project progresses and a better sequence is found or the schedule needs to be condensed.
- An **external dependency**\* is a relationship between project activities and non-project activities. For example, the delivery of a part that is needed to build a prototype.
- An **internal dependency**\* is a dependency between project activities and is usually under the project's control. For example, the software testing is dependent on the software being written by a software development team.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 191-192.

## Precedence Relationships

A **precedence relationship**\* is a logical dependency used in the **precedence diagramming methods (PDMs)**\*. In other words, the precedence relationship exists between activities that describe the sequence in which the activities should be carried out. Each activity has two open points: start and finish. Precedence relationships consider appropriate logic while connecting these points. Precedence indicates which of two activities drives the relationship (the predecessor activity) and which is driven by it (the successor activity). In most situations, predecessors occur earlier in time than successors. Precedence relationships are always assigned to activities based on the dependencies of each activity. A finish-to-start relationship is an example of the precedence relationship: Drywall installation must finish before painting can begin.

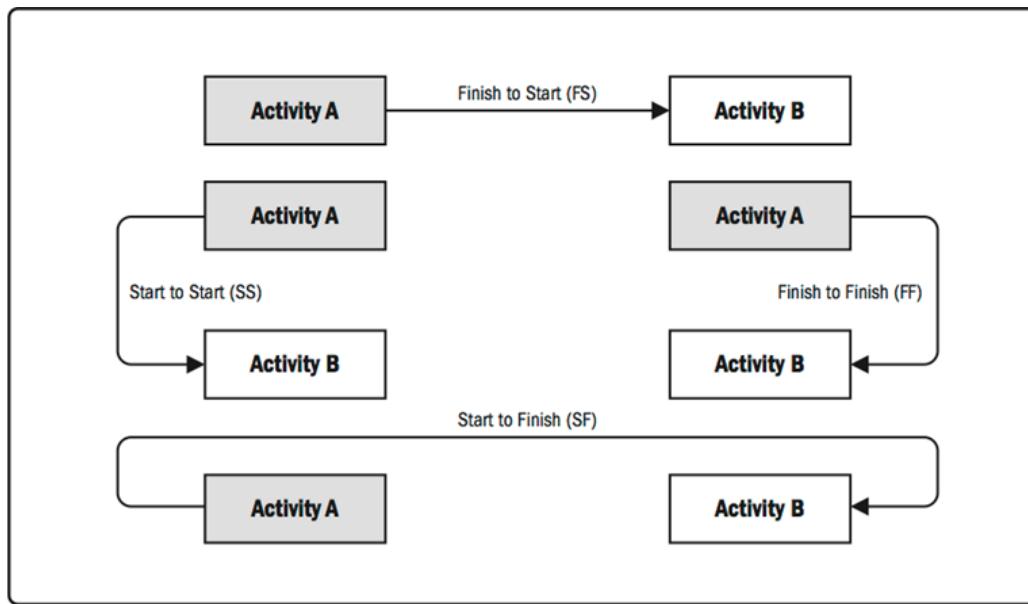
Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 189-190.

## Types of Precedence Relationships

There are four precedence relationship types. Predecessor activities come before a dependent activity and successor activities come after another activity.

- **Finish-to-Start (FS)\*** is a logical relationship in which a successor activity cannot start until a predecessor activity has finished. For example, the foundation for the house must be finished (Activity A) before the framing can start (Activity B). The total time for these two activities is the sum of A + B.
- **Finish-to-Finish (FF)\*** is a logical relationship in which a successor activity cannot finish until a predecessor activity has finished. For example, construction must be finished (Activity A) before the building inspection can be finished (Activity B). The total time to complete both activities is the sum of A + B, minus any overlap.
- **Start-to-Start (SS)\*** is a logical relationship in which a successor activity cannot start until a predecessor activity has started. For example, the building design must start (Activity A) before the electrical layout design can start (Activity B). As with the FF example, the total time for activities A and B will vary, depending on when Activity B starts. But in SS, there is a longer window of time during which Activity B can begin.
- **Start-to-Finish (SF)\*** is a logical relationship in which a successor activity cannot finish until a predecessor has started. For example, ticket sales (Activity B) don't end until the concert (Activity A) starts. The total time for two activities in an SF relationship is either A or B, whichever is longer.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 189-190.



*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 190.

Figure 2-8: Precedence Diagramming Method relationship types.

## Guidelines to Sequence Project Activities

To sequence project activities effectively:

- Review the schedule management plan for information on the scheduling method and tool, and information on how activities may be sequenced.

- Determine the dependencies among project activities by using your activity list and product descriptions.
- Identify predecessor and successor activities by reviewing the activity attributes for each activity, including predecessor or successor relationships.
- Review the **milestone list** for the dates for specific schedule milestone events.
- Review the project scope statement for the scope description, deliverables, constraints, and assumptions that may affect activity sequencing.
- Review the EEFs such as government or industry standards, Project Management Information System, scheduling tool, and work authorization systems.
- Review the OPAs such as activity planning policies, procedures, guidelines, and templates.
- Use tools and techniques such as Precedence Diagramming Method (PDM), dependency determination, and **leads\*** and **lags\*** to develop the project schedule network diagram.
- Document the project schedule network diagram and update any project documents as needed.

## Activity Duration Estimates

**Activity duration estimates\*** are the quantitative assessments of the likely number of time periods that are required to complete an activity. These estimates do not include any lags between the finish of one activity and the start of the next one. Each activity will have one duration associated with it; for example, two days, one week, or one month. Remember that duration includes only working times, not non-working periods such as weekends or holidays.

You can refer to the schedule management plan for considerations that might affect activity durations. Examples of things that might be affected are:

- Domestic and international holidays
- Unit of measurement to be used for durations
- Other projects and operations

**Elapsed time** is the actual calendar time required for an activity's completion. An activity that requires two weeks to complete would take four calendar weeks of elapsed time if there's a two-week plant shutdown in the middle.

**Effort\*** is the number of labor units required to complete a scheduled activity or WBS component, often expressed in hours, days, or weeks. Contrast with duration. The estimates of effort provide the basis for cost estimating and resource allocation.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 196-197.

## Guidelines to Estimate Activity Durations

Accurate activity duration estimates form the basis of an accurate project schedule. To ensure your estimates are as accurate and realistic as possible, follow these guidelines:

- Involve the work package owners or others who are familiar with the work of the activity.
- Consult lessons learned and historical information.
  - Are there any detailed records from previous earlier iterations of this project or from similar projects that you could use to derive your estimates?
  - Are there any relevant commercial duration estimating databases?
  - Do any project team members have experience with similar activities?
- Review the schedule management plan to determine the appropriate estimation method to use and the level of accuracy needed to estimate activity durations.
- Determine how you want to quantify the work that needs to be done, in terms of the estimated hours of labor that will be needed, the number of units to be produced, and the number of customers to be served.

- If it is early in the planning phase or if there is good historical data, consider using analogous estimating.
- If there is inadequate historical data, consult SMEs.
- Use quantitatively based durations to estimate activities when quantities of work units can be multiplied by the productivity rate.
- If you are using the three-point estimating technique, ask the estimators for the best-case, most likely, and worst-case estimates.
- Consider resource requirements and capabilities.
  - Which people will be assigned to this activity?
  - How will the skills of the assigned staff affect the duration estimates?
- Review the resource requirements for each activity, as the level of that resource can affect the time it will take to complete that activity.
- Check the resource calendars for when resources are available.
- Consider interactions with other projects or operations.
- Review the project scope statement for assumptions and constraints.
- Review the risk register to consider any risks that may impact resource estimation.
- Review the resource breakdown structure of resources listed by category and type.
- Use tools and techniques such as expert judgment, analogous estimating, parametric estimating, three-point estimating, group decision-making techniques, and reserve analysis to determine good duration estimates for each activity.
- Document the activity duration estimates.

## Schedule Presentation Formats

The project schedule can be presented in different formats, depending on the circumstances. Three commonly used schedule formats are:

- Gantt chart
- Milestone chart
- Project schedule network diagram with dates

## Gantt Chart

Created by Henry Gantt, the **Gantt chart**\* is a **bar chart**\* of schedule information where activities are listed on the vertical axis, dates are shown on the horizontal axis, and the activity durations are shown as horizontal bars placed according to start and finish dates. Tasks in the Gantt chart are listed down the left side and dates are listed across the top or bottom with bars to indicate start and finish dates. Time is represented with horizontal bars that correspond to the activities. Gantt charts may also show the dependencies of the project activities, as well as the percentage of the activity completed to date and the actual progress in relation to planned progress.

These charts are often used when presenting project status to upper management. A detailed view of the chart is used when reviewing project status with the project team.

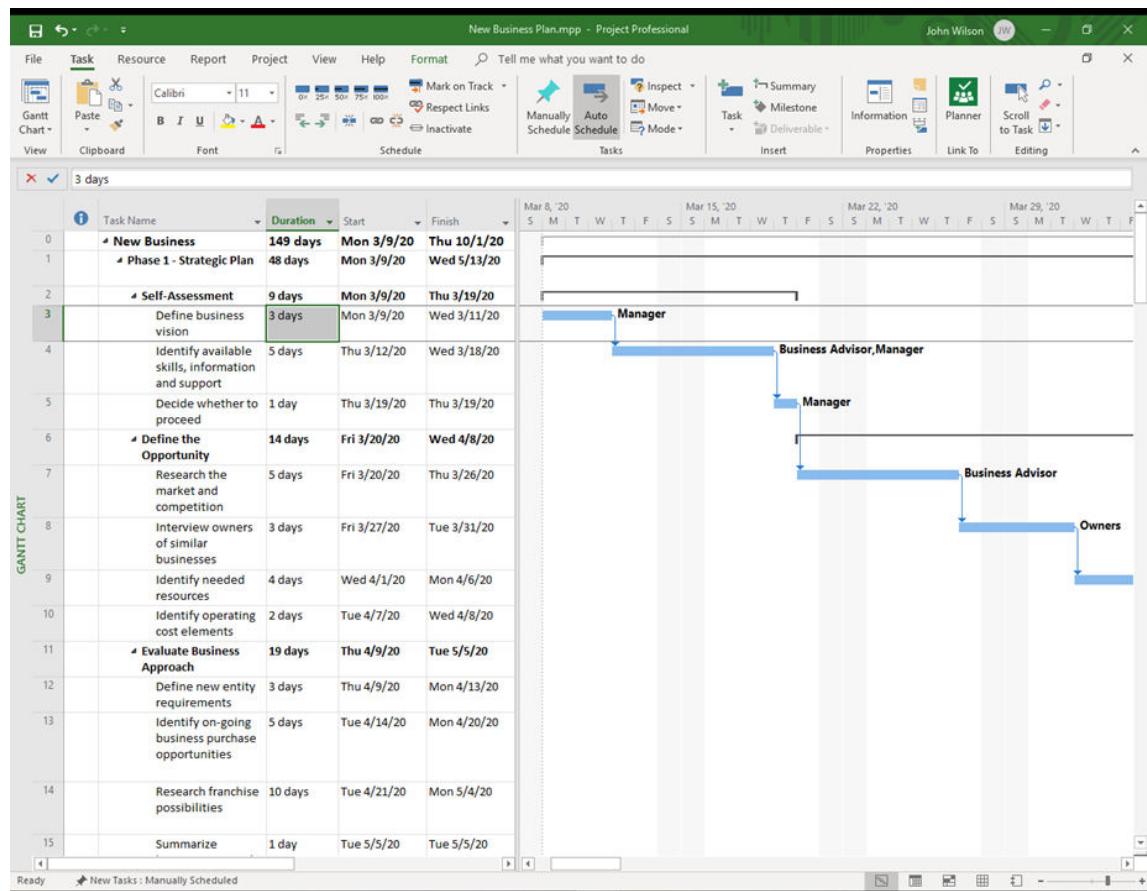


Figure 2-9: An example of a Gantt chart in Project 2019.

## Milestone Chart

A **milestone chart** provides a summary level view of a project's schedule in terms of its milestones. Milestones are typically listed from the left to right of the chart, and icons or symbols are used to show scheduled milestone events. Time intervals—divided into hours, days, weeks, or months—are usually presented horizontally across the top or bottom of the chart, as illustrated in the figure. Milestone charts can be effective in demonstrating the project's overall schedule to project team members, stakeholders, and upper management. It is especially useful for upper management, who are usually not concerned with the level of detail shown in a Gantt chart.

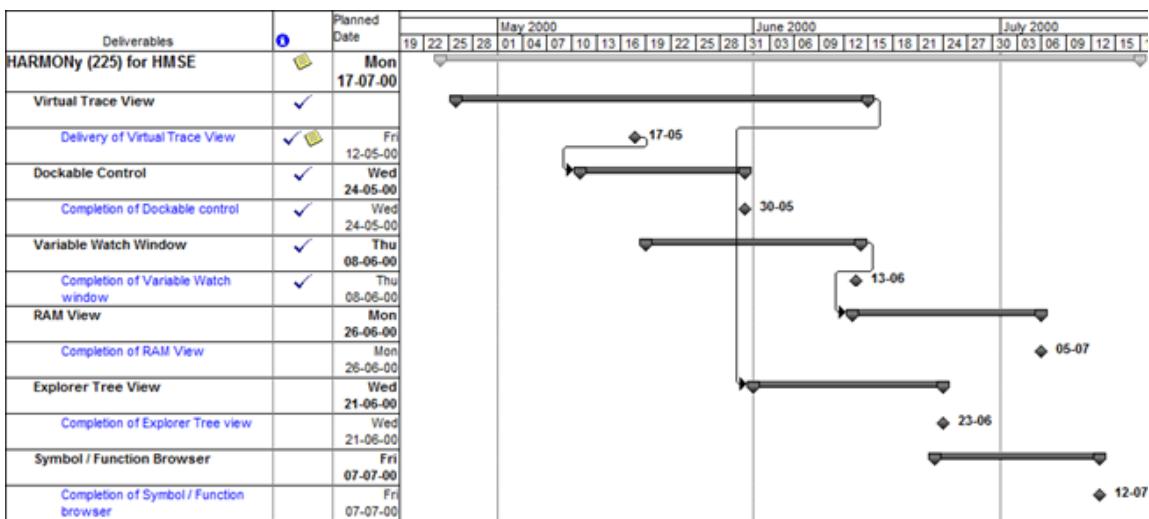


Figure 2-10: An example of a milestone chart.

## Project Schedule Network Diagram with Dates

Adding dates to the *project schedule network diagram*\* helps when assigning start and finish dates to activities on the project schedule network diagram. These types of charts can be useful when you need to communicate the project status in terms of activity precedence relationships.

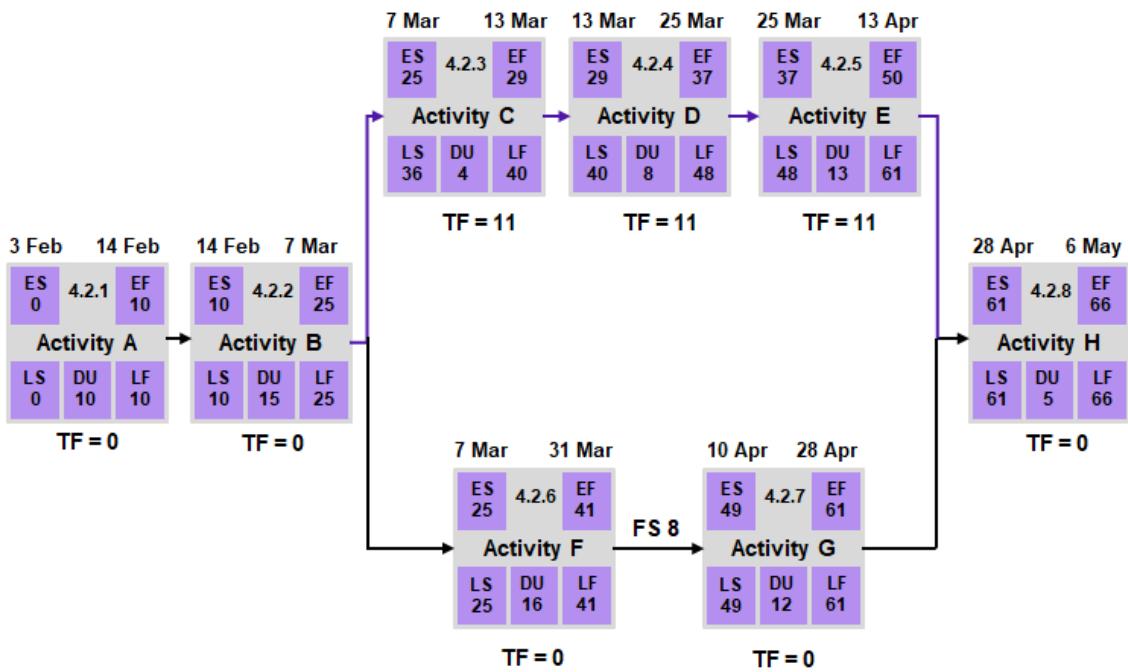


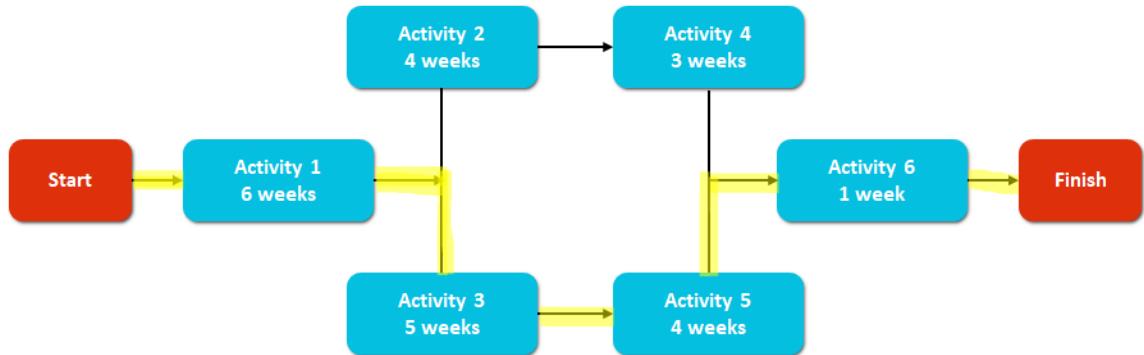
Figure 2-11: A project schedule network diagram with dates.

## Critical Path

The *critical path*\* is the sequence of activities that represents the longest path through a project, which determines the shortest possible duration. Activities on the critical path cannot be delayed, or the whole project will be delayed unless subsequent activities are shortened. The longest path in the project schedule represents the shortest project duration. The activities on this path must be

monitored closely throughout the project. The critical path is calculated by doing a forward pass to calculate the ES and EF for each activity and then a backward pass to calculate the LS and LF for each activity. The path with the longest total duration and no scheduling flexibility is the critical path.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 210-211.



$$1[6w] + 2[4w] + 4[3w] + 6[1w] = 14 \text{ weeks}$$

$$1[6w] + 3[5w] + 5[4w] + 6[1w] = 16 \text{ weeks} \quad \textbf{Critical Path}$$

**Figure 2-12: The critical path.**



**Note:** To further explore the critical path, you can access the Spotlight on **Working with the Critical Path** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Critical Path Activities

A **critical path activity**\* is any activity on the critical path in a project schedule. Generally, for all activities along the critical path, ES = LS and EF = LF. There can be no flexibility in the start time or the finish time for these activities. Activities that are not on the critical path usually have some flexibility in their start and finish times. Activities on the critical path have a total float of zero.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 210-211.

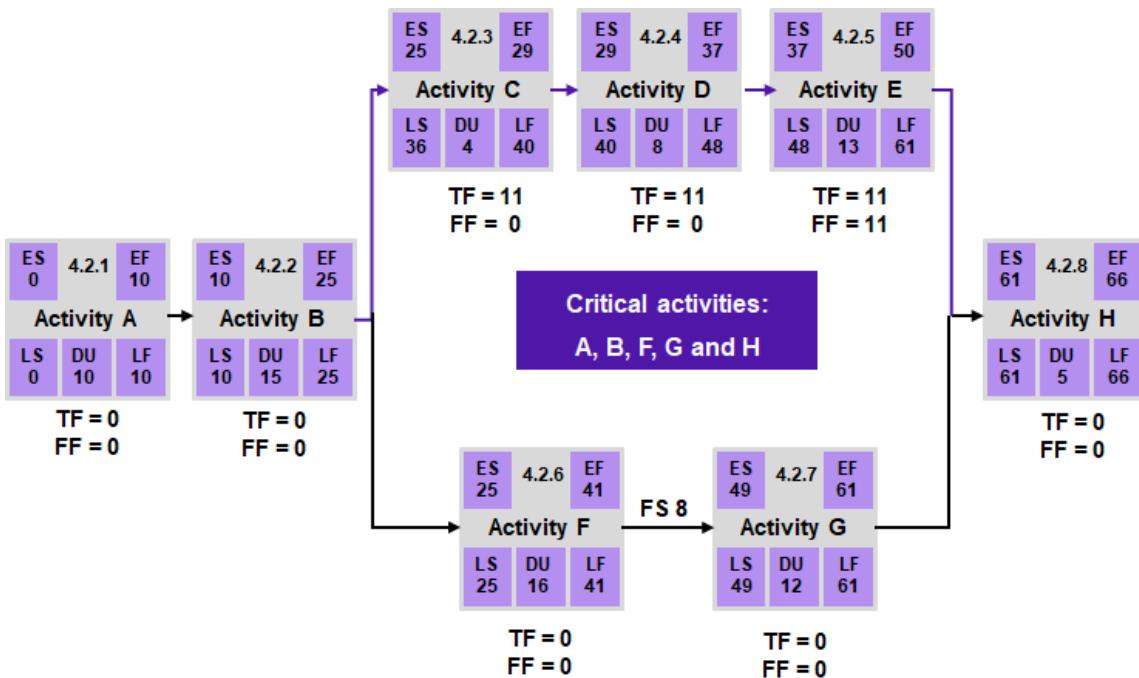


Figure 2-13: Critical activities lie on the critical path (Activities A, B, F, G, and H).

Note the following characteristics in the figure:

- The ES for the first activity (A) equals zero.
- The EF for the first activity is its ES plus its duration ( $0 + 10 = 10$ ).
- The ES for all successor activities is the latest EF of any of its predecessor activities plus any lags or minus any leads between the two activities.

For example, the ES for Activity D is the same as the EF for Activity C (29) and the ES for Activity G is the EF for Activity F (41) plus an 8-day FS lag, which is indicated as FS 8 ( $41 + 8 = 49$ ).

	<b>Note:</b> Although the ES of the first activity can be zero, it can also have the value one. But when the ES of the first activity is one, then the EF should be calculated as $ES + DU - 1$ . The ES of the successor activity will then be the EF of the predecessor activity plus one. For example, if the ES of the first activity is one, then its EF will be $1 + 10 - 1 = 10$ and the ES of the second activity will be 11.
---	---

- The EF for all subsequent activities is its ES plus its duration. For example, the EF of Activity B (25) is its ES (10) plus its duration (15).
- The LF for the last activity is the same as its EF time (66).
- The LS for the last activity (61) is its EF (66) minus its duration (5).
- The LF for any predecessor activity is the same as the earliest LS of any of its successors plus or minus any leads or lags between the two activities.

For example, the LF of Activity E is the same as the LS of Activity H (61), and the LF for Activity F (41) is the LS for Activity G (49) minus the 8-day FS lag ( $49 - 8 = 41$ ).

- The LS for any predecessor activity is its LF minus its duration. For example, the LS for Activity E (48) is its LF (61) minus its duration (13).
- Only the three activities that are not on the critical path (C, D, and E) have total float ( $TF = 11$ ).
- Only the last activity in that string (Activity E) has free float ( $FF = 11$ ).
- The critical path is indicated by bold lines with arrows and includes activities A, B, F, G, and H. It is the path with the longest duration and zero float.

## Float

**Float\*** is also called slack. It is known as the amount of time an activity can be delayed from its ES without delaying the project finish date or the consecutive activities. Float occurs only in activities that are not on the critical path. There are two types: total float and free float.

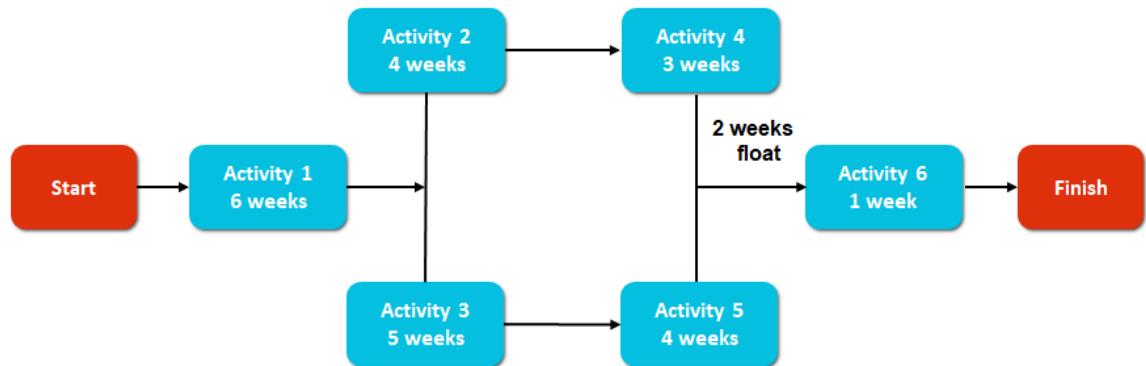


Figure 2–14: A schedule network diagram showing float.

### Total Float

**Total float\*** is the amount of time that a schedule activity can be delayed or extended from its early start date without delaying the project finish date or violating a schedule constraint. Total float for an activity can be calculated by subtracting its EF from its LF or its ES from its LS.

### Free Float

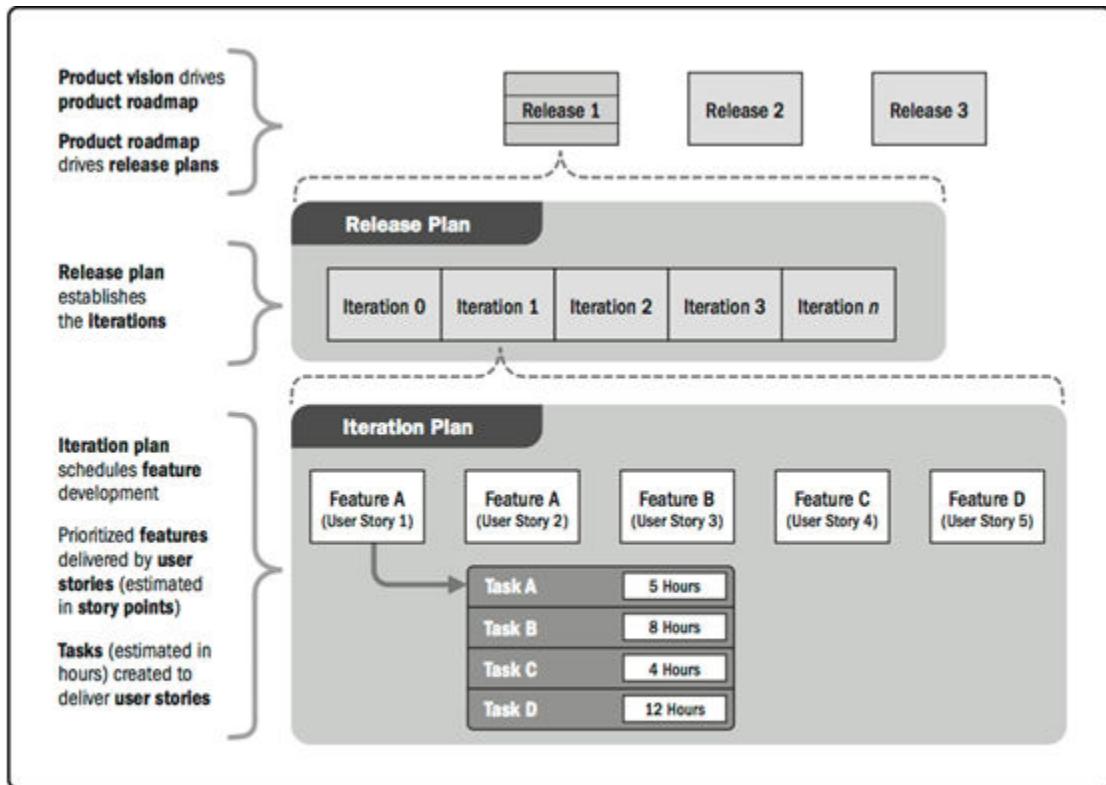
**Free float\*** is the amount of time that a schedule activity can be delayed without delaying the early start date of any successor or violating a schedule constraint. It allows flexibility of the start or finish time within that activity only. If there is a string of activities with float, free float will be available for the activity only at the end of the string. Free float on the activity is calculated by subtracting the EF of an activity from the ES of its successor activity.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 210-211.

## Agile Release Planning

As mentioned earlier in the course, the Agile methodology focuses on creating a number of product releases, each containing completed features that are ready for customer use. Each release consists of iterations, in which a piece of the product is designed, developed, and tested. Release planning focuses on creating the summary timeline for the project's product release. In the **Agile release planning** process, you determine the number of iterations or Sprints that are needed to complete each release, the features that each iteration will contain, and the target dates of each release. This enables customers to see the dates when the features that they want are expected to be available.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 216.



*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Page 216.*

**Figure 2-15: Relationship between product vision, release planning, and iteration planning.**

## Ongoing Progress Based on Methodology

Measuring the project's progress with respect to the schedule consists of monitoring the status of the project to update the project schedule and managing changes to the schedule baseline. During this process, the project manager continually monitors schedule performance by comparing actual work completed to the amount of work that was planned to be completed. In addition, the project manager and the Change Control Board (CCB) monitors, coordinates, and implements changes to the project schedule and evaluates the impact of those changes on other performance baselines and the original scope definition.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 222-224.

Schedule performance measurement is any technique used to determine how the project is performing in terms of time as compared to its planned performance. Schedule performance measurement tells the project manager how much variance exists between the actual work completed and the work scheduled.

Performance measurement techniques such as Earned Value Management (EVM), trend analysis, and variance analysis are used to help determine if the schedule variance is potentially detrimental to the project and if corrective actions are needed to ensure on-time deliverables. By using the approved schedule baseline as the standard for measuring progress, the project manager collects reporting information for each activity and uses a bar chart to summarize the data.



**Note:** EVM will be discussed later in this course.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 261-262, 267-268.

If an agile approach is used to manage the project, progress can be evaluated with the following steps:

- Compare the total amount of work delivered and accepted with the estimate of the work to be completed for the current time period.
- Review the completed work in the regular Sprint demos.
- Conduct scheduled reviews to record lessons learned (also known as retrospectives) for correcting and improving processes.
- Determine the rate at which deliverables are produced, validated, and accepted in the given time per iteration.

## Coordination with Other Projects

If the project is part of a program or a portfolio, the schedule status of the project should be evaluated for any effect it has on the other components of the *program*\* or *portfolio*\*. In some situations, a delay (or acceleration) of a project may not impact other projects. However, if the delay or acceleration is caused by activities on the project's critical path and that project is critical to the schedule of other projects, the overall effect can be significant.

# ACTIVITY 2–6

## Sequencing Activities

### Data File

C:\ATPPMP1Data\Getting Started with the Project\Sequence Activities.docx

### Before You Begin

The file you created earlier, My Activity List.docx, is still open.

### Scenario

With the project activities identified for the framing work package, you must sequence those activities so that the work gets done in the most efficient order. You may need to add lag or lead time as appropriate. Activities to be sequenced include:

- Install doors
- Install windows
- Frame exterior walls
- Install plywood flooring
- Frame interior walls
- Frame roof
- Frame garage
- Install drywall
- Install trim

1. Open C:\ATPPMP1Data\Getting Started with the Project\Sequence Activities.docx and consider the order in which the activities need to be completed. Discuss with the class.
2. In the Framing Activity List table, complete the middle columns.

Activity	Activity Identifier	Predecessor Activities	Successor Activities	Logical Relationships	Leads and Lags
Install plywood flooring					
Frame exterior walls				After floor	
Frame interior walls				After exterior walls	
Frame roof				After interior walls	
Install doors				After roof framing	
Install windows				After roof framing	
Install drywall				After doors and windows	
Install trim				After drywall	

- a) In the **Activity Identifier** column, assign a number to each activity.
  - b) Using the information in the **Logical Relationships** column, identify the **Predecessor Activities** and **Successor Activities** for each entry.
3. During a recent meeting with your project team, a decision was made to add five days between two activities—installing the plywood flooring and framing the exterior walls—due to other projects that some members of the team have already committed to. Will this be a lag or lead relationship that you should account for? Add it to the table and explain.
  4. Open C:\ATPPMP1Data\Getting Started with the Project \Solutions\Sequence Activities Solutions.docx and compare your predecessor and successor activity answers.
  5. Referring to **My Activity List.docx**, draw a network diagram for the framing work package with the following specifications.
    - Make sure that all the required activities are included in your network diagram.
    - Make sure your diagram shows the sequence constraints from left to right.
    - Check to make sure the activities that are connected by arrows correctly indicate their precedence relationship.
    - Inside each node, indicate any lag or lead time needed.
  6. Compare your network diagram to the one shown on page 2 in the **Sequence Activities Solutions** document.
  7. Close all open files.
-

# TOPIC E

## Plan and Manage Quality of Products and Deliverables

All projects must be of a certain quality. What that level of quality is, the expectations around the quality, how the project's quality is to be measured, how it will be aligned to the project's objective, and how the quality is to be tracked and reported are a few important aspects of managing project quality. There is a lot to do and consider when it comes to assuring and delivering quality deliverables and products.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Plan quality standard required for project deliverables. (ECO 2.7.1)
- Recommend options for improvement based on quality gaps. (ECO 2.7.2)
- Continually survey project deliverable quality. (ECO 2.7.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<i>Deliverables</i>	<i>Tools</i>
Quality Management Plan	Cost benefits analysis
Define Quality Metrics	Cost of Quality
Quality Assurance	Benchmarking
Quality Control	Quality audit
	Process analysis
	Measure quality
	Validate deliverables
	Quality measurement tools

### Quality

**Quality\*** is the degree to which a set of inherent characteristics fulfills requirements. Remember that quality represents what the stakeholders expect from the project. The stated and implied quality needs are inputs for devising project requirements. In business, quality should be feasible, modifiable, and measurable.

The quality standards that need to be met must be managed throughout the life of the project. At the beginning of the project, you should plan quality policies and procedures that can then be managed and controlled throughout the project using the organization's quality management system. Continuous process improvement activities also need to be considered for the benefit of the project. Project quality may be affected by applicable standards and regulations.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 271-273.

## Quality Standards and Regulations

A **standard**\* is a document established by an authority, custom, or general consent as a model or example. Standards are typically voluntary guidelines or characteristics that have been approved by a recognized body of experts such as the International Organization for Standardization (ISO). In some cases, the standards body will provide certification that suppliers conform to the requirements of their standards. Often, the conformance to standards is a customer requirement.

**Regulations**\* are requirements imposed by a governmental body. These requirements can establish product, process, or service characteristics, including applicable administrative provisions that have government-mandated compliance. Standards often start out as accepted or **de facto** best practices describing a preferred approach, and may later become **de jure regulations** such as using the critical path method in scheduling major construction projects.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 718, 723.

## Validated Deliverables

Products and other outputs are measured against the quality standards set by the project. Their quality is assured throughout the project per the tools, methods, and timing planned. When the quality standards are neither met nor within acceptable ranges, corrections and controls are put into action. Whether deliverables are controlled or within standards throughout, the validation performed by the project team and verified by the customer or business equals validated deliverables. All project deliverables must be validated based on quality standards or acceptance criteria.

## Quality Management Plan

A **quality management plan**\* is a component of the project or program management plan that describes how applicable policies, procedures, and guidelines will be implemented to achieve the quality objectives. It also documents and defines how the project's quality requirements will be met, and how the quality aspect of the project will be managed. Quality requirements and standards need to be gathered and documented for both the project and its deliverables. How the project will demonstrate that the quality requirements and standards have been met and how that will be validated will also need to be determined and documented.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 286.

## Quality Management Plan

### Andrews Family House Project

#### **INTRODUCTION**

The Quality Management Plan for the Andrews Family House project will establish the activities, processes, and procedures for ensuring a quality product upon the conclusion of the project.

#### **QUALITY MANAGEMENT APPROACH**

This section describes the approach the organization will use for managing quality through the project's lifecycle.

#### **QUALITY REQUIREMENTS/STANDARDS**

This section should describe how the project team or quality group will identify and document the quality requirements and standards. Additionally, there should be an explanation of how the project will demonstrate compliance with the identified quality standards. The quality standards and requirements should include both the project and processes.

#### **QUALITY ASSURANCE**

This section should explain how you will define and document the process for auditing the quality requirements and results from quality control measurements to ensure that quality standards and operational definitions are used. This section should also document the actual quality assurance metrics used for this project.

**Figure 2–16: A sample quality management plan.**

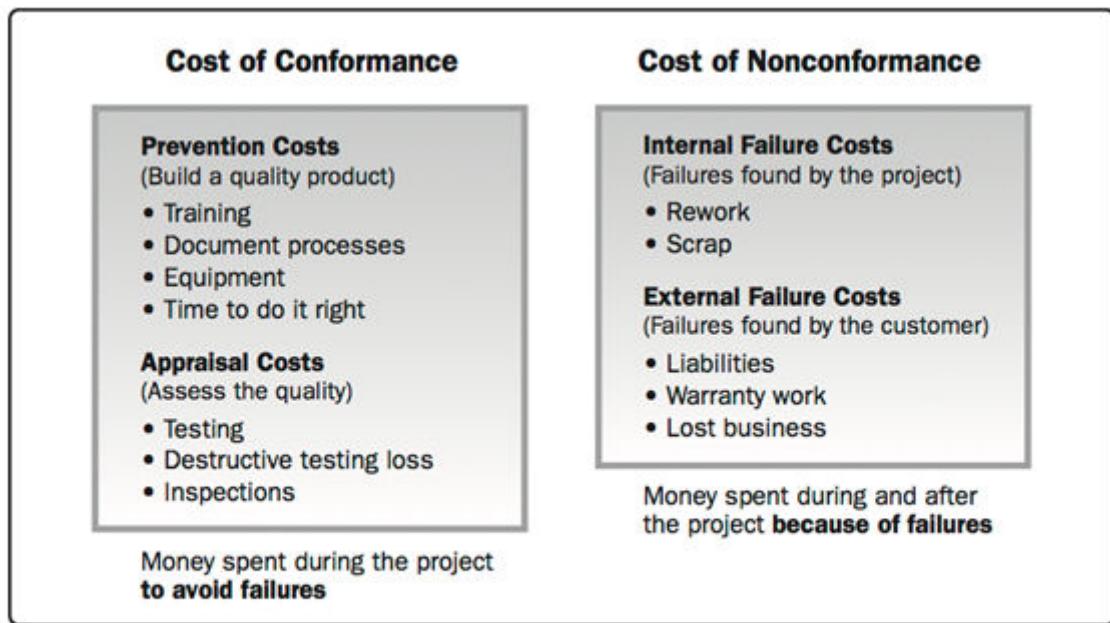
## Cost of Quality

**Cost of Quality (CoQ)\*** refers to all costs incurred over the life of the product by investment in preventing non-conformance to requirements, appraisal of the product or service for conformance to requirements, and failure to meet requirements.

**Cost of conformance** is the money spent during a project to avoid failures and includes prevention costs that build a high-quality product and appraisal costs that assess the quality. Examples of prevention costs include training, doing things right the first time, and following documented processes. Appraisal costs include testing and inspection.

**Cost of non-conformance** is the money spent after a project is complete because of failures and includes internal and external failure costs. Internal failures found during the project include rework and scrap. External failures found by the customer include liabilities, warranty work, and lost business due to a poor-quality product or damaged reputation.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 282-283.



*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Page 283.*

*Figure 2-17: Cost of Quality areas of consideration.*

## Quality Metrics

A **quality metric**\* is a description of a project or product attribute and how to measure it. The tolerance is the allowable variation in this measurement. For example, a quality metric on the schedule could say that the schedule is to stay within +10% and –10% of the actual schedule. When the measurement falls outside this range, action needs to be taken. Other examples of quality metrics include budget variance, defect count, requirements coverage, and failure rate.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 287.

## Quality Audits

A **quality audit**\* is a structured, independent process to determine if project activities comply with organizational and project policies, processes, and procedures. The audits can take place at scheduled or random intervals. The auditor may be a trained individual from within the performing organization or a qualified representative of a third-party organization. During a quality audit, the quality management plan is analyzed to make sure that it is still reflective of what has been learned in the project and to make sure the operational definitions are still adequate and valid. The results of a quality audit are important for the current project, as well as for later projects or other parts of the organization.

### Quality Audit Objectives

There are various objectives for performing quality audits. Some of them are:

- Identify the best practices that have been implemented.
- Identify the flaws or deficiencies in the project processes.
- Use the best practices followed in similar projects performed earlier.
- Help increase team productivity by providing assistance for process implementation improvements.
- Highlight the contributions of each quality audit in the organization's lessons-learned library.

## Topics of Quality Audits

Several topics can be included in a quality audit.

Topic	Description
Quality management policy	May be evaluated to determine how well management uses quality data and how well others in the organization understand how the data is being used. The evaluation might include an analysis of management policies for collection, analysis, and use of data in decision-making or strategic planning.
Collection and use of information	May be evaluated to determine how well the project team is collecting, distributing, and using quality data. Items for analysis in this category might include consistency of data collection processes, speed of information distribution, and use of quality data in decision-making.
Analytical methods	May be evaluated to determine if the best analytical methods are being used consistently and how well their results are being used. Items for audit might include how analysis topics and analysis methods are selected, what technology is used, and how results are fed back to others in the process.
Cost of quality	May be evaluated to determine the most effective proportion between prevention, inspection, and costs of repair or rework.
Quality process design	May be evaluated to determine how process design, process analysis, and statistical process control should be used to establish and improve the capability of a process.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 294-295.

## Guidelines to Manage Quality

Effective quality management provides confidence that the project's product or service will satisfy relevant quality requirements and standards. To manage the quality of your project, follow these guidelines:

- Ensure that random and/or scheduled quality audits are conducted by qualified auditors to evaluate the quality management plan, quality testing procedures, and measurement criteria.
  - Are the quality parameters set forth in the quality management plan valid?
  - Are the operational definitions and checklists adequate and appropriate to achieving the desired final results?
  - Are the testing methods being implemented correctly?
  - Is data being interpreted, recorded, and fed back into the system properly?
- Use one or more of the Manage Quality tools and techniques to determine the causes of quality problems of the project's product, service, systems, or processes.
- Identify and implement the appropriate actions to increase the effectiveness and efficiency of the project team's work results to improve quality in the product or service.

## Quality Measurement Tools

There are a variety of tools available for continually surveying the quality of your project. The following tools are discussed.

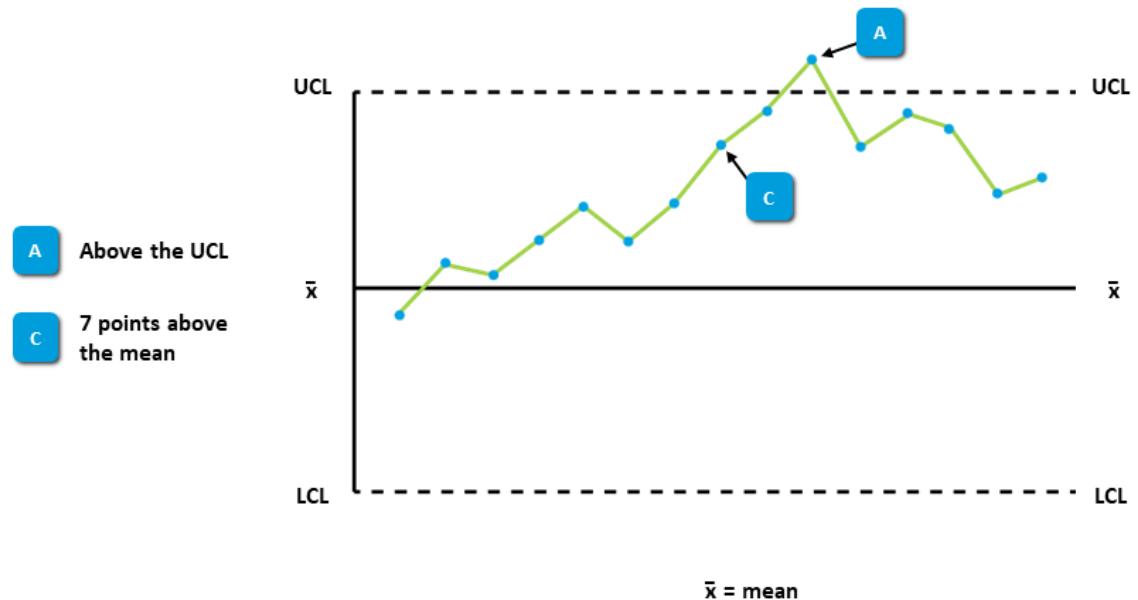
- Control Charts and Variability
- Pareto Chart

- Statistical Sampling
- Statistical Sampling Process

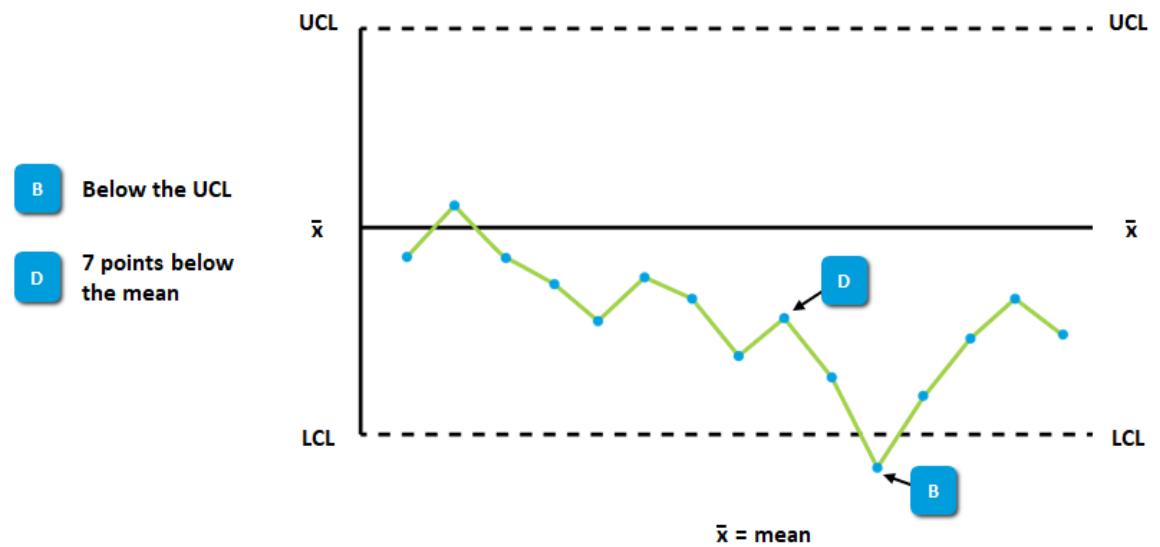
## Control Charts and Variability

Control charts are graphs that are used to analyze and communicate the variability of a process or project activity over time. Control charts help show the potential capability of the process and also suggest the range of variability in the process. This range of variability can assist a project manager in determining if the variance is caused by common or assignable sources.

The components of a control chart include the process mean, the Upper Control Limit (UCL), and the Lower Control Limit (LCL). The process mean is determined by taking samples from the actual process and calculating the statistical mean. As additional samples are taken and tested, they are evaluated in terms of standard deviations from the process mean. For most repetitive processes, the UCL will be three standard deviations above the mean, while the LCL will be three standard deviations below the mean.



*Figure 2–18: Variability above the mean.*



*Figure 2–19: Variability below the mean.*

The range of variability in a process can assist a project manager in determining if a variance is caused by common or assignable sources. If the process variability fluctuates around the average, or statistical mean, the process shows very little variability and is said to be stable.

Excessive variability is indicative of an unstable process. There are two types of instability.

- Measurements that are above the UCL or below the LCL result from an unstable process. Data points A and B in the figures reflect this type of instability.
- A second type of instability exists when seven or more consecutive measurements are above or below the process mean. This is shown by data points C and D in the figures, and it indicates that there has been a shift in the mean. This seven-point variance is called the seven-run rule.

It is important to remember that, while control charts can effectively show variability, they cannot indicate the source of the variability or show performance in relation to an expected performance. The control chart shows only the capability of the process to produce similar products. It does not show the conformity of that process to a customer's specifications.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 304.

## Pareto Chart

A **Pareto chart** is a histogram that is used to rank causes of problems in a hierarchical format. The goal is to narrow down the primary causes of variance on a project and focus the energy and efforts on tackling the most significant sources of variance. The variables in the chart are ordered by the frequency of occurrences.

A typical Pareto chart is used to represent data, which you first organize in descending order of occurrences, and then you plot the cumulative curve. The bars represent the number of failures for each of the causes (A through E). In this example, approximately 72% of the total number of failures are due to causes A and B (320 out of 440). The project team can easily see that they should focus most of their corrective action efforts on those two causes.

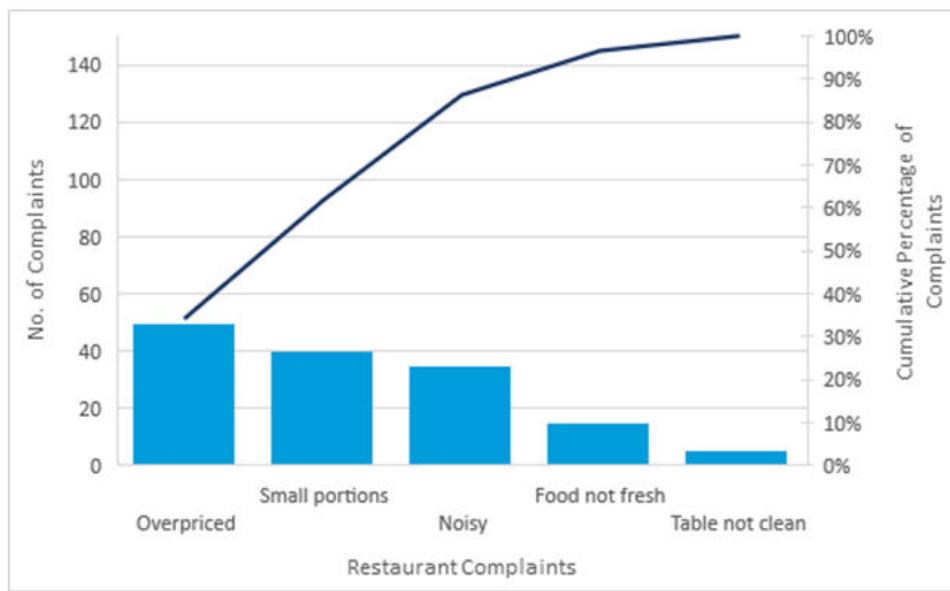


Figure 2-20: A Pareto chart.

## Pareto Analysis

The analysis used to develop Pareto charts is referred to as a Pareto analysis, after Vilfredo Pareto, an Italian economist of the late 19th and early 20th centuries. In his analysis, Vilfredo Pareto found that 80% of the land in late 19<sup>th</sup>-century Italy was controlled by 20% of the population.

During a Pareto analysis, data is collected in various forms such as reports, inspections, and surveys. This data is then analyzed to isolate the major causes of project variance and is assigned a frequency or percentage value. The resulting chart is a histogram that identifies specific sources of variance and ranks them according to their effect on quality performance. Pareto charts can be useful tools throughout the entire project for prioritizing and focusing on corrective actions. Comparative analysis of Pareto charts at different points in the project can be an effective tool for determining and communicating the effect corrective actions have had on curtailing or eliminating variability.

### The 80/20 Rule

Pareto charts are based on Pareto's law, also known as the **80/20 rule**. The 80/20 rule is a general guideline with many applications; in terms of controlling processes, it contends that a relatively large number of problems or defects, typically 80%, are commonly due to a relatively small number of causes, typically 20%.

## Statistical Sampling

**Statistical sampling\*** is defined as choosing part of a population of interest for inspection. It's a technique that is used to determine the characteristics of an entire population based on actual measurement of a representative sample of that population. Sampling is a way to determine if large batches of a product should be accepted or rejected without having to test every single item produced. Its goal is to produce a process that does not require inspection of every item. The size of samples and the frequency and cost of sampling must be determined when planning for project quality.

A common example of statistical sampling is polling. Polling organizations ask questions to a small, random sample of participants. The answers given by the sample group are used to suggest how an entire group may feel regarding an issue.

Sample size can affect the accuracy of results. Generally speaking, the larger the sample size, the higher the likelihood the sample will truly represent the variability of the population. In quality terms, the larger the sample size, the more confidence you can have that your measurements reflect the quality level of the entire product population.



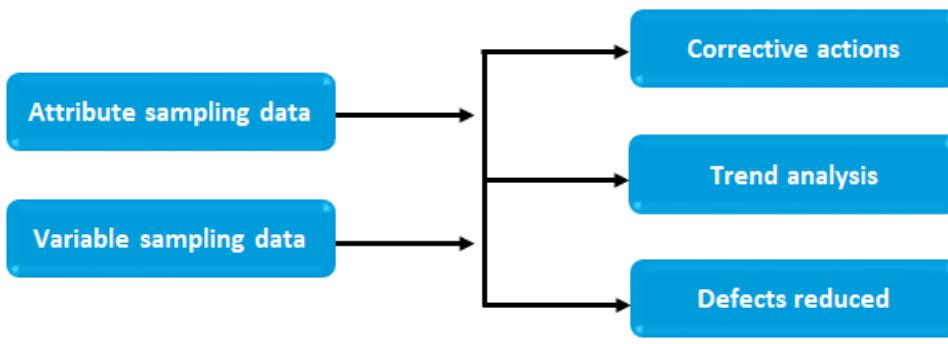
**Note:** It is important that members of a team whose focus is on quality control have a strong understanding of statistics. Other members need only have a basic understanding of statistical concepts.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 303.

## Statistical Sampling Process

The **statistical sampling process** involves dividing sampling data into two categories—attribute and variable—each of which is gathered according to sampling plans. As corrective actions are taken in response to analysis of statistical sampling and other quality control activities, and as trend analysis is performed, defects and process variability should be reduced. The use of statistical sampling during quality control can reduce overall quality cost by helping to forecast and prevent errors before they occur.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 240, 252, 564.



The statistical sampling process

*Figure 2-21: Statistical sampling process.*

## Attribute Sampling Data

**Attribute sampling data** is data from the sample that is counted such as the number of employees participating in profit sharing, the number of customer complaint calls, and the number of returned items.

Attribute sampling uses no scale. It simply tells you whether or not a standard has been met. Implementing an attribute sampling plan is fairly simple. Team members may be required to count the number of items that do not conform to a quality specification or that show evidence of a quality defect. If the number exceeds a certain limit, the sample fails to meet quality specifications.

## Variable Sampling Data

**Variable sampling data** is data from a sample that is measured on a continuous scale such as:

- Time
- Temperature
- Weight

For variable data, the compliance to specifications is rated on a continuous scale. Measurements can fall between an upper and a lower range. To implement a variable sampling plan, you will collect a sample of the product and take some specific measurements to determine if the sample meets quality specifications. Variable samples typically provide the same level of accuracy as attribute samples with much smaller sample sizes.

## Guidelines to Controlling Project Quality

Monitoring and controlling project quality ensures that the quality complies with relevant quality standards. Meeting quality standards enhances the team's ability to deliver an overall project performance that meets the project objectives. To effectively control project quality, follow these guidelines:

- Conduct inspections to detect quality errors as project work is ongoing.
  - Consult the quality management plan for the procedures and guidelines to use during quality control.
  - Check work results against relevant operational definitions and checklists. Document the results.
  - Use statistical sampling to determine whether large batches of a product should be accepted or rejected based on the quality of the sample(s). Ensure that samples are chosen randomly and that the sample size is large enough to demonstrate the variability of the entire group.
- Use Pareto diagrams to focus corrective actions on the problems having the greatest effect on overall quality performance and to measure and monitor the effect of corrective actions over time.

- Use control charts to analyze and communicate the variability of a process or project activity over time. As you analyze performance with control charts, you must not only look for variability outside the control limits, but you should also analyze patterns of data within control limits.
- Identify ways to eliminate causes of unsatisfactory results to minimize rework and bring nonconforming items into compliance.
- Use flowcharts to identify redundancies, missed steps, or the source of quality performance problems.
- Initiate process adjustments by implementing corrective or preventive actions necessary to bring the quality of work results to an acceptable level. Major adjustments must be made according to the project's change control system.
- Continue to monitor, measure, and adjust quality throughout the project life cycle.

# ACTIVITY 2-7

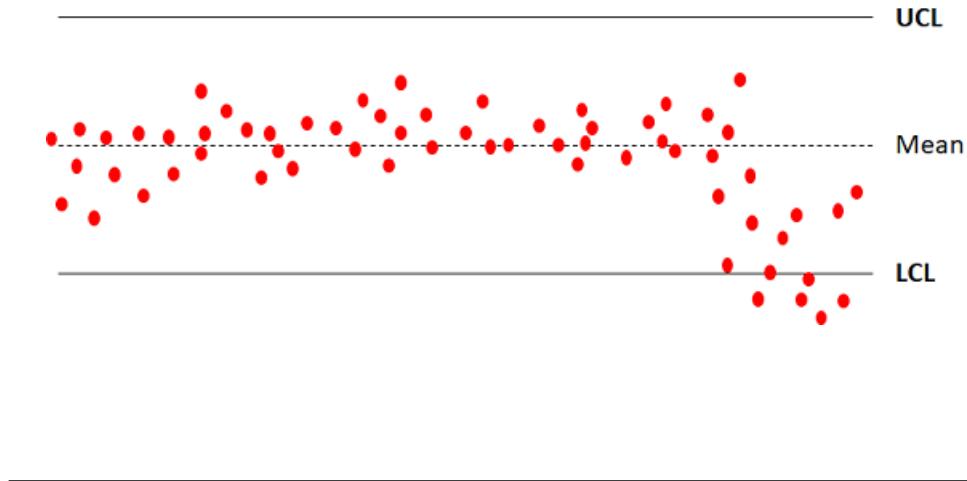
## Planning and Managing Quality

## Scenario

For next year's Valentine season, your company's candy production facility is rolling out a pink chocolate panda. There are many quality areas the company is worried about for this new product line.

1. Since there are many areas where quality may be an issue, how does the product team determine what the quality standards are?
  2. The project team includes quality engineers that want to include a quality check at the end of the production line to scan for foreign objects that may be in the chocolate. The scanning tool is \$30,000 to procure and install. What Kind of project cost is this?
    - Cost of non-conformance
    - Warranty cost
    - Cost of conformance
    - Variable cost
  3. The chocolate must not exceed a set size with a 3% tolerance in order to fit in the packages and for those packages to fit in the shipping containers. For this quality metric, how could the project team measure conformance? (Choose two.)
    - By observing the amount of chocolate in the mold
    - By using an electronic measuring tool
    - By asking the customer to ship back any products too small or too large
    - By cleaning the assembly line every 4 hours

4. During the first production run, the quality measurements were examined closely. The first 100 chocolate pandas produced were measured on a scale to assure they meet the weight requirement. The control chart from those first hundred looked like the diagram below. What can be determined based on the chart? What should have been done at certain points in the production run?



# TOPIC F

## Integrate Project Planning Activities

As plans are being developed and updated, integration of all those plans and components is necessary to ensure coordinated and efficient progress.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Manage and rectify ground rule violations. (ECO 1.12.3)
- Consolidate the project/phase plans. (ECO 2.9.1)
- Assess plans for dependencies, gaps, and continued business value. (ECO 2.9.2)
- Analyze the data collected. (ECO 2.9.3)
- Collect and analyze data to make informed project decisions. (ECO 2.9.4)
- Determine critical information requirements. (ECO 2.9.5)
- Plan and manage project compliance to business factors.

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
No specific deliverables.	No specific tools.

### Integration Management

There are many plans built, maintained, and executed throughout a project. Consolidating those plans enables the project manager and others to assess and coordinate all the various plans and activities. A holistic, integrated view ties together plans and concentrations that may be worked on by sub groups of the project team and aligns their efforts and highlights how they depend on each other. The integrated view of all the plans within a project or a phase or across iterations (e.g., a release or epic) can identify and correct gaps or conflicts. A consolidation of the plans encapsulates the overall plan for the project and its intended business value.

### Project Management Plan

A *project management plan*\* is the document that describes how the project will be executed, monitored and controlled, and closed. There is generally not one single plan, but many plans that make up the project management plan. The contents and plans themselves will vary with every project and will be unique to a specific project's needs. A project's plan is always changing and is updated, altered, and tweaked as project demands change. Changes to the project management plan are controlled and managed through the integrated change control process.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 82-83.

<b>Project Management Plan</b>		<b>Project Documents</b>
1. Scope management plan	1. Activity attributes	19. Quality control measurements
2. Requirements management plan	2. Activity list	20. Quality metrics
3. Schedule management plan	3. Assumption log	21. Quality report
4. Cost management plan	4. Basis of estimates	22. Requirements documentation
5. Quality management plan	5. Change log	23. Requirements traceability matrix
6. Resource management plan	6. Cost estimates	24. Resource breakdown structure
7. Communications management plan	7. Cost forecasts	25. Resource calendars
8. Risk management plan	8. Duration estimates	26. Resource requirements
9. Procurement management plan	9. Issue log	27. Risk register
10. Stakeholder engagement plan	10. Lessons learned register	28. Risk report
11. Change management plan	11. Milestone list	29. Schedule data
12. Configuration management plan	12. Physical resource assignments	30. Schedule forecasts
13. Scope baseline	13. Project calendars	31. Stakeholder register
14. Schedule baseline	14. Project communications	32. Team charter
15. Cost baseline	15. Project schedule	33. Test and evaluation documents
16. Performance measurement baseline	16. Project schedule network diagram	
17. Project life cycle description	17. Project scope statement	
18. Development approach	18. Project team assignments	

A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Page 89.

**Figure 2–22: List of subsidiary plans and project documents.**

## Project Management Plan Components

Collectively, the following plans make up the project management plan.

<b>Component</b>	<b>Description</b>
Baselines	<p>Baseline management is a key component of the project management plan. Most plans will include a description of how the integrity of the project baselines will be maintained. There are a few common baselines used when developing a project management plan:</p> <ul style="list-style-type: none"> <li>• Scope baseline</li> <li>• Schedule baseline</li> <li>• Cost baseline</li> <li>• Performance measurement baseline</li> </ul>
Subsidiary plans	<p>There are a number of subsidiary plans that will be integrated in the overall project management plan. Any of the following plans may be used:</p> <ul style="list-style-type: none"> <li>• Scope management plan</li> <li>• Requirements management plan</li> <li>• Schedule management plan</li> <li>• Cost management plan</li> <li>• Quality management plan</li> <li>• Resource management plan</li> <li>• Communications management plan</li> <li>• Risk management plan</li> <li>• Procurement management plan</li> <li>• Stakeholder engagement plan</li> <li>• Configuration management plan</li> <li>• Change management plan</li> <li>• Compliance management plan (While not an official sub-plan, it might be included in the project management plan.)</li> </ul>

<b>Component</b>	<b>Description</b>
Life cycle	The plan may include a specific life cycle selected for the project and processes that will be applied to each phase of the project.
Project processes	Project processes selected for a specific process will be stated within the plan. These descriptions can include: <ul style="list-style-type: none"> <li>• Project management processes selected by the project management team.</li> <li>• Level of implementation for each selected process.</li> <li>• Descriptions of the tools and techniques to be used for accomplishing those processes.</li> <li>• Description of how the selected processes will be used to manage the specific project, including dependencies and interactions among those processes and the essential inputs and outputs.</li> </ul>
Work explanation	An explanation of how project work will be executed to meet the project's objectives.
Agile project plan	For agile managed projects, documentation on how the team will work together on the project, and manage resources, decisions, timing, and other process related plans.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 86-89.

## Project Management Plan Tools and Techniques

These are the useful tools and techniques that can be used when developing a project management plan for a project.

<b>Tools &amp; Techniques</b>	<b>Description</b>
Expert judgment	Expert judgment is used to adjust the process to meet the specific needs of a project. You will use this technique to: <ul style="list-style-type: none"> <li>• Determine the appropriate methodology approach (predictive, adaptive, etc.) for this project.</li> <li>• Customize the process to meet specific project needs.</li> <li>• Develop technical and management details that will be used within the project management plan.</li> <li>• Determine the resources and skills needed for project work.</li> <li>• Define the level of configuration management needed to apply to a project.</li> <li>• Identify the project documents that will be subject to a formal change control process.</li> <li>• Prioritize the work on the project to ensure resources are allocated to the appropriate work at the appropriate time.</li> </ul>
Data gathering	There are a variety of tools and techniques that can be categorized as data gathering, including the following: <ul style="list-style-type: none"> <li>• Brainstorming</li> <li>• Checklists</li> <li>• Focus groups</li> <li>• Interviews</li> </ul>

Tools & Techniques	Description
Interpersonal and team skills	Used to resolve issues, brainstorm ideas, enable problem solving, and manage conflicts that may arise over the course of a project. The following interpersonal skills are specifically called out and can be used by any project team member to assist other team members.
	<ul style="list-style-type: none"> <li>• Conflict management</li> <li>• Facilitation</li> <li>• Meeting management</li> </ul>
Meetings	Meetings are a useful way of assembling the necessary team members and stakeholders to effectively gather necessary information.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 85-86.

## Project Management Information System (PMIS)

A **Project Management Information System (PMIS)**\* is an information system consisting of the tools and techniques used to gather, integrate, and disseminate the outputs of project management processes. Their purpose is to collect and make easily accessible all the project information. For example, Microsoft® Project® is commonly used by project managers to develop and build project schedules. In Agile methodology, projects may use sticky notes, whiteboards, and paper attached to the wall as their project management information system or commercial tools such as JIRA and Rally.

## Configuration Management Plan

The **configuration management plan**\* is a component of the project management plan that describes how to identify and account for project artifacts under configuration control, and how to record and report changes to them.

The configuration management plan details the following:

- What work products need to be managed.
- How these products will be created, stored, revised, documented, and archived.
- The processes and the authorization levels for doing so.
- The naming schemes for different types of revisions (e.g., Rev 1 to Rev 2 versus Rev 1 to Rev 1.1, etc.).
- Discusses release management for products which will be released incrementally.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 88, 116.

## Change Management Plan

Projects managed in an agile approach welcome changing requirements, even late in the development. Plan driven projects undergo changes during their lifetime as well. New or changed requirements can impact the project's scope, schedule, cost, risk, and quality. During project execution, monitoring can also dictate the need for a change in any of these areas. A **change management plan**\* is a component of the project management plan that establishes the change control board or involvement level of the Product Owner, documents that extent of its authority, and describes how the change control system will be implemented.

A change management plan can answer the following questions:

- Who can propose a change?

- What exactly constitutes a change?
- What is the impact of the change on the project's objectives?
- What steps are necessary to evaluate the change request before approving or rejecting it?
- When a change request is approved, what project documents must be amended to record the actions necessary to effect the change?
- How will these actions be monitored to confirm that they have been completed satisfactorily?

The change management plan is a sub-plan created when the project management plan is created, and, in its definition of change, if scope changes are considered changes, then it also needs to include how changes in the external business environment will be assessed, prioritized, and integrated as scope/backlog changes. For all changes, including external business environment changes and internal organizational changes that yield scope/backlog changes, it needs to include how options (e.g., schedule, cost changes) will be evaluated and recommended.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 113-120.

## Compliance Management Plan

Another important aspect of the planning process involves compliance goals and requirements. These include compliance with any appropriate government regulations and corporate policies as well as product and project quality and project risk. The flavors of compliance are often dictated by the project's EEFs and OPAs.

Project managers might use a separate sub-plan of the project management plan called the Project Compliance Plan, or they may incorporate the compliance aspects into other sub-plans such as the Quality Management Plan, Requirements Management Plan, and Risk Management Plan. Regardless of where the information is housed, the plans need to classify compliance categories, determine potential threats to compliance, analyze the consequences of noncompliance, and determine the necessary approach and action to address compliance needs.

The following table provides a description of these components.

<b>Component</b>	<b>Description</b>
Classify compliance categories	In a standalone sub-plan, this section addresses the types of compliance categories applicable to this project. These could include requirements, quality, risk, change, etc. If integrating compliance into other sub-plans, this thought process allows the project manager to determine which sub-plans would be affected.
Determine potential threats to compliance	This section identifies the stumbling blocks that might keep a project from complying to the variety of compliance categories. Significant threats would be handled as outlined in the following approach section described.
Analyze the consequences of noncompliance	Understanding the impacts of noncompliance is important because very often the cost (both in time and in dollars) of compliance is higher than the results of noncompliance.
Determine necessary approach and action to address compliance needs	Each identified compliance category should be evaluated for both compliance and noncompliance to decide if each needs to be further addressed. If so, then this section describes the implementation steps.

## Guidelines to Develop a Project Management Plan

Guidelines to develop a project management plan are as follows:

- Review the project charter for the high-level boundaries of the project.

- Review outputs from other processes such as baselines and subsidiary plans that are outputs of other planning processes.
- Review EEFs, including governmental or industry standards; Project Management Information Systems; organizational structure, culture, management practices, and sustainability; infrastructure; and personnel administration, as applicable to your project.
- Review OPAs, including standardized guidelines, work instructions, proposal evaluation criteria, performance measurement criteria, project management plan templates, change control procedures, project files from previous projects, historical information and configuration management knowledge base, as applicable to your project.
- Use tools and techniques such as expert judgment to tailor the process to meet the project needs, develop technical and management details, determine resources and skill levels needed to perform project work, define the level of configuration management to use on the project, and prioritize the work on the project to ensure resources are allocated to the appropriate work at the appropriate time, as applicable to your project.
- Use facilitation techniques such as brainstorming, conflict resolution, problem solving, and meeting management, which are examples of key techniques used by facilitators to help teams and individuals accomplish project activities and develop the project management plan.
- Document the project management plan.
- Review the plan components to assess ways to potentially deliver product components and business value incrementally.

## Scrum of Scrums and SAFe

Project environments where there are multiple agile based projects operating, coordinating plan and analyzing the data and dependencies between them can be performed on a regular cadence throughout the project. Two popular formats are Scrum of Scrum and SAFe.

### Scrum of Scrums

As more and more groups within a department or organization implement Agile-based projects, there emerges the necessity to roll the individual agile projects up into larger formations or levels of coordination. As such, the **Scrum of Scrums (SoS)**\*, sometimes referred to as a "meta scrum," is a method wherein two or more scrum-based agile projects send representatives to an oversight scrum team organization in order to be knowledgeable of, and coordinated to, each other's efforts and progress. These representatives from each scrum team meet daily to ensure all teams are effective and supporting each other and the customer or customers.

### Scaled Agile Framework (SAFe)

**Scaled Agile Framework**, more commonly referred to by its acronym SAFe, is a more holistic view of agile approaches across an organization or enterprise. The focus of SAFe is to build a useful knowledge base of scaling development work across all levels of the enterprise. To accomplish this, organizations are not simply applying agile methodologies as the small team, local level, but also need to think larger and in systematic ways. Knowledge is shared and cultivated across the organization. SAFe methodology promotes alignment, collaboration, and delivery across large numbers of agile teams.

## Guidelines to Determine Critical Information Requirements

Guidelines to determine critical information requirements are as follows:

- Review the project stakeholders identified for the project.
- Review and update the communication needs and expectations for each stakeholder.
- Determine the primary points in the project that have the most touchpoints or stakeholders affected.
- Evaluate those project points for the information contained.

- Assess whether that information is best communicated to stakeholders.
- Examine smaller points around the primary points to assess their value to stakeholders.
- Prioritize the points of information needs.
- Agree as a group or with the impacted stakeholders on a cutoff line between the most business-critical information and those less critical.
- Set those at higher priorities to be critical information requirements.
- Review and update these requirements regularly.

## ACTIVITY 2–8

### Integrating Project Planning Activities

#### Scenario

The project you have been assigned to involves many people and groups with specialized knowledge. Due to the intense coordination required, defined and detailed plans are necessary.

1. Reflecting on your project management experience, what types of project management plans have you worked with or created?
  
2. Which subsidiary plan deals with the closure of contracts, including those signed to bring in consultants?
  - The scope management plan
  - The procurement management plan
  - The process improvement plan
  - The communications management plan
  
3. The project team recognizes there are going to be a lot of changes to documents and procedures throughout the project. The importance of team members using the correct checklist, document, or file is key. Operating off the incorrect version can have a major impact. Which plan most addresses this project concern?
  - Project charter
  - Scope management plan
  - Configuration management plan
  - Control quality
  
4. You are creating a sub-plan, which describes the problems the project might encounter if government standards, municipal laws, or internal processes are not correctly followed. What plan are you working on?
  - Compliance management plan
  - Configuration management plan
  - Communication management plan
  - Quality management plan

# TOPIC G

## Plan and Manage Procurement

As you execute your project, you might need to procure external resources so you can meet your project objectives. Procuring products and services from external suppliers requires identifying suppliers, obtaining bids or proposals from them, and awarding contracts based on their evaluation. All procurements for the project must be done within the specified parameters of time, cost, and quality so as to ensure that the project meets the stakeholders' requirements.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Define external resource requirements and needs. (ECO 2.11.1)
- Communicate external resource requirements. (ECO 2.11.2)
- Manage suppliers/contracts. (ECO 2.11.3)
- Plan and manage procurement strategy. (ECO 2.11.4)
- Develop a delivery solution. (ECO 2.11.5)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Statement of Work	Make or Buy Analysis
Procurement Management Plan	Market research
Source selection criteria	Meetings
Select sellers	Expert judgment
Monitor work and changes	Set up evaluation techniques and bidder conferences
	Negotiations
	Prepare agreements
	Monitor work / deliverables
	Prepare and process change requests

### Procurement Strategy

Unless a project is extremely small, very few organizations can do everything to complete it with only their in-house resources. The project team will need to decide which resources they will need to procure from outside. **Procurement** is the acquisition of goods and services from an external organization, vendor, or supplier to enable the deliverables of the project.

A **Make-or-buy analysis**\* is the process of gathering and organizing data about product requirements and analyzing them against available alternatives including the purchase or internal manufacture of the product. **Make-or-buy decisions**\* are decisions made regarding the external purchase or internal manufacture of a product. These decisions can significantly impact project time, cost, and quality. In the case of a buy decision, you must also consider if the product needs to be purchased, leased, or rented.

## Make-or-Buy Decisions

When considering a make-or-buy decision, it is important to consider several factors.

- Consider the impact on cost, time, or quality. For instance, if current personnel must be retrained for services requiring a new skill set, it may be less expensive to outsource those services.
- Consider the ongoing need of a specific skill set—even for future, unrelated projects. It may be a worthwhile investment to train current personnel to perform that service.
- Think about the learning curve. Although it may make financial sense to develop an in-house solution, there may not be enough time to train personnel and/or implement the necessary policies and equipment to produce that solution.
- If the required resources are readily available internally, organizations will usually use them. However, if the project involves technology, skills, materials, or resources that are beyond the organization's capabilities, it may be cost-effective to hire outside help.

The make-or-buy analysis can be made using one or more of the following financial tools:

- Benefit cost analysis
- Return on investment (ROI)
- Internal rate of return (IRR)
- Net present value (NPV)



**Note:** These financial tools are discussed in the lesson titled "Keeping the Business in Mind."

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 473.

There also can be situations where an organization does not need (or wish) to procure a resource, but instead chooses to join forces with another organization to fulfill a portion of the project's scope.

A **teaming agreement** is a legal contractual agreement between two or more parties to form a joint venture or any other arrangement as defined by the parties to meet the requirements of a business opportunity. The parties can be internal or external to the organization executing the project. When a teaming agreement is created for a project, it significantly affects the planning processes for the project and predefines issues such as the scope of work and competition requirements.

## Procurement SOW

A **procurement SOW (statement of work)\*** describes the procurement item in sufficient detail to allow prospective sellers to determine if they are capable of providing the products, services, or results. It is distributed to potential sellers, who will use it to evaluate their capability to perform the work or provide the services. In addition, the SOW will serve as a basis for developing the **procurement documents\*** during the solicitation process. Information in the project scope baseline is used to create the procurement SOW. The procurement SOW goes through multiple rounds of reviews and fixes until the contract award is signed.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 477-478.

## Procurement Management Plan

The **procurement management plan\*** is a component of the project or program management plan that describes how a project team will acquire goods and services from outside of the performing organization. It specifies the types of contracts that will be used, describes the process for obtaining and evaluating bids, mandates the standardized procurement documents that must be used, and describes how multiple providers will be managed. The plan also states how procurement activities will be coordinated with other project management activities such as scheduling and

performance reporting. Depending on the needs of the project, the procurement management plan may be formal or informal; brief or highly detailed.

For example, a small advertising agency would procure contracts from external sources for some of the work considered necessary but beyond its core capabilities such as specialized printing and professional photography services. The procurement management plan would outline the company's processes for soliciting and evaluating bids from competing service providers and would specify how management would schedule the contract work, schedule payments to providers for the work done, and evaluate the quality.

As stated in the *PMBOK® Guide*, the procurement management plan can include guidance for:

- Coordination of procurement with other aspects of the project.
- Timetable of key procurement activities.
- Procurement metrics used to manage contracts.
- Stakeholder roles and responsibilities related to procurement.
- Constraints and assumptions that could affect planned procurements.
- Legal jurisdiction and currency in which payments will be made.
- Determination of whether independent estimates will be used.
- Procurement-related risk management issues.
- Pre-qualified sellers, if any, to be used.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 475

## Source Selection Criteria

**Source selection criteria\*** is a set of attributes desired by the buyer which a seller is required to meet or exceed to be selected for a contract. In other words, these criteria are the standards used to rate or score proposals, quotes, or bids, and form a part of the procurement solicitation documents. Some criteria are objective and can be readily demonstrated and measured. Other criteria are subjective and open to different interpretations. Objective criteria tend to be much more specific than subjective criteria.

### Sample Source Selection Criteria

Sample source selection criteria can include the following.

<b>Source Selection Criteria</b>	<b>Description</b>
Overall or life-cycle cost	Does the selected seller produce the lowest total cost of ownership, which includes the purchase cost plus operating cost?
Understanding of need	How well does the seller's proposal address the procurement SOW?
Technical capability	Does the seller have or is the seller expected to acquire the technical skills and knowledge needed for the project?
Management approach	Does the seller have or can the seller reasonably develop the management processes and procedures to ensure a successful project?
Technical approach	Do the seller's proposed technical methodologies, techniques, solutions, and services meet the project requirements?
Warranty	Does the seller provide a warranty for the final product and, if so, for what duration?
Financial capacity	Does the seller have or is the seller expected to obtain the necessary financial production capacity and interest resources?
Production capacity and interest	Does the seller have the capacity and interest to meet the project requirements?

<b>Source Selection Criteria</b>	<b>Description</b>
Business size and type	Does the seller's company meet a specific category of business defined by the buyer, or established by a governmental agency, and included as a condition in the contract? Categories could include small, women-owned, or disadvantaged small businesses.
Past performance of sellers	Does the company have past experience with selected sellers?
References	Does the seller provide references from previous customers verifying the seller's work experience and compliance with contractual requirements?
Intellectual property rights	Are intellectual property rights established by the seller in work processes or services to be used for the project?
Proprietary rights	Are proprietary rights ensured by the seller in the work processes or services to be used for the project?

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 478-479.

## Qualified Vendors

**Qualified vendors** are vendors approved to deliver products, services, or results based on the procurement requirements identified for a project. The list of qualified vendors can be created based on historical information about different vendors who delivered resources for prior projects in your organization.

If the resources you require are new to the organization, you may need to do some market research to identify qualified vendors for each resource. You can perform an Internet search using specific search criteria to expedite the process. This research will generate a list of possible vendors, and you will need to interview the prospective vendors, visit their work sites, review work samples, interview their references, check with certification boards, or use other approaches to validate whether they qualify as vendors for the procurement requirements. Many vendors publish an Internet knowledge base that contains information about their products and services, where you can search for specifics that will help you determine whether a company should be included in the qualified vendors list.



**Note:** In case further information is required about the prospective vendors, you can send an RFI to each to gather details about their capabilities.

## Qualified Vendors List

A **qualified vendors list** contains details regarding vendors who meet the organization's requirements and to whom requests can be sent. It is sometimes known as an approved vendor list. The **Request for Information (RFI)**\* for each vendor is scrutinized and evaluated for qualifying vendors. The term "qualified vendors" does not mean the organization is bound to do business with them. It only indicates that when needed, the organization will interact with the vendors and **Request for Proposals (RFPs)**\*, **Invitation for Bids (IFBs)**\*, or **Request for Quotes (RFQs)**\* will be sent to the qualified vendors. Generally, vendor identification number or vendor registration number is assigned to the qualified vendors.



**Note:** In project management, the following terms are frequently used interchangeably: seller, vendor, supplier, and contractor.

Qualified Vendors List					
<b>Project Name:</b> Computer Network Upgrade Project					
Vendor	Industry/Expertise	Capacity	Staff	Reputation	References
Company 1	Computer networking consultants	100 to 500 machines in local network	60	Able to provide solutions for large businesses on time	Name 1: Designation/Contact details Name 2: Designation/Contact details
Company 2	Networking hardware router manufacturers	1000	500	Quality equipment providers – rated #1	Name 1: Designation/Contact details Name 2: Designation/Contact details
Company 3	Networking cable suppliers	Any quantity within 2 weeks	150	Can provide required brands at competitive prices	Name 1: Designation/Contact details Name 2: Designation/Contact details

Figure 2–23: A qualified vendors list for a computer network upgrade project.

## Bidder Conferences

**Bidder conferences\*** are meetings conducted by the buyer after issuing an RFP, but prior to submissions of a bid or proposal by the vendors. During this meeting, the buyer explains the requirements, proposed terms, and conditions, and the buyer clarifies the vendors' queries. The buyer facilitates the conference to ensure all prospective vendors have a clear and common understanding of the technical and contractual requirements of the procurement. Bidder conferences can also be called vendor conferences, pre-bid conferences, pre-proposal conferences, or contractor conferences.

## External Resource Requirements and Needs

**Outsourcing** refers to moving beyond the organization to secure services and expertise from an outside source on a contract or short-term basis; it is done for core work that has traditionally been done within the organization. Outsourcing is used frequently because it allows businesses to focus more on their core competencies. On the other hand, many businesses are emphasizing that work should be kept in-house whenever possible, in an effort to maintain stricter quality controls and security measures. As a project manager, you will need to work within the expectations and constraints that result from either situation.

## Communication

Communication is a critical component of the procurement process, because it always involves people outside of the procuring organization where misinterpretation or misunderstanding of intent is possible. The project's Communication Plan should include provisions for working with vendors or suppliers, such as:

- Periodic progress reports of supplier activities.
- Advance notification of potential supplier cost overruns or schedule delays, and acknowledgement by the project manager to the supplier.
- Formal acceptance by the project manager of supplier's contract deliverables.

## Supplier and Contracts

**Contracts\*** are mutually binding **agreements\*** that obligate the seller to provide the specified project or service or result and obligate the buyer to pay for it. Although contracts are customized for each agreement, they tend to fall into a number of standard patterns such as fixed-price, cost-reimbursable, or time-and-material (T&M) contracts.

## Components of Contracts

In general, any contract must include these elements, at a minimum:

- Description of the work being procured for the project, its deliverables, and scope.
- Delivery date or other schedule information.
- Identification of authority, where appropriate.
- Responsibilities of both parties.
- Management of technical and business aspects.
- Price and payment terms.
- Provisions for termination.
- Applicable guarantees and warranties.

## Contract Types

The table defines common types of contracts used in the procurement of goods and services.

<b>Contract Type</b>	<b>Description</b>
<b>Fixed-price*</b>	An agreement that sets the fee that will be paid for a defined scope of work regardless of the cost or effort to deliver it. Also called a lump sum contract, it establishes a total price for a product or service. The seller agrees to perform the work at the negotiated contract value. This value is based on anticipated costs and profit, as well as a premium to cover unforeseen problems. The contract may include incentives for meeting or exceeding requirements such as schedule milestones. Fixed-price contracts provide maximum protection to the buyer but require a long time for preparation and bid evaluation. Because this type of contract is tied to a fixed cost, it is most suited to projects with a high degree of certainty about their parameters.

<b>Contract Type</b>	<b>Description</b>
	<p>Types of fixed-price contracts include:</p> <ul style="list-style-type: none"> <li>• <b>Firm Fixed Price (FFP) contracts*</b>: This is a type of fixed price contract where the buyer pays the seller a set amount (as defined by the contract), regardless of the seller's costs. It's a commonly used contract type favored by most buying organizations because the price for products or services is set at the outset and not subject to change unless the scope of work changes.</li> <li>• <b>Fixed Price Incentive Fee (FPIF) contracts*</b>: A type of contract where the buyer pays the seller a set amount (as defined by the contract), and the seller can earn an additional amount if the seller meets defined performance criteria. Financial incentives are tied to achieving metrics that are agreed to earlier.</li> <li>• <b>Fixed Price with Economic Price Adjustment (FPEPA) contracts*</b>: A fixed-price contract, but with a special provision allowing for pre-defined final adjustments to the contract price due to changed conditions, such as inflation changes, or cost increases (or decreases) for specific commodities. An FPEPA contract protects both buyer and seller from external conditions beyond their control. It is used whenever the seller's performance period spans a considerable period of time. The economic price adjustment (EPA) clause must relate to a reliable financial index, which is used to precisely adjust the final price.</li> </ul>
<b>Cost-reimbursable*</b>	
	<p>A type of contract involving payment to the seller for the seller's actual costs, plus a fee typically representing the seller's profit. Incurred costs are generally classified as direct costs (those incurred for the project), or indirect costs (costs allocated to the project by the organization as a cost of doing business). These contracts sometimes include incentives for meeting certain objectives such as costs, schedule, or technical performance targets. This approach is tied to the actual cost to perform the contract, and therefore is most suitable if project parameters are uncertain.</p>
	<p>The cost-reimbursable contracts include:</p>
	<ul style="list-style-type: none"> <li>• <b>Cost Plus Fixed Fee (CPFF) contracts*</b>: A type of cost-reimbursable contract where the buyer reimburses the seller for the seller's allowable costs (allowable costs are defined by the contract) plus a fixed amount of profit (fee). The seller receives a fixed fee payment calculated based on the initial estimated project costs. This fixed fee does not change due to seller performance.</li> <li>• <b>Cost Plus Incentive Fee (CPIF) contracts*</b>: A type of cost-reimbursable contract where the buyer reimburses the seller for the seller's allowable costs (allowable costs are defined by the contract), and the seller earns its profit if it meets defined performance criteria. In case the final costs are lesser or greater than the original estimated costs, then both the buyer and seller share the costs from the difference based on the pre-negotiated cost sharing formula; for example, an 80/20 split over or under target costs based on actual performance of the seller.</li> <li>• <b>Cost Plus Award Fee (CPAF) contracts*</b>: A category of contract that involves payments to the seller for all legitimate actual costs incurred for completed work, plus an award fee representing seller profit. The majority of the fee is earned based on the satisfaction of certain broad subjective performance criteria defined and incorporated into the contract. The determination of the fee is based on the buyer's subjective determination of seller performance and is generally not subject to appeals.</li> </ul>

<b>Contract Type</b>	<b>Description</b>
<b>Time-and-material (T&amp;M)*</b>	A type of contract that is a hybrid contractual arrangement containing aspects of both cost-reimbursable and fixed-price contracts. The buyer pays the seller a negotiated hourly rate and full reimbursement for materials used to complete the project. This contract is used for staff augmentation, acquisition of experts, and any outside support when a precise statement of work (SOW) cannot be quickly prescribed. Many organizations include not-to-exceed values and time limits in T&M contracts to prevent unlimited cost growth.

### Term vs. Completion Contracts

A **term contract** engages the seller to deliver a set amount of service—measured in staff-hours or a similar unit—over a set period of time. A **completion contract** stipulates that the work will not be considered complete until the seller delivers the product to the buyer and the buyer accepts the product.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 471-472.

### Delivery Solution

The ultimate goal of procurement is the delivery of procured goods or services by the supplier to the procuring organization (the customer). The following phases are typically considered, although the details of each phase will vary depending on the specific procurement and contract.

<b>Solution Delivery Phase</b>	<b>Description</b>
Planning and analysis	Customer requirements are documented
Detailed design	Solution is documented
Implementation or installation	Solution is implemented or installed
Testing	Solution is tested
Training	Training is provided to the customer
Handover	Solution is formally handed over to the customer
Support and maintenance	Solution is transferred to customer support

### Control Procurements Process

The **Control Procurements process\*** is the process of managing procurement relationships, monitoring contract performance, making changes and corrections as appropriate, and closing out contracts. During control procurements, the project manager applies other project management processes to the contractual relationship and integrates the coordination of the outputs from these processes into the overall management of the project. The other project management processes include:

- Project plan execution to formally sanction the seller's work to begin at the appropriate time.
- Performance reporting to monitor seller cost, schedule, and technical performance.
- Quality control to ensure that the quality of the seller's service or product meets contract objectives.
- Change control to ensure that changes to the contract are carefully managed and properly approved.
- Monitor and control the project risks to ensure that the risks are properly managed.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 492-494.

## Contract Change Control System

The **contract change control system**\* is the system used to collect, track, adjudicate, and communicate changes to a contract. It might be a component of the integrated change control system or it might be a separate system, but it is dedicated specifically to control contract changes. It specifies the process by which project contract changes can be made. It includes the documentation, dispute-resolution processes, and approval levels to authorize the changes to contract specifications.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 702.

## Types of Contract Changes

Either party—the seller or the organization that hired the seller—can propose contract change requests for any of the contract terms, including scope, cost, delivery date, or quality of goods or services. The following table describes the types of contract changes you might encounter.

<b>Contract Change</b>	<b>Description</b>
Administrative changes	These are non-substantive changes to the way the contract is administered, and is the most common type of contract change. Administrative changes should be documented and written notification sent to the seller with a clear expectation that the seller will approve and return the change document. Administrative changes require no adjustment in payment.
Contract modification	This is a substantive change to the contract requirements such as a new deadline or a change to the product requirements. Contract modifications should be documented and a formal change order should be sent to the seller. Contract modifications may result in claims for payment adjustment.
Supplemental agreement	This is an additional agreement related to the contract but negotiated separately. A supplemental agreement requires the signatures of both buyer and seller. A separate payment schedule is attached for the work in a supplemental agreement.
Constructive changes	These are changes that the buyer may have caused through action or inaction. As a result of constructive changes, a seller is required to change the way the contract is fulfilled. The seller may claim a payment adjustment as a result of constructive changes.
Termination of contract	A contract may be terminated due to seller default or for customer convenience. Defaults are typically due to non-performance such as late deliveries, poor quality, or non-performance of some or all project requirements. Termination due to customer convenience may result due to major changes in the contract plans, through no fault of the seller.

## Legal Concepts when Managing Disputes

Occasionally, a buyer and a seller cannot agree that the terms of a contract have been met by both parties. In such situations, legal advice is often sought to resolve the dispute. Such legal issues can include the following.

Legal Issue	Description
<b>Warranty</b>	A promise, explicit or implied, that goods or services will meet a predetermined standard. The standard may cover features such as reliability, fitness for use, and safety. Some warranty agreements may promise repair or replacement of products or services for certain months, years, or for life.
<b>Waiver</b>	The giving up of a contract right, even inadvertently.
<b>Breach of contract</b>	The failure to meet some or all of the obligations of a contract. It may result in damages paid to the injured party, litigation, or other ramifications.
<b>Cease and desist letter</b>	A document sent to an individual or a business to stop (cease) allegedly illegal activities and to not undertake them again (desist). Such a letter can be used as a warning of impending legal action if it is ignored.

## Negotiated Settlements

**Negotiated settlements** are undertaken to arrive at a final equitable settlement for all outstanding issues, claims, and disputes by negotiation. The parties may resort to Alternative Dispute Resolution (ADR), which includes mediation and arbitration, if settlement cannot be achieved through direct negotiations held between the parties.

## Guidelines for Handling Disputes

Project managers should have a general understanding of contracts and breaches of contracts, but they are not expected to be legal experts. The best way to protect yourself, your project, and your organization is to make sure that your legal department reviews and approves all contracts before you sign them. As a general guideline, you should never sign a contract unless you are sure that you understand all its terms. Other guidelines for handling legal issues include:

- Have a good understanding of the differences between important legal terms that can, if ignored, have a significant impact on the project—warranty, waiver, and breach of contract.
- Be sure to consult with somebody in your company's legal department or seek advice from an outside legal expert so you thoroughly understand any contracts that affect your project.
- If your contract isn't written specifically to exclude inadvertent waivers, avoid doing any of the following that would waive your contract rights:
  - Accept a product that fails to meet standards for quality or performance.
  - Accept late deliveries.
  - Overlook an aspect of non-conformance to contractual obligations.

## Closing Procurements

A procurement is closed when a written notice is provided from the buyer to the seller once a contract is complete. This is usually documented in the terms and conditions that were specified in the contract and the procurement management plan. Procurements can be closed throughout the life of the project as contracts are satisfied and closed, and might not always occur at the end of the project.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* – Sixth Edition, Project Management Institute, Inc., 2017, Page 499.

Closing a procurement includes the following actions:

- Verification that all deliverables are acceptable to the procuring organization.
- Provision for final settlement of payments to the supplier.

- Updating and archiving of all contract records and documents.

## Guidelines to Close Procurements

Guidelines to closing procurements are as follows:

- Ensure that all required products or services were provided by the seller.
- Make sure that any buyer-furnished property or information was returned to the buyer.
- Settle any outstanding contracting issues. Are there any claims or investigations pending on this contract?
- Conduct a *procurement audit*\* to identify successes and failures of the procurement process and to evaluate the performance of the seller.
- Address any outstanding invoices and payments.
- Archive the complete contract file with the project archives.
- Provide the seller with formal written notice that the contract has been completed.
- Communicate that all procurements are closed and update OPA documents as needed.

## Guidelines to Manage Suppliers and Contracts

Regardless of project size, the project manager is responsible for administering procurements for the project. Experienced project managers always rely heavily on the contract administration expertise of their organizations' procurement, purchasing, and legal departments. Effective procurement control ensures that the seller's performance meets contractual requirements and objectives. To control procurements, follow these guidelines:

- Index and store all contract correspondence for ease of retrieval.
- Develop and implement an effective contract change control system. The system should be integrated with the project's overall change control system and should include these elements:
  - Forms and paperwork required to request a contract change.
  - Contract performance-tracking mechanisms.
  - Procedures for submitting and approving change requests, including approval levels based on cost or impact of change.
  - Procedures for reviewing and resolving contract disputes.
- Evaluate the risk of each contract change request.
- Document all contract changes and incorporate any effects of the changes into the project plan.
- Develop and implement an effective performance reporting system for the seller. The performance reporting system should include these elements:
  - Baseline time, cost, and quality specifications.
  - Actual time, cost, and quality specifications.
  - Procedures for determining contract performance, including status reporting, on-site visits, and product inspection.
  - Procedures for determining acceptance or non-acceptance of delivered goods or services. These might include the options to accept the entire delivery, reject the entire delivery, or accept part of a delivery.
- Spell out in the contract any performance reporting specifications to be imposed on the seller.
- Set performance milestones to monitor project progress.
  - Depending on your project, you might use partial deliveries, completion of selected portions of the product, or preliminary versions of the finished product as milestones.
  - Make sure the milestones are arranged and agreed upon with the seller ahead of time.
  - Negotiate a deadline for each milestone, as well as quality and completeness specifications for the milestone.
- If work is performed at another site, conduct site visits to determine how the seller's work is progressing.

- Be sensitive to the cost of site visits in terms of time and impact on vendor relationships.
- Schedule the visits up-front, set an agenda for each visit, and use only the time required.
- Submit approved invoices for payment in accordance with the contract and the project's payment system.

## ACTIVITY 2–9

### Managing Suppliers and Contracts

#### Scenario

You are assigning resources to the public meeting work package of the new shopping center project. Most of the labor will come from within your company, although some labor and the non-labor resources will be outsourced.

1. You will need six professional security guards for four hours during the evening of the public meeting. What contractual considerations are important as you select the security firm who will provide the guards? (Choose two.)
  - Cost-reimbursable contract
  - Fixed-price contract
  - Term contract
  - Completion contract
  - Cost plus incentive fee contract
2. You will rent three large monitors so meeting attendees can see the speakers. Which of the following documents should you prepare first in order to procure the monitors?
  - Procurement Statement of Work
  - Procurement Management Plan
  - Contract
  - Teaming agreement
3. Your public meeting requires approximately 5,000 square feet of space. Which of the following selection criteria are most important? (Choose two.)
  - Past performance of company that owns the space
  - Size of the company that owns the space
  - Warranty
  - References from previous renters
  - Use of two smaller rooms if one large room is not available
4. The contract to rent the monitors stipulates that you should inspect them before the meeting. You are in a hurry and forget to do this, and as the meeting begins one of the monitors does not work. Which of the following is the correct term for this situation?
  - Warranty
  - Breach of contract
  - Waiver
  - Negotiated settlement

# TOPIC H

## Establish Project Governance Structure

Organizations use governance guidelines to establish strategic direction and performance parameters. The strategic direction provides the purpose, expectations, goals, and actions to guide business pursuits and is aligned with business objectives. Project management activities should be, and must stay, aligned with business direction to increase project success.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Determine appropriate governance for a project. (ECO 2.14.1)
- Define escalation paths and thresholds. (ECO 2.14.2)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Create project team	Meetings
Identify governance structure	Leverage Organizational Process Assets
Project change / configuration control	PMIS
	Update documents

### Project Governance

**Project governance**\* is the framework, functions, and processes that guide project management activities in order to create a unique product, service, or result to meet organizational, strategic, and operational goals. It is a comprehensive methodology that provides oversight on the project life cycle for the organization and ensures its success. It provides the structure, processes, decision-making models, and tools for the project manager and team to manage the project. It provides critical support to the project and is a method of controlling the project and increasing the success of the project by defining, documenting, and communicating effective, reliable, and repeatable project practices for the project to use. In large organizations that utilize a Project Management Office (PMO), governance is generally managed and controlled by the PMO.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 44.

### Project Governance Framework

As stated in the *PMBOK® Guide*, a project governance framework can include:

- Project success and deliverable acceptance criteria.
- Process to identify, escalate, and resolve issues.
- Relationship between project team, organizational groups, and external stakeholders.
- Project organization chart with project roles.
- Communication processes and procedures.
- Processes for project decision-making.
- Guidelines for aligning project governance and organizational strategy.

- Project life cycle approach.
- Process for stage gate or phase reviews.
- Process for review and approval of changes above the project manager's authority.
- Process to align internal stakeholders with project process requirements.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition*, Project Management Institute, Inc., 2017, Page 34.

## Project Phases

A project can be divided into phases that represent activities that produce one or more deliverables. A **project phase**\* is a collection of logically related project activities that culminates in the completion of one or more deliverables. The output of one phase is often a hand-off, or input, to the next phase. Phases facilitate management, planning, and control as the work is represented in smaller, more focused segments. Some organizations have standard phases across all projects.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 20.

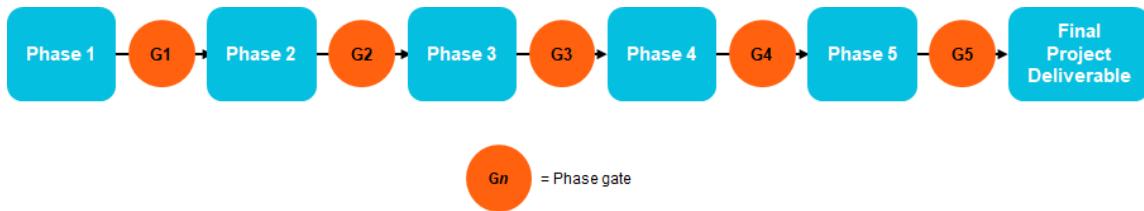
## Applying Governance to the Project Life Cycle

At the beginning of each phase, it is a good practice to verify and validate the former assumptions made to the project, analyze risks, and explain in detail the processes required to achieve a phase's deliverables. After the key deliverables of a particular phase are produced, a review at the end of the phase is necessary to ensure completeness and acceptance. Even though this method signifies the start of the subsequent phase, a phase can be closed or the project terminated when huge risks are involved for the project or when the objectives are no longer required.

## Escalation Paths

A **phase gate**\*, also known as a governance gate, tollgate, or kill point, is a review at the end of a phase in which a decision is made to continue to the next phase, to continue with modification, or to end a project or program. Each review is used to check if each phase has fulfilled the exit criteria and is eligible to move to the next phase. These criteria serve as thresholds for the project to continue. The advantage of this approach is that the project is controlled by incremental decisions based on information, rather than one big decision based on speculation and conjecture. The disadvantage of this approach is that it may create the impression that the project team keeps approaching management for assurance, approval, and support.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 21.



**Figure 2-24: An illustration of phase gates in the project life cycle.**

Software development projects can utilize a special type of phase gate called a **quality gate**. It is located before a phase that is strongly dependent upon the outcome of a previous phase. The quality gate process is a formal way of specifying and recording the transition between stages in the project life cycle.



**Note:** Like phase gates, tollgate reviews also check if a project phase in a Six Sigma project has met all the set objectives and is eligible to move to the next phase. When a phase receives tollgate approval, the project can proceed with the next phase.

## Phase-to-Phase Relationships

Projects that have multiple phases will generally follow a sequential process that ensures greater control over the project and aids in achieving the desired product, service, or result. Sometimes multi-phased projects will have more than one phase-to-phase relationship occurring during the life cycle of a project. In such cases, factors such as the level of control, effectiveness, and the degree of uncertainty decide the relationship that can be applied between phases. Based on these factors, both types of relationships can be applied between different phases of a project.

- **Sequential relationships** contain consecutive phases that start only when the previous phase is complete. This relationship reduces the level of uncertainty, which may eliminate the option for shortening a project's schedule.
- **Overlapping relationships** contain phases that start prior to the previous phase ending. This relationship increases the level of risk and may cause rework if something from the previous phase directly affects the next phase.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 42-44.

## Guidelines to Determine Appropriate Governance for a Project

Projects often have several phases, and it is important that they be planned and executed in an efficient manner. Here are several guidelines to determine the appropriate governance for a project:

- Involve the organization's decision managers, who are frequently its senior managers.
- Choose the most appropriate governance goals, and try to keep them simple.
- Select a group of experienced individuals to be responsible for all governance activities.
- Practice governance for projects, programs, and portfolios.
- Keep the governance process transparent to the project stakeholders.
- Remember that governance is an evolutionary process, and take advantage of the lessons you have learned during it.

Reference: Association for Project Management, *Directing change: A guide to governance of project management*. High Wycombe, UK, 2004, p. 6.

# ACTIVITY 2-10

## Determining Governance

### Scenario

The new shopping center project will take three years from design through construction to complete. You are new to the term “governance” and you want to test yourself to confirm that you have a solid understanding of it.

**1. Which of the following best represents the definition of governance?**

- A set of practices to help assure the success of the project.
- Phase-to-phase relationships within the project.
- The PMO directive on managing the project.
- The sponsor's directive on managing the project.

**2. When should the assumptions made about a phase be verified?**

- At the beginning of a phase
- At the beginning of the next phase
- At the end of the project
- Continually throughout the project

**3. The decision to move from one phase to another is known as which of the following? (Choose three.)**

- Kill point
- Go/No go
- Phase gate
- Phase endpoint
- Continuance threshold
- Governance gate

**4. Which of the following describes the most common phase-to-phase relationship in multi-phase projects?**

- Finish-to-start
- Sequential
- Orderly
- Non-overlapping

# TOPIC I

## Plan and Manage Project/Phase Closure

Closing a project or project phase is one of the last steps in completing a project or phase. Because a project is a unique, one-time activity, the formal closing out of the project is essential. In some cases, without an official close out of a project or phase, the next related activity, phase, or project will not get started. This happens often when there are multiple projects managed within a program.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Determine criteria to successfully close the project or phase. (ECO 2.17.1)
- Develop transition planning artifacts.
- Validate readiness for transition (e.g., to operations team or next phase). (ECO 2.17.2)
- Conclude activities to close out project or phase. (ECO 2.17.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Definition of Done	No specific tools.
Validate work	

### Close Project or Phase

The **Close Project or Phase process**\* is the process of finalizing all activities for the project, phase, or contract. During this process, all invoices are paid, contracts are closed out, project lessons learned are discussed and documented, and any other loose ends are wrapped up so that the project is complete and resources (people, equipment, facilities, and money) can be released to work on new projects or project phases. This process ensures that the activities across all of the project management process groups are finalized to signify the formal ending of the project work and the project or phase. The project manager reviews all project information to verify that all project work is complete and the project has delivered its objectives. The scope baseline is also reviewed to confirm completion. If a project is terminated before completion, this process analyzes and documents the reasons for the early ending.

Several important activities occur during closeout:

- The planned work is completed.
- Project or phase information is archived.
- Project team resources are released to pursue other endeavors.

### Close Project or Phase Criteria

A common misperception is that only successful projects or phases are closed. In fact, any one of the following events can result in closure:

- The project or phase successfully met its completion objectives.
- The requirements changed during execution to the point where the project is no longer feasible.
- Adequate funding is no longer available to complete the requirements.
- Significant risks are encountered that make the successful completion of the project impossible.
- The organization no longer needs the project deliverables.

- External factors arise that do away with the need for the project. Examples of these factors include:
  - Change in laws or regulations.
  - Merger or acquisition that affects the organization.
  - Global or national economic changes.

## Close Procurements

Procurements are closed when the contract terms of a procurement have been satisfied by both the buyer and seller. This occurs throughout the life of the project, not during project closure. Contracts are not kept open any longer than necessary, to avoid erroneous or unintentional charges against the contract.

## Acceptance

Project deliverables are deemed accepted when certain *acceptance criteria* have been met. These criteria generally refer to some or all of the requirements that were established at the beginning of the project (and which might have been modified during the project's life cycle).

Deliverables that meet these acceptance criteria are formally signed off and approved by the customer or sponsor.

## Payments

Payments made to a supplier or vendor are made in accordance with the terms of the contract between the buyer and the supplier or vendor. Unless a contract is closed at the completion of the project or phase, payment will most likely have been made at the time of contract closure. It should not be delayed until project or phase closure (unless specified in the contract), to avoid the potential for accidental charges to the contract.

## Knowledge Management

Knowledge management during project or phase closure consists of finalizing the lessons-learned register, which is compiled throughout the project life cycle. This document should then be added to the *lessons-learned repository*\*, which is a database of lessons learned from multiple projects.



**Note:** Knowledge management is discussed in detail in the next lesson.

## Transition Planning Artifacts

As the project readies for the product(s) to be in the hands of end users, coordination and strategy about how best to deliver and transition the product and other deliverables is needed. Projects that release and deploy deliverables in the most suitable manner ensures end-user awareness and increases the proper usage and adoption of the outputs. Optimizing acceptance and usability includes preparation of artifacts such as training, documentation, communication, and support.

## Transition Readiness

Releasing, delivering, and deploying your project's work into an environment that is not ready may negate its value. Project teams must examine the readiness of all parties and prepare them for delivery. This includes the end users, the business, the physical resources, and even the project team—for example, if there is an increase of questions and support issues.

Transition readiness is most critical in situations where there is an upgrade or improvement to an existing product or service. Guiding a seamless transition from an earlier version, method, software, process, or hardware to the output of your project requires coordination, planning, and readiness. You should assess the readiness of all parties, then implement the transition plans accordingly, and finally capture lessons learned for the next release or project.

## Lessons–Learned Register

At the end of the project, you have gathered all of the relevant information about the work done in a project or a project phase and documented it in the lessons-learned register. It's important to include both what the project team did well and what needs to be improved on. When the project is closed and the lessons-learned register is complete, the register content needs to be added to the lessons-learned repository so future project teams can benefit from this knowledge.

### Considerations of Lessons Learned

During **administrative closure**, project managers should take into account some of the following considerations of lessons learned:

- Scheduling lessons learned include any relevant scheduling problems or issues. They also document the management strategies that were implemented to deal with schedule or resource constraints.
- Conflict management lessons learned include any issues that arose within the team or between the team and customers. They include documentation of the nature and source of the conflict, as well as the impact that the conflict had on the project. The documentation should also specify how management intervened in response to the conflict.
- Sellers lessons learned include seller experience and performance documented and provided to the procurement department.
- Customer lessons learned can include useful information such as customers that are excessively litigious or unreasonable to work with. This information should be conveyed to the sales and legal departments, as well as documented in the lessons-learned repository.
- Strategic lessons learned are those that typically impact some aspect of the organization's project management methodology or significantly improve a template, form, or process. These address the questions: Can you reuse this project's artifact to get more done with the same resources and/or deliver work sooner?
- Tactical lessons learned answer the question: If you were to do this type of project again, what should you stop, start, and continue so that you can execute flawlessly? They focus on developing recommendations, reviewing recommendations with other managers in other departments, developing implementation plans, and implementing those plans.
- Other aspects of lessons learned include scope, schedule, cost, quality, and customer satisfaction, as well as any corrective action taken in response to issues.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 104, 124.

## Close–Out Meetings

**Close-out meetings** are sessions held at the end of a project or phase; they involve discussing the work and reviewing lessons learned. Close-out meetings may include stakeholders, team members, project resources, and customers. They typically follow a formal agenda and may require official minutes to be recorded. Not all organizations or projects require close-out meetings. Some organizations require the minutes from close-out meetings to be completed in full, approved by management, and preserved in a specific manner.



**Note:** In an agile environment, a retrospective meeting is used when closing the project.

## Varieties of Close-Out Meetings

Some organizations require official close-out meetings so that they can obtain the customers' formal project acceptance, while others use them as an opportunity to discuss the project with the customers as a prelude to soliciting additional business. Other organizations use close-out meetings for internal purposes, for the edification of the staff and improvement of internal processes. From an organizational standpoint, good endings lead to good beginnings on subsequent projects.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 127.

## Retrospective

The close-out meeting in an agile project is called a retrospective and consists of the agile team, Product Owner, and key stakeholders. Conducting a retrospective encourages the participants to review what went well and what could have been done better. This assessment includes the work on the product, but also the processes, level of collaboration inside and outside the agile team, and other areas that influence the effectiveness of product delivery.

## Guidelines to Close a Project or Phase

Each phase of the project must be properly closed to ensure that valuable information is safeguarded for future projects. To properly close a phase or project, do the following:

- Review the project management plan, accepted deliverables, and OPAs to confirm that the activities for the project are complete.
- Some organizations and application areas have a project termination checklist that may be useful when closing out a project or phase. You may find it useful to prepare one if there is not one available. This helps to ensure that you are thorough in your administrative close out.
- Gather and organize performance measurement documentation, product documentation, and other relevant project records for ease of review by stakeholders.
- Confirm project's products meet compliance requirements.
- Release project resources.
- Update records to ensure that they reflect final specifications.
- Be sure to update the resource pool database to reflect new skills and increased levels of proficiency.
- Analyze project success and effectiveness and document lessons learned.
- Prepare lessons-learned reports and a final project report.
- Obtain project approval and formal project acceptance. Demonstrate to the customer or sponsor that the deliverables meet the defined acceptance criteria to obtain formal acceptance of the phase or project. This may involve preparing an end-of-project report or giving a presentation.
- Archive a complete set of indexed project records.
- Celebrate the success of the project with the team and other stakeholders.

## ACTIVITY 2-11

### Closing a Project or Phase

#### Scenario

Your thorough project planning and control has resulted in the new shopping center project coming to a successful close. The final project deliverable is complete. You have collected the performance measurement reports and updated product documents and other relevant project records for archiving. Before you can close your project, you need to obtain formal project approval from the project sponsor. You have scheduled a meeting for the following afternoon.

1. Are your project records ready for review by the project sponsor? Why or why not?
  
2. What document will you prepare before obtaining formal acceptance from your project sponsor to officially complete the project?
  
3. In this case, what might constitute formal acceptance?
  
4. What types of documentation or computer files should you store in the project archives?

## Summary

In this lesson, you developed scope, budget, schedule, and procurement management plans. This also involved integrating project planning activities, defining scope, and creating a WBS. With these plans established, you will have a better idea of what is needed as your project team performs the work of the project.

The learning goals for this lesson were:

- Assess project needs, complexity, and magnitude to determine the appropriate project methodology/methods and practices.
- Plan and manage the scope.
- Plan and manage the budget and resources.
- Plan, prepare, modify, and manage the project schedule based on methodology.
- Plan and manage the quality of products and deliverables.
- Integrate project planning activities.
- Plan and manage procurement strategy.
- Establish the project governance structure.
- Plan and manage project/phase closure.

**Why do you think developing project and scope management plans is important?**

**Why do you think it's important to collect requirements, define scope, and create a work breakdown structure?**



**Note:** Check your CHOICE Course screen for opportunities to interact with your classmates, peers, and the larger CHOICE online community about the topics covered in this course or other topics you are interested in. From the Course screen you can also access available resources for a more continuous learning experience.



3

# Doing the Work

**Lesson Time: 7 hours**

## Lesson Introduction

Now that you have a project plan and have determined the requirements for managing the project from initiation to closure, you are ready to execute the project. All of the time and effort spent on planning will come to fruition as the project team starts doing the work of the project. During project execution, the ultimate goal is to deliver business value to the customer. In this lesson, you will execute the work of the project.

This lesson addresses tasks from the Process domain of the PMP® Exam Content Outline (ECO).

## Lesson Objectives

In this lesson, you will:

- Assess and manage risks. (ECO Task 2.3)
- Execute the project with the urgency required to deliver business value. (ECO Tasks 2.1, 2.6, 2.9)
- Manage communications. (ECO Task 2.2)
- Engage stakeholders. (ECO Task 2.4)
- Create project artifacts. (ECO Tasks 1.12, 2.9, 3.1)
- Manage project changes. (ECO Task 2.10)
- Attack issues with the optimal action to achieve project success. (ECO Task 2.15)
- Confirm approach for knowledge transfers. (ECO Tasks 1.6, 2.16)

# TOPIC A

## Assess and Manage Risks

Up to this point, you have laid out all your project activities, developed a schedule, and planned a project budget. That is all well and good until something unforeseen happens that affects all the plans you have made. How will you react? Risk management provides you with specific actions to take for responding to potential project risks.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Determine risk management approach. (ECO 2.3.1)
- Iteratively identify, assess and prioritize risks and risk responses. (ECO 2.3.2)
- Determine risk response.
- Implement risk response.

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Risk Management Plan	Organizational Process Assets
Risk Register	Meetings
Create Risk Response Plan	Expert judgment
Implement Risk Response Plan	Risk analysis techniques
	Update Risk Register
	Risk probability and impact assessment
	Monitor and manage risks

### Risk

A **risk**\* is an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives. Its primary components are a measure of probability that a risk will occur and the impact of the risk on a project. Some common ways to classify risk are effect-based classification, source-based classification, and level of uncertainty.



**Note:** In general usage, risk is perceived as a negative, but in project management, risk can be positive or negative.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 397.

Negative risks are risks that have a negative impact on the project. Also referred to as **threats**\* which are defined as risks that would have a negative effect on one or more project objectives. Project managers strive to prevent these risks from occurring or reduce their impact.

Positive risks are risks that when taken, produce a positive project outcome. Also known as an **opportunity**\* which is defined as a risk that would have a positive effect on one or more project objectives.

A **trigger condition**\* is an event or situation that indicates that a risk is about to occur. Triggers can come from external factors that influence your project such as proposed changes in relevant

legislation. They could also be internal factors that influence your project such as proposed changes in staffing, governance, or funding within your organizations. Triggers can have both positive and negative effects on a project. For example, changes in legislation or regulations might adversely affect the project timelines and budget. Known triggers can be identified during the Identify Risks process and documented within the risk management plan and the risk register.

## Risk Management Plan

A **risk management plan**\* is a component of the project, program, or portfolio management plan that describes how risk management activities will be structured and performed. It identifies the methodology, approaches, and tools that will be used, documents the roles and responsibilities of those involved, identifies the budgeting and the scheduling for risk management activities, and identifies risk categories.

<b>Plan Component</b>	<b>Description</b>
Risk strategy	Describes the risk management approach for the project.
Methodology	Describes and defines what specific tools, approaches, and data sources will be used to perform risk management for a project.
Roles and responsibilities	Defines the lead, support, and risk management team membership for each type of action in the risk management plan.
Funding	Includes budgeting information that estimates and identifies risk funds that will need to be included in the cost baseline and how the contingency and management reserves will be estimated.
Timing	Defines at what points the risk management process will be performed on the project and determines guidelines for use of schedule contingency reserves. Determines what risk management activities will be in the project schedule.
<b>Risk categories</b>	Categories can be used to group potential causes of risk. A <b>Risk Breakdown Structure (RBS)</b> * documents what sources a project risk may come from in a risk identification exercise. The categories could be technical, external, financial, organizational, and project management risk.
Stakeholder risk appetite	Identifies the amount of risk that is acceptable to stakeholders. These thresholds are considered when determining the probability and impact of risk during the project.
Definition of <b>risk probability</b> and <b>impact</b>	Defines the levels of probability and impact for the project using terms such as "very unlikely" to "almost certain" with respective numerical values assigned to the terms. For example, "very unlikely" may have 0.05 as a probability value.
Probability and impact matrix	This maps the probability of occurrence for each risk and the impact on the project if that risk occurs. Risks need to be prioritized based on their impact by using a probability and impact matrix. The organization determines the specific combinations of probability and impact that lead a risk to be rated as high, medium, or low importance, or rated according to other similar rating scales.
Reporting formats	Defines how project risk information will be documented, analyzed, and communicated to the stakeholders. This section also describes the format of the risk register and other risk reports.
Tracking documents	Documents how risk activities will be recorded and how the risk management processes will be audited during the course of a project.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 405-408.

## Risk Identification

There are several ways you can use to identify risks.

<b>Risk Identification Methods</b>	<b>Description</b>
Expert judgment	Individuals with the proper experience in risk analysis provide appropriate feedback.
Data gathering	<ul style="list-style-type: none"> <li>Brainstorming: A method to collect data that can be used to assist in identifying risks.</li> <li><b>Checklist analysis*</b>: Developed based on historical information as a standardized way to identify risks. Be careful to look for items that do not appear on the existing checklist, as each project is unique.</li> <li>Interviews: Collecting information about project risks by talking with those closest to the project, including stakeholders and SMEs.</li> </ul>
Data analysis	<ul style="list-style-type: none"> <li><b>Root cause analysis*</b> examines a problem and seeks to determine the underlying reason or cause of the problem, which can then be used to work on creating a preventive action.</li> <li><b>Assumption and constraint analysis</b> explores the validity of the project assumptions within the constraints, and identifies risks from any incompleteness or inaccuracy of these project assumptions. A technique used to explore the validity of project assumptions.</li> <li>SWOT analysis examines the project from the perspective of strengths, weaknesses, opportunities, and threats.</li> <li>Document analysis is structured reviews of project plans and related documents to help identify risks that might apply to your existing project. These reviews can be performed on project documentation such as project plans, assumptions, previous project files, agreements, and other information. Quality of and consistency between plans and project requirements and assumptions may be areas of risks that should be considered.</li> </ul>
Facilitation	During the Identify Risks process, an expert facilitator can keep the project team on task and focused on collecting information about project risks.
Prompt lists	A predefined list of risk categories that might help project team members as they are gathering and analyzing risk-related data.
Meetings	During this process, teams might hold a special meeting called a <b>risk workshop</b> to focus on identifying risks. Depending on the size of the project, these workshops might also include the project sponsor, SMEs, customer representatives, and other stakeholders.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 414-416.



**Note:** For more information, check out the Spotlight on **Identifying Project Risks** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Risk Management Approach

Risk management must be addressed proactively and consistently throughout the project in order to reduce the potential for unmanaged threats to negatively impact the project.

Risk management can be a very tedious and time-consuming task. In many organizations, when there are numerous large projects going on at the same time, there might be a designated team appointed whose purpose it is to identify, manage, handle, and monitor risks throughout the project life cycle.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 395.

## Risk Classification

Risks can be classified by two different methods, effect-based and source based.

**Effect-based risk classification** is a method of analyzing the way that risks to a project could impact its success. A risk can have an effect on time, cost, quality, and scope. All these effects are interrelated; therefore, any changes to one element will affect all the others.

A project manager may choose to use effect-based risk classification for a complex project in which many of the risk factors are interrelated such as a large-scale corporate endeavor or initiative in which many departments, teams, and external resources are participating. Any one department's failure to produce will impact the rest of the project.

**Source-based risk classification** is a method of analyzing risk in terms of its origins. Sources may be internal or external to the project and technical, nontechnical, industry-specific, or generic.

For a project requiring internal and external resources such as an advertising campaign, a project manager may classify the risks in terms of where they originate. One source of risk could be the potential rise in the price of advertising time on network television, which could affect cost and scope. Another source of risk could be the failure of an external advertising agency to meet its deadlines, which would affect the schedule and scope.

## Business Risk Types

Project risks are of two types: business and insurable. A **business risk** is one that is inherent in a business endeavor such as when a company assumes that it will spend money and make money, and that any project undertaken carries with it the potential for success or failure, profit or loss.

**Insurable risk** is a risk that has only the potential for loss and no potential for profit or gain. An insurable risk is one for which insurance may be purchased to reduce or offset the possible loss.

Project managers should be aware of some of the common types of business risks.

Business Risk	Description
Competitive	Risks such as the risk of increased competition in the marketplace and a rival company developing a superior product.
Legislative	Risks such as the risk of new laws or changes in regulations governing your products, goods, or services, that require your company to spend more to maintain compliance.
Monetary	Risks such as the risk of increased prices for raw materials, increased taxes, increased operating costs, and losses due to nonpayment by customers.
Operational	Risks such as the risk of fraud, theft, employee injury, workplace accidents, and damage to equipment.

## Risk Tolerance, Appetite, and Threshold

The following risk-related terms are all similar; however, there are differences.

- **Risk tolerance** refers to the maximum amount of risk, and the potential impact of that risk occurring, that a project manager or key stakeholder is willing to accept. When analyzing project risks, the risk tolerance must be known and understood by the project risk team so that identified risks can be evaluated against the accepted risk tolerance for a project.
- **Risk appetite**\* is the degree of uncertainty an organization or individual is willing to accept in anticipation of a reward. In a literal sense, think of appetite as how "hungry" a person or group is for risk. Risk appetite exists along a spectrum, ranging from avoiding risk and uncertainty to choosing options that offer higher rewards but that come with inherently more risk.
- Appetite and tolerance sound similar, but they are not identical. Appetite refers to the amount and type of risk, whereas tolerance refers to the maximum risk an organization is willing to take.
- **Risk threshold**\* is the level of risk exposure above which risks are addressed and below which risks may be accepted. Risks below the threshold are by definition of no concern.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 398, 407.

## Guidelines to Iteratively Identify, Assess, and Prioritize Risks



**Note:** All of the Guidelines for this lesson are available as checklists from the **Checklist** tile on the CHOICE Course screen.

It is important to identify and document the characteristics of risks that might affect the project so that the project team can determine the most effective action to take for each risk. The project risks and triggers identified will determine the type of risk analysis to be performed. To identify project risks and triggers, follow these guidelines:

- Perform a structured review of appropriate documentation from other planning processes with key project stakeholders to ensure an understanding of each. These documents are a valuable source for risk identification, and they may include:
  - Project charter
  - WBS
  - Product description
  - Schedule and cost estimates
  - The network diagram
  - Estimates of duration
  - Resource plan
  - Procurement plan
  - List of constraints and assumptions
- Use one or more risk identification techniques to identify risks and their possible triggers. Techniques may include:
  - Information-gathering techniques such as brainstorming, interviewing, and SWOT analysis, among others.
  - Risk identification checklists (make every effort to itemize all types of possible risks to the project on the checklist).
  - Assumptions analysis.
- Be consistent. Whatever method you adopt, apply it systematically across your project. Before the project begins, identify risks in every project segment and work package. At the start of each project milestone, segment, or phase, re-examine the risks for that segment. Update your list of risks at the close of each project segment.
- Apply your method consistently, but be on the lookout for special circumstances that might arise in any project segment. Those checklists and templates are in place to help get the risk

identification process going, but they are far from complete. As the project progresses, circumstances change. Be on the lookout for changed assumptions, new risks, or additional impacts from previously identified risks.

- Consult relevant historical information such as risk response plans and final reports from previous, similar projects that may include lessons learned describing problems and their resolutions. Another source of historical information for risk identification is published information such as commercial databases, academic studies, and benchmarking results.
- Once risks have been identified, group them into categories that reflect common sources of risk for your industry or application area. Examine each identified risk to determine what triggers will indicate that a risk has occurred or is about to occur.
- Use the results of your analysis to initiate the risk register.
  - Consider implementing any risk-register software that may be in common usage at your company. You can also create a risk register without specialized software by using a spreadsheet or table.
  - Include the project's name, sponsor, key stakeholders, and objectives.
  - Identify the risks inherent in your project with a description of each.

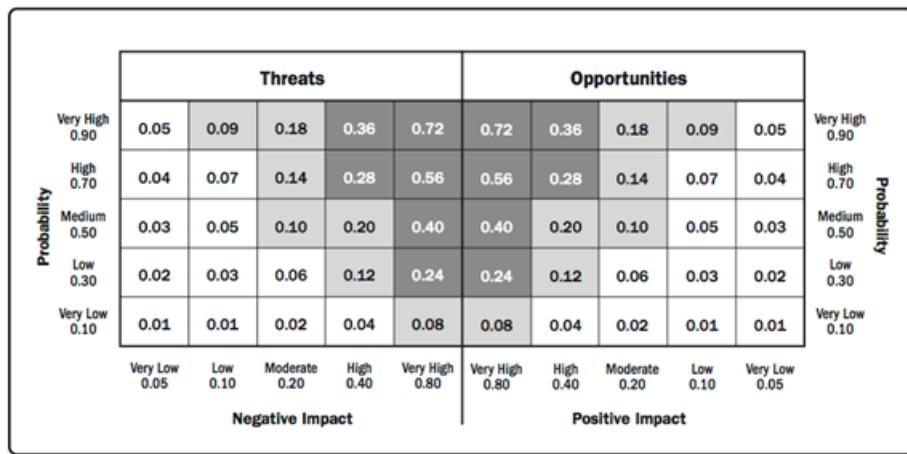
## Qualitative Risk Analysis

**Qualitative risk analysis** is a technique used to determine the probability of occurrence and the impact of each identified risk. To determine the risk exposure to the project of a particular risk, multiply its probability and impact. To get an overall risk figure for the entire project, you can either sum the risk figures for each risk, or sum those figures and then divide by the total number of risks. The qualitative risk analysis process ultimately provides the list of prioritized risks for further actions.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 419.

## Probability and Impact Matrix

The **probability and impact matrix\*** is a grid for mapping the probability of occurrence of each risk and its impact on project objectives if that risk occurs. The matrix combines the probability and impact scales to prioritize risks and identify risks that are likely to require further analysis. The risk rating is calculated by multiplying the risk's impact score by its probability score. The risks can then be placed in priority order, highest score at the top of the list. The higher rating indicates a higher risk to the project. This ranking allows you to focus on the higher value risks as you develop the risk responses. The probability and impact matrix will guide the response plans.



*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Page 408.*

**Figure 3–1: An example of a probability and impact matrix with scoring scheme.**

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 408 and 425.

## Quantitative Risk Analysis

**Quantitative risk analysis** is a technique used to assess the risk exposure events to overall project objectives and determine the confidence levels of achieving the project objectives. Quantifying risk can help you to identify time and cost contingencies of a project. It further refines and enhances the prioritization and scoring of risks produced during qualitative analysis.



**Note:** Quantitative risk analysis methods including decision tree analysis and Monte Carlo analysis are presented in the lesson titled "Keeping the Business in Mind."

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 428.

## Risk Responses

Planning risk responses consists of developing options, selecting strategies, and agreeing on actions to address overall project risk exposure, as well as to treat individual project risks. These responses are included as a part of the risk response plan. Risks are addressed by priority, and resources and activities can be added to the budget, schedule, and project management plan to support the risks. Each risk is assigned a risk response, which is an action to address that risk and a person to implement that action.

Implementing the risk response plan consists of choosing a risk response for each risk. A fallback plan can also be developed in case the primary strategy is not effective. Secondary risks should also be reviewed. These are risks that could occur as a result of implementing a risk response.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 437-439.

## Negative Risk Strategies

There are five strategies for managing negative risks or threats. These strategies are selected based on the risk's probability and impact on the project. Critical risks with high impact should be avoided or mitigated, whereas less critical risks can be transferred or accepted. You may also outsource critical risks and avoid less critical risks without having to accept them.

- **Escalate:** Determining that the threat is outside the scope of the project or beyond the project manager's authority, and then forwarding the threat to a person or part of the organization at a higher level such as the program level, portfolio level, or other part of the organization. To consider the threat escalated, the new person or party must accept ownership of it. The escalated threat is documented in the risk register, but the project team no longer monitors it.
- **Avoid:** Changing the project management plan to remove the risk entirely by extending the schedule, changing the strategy, increasing the funding, or reducing scope. Some risks can be avoided entirely by clarifying requirements, obtaining more information, improving communication, or acquiring expertise in that area of risk.
- **Transfer:** Shifting the impact and ownership of the risk to a third party and paying a risk premium to the party taking on the liability of the risk. This can be done with insurance, performance bonds, warranties, guarantees, contracts or agreements, and so on. An example of when you may want to transfer risk is in the case of having little internal experience performing a particular type of work on a project. In this case, you may want to outsource that work to a vendor that is more capable of performing it.
- **Mitigate:** Taking action to reduce the probability of occurrence or the impact of a risk. Adopting less complex processes, increasing the duration of an activity, conducting more testing, and choosing a more stable supplier are examples of mitigating a risk.
- **Accept:** Acknowledging a risk and not taking any action until the risk occurs. Acceptance can be either a passive or an active strategy. An example of passive acceptance would be simply acknowledging and documenting the risks. Then, the risk management team can periodically review the threat and determine what, if any, action to take with risks as they occur. A common active acceptance strategy involves creating a contingency reserve with amounts of time, money, or resources to address the risk if it happens.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 442-443.

## Positive Risk Strategies

There are five strategies for managing positive risks or opportunities. These strategies are selected based on the risk's probability and impact on the project.

- **Escalate:** Forwarding opportunities that are beyond the scope of the project. The opportunity is escalated to the level in the organization that would be affected if the opportunity materializes.
- **Exploit:** Attempting to make sure that the opportunity happens. Examples include assigning the best resources to the project, hiring an expert consultant, or using new technology to reduce project cost and duration.
- **Enhance:** Increasing the probability that the opportunity will happen or the impact it will have by identifying and maximizing enablers of these opportunities. An example is to add more resources to an activity so it finishes early.
- **Share:** Allocating some or all of the ownership of the opportunity to a third party. Examples include risk-sharing partnerships, teams, special purpose companies, or joint ventures.
- **Accept:** Being willing to take advantage of an opportunity if it happens, but not actively pursuing it.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 444.

## Contingency Plans

A **contingency plan** is a risk response strategy developed in advance, before risks occur; it is meant to be used if and when identified risks become reality. An effective contingency plan allows a project manager to react quickly and appropriately to the risk event, mitigating its negative impact or increasing its potential benefits. A contingency plan may include a fallback plan for risks with high impact. The fallback plan is implemented if the initial contingency plan is ineffective in responding

to the risk event. As mentioned in the budget section, a contingency reserve is predetermined and factored into the schedule baseline. The amount of the reserve is estimated to account for the rework amount.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 445.

## Guidelines to Determine and Implement Risk Responses

Response strategies should be developed for each identified risk. The selected response strategies should take advantage of opportunities and reduce the probability and/or impact of threats to project objectives. To develop an effective risk response plan, follow these guidelines:

- Examine each identified risk to determine its causes and how it may affect project objectives. Brainstorm possible strategies for each risk.
  - Identify which project stakeholders can be assigned responsibility of a risk. Involve those people in your risk response planning.
  - Write down every idea mentioned regardless of feasibility or cost.
- Choose the response strategy that is most likely to be effective for each identified risk. Ensure that the chosen risk response strategies are:
  - Enough to bring the risk below the organization's threshold.
  - Appropriate to the severity of the risk.
  - Cost effective.
  - Timely enough to be successful.
  - Realistic within the context of the project.
  - Agreed to by all parties involved.
  - Owned by a responsible person.
- If you are unable to bring a risk's rating below the organization's risk threshold, ask your sponsor for help. Develop specific actions for implementing the chosen strategy.
- Identify backup strategies for risks with high risk factor scores.
- Determine the amount of contingency reserves necessary to deal with identified risks.
  - How much will your contingency plans cost?
  - How much time will your contingency plans add to the schedule?
- Consult the risk management plan for the description of the content and format of the risk response plan. Include the following elements in your risk response plan:
  - A description of the identified risks along with the area of the project affected (that is, the WBS element).
  - Risk owners and assigned responsibilities.
  - Qualitative and/or quantitative risk analysis results.
  - Response strategies selected and the specific actions for implementing the strategies.
  - Level of residual risk expected to remain after the response strategies are implemented.
  - Budget and schedule for responses.
  - Contingency plans and fallback plans for all accepted risks with high impact.
- Incorporate the risk response plan into the overall project plan so the strategies can be implemented and monitored. As the project progresses through the life cycle, examine trends in qualitative and quantitative analysis results that may guide your response strategies.
- Use the following guidelines to implement risk responses:
  - Be aware of the appropriate and acceptable responses to risks.
  - When possible, take preventive actions before risks are realized.
  - Review the risk management plan to verify the agreed upon responses.
  - Refer to the lessons-learned repository to leverage knowledge from other similar projects.
  - Use your influencing skills to convince risk owners to take the necessary actions.

- Use a PMIS to capture, store, and distribute information about project risks.
- Document any lessons learned in the lessons-learned register for future risk response plans.

# ACTIVITY 3-1

## Assessing and Managing Risks

### Data File

C:\ATPPMP1Data\Doing the Work\Risk Register.xlsx

### Scenario

You work for a small development company that builds homes for low-income families. The home-build program's purpose is to build a two- or three-bedroom home for each qualifying family. Under the sponsorship of Linda Michaels, your company is getting ready to build a new home for the Andrews family. The family has qualified for the home-build program and is the next family on the home list. You have been assigned to manage this project. Each new build project is named by the address and the next available lot is located at 234 West Adams Street.

For the 234 West Adams project, the scheduling will need to be managed around the delivery of products and materials. The costs of these materials have been known to fluctuate lately due to the uncertain economy. Occasionally, projects in this part of town are vandalized during construction. Of course, you must also be mindful of the weather during construction. It is somewhat unpredictable, but as far as you know, the forecast is looking good for the next few weeks.

Now that you have identified how to manage the project and what the costs are, you can take the next step and determine what the project risks are. You would like to review the potential project risks in a risk register.

1. Open the file C:\ATPPMP1Data\Doing the Work\Risk Register.xlsx.
2. Use the following questions to fill in the first four columns of the risk register for the 234 West Adams project. The remaining columns will be filled in later.
3. Which of the following might be risks (either opportunities or threats) for this project? (Choose three.)
  - Fluctuating material costs
  - Finding another family for the house if the Andrews family moves to another town
  - Weather
  - Vandalism
4. Would you classify the weather as a positive risk (opportunity) or a negative risk (threat)?
5. What events might be considered triggers for the risks?

6. Save the file as ***My Risk Register.xlsx***
  7. Open C:\ATPPMP1Data\Doing the Work\Solutions\Risk Register Solution.xlsx and compare your file to it.
  8. Close all open files.
-

# TOPIC B

## Execute Project to Deliver Business Value

Projects are commissioned to deliver value. In a fast-paced world, time is of the essence. Organizations and customers want to see and consume the value sooner rather than later. Project managers must execute the project in the most appropriate manner to balance the urgency to realize the value with the abilities of the team based on quality expectations. This topic explores this important aspect of project management in the modern era.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Assess opportunities to deliver value incrementally. (ECO 2.1.1)
- Examine the business value throughout the project. (ECO 2.1.2)
- Support the team to subdivide tasks to find the minimum viable product. (ECO 2.1.3)
- Measure ongoing progress based on methodology. (ECO 2.6.4)
- Collect and analyze data to make informed project decisions. (ECO 2.9.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<i>Deliverables</i>	<i>Tools</i>
No specific deliverables.	No specific tools.

### Creating a Culture of Urgency

Appreciating the urgency to accomplish goals in projects is best achieved when the sense of urgency is ingrained in the project environment and culture. Establishing and cultivating the appropriate project urgency culture is an ongoing task. The project manager can lead the way by articulating the project's importance and vision. Everyone involved can commit to and be accountable for striving towards that vision. Bringing in the voice of the customer, such as during backlog refinement sessions with Product Owners and requirement collection meetings, can express the desires and personalize the value. The project team can promote the culture in their daily actions, responsiveness, and attentiveness.

### Examination of Business Value

Projects produce business value. Exactly what is of value to the business and to which extent requires examination, evaluation, and confirmation. Throughout a project this can be performed in a variety of means. The business value can be:

- Financial
- Improvements
- New customers
- First to market
- Social
- Technological

## Product Roadmaps

As goals, milestones, and potential deliverables are determined, a product roadmap emerges. The **product roadmap** serves as a high level visual summary of the product or products of the project. The roadmap can vary in appearance and presentation. The objective is to display the strategy and direction of the product being built and value to be delivered over time.

Roadmaps are progressively elaborated over time as more information is known, work is being completed or not completed, and vision is refined. Typically, product roadmaps start with the overarching vision of the product and any known time constraints or milestones. From there, project stakeholders can paint broad strokes along the timeline based on priorities and high-level estimates. As agreements emerge in the direction towards the vision, themes also emerge. Capturing the themes assists in bringing structure and associations to the roadmap. Those themes equate to goals. The themes give narrative to features, feature sets, phases, requirements, or other aims.

The product roadmap provides short term and long term visualization of the product. The roadmap matures and evolves as the project travels down the road.

## Incremental Delivery

One means of delivering value sooner rather than later is via incremental delivery. Early and regular incremental releases lead to higher customer value and an increased market share. Dividing the product into **increments\*** enables parts or elements of the product to be in the hands of customers prior to full delivery of the product.

Delivering the product incrementally allows users and the business to not only consume the targeted value—even if only partially—but also to provide feedback to the project team. Feeding input back into the project enables the project team to adjust the direction, priorities, and quality of the product.

Finding suitable increments demands conversation and alignment. Furthermore, iterative and incremental delivery reduces effort spent on non-essential features by focusing on high-priority items at any given point. Stakeholders are delivered a usable product with the expectations that additional features and revisions are to come.

## Minimum Viable Product

In order to determine a usable product for the customer in each increment, the core value must be understood. Based on the essential value sought by the project, the bare minimum of how the value can be realized is established. This is referred to as the **minimum viable product (MVP)**.

With a MVP, all stakeholders have an opportunity to see and experience some form of project outcomes. A tangible output channels targeted conversations. More valuable feedback can be provided. Ideas and concepts become reality, even if only at a bare minimum.

Establishing a MVP inspires the team to achieve that aim. When outcomes are too abstract or too far off, teams can get discouraged or overwhelmed. Minimum Viable Products ignite shorter-termed urgency and a feeling of accomplishment. All of which is of value to the customer but also the project team.

## Minimum Business Increment

Some projects are improving or revising products that are live and in-use. As such, an MVP with minimal features and functionality may be disruptive to the users and business, especially when a basic preliminary product to gauge interest is not necessary. Utilizing the concept of a **Minimum Business Increment (MBI)** is more viable.

An MBI works best when:

- The product and functions are understood.

- An incremental increase of value can be pinpointed.
- The delivery of some of that value benefits the business.

Targeting MBIs enables your project team to deliver bits of value sooner to those who can benefit from its development. Additionally, it helps your team validate whether or not the team has captured the improvement. Then everyone can give feedback on the improvement. The team can incrementally build on that success or pivot as needed.

## Cycles and Timeboxes

Based on the product roadmap, project teams can set up release cycles and working time blocks. Establishing set *timeboxes*\*—typically in the form of weeks or days for urgency sake—keeps the team focused and driven to fulfill expectations within that self-imposed time constraint.

Timeboxes allow for better telemetry over time. Cycling the project through similar timeboxes provides progress measurements from one timebox to the next and over many timeboxes. Over time and repeated cycles, the team begins to gain more predictable measurements that can communicate expectations of cycle times, throughput, and velocity.

## Guidelines to Measure Ongoing Progress

Guidelines to collect and analyze data to make informed decisions on project progress:

- Define value from the customer's, business, and/or user's perspective.
- Determine value expectations.
- Set targets and baselines based on expectations.
- Determine metrics that communicate progress towards those value expectations.
- Select one or more means of collecting metric data that is not too cumbersome or time consuming for the project team.
- Collect data at a regular interval.
- Present the data of the progress.
- Compare the progress with the baselines and expectations.
- Improve on success or correct areas where progress is not meeting expectations.

## ACTIVITY 3–2

### Executing a Project with Urgency

#### Scenario

Venture capitalist funding was released for your company to undertake a new space in the marketplace. The phone and tablet app is the primary means for users to use the new products and services to be launched with this funding. The marketspace has other emerging competitors but no one clear dominant player. Your company thinks it has a good chance to be that player. Therefore, they have entrusted you to lead the phone app project.

1. There are so many features and functions that must be designed, developed, and deployed. The assembled project team is overwhelmed and unsure where to even begin. How would a preliminary examination of the business value of some of the features and functions assist the team at this early stage?
  
  
  
  
  
2. What is the value of doing this before having technical discussions?
  
  
  
  
  
3. As the project team gains better understanding of the value their product might deliver, they are excited to make the product a reality. Due to the volume of features and the work required, the project team decides to delivery incrementally. What are some benefits to this strategy? (Choose three.)
  - Creates a sense of urgency to deliver part of a solution.
  - Allows progress to be realized.
  - Makes senior leadership promote their work.
  - Allows the team to discard or ignore the challenging work.
  - Enables the end users to provide feedback.

4. You and the project team determine the minimal viable product (MVP) to release only one month after the project launch. Others in the organization are asking for many other features and designs to be included before it is released to the public. Should the project team hold off on the release until more features are added or should they move forward on their MVP plans?
-

# TOPIC C

## Manage Communications

Project managers spend approximately 90 percent of their time communicating with the project team and other stakeholders. For this reason, it is imperative that communications should be a high priority for every project manager.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Analyze communication needs of all stakeholders. (ECO 2.2.1)
- Plan communication methods, channels, frequency, and level of detail. (ECO 2.2.2)
- Communicate project information and updates effectively. (ECO 2.2.3)
- Confirm communication is understood and feedback is received. (ECO 2.2.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Communications Management Plan	Stakeholder analysis
Project communications	Create and update project communications plan
Stakeholder Register	Update documents
Work performance and change updates	Understand and practice Sender-Receiver Model
Update project communications	

### Project Communications

The ability to effectively communicate is critical when it comes to performing such tasks as actively listening, questioning and probing, training, fact finding, setting expectations, persuading, coaching, negotiating, resolving conflict, and summarizing and recapping.

The method and type of communication that a project manager plans to use will depend on a variety of factors such as the following:

- Internal or external stakeholders: Internal stakeholders on the project team or employees of the organization compared to external stakeholders such as customers, vendors, governing agencies, and so on.
- Formal or informal: Formal reports, presentations, and meetings compared to informal communications such as email, social media, websites, and casual chats in the hallway.
- Hierarchical focus: The appropriate communication will change when communicating to senior management compared to the project team or peers of the project team.
- Official or unofficial: Official communication includes annual reports compared to project-related communication that provides information.
- Written or oral: For verbal communication, the tone or inflection is a consideration as well as nonverbal (body language) gestures.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 360-364.

## Communications Management Plan

A **communications management plan**\* is a component of the project, program, or portfolio management plan that describes how, when, and by whom information about the project will be administered and disseminated.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 377.

This plan is created very early in the project. It is updated when the new stakeholders join the project or existing stakeholders leave it, or when the communications requirements of any stakeholder change.

Stakeholder	Communication Method	Frequency	Responsibility	Notes
<b>Key Stakeholders</b>	Project Kickoff Meeting	Start of project	Project Management Office	Both team and client kickoff meetings recommended
	Extranet	Ongoing	Project Management Office	Includes project schedule, key project deliverables, meeting minutes, change request log, issues log
<b>Client Executive</b>	Executive Steering Committee	Monthly – first Wednesday of each month	Account Manager	Review status, milestones met, earned value indicators, key issues
<b>Client Sponsor</b>	Status Meetings Status Report (Email)	Weekly – Friday 2 p.m.	Project Manager	Review project status, schedule, change requests, issues
<b>Development Team</b>	Status Meetings	Weekly – Friday 11 a.m.	Project Manager	Provides input for subsequent meetings with client sponsor
<b>Client Managers</b>	Newsletter (Email)	Weekly – Friday	Project Management Office	
<b>Client Sponsor/Key Client Stakeholders</b>	Client Satisfaction Survey	Monthly/end of each phase	Account Manager/Project Manager	Informal (Monthly) Formal (End of each phase)

**Figure 3–2: A sample communications management plan.**

## Components of the Communications Management Plan

As stated in the *PMBOK® Guide*, the communications management plan contains the following information:

- Stakeholder communications requirements.
- Information to be communicated, including language to be used.
- Reason for the distribution of the information.
- Time frame and frequency of information distribution.
- Person responsible for the communication.
- Person responsible for the release of confidential information.
- People who will receive the information.
- Methods or technologies that will be used to convey the information.
- Time and budget allocated for communication.
- Escalation process for issues that need visibility.
- Method for updating the communications management plan.
- Glossary of common terminology.
- Flowcharts of information flow.
- Any communication constraints due to regulation or policies.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 377.

## Communication Requirements Analysis

Communication requirements are the project stakeholders' documented communication needs. They include relevant information that contributes to the success of a project and analysis of cost, time, and logistics. Not all stakeholders will require the same amount, level, or timeliness of communication. The variances must be factored into the communication requirements.

**Communication requirements analysis**\* is an analytical technique to determine the information needs of the project stakeholders through interviews, workshops, study of lessons learned from previous projects, etc. This analysis can lead to a clear articulation of the stakeholders' communication needs and help the project manager make effective choices regarding the **communication technologies** to be recommended in the communications management plan. It should also address special communication needs such as time zones, communication preferences, functional or hierarchical barriers, language barriers, technological barriers, and cultural differences, when working with remote teams or team members.

This analysis can take the form of a grid, questionnaire, or survey that documents the communication and technology requirements for each stakeholder. It will also enable the project manager to obtain buy-in from stakeholders and shape their perceptions by providing the right information at the right time.

A project manager conducting communication requirements analysis may survey stakeholders regarding their communication needs by asking some basic questions such as:

- How often will you like to receive status reports?
- How will you prefer to receive information—by phone, by email, or in face-to-face meetings?
- What level of detail are you expecting?

Issues of appropriateness, level of detail, timeliness, and cost should be considered in addition to the preferences and technology capabilities of stakeholders.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 369-370.

## Communication Types

The communication medium and type that you choose will depend on who is communicating, what type of message is being communicated, and how much feedback (verbal or non-verbal) the speaker wants or needs. Common examples of communication types include, but are not limited to, the following.

Type	Benefits	Constraints
Face-to-face meetings	<ul style="list-style-type: none"> <li>• Provides the opportunity for instant feedback—auditory and visual.</li> <li>• Can immediately clarify if there are questions or confusion.</li> <li>• Can be scheduled or impromptu.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires parties to be in the same physical location.</li> <li>• Requires a meeting date and time.</li> </ul>
Video and voice conferencing (virtual meetings)	<ul style="list-style-type: none"> <li>• Eliminates the need to be in the same physical location.</li> <li>• Can provide beneficial audio and visual feedback.</li> <li>• Can be scheduled or impromptu.</li> </ul>	<ul style="list-style-type: none"> <li>• Potential for message to get lost in translation.</li> <li>• Crossing time zones can be problematic.</li> <li>• Requires special equipment and connection.</li> </ul>

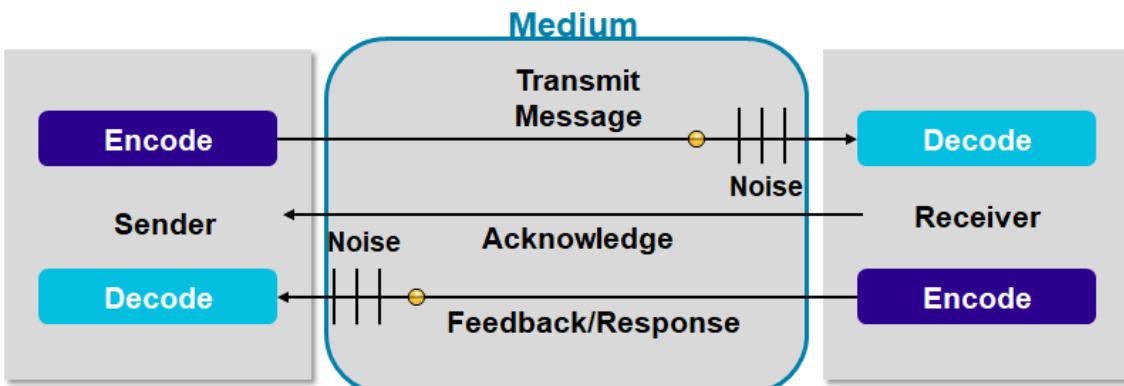
Type	Benefits	Constraints
Email	<ul style="list-style-type: none"> <li>Enables parties to communicate when it's convenient and works with their schedules.</li> <li>Can provide an official paper trail.</li> <li>Enables receiver to have a record of communication.</li> </ul>	<ul style="list-style-type: none"> <li>Not always the most timely.</li> <li>Security/hacking might be an issue for confidential messages.</li> </ul>
Fax	<ul style="list-style-type: none"> <li>Convenient and easy to send.</li> <li>Software enables you to send a fax from your computer.</li> </ul>	<ul style="list-style-type: none"> <li>Equipment and connection required.</li> <li>Outdated form of communication that not all offices have set up.</li> </ul>
IM—Instant Messaging	<ul style="list-style-type: none"> <li>Immediate real-time communication.</li> <li>Can be set up and configured by an organization (such as Skype for Business).</li> </ul>	<ul style="list-style-type: none"> <li>Message content can be limited.</li> <li>Informal nature might be seen as "unofficial."</li> </ul>
Text messaging	<ul style="list-style-type: none"> <li>Immediate communication.</li> <li>Available and accessible to anyone with a mobile device.</li> </ul>	<ul style="list-style-type: none"> <li>Requires a mobile device and app.</li> <li>Limited to short bursts of communication.</li> </ul>
Printed media and documents	<ul style="list-style-type: none"> <li>Provide official documentation and legal archives.</li> <li>Gives a sense of legitimacy to the message.</li> </ul>	<ul style="list-style-type: none"> <li>Costly to produce.</li> <li>Is a permanent record of the communication, which can be a disadvantage in some situations.</li> </ul>
Social media	<ul style="list-style-type: none"> <li>Low-overhead method of broadcasting a message.</li> <li>Specialized method to communicate with a specific demographic.</li> </ul>	<ul style="list-style-type: none"> <li>Communication can tend to be one-way.</li> <li>Limited amount of feedback.</li> </ul>
Company website	<ul style="list-style-type: none"> <li>Enables consistent, dynamic communication to broad base of recipients.</li> <li>Reduces the geographic location factor.</li> </ul>	<ul style="list-style-type: none"> <li>Requires personnel to manage and update.</li> <li>Two-way communication is not real-time and feedback can be limited.</li> </ul>

## Communication Models

**Communication models\*** are a description, analogy, or schematic used to represent how the communication process will be performed for the project. There are five steps to a standard communication model:

1. Encode: Ideas are translated into language used by the sender to convey information.
2. Transmit message: The information is actually sent to the receiver by the sender.
3. Decode: The receiver translates the message into meaningful ideas.
4. Acknowledge: The receiver signals that he or she has received the information.
5. Feedback/response: The receiver encodes a message and transmits it back to the sender.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 371-374.



*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Page 373.*

**Figure 3-3: Linear communication model.**



**Note:** To examine the importance of clear communication, you can access the Spotlight on **Communication Channels** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Communication Methods

**Communication methods\*** are a systematic procedure, technique, or process used to transfer information among project stakeholders. They help the team communicate project performance and progress. These ensure that the concerned people in the issue resolution process are aware of the impending severity of the issue, which enables them to take immediate action. Communication methods are specified in the communications management plan.

Communication methods can be broadly classified into three types:

- **Push communication:** Involves sending information to a receiver. It ensures that the information has been distributed but does not guarantee that it has reached the receiver.
- **Pull communication:** Involves receivers accessing information whenever required.
- **Interactive communication:** Involves communication between multiple people performing multi-directional information exchange.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 374-375.

## Feedback

Communication is a two-way street. The initiator of every communication should expect that recipient(s) might offer their response or reaction to the sender's message. This feedback can be verbal, non-verbal (body language and facial gestures), or written.

Feedback can be positive, if the message was received and understood as intended by the sender. In this case, the sender does not need to take any action regarding the communication. On the other hand, it can be negative if the receiver does not understand what the sender intended to convey. In this situation, the sender must take some action to correct the misunderstanding.

In most situations there will be no feedback, thus providing an implicit acceptance of the message by the recipient.

Effective feedback should be clear, specific, and offered in a timely manner. Vague generalizations will not be helpful, nor will feedback given too late to allow the sender to correct the problem.

## Guidelines to Effectively Manage Communication throughout the Project

To create an effective communications management plan, follow these guidelines:

- Gather and distribute contact information for all involved parties.
- Determine the communication needs of project stakeholders.
  - Work from an organization chart to avoid omitting a key stakeholder.
  - Ask for your project sponsor's input.
  - Ask open-ended questions.
- As a rule of thumb, project team members require more detail on a more frequent basis. Senior management typically requires summary information on a less frequent basis.
- Analyze the value to the project of providing the information.
- Evaluate any constraints and assumptions to determine their possible impact on communication planning.
- Determine the appropriate communication technologies to use for communicating project information.
  - Determine the immediacy of the need for information.
  - Analyze the availability of technology systems.
  - Evaluate the expected project staff to identify their knowledge of and access to proposed technology.
  - Conduct research to determine the likelihood that there will be changes to the proposed technology before the project is over.
- Make sure your communications management plan includes all key elements:
  - A description of the types of information required for each project stakeholder.
  - A collection and filing structure that describes the methods the project team will use to collect and file project information.
  - A distribution structure describing to whom and by whom project information such as status reports, data schedules, and meeting minutes, should be provided.
  - The methods that will be used to distribute the various types of information.
  - How the team will gather, update, store, and disseminate its own institutional knowledge.
  - Schedules for the production of each type of communication.
  - Methods for accessing information between scheduled communications.
  - How knowledge will be stored and transferred as needed throughout the project.
  - A method for updating and refining the communications management plan throughout the project life cycle.
- Integrate the communications management plan into the overall project plan.
- Distribute the plan to project stakeholders.

## ACTIVITY 3–3

### Planning Communications Management

#### Scenario

You have assigned roles and responsibilities to your project team members and now you need to define in your communications management plan how you and your project team will communicate with each other. Although most of your team is local, there are a few key members that are dispersed across several states.

- 1. What communication skills can be used when working with the various people?**
  
- 2. Which item should you use to determine the communications needs of your project stakeholders?**
  - Stakeholder analysis data
  - Research material
  - Project report deadlines
  - Executive board schedule
  
- 3. Given the scenario, what would be a good technology for enhancing team member interactions and building relationships throughout the life of the project?**
  - Team building event at project kick-off
  - Project team threaded discussion board
  - Use email and databases to collect and store information
  - High-quality virtual teleconferencing on a semi-weekly or weekly basis
  
- 4. Which of the following is not a component of the communications management plan?**
  - The initiator and receiver of project communications
  - The Stakeholder Register
  - The collection and transfer of institutional knowledge
  - The frequency of each communication
  
- 5. After integrating the communications management plan into the overall project plan, what would be the next logical step?**
  - Determining whether there will be changes to the proposed technology before the project is over
  - Creating a schedule for the production of each type of communication
  - Creating a description of stakeholder communication requirements
  - Distributing the plan to all the stakeholders

# TOPIC D

## Engage Stakeholders

Now that you have established a project management plan, you are ready to dive in a little further and start planning how stakeholders will be engaged during the course of a project. As project managers, it is in your best interest to keep project stakeholders interested in the project and the outcomes. You rely on their knowledge and expertise in specific areas. Because stakeholders have a vested interest in the project as a whole, they may request updates, changes, or project outcome status.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Analyze stakeholders. (ECO 2.4.1)
- Categorize stakeholders. (ECO 2.4.2)
- Engage stakeholders by category. (ECO 2.4.3)
- Develop, execute, and validate a strategy for stakeholder engagement. (ECO 2.4.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Create Stakeholder Register	Organization Process Assets
Update Stakeholder Register	Expert judgment
Stakeholder Engagement Plan	Meetings
Assess work performance information	Create Power or Influence vs. Impact Grid Interpersonal skills Management skills
	Update Stakeholder Register

### Stakeholder Categories

Project stakeholders can include:

- **Sponsors** who may be individuals or groups that provide the financial assistance, resources, and support for the project. The sponsor formally authorizes the project by signing the project charter.
- **Customers and users** who will approve the project's deliverables.
- **Sellers** who will provide components or services to the project under a contract.
- **Business partners** who will have a special business relationship and role with the project such as performing installation, training, or support.
- **Organizational groups** that are internal stakeholders affected by the activities of the project team such as legal, finance, operations, sales, and customer service.
- **Functional managers** who manage organizational departments such as human resources, finance, procurement, or accounting and who need to support the project activities.
- **Other stakeholders** that contribute to or have an interest in the deliverables such as government regulators, consultants, and financial institutions.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 550, 551.

## Stakeholder Engagement Strategy

You should develop a strategy to involve each project stakeholder, based on their needs, expectations, interests, and potential impact on the project. The strategy can be used to guide project managers in effectively involving stakeholders throughout the life cycle of a project. This strategy enables you to provide the right level of management to the number of stakeholders you have on a specific project. It also enables you to develop appropriate management strategies to effectively engage stakeholders throughout the project life cycle, based on the analysis of their needs, interests, and potential impact on the project success. This strategy is about the creation and maintenance of relationships between the project team and stakeholders while satisfying their respective needs and requirements within project boundaries.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 516-518.

## Stakeholder Engagement Assessment Matrix

**Stakeholder Engagement Assessment Matrix\*** is a matrix that compares current and desired stakeholder engagement levels. This matrix can be used to classify project stakeholders into smaller groups that are rated based on a classification level. Stakeholder engagement and involvement will vary with every project. Classification levels can include:

- **Unaware:** Unaware of project and potential impacts
- **Resistant:** Aware of project and potential impacts and resistant to change
- **Neutral:** Aware of project yet neither supportive nor resistant
- **Supportive:** Aware of project and potential impacts and supportive of change
- **Leading:** Aware of project and potential impacts and actively engaged in ensuring the project is a success

In the following Stakeholder Engagement Assessment Matrix, the stakeholder's level of involvement is identified. The current engagement level is indicated by the letter "C" and the desired level is indicated by the letter "D" for each stakeholder.

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Stakeholder 1	C			D	
Stakeholder 2			C	D	
Stakeholder 3				C	D

**C = Current engagement level    D = Desired engagement level**

**Figure 3–4: A Stakeholder Engagement Assessment Matrix.**

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 521-522.

## Guidelines to Develop, Execute, and Validate a Strategy for Stakeholder Engagement

Guidelines to developing, executing, and validating a strategy for stakeholder engagement are as follows:

- Review the project management plan for information such as life cycle selected for the project, description of how work will be executed, description of how resource requirements will be met, how changes will be monitored and controlled, and the need and techniques for communication among stakeholders.
- Review the stakeholder register for information needed to plan appropriate ways to engage project stakeholders.
- Review the organizational culture, structure, and political climate to help in determining the best options to support a better adaptive process for engaging stakeholders.
- Review the lessons-learned database and historical information, as they provide insight on previous stakeholder engagement plans and their effectiveness.
- Use expert judgment to decide upon the level of engagement required at each stage of the project from each stakeholder.
- Hold meetings with experts and the project team to define the required engagement levels of all stakeholders.
- Use analytical techniques to classify the level of engagement for stakeholders.
- Document the stakeholder engagement plan.

# ACTIVITY 3–4

## Creating a Stakeholder Register

### Data File

C:\ATPPMP1Data\Doing the Work\Engage Stakeholders.docx

### Scenario

There are many people involved in the new 234 West Adams project, including Mayor John Jacobson, the local government, a building inspector, a master carpenter, a plumber, an electrician, a landscaper, a project manager, family and friends, volunteers, and so on. The CEO, Linda Michaels, reviews and approves each new build project. You need to create a stakeholder register based on the information you have gathered to this point.

1. Open C:\ATPPMP1Data\Doing the Work\Engage Stakeholders.docx.
2. Given the information in the scenario, who is the sponsor of the 234 West Adams project? Enter your answer in the stakeholder register.
3. How are the mayor and local government involved in the building project? Enter your answer in the stakeholder register.
4. What are some of the possible expectations that the homeowners will have? Enter your answers in the stakeholder register.
5. Who are the external stakeholders involved in the actual construction of the home at 234 West Adams? Enter your answers in the first four columns of the stakeholder register.
6. Save the file as *My Engage Stakeholders.docx*
7. Compare your stakeholder register to C:\ATPPMP1Data\Doing the Work\Solutions\Engage Stakeholders Solution.docx.
8. Close all open files.

## ACTIVITY 3–5

### Creating a Stakeholder Engagement Assessment Matrix

#### **Scenario**

Dave is the manager of your company's accounting department. The organization's Information Technology (IT) department has a new initiative to upgrade and improve the existing accounting system due to new tax regulations. Dave likes the older system he's been using for more than 10 years and is questioning whether the new system will produce the same results as the old one. The accountants that work for Dave don't have strong feelings either way, but will most likely follow Dave's lead.

As the IT department manager, Seth is leading the charge on converting to the new system and often finds himself explaining its benefits—which he is more than happy to do. With the anticipation of a reduction in help desk calls, John and the other IT support staff, are looking forward to the new system.

**1. Why is it important to plan for stakeholder engagement?**

**2. Based on the scenario, enter the stakeholders in the following table.**

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading

**3. Based on the scenario, what classification would you use for Dave's level of involvement in this project? Enter your assessment in the matrix table above.**

- Resistant
- Unaware
- Leading
- Supportive
- Neutral

**4. Assess the remaining stakeholders' engagement levels and indicate them in the table.**

5. Discuss your assessment of the stakeholders' engagement with the class.
  6. How would you plan to manage Dave's resistance?
-

# TOPIC E

## Create Project Artifacts

Everyone knows that projects create deliverables—the interim and final products of the project’s scope. Projects also create artifacts throughout their life cycle.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Determine the requirements for managing project artifacts. (ECO 2.12.1)
- Validate that the project information is kept up to date and accessible. (ECO 2.12.2)
- Continually assess effectiveness of the management of the project artifacts. (ECO 2.12.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<i>Deliverables</i>	<i>Tools</i>
No specific deliverables.	No specific tools.

### Project Artifact Characteristics

A *project artifact* is any document related to the management of a project. The project team will create and maintain many artifacts during the life of the project, to allow reconstruction of the history of the project and to benefit other projects.

Artifacts are normally living documents, and are formally updated to reflect changes in project requirements and scope.

Project artifacts include, but are not limited to, the following:

- Acceptance Criteria
- Assumptions
- Business Case
- Change Requests
- Constraints
- Lessons learned
- Minutes of status meetings
- Project Charter
- PowerPoint (or other presentation software) slide decks
- Requirements
- Scope
- Scope Baseline
- Subsidiary project management plans (Scope Management Plan, Requirements Management Plan, Change Management Plan, etc.)

Agile projects have several artifacts that do not exist for waterfall projects:

- Product Backlog
- Product Increment
- Product Roadmap
- Product Vision Statement
- Release Plan
- Sprint Backlog



**Note:** A *Sprint backlog*\* is a list of work items identified by the Scrum team to be completed during the Scrum sprint.

## Configuration Management

**Configuration management** is a tool used to manage changes to a product or service being produced as well as changes to any of the project documents such as schedule updates. These can include changes of a technical nature, and changes in administrative direction. Configuration management is used to:

- Control product iterations.
- Ensure that product specifications are current.
- Control the steps for reviewing and approving product prototypes, testing standards, and drawings or blueprints.

Configuration management focuses on the following:

- What work products need to be managed.
- How these products will be created, stored, revised, documented, and archived.
- The processes and the authorization levels for doing so.
- The naming schemes for different types of revisions (e.g., Rev 1 to Rev 2 versus Rev 1 to Rev 1.1, etc.).
- Release management for products which will be released incrementally.



**Note:** When dealing with government contracts or other large systems, a configuration management system is often required.

## Configuration Management Systems

A *configuration management system*\* is a collection of procedures used to track project artifacts and monitor and control changes to these artifacts. One of the subsystems of the configuration management system is the change control system.

Configuration management systems, when combined with integrated change control, provide standardized and effective ways of managing approved changes and baselines within a project. Configuration control involves specifying the deliverables and processes, whereas change control involves identifying, recording, and supervising changes to project baselines.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 41, 701.

## Version Control

**Version control** is a system that records changes to a file in a way that allows you to retrieve previous changes made to it. Each time the file is updated, it is automatically saved and then given a new version number. The version control system can contain a date/time stamp and the name of the user who made the changes, thus providing a digital “paper trail” of the document’s history.

A robust project management system will contain version control for important artifacts such as the project management plan, the subsidiary project management plans, the scope, and other documents.

## Storage/Distribution of Artifacts

Project artifacts exist for the benefit of the project team and other relevant stakeholders, so they are aware of information that is important to them. For this reason, artifacts should be stored in a location that is accessible to the people who use them.

Small projects where team members are in a single location might use a simple, paper-based storage system with documents in notebooks and/or file boxes where they can be accessed easily. The system should be manageable given the complexity of the project—not a cumbersome system that is better suited for a large project.

Cloud-based document storage and retrieval systems are appropriate for larger projects, especially where team members are geographically distributed. Off-the-shelf systems are available with a wide range of features, including:

- Built-in version control.
- Document check-out and check-in.
- User-based document security (read only, create, create and edit, edit only, delete, etc.).
- Automatic email notification to specified users when a document is created or edited.

The system chosen to distribute project artifacts should also be based on the size and complexity of the project, similar to document storage: simple for small projects, and increasingly more detailed as project size increases.

## Project Artifact Management

Artifact management includes the procedures used to create, store, retrieve, and distribute project documents. An effective archive management system includes these provisions:

- A way to produce and control documents without unnecessary administrative overhead.
- Standardized formats and templates.
- A structured process for the review and approval of documents.
- Version control and security.
- Timely distribution of documents.

Ask yourself these questions as you plan your artifact management system:

1. What types of documents does your project require? Many are standard for all projects (e.g., requirements, scope, Work Breakdown Structure, etc.), but others might be required by the organization's Project Management Office (PMO) or senior management.
2. What is the purpose of each document? The answer to this question will help you "right-size" the document so it is not overly complex.
3. How and when will these documents be used?
4. Who will have input on creating the documents?
5. Should access to a document be limited to certain individuals, and if so how will you implement this?
6. Does the artifact management system "fit" the size and complexity of the project? One size definitely does not fit all projects.

## Guidelines to Continually Assess the Effectiveness of Management of Project Artifacts

To continually assess the effectiveness of management of project artifacts, follow these guidelines:

- Use an appropriate degree of configuration management for your project.
- Follow any organizational procedures regarding project management documentation.
- Develop an archive management system that is of appropriate size and complexity for your project. Pay particular attention to these issues:
  - Types of documents needed and their purpose.
  - Templates to facilitate document creation.
  - Authors, reviewers, and approvers of documents.
- Implement version control of documents, so you will be able to reconstruct changes and revert to an earlier version if necessary.

# ACTIVITY 3–6

## Creating Project Artifacts

### Scenario

You know the 234 West Adams project team will produce quite a few documents before the home is finished. Since this is your first major project to manage, your sponsor wants you to have a solid grasp of these documents and how to use them. You take this opportunity to test yourself about your familiarity with the topic of project artifacts.

- 1. Which of the following documents will you not prepare for the project to build a new house?**
  - Assumptions
  - Release Plan
  - Acceptance criteria
  - Scope Management Plan
  
- 2. Which of the following is a tool used to manage changes to a product or service?**
  - Version control
  - Configuration management
  - Configuration management system
  - Artifact management system
  
- 3. Which artifacts would you likely include under version control? (Choose three.)**
  - Schedule Management Plan
  - Lessons learned
  - List of assumptions
  - Stakeholder register
  - Minutes of status meetings
  - Project Charter
  
- 4. Which of the following systems is used to create, store, retrieve, and distribute project documents?**
  - Artifact management
  - Configuration management
  - Document management
  - Project management

# TOPIC F

## Manage Project Changes

A great project manager is an effective manager of change, able to anticipate, respond to, and deal with the changes that will inevitably arise on any project. Throughout the life of a project, there will be changes in the project that can turn risky if not handled at the right time. As a project manager, you need to appropriately handle those changes. In this topic, you will manage project changes.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Anticipate and embrace the need for change. (ECO 2.10.1)
- Determine strategy to handle change. (ECO 2.10.2)
- Execute change management strategy according to the methodology. (ECO 2.10.3)
- Determine a change response to move the project forward. (ECO 2.10.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Issues Log	Manage and update Issues Log
Risk Register	PMIS
Stakeholders Register	Communicate with stakeholders
Updated Issues Log	Negotiate with stakeholders

### Change Management Plan

Most projects undergo one or more changes during their lifetime. New or changed requirements can impact the project's scope, schedule, cost, risk, and quality. During project execution, monitoring can also dictate the need for a change in any of these areas. A **change management plan**\* is a component of the project management plan that establishes the change control board, documents that extent of its authority, and describes how the change control system will be implemented.

A change management plan can answer the following questions:

- Who can propose a change?
- What exactly constitutes a change?
- What is the impact of the change on the project's objectives?
- What steps are necessary to evaluate the change request before approving or rejecting it?
- When a change request is approved, what project documents must be amended to record the actions necessary to effect the change?
- How will these actions be monitored to confirm that they have been completed satisfactorily?

The change management plan is a sub-plan created when the project management plan is created, and, in its definition of change, if scope changes are considered changes, then it also needs to include how changes in the external business environment will be assessed, prioritized, and integrated as scope/backlog changes. For all changes, including external business environment changes and internal organizational changes that yield scope/backlog changes, it needs to include how options (e.g., schedule, cost changes) will be evaluated and recommended.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 113-120.

## Causes of Project Changes

Performance variation is an inevitable component of project work and can be caused by any of several common factors.

Cause	Description
Inaccurate initial estimates	There are many reasons why initial time and cost estimates for completing the project work prove to be inaccurate. These reasons may range from lack of experience, lack of information, or precedence to inaccurate data, excessive optimism, technological difficulties, and unreliable resources. Getting those original estimates to be as realistic and accurate as possible makes the control process more manageable.
Specification changes	Project work can open up new avenues of development and design that were not considered during the initial planning of the project work and scope. As new options for a product or service become apparent, customers, sponsors, or the project manager may broaden the project's scope to include new specifications and deliverables.
New regulations	As project work progresses, new governmental or industry-specific regulations may be enacted. This can be especially true for lengthy projects. If the new regulations are related to the ongoing project, project change becomes necessary. Accommodating new regulations or legislation can also mean revisiting the planning process to determine the effect the new regulations will have on resource needs, schedule durations, and quality specifications.
Missed requirements	Many times the requirements are understood by reviewing the documentation, and interviewing the end users and policy makers. However, there are times when complete and comprehensive understanding may not be possible. The interviewer feels that he/she has understood the point, and the interviewee feels that he has expressed all that matters. Although a Requirements Traceability Matrix (RTM) is prepared, the same confusion might arise in a written document. Prototyping is used where a demonstration of functional and/or technical requirements is done. Although all these techniques reduce the chances of missing any requirements, it cannot guarantee that every requirement is captured. There are often some slippages that surface at different phases in the project.

## Change Control Systems

A **change control system**\* is a set of procedures that describes how modifications to the project deliverables and documentation are managed and controlled. An effective change control system includes the forms, tracking methods, processes, and approval levels required for authorizing or rejecting requested changes. Change control systems often specify that a Change Control Board (CCB) will address the issues that affect cost, time, and product quality.

### Change Control Board

A **Change Control Board (CCB)**\* is a formally chartered group responsible for reviewing, evaluating, approving, delaying, or rejecting changes to the project, and for recording and communicating such decisions. Normally, the CCB operates closely with the project's sponsor, customers, and other key stakeholders.

The responsibilities of the CCB will have been delineated, documented, and agreed to by the stakeholders, customers, and project team. Decisions made during the CCB meetings are

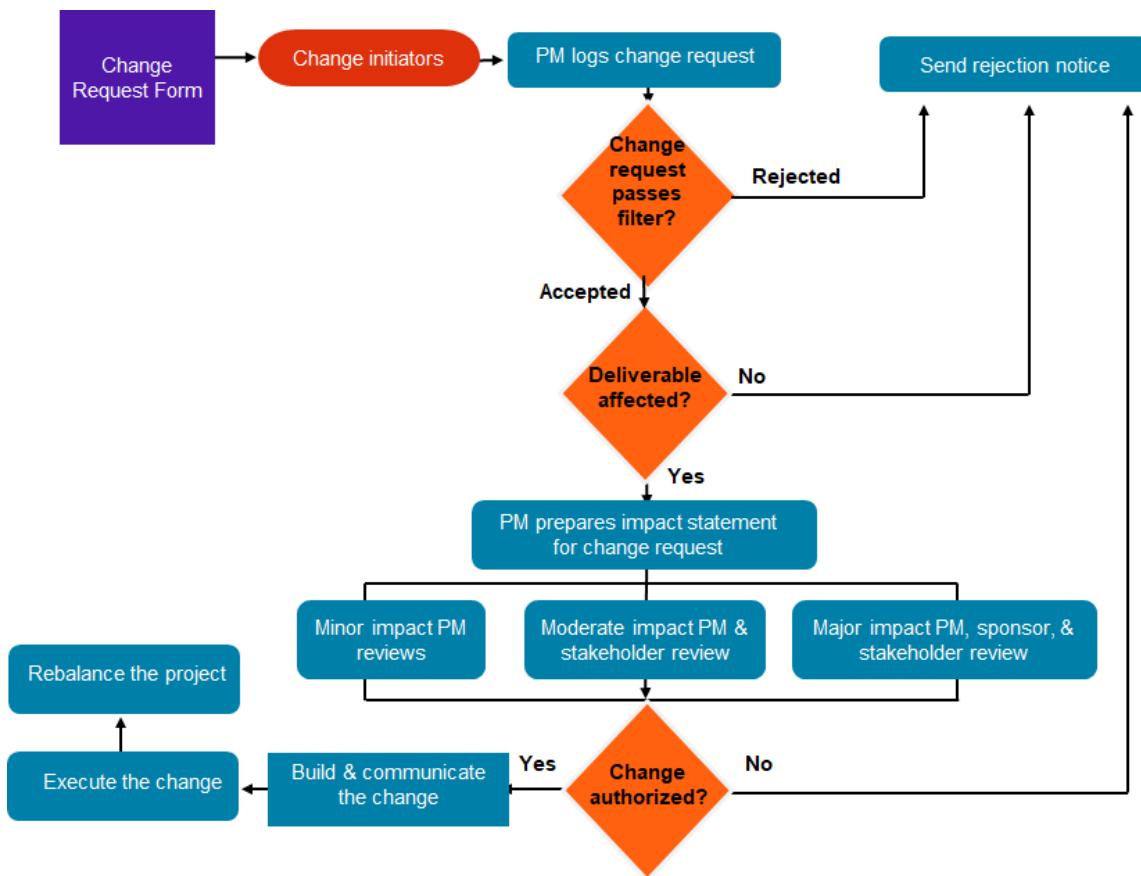
documented and communicated to the required stakeholders. Stakeholders can use this information to follow-up on the necessary actions.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 115.

## Change Control Strategy

**Change management** is the process of managing project changes in a structured and standardized manner. It consists of five main stages.

Stage	Description
1. Change identification	Involves identifying the changes that must be made to a project. The changes may positively or negatively impact the planned project deliverables and performance. The requirement for change can be identified by anyone involved in the project.
2. Change documentation	Involves documenting the changes in the <b>change control form</b> , initiating a formal request for the change.
3. Analyzing the impact of the change	Involves identifying and assessing issues that may arise and adversely impact the various aspects of the project. This will usually be done by the project manager or any other requester.
4. Course of action	Involves coordinating with the appropriate stakeholders, to select the necessary actions to be taken, and implementing the approved changes.
5. Updating related plans	Involves updating the project management plan components related to the approved <b>change requests</b> .



**Figure 3–5: A process flowchart for managing project changes.**

## Advantages of Effective Change Management

Effective change management presents several advantages to project managers, including:

- Faster response time.
- Maximum traceability of changes.
- Increased team awareness of change needs.
- Increased engagement of team and stakeholders, internally and externally.
- Better team support for change requirements.
- An organizational framework for moving forward effectively.

## Approved Change Requests

**Approved change requests** are requests that have been reviewed and approved in accordance with the integrated change control plan and are ready to be scheduled for implementation. These changes can affect costs, scope, schedule, quality, procedures, plans, or policies. Approved changes can include:

- **Corrective action:** Adjusts the performance of the project work with the project management plan.
- **Preventive action:** Ensures future performance of the project work with the project management plan.
- **Defect repair:** Modifies a non-conformance within the project.
- **Updates:** Modifies project documents and plans to reflect the project changes.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 93.

## Guidelines to Manage Project Changes

Managing changes to performance baselines ensures that the original project scope and the integrity of performance baselines are maintained. Ensuring that changes are agreed upon and continuously managing changes as they occur minimizes the impact changes may have on project time, cost, and quality concerns. To effectively perform integrated change control, follow these guidelines:

- Make sure your change control system is cost-effective. It should not cost more money to implement than it saves through controlling.
- Establish or make use of an existing CCB composed of project stakeholders to evaluate change requests.
  - What is the magnitude of the change when compared to the plan?
  - What is the impact of the change on project schedule, cost, and quality objectives?
  - What are the potential risks and benefits of the change?
- Document the effect the changes have on the applicable project baselines.
- Obtain approval from the appropriate parties for all change requests before implementing the change.
- Use configuration management to document and control changes to original product characteristics.
- Coordinate changes across knowledge areas as appropriate. For example, does a proposed schedule change affect cost, risk, quality, and/or staffing?
- Use performance reports to measure project performance and assess whether planned variances require corrective action. Make sure performance reports are timely and accurate to increase the effectiveness of control decisions.
- Identify corrective action necessary to bring expected performance in line with the project plan.
  - Determine the source and severity of the problem.
  - Review the project plan and objectives.
  - Consider factors inside and outside the project that may influence corrective action decisions.
  - Identify alternative options available.
  - Choose from among the alternatives by evaluating the impact of each alternative on cost, schedule, quality, and risk.
- Update the project plan to reflect changes made that affect performance baselines.
- Document the lessons learned, including:
  - Causes of variances
  - Project baselines affected by the changes
  - Rationale behind the recommended decision-making process and corrective action
  - Any other lessons learned during change control

# ACTIVITY 3–7

## Managing Project Changes

## Scenario

The 234 West Adams project has a tight schedule, as well as a strict budget. You are concerned that any possible changes could negatively affect project performance baselines. You need to ensure that there is a standardized method for handling changes. Your development company has included a Change Control Board (CCB) in this process.

1. Who will you involve in the change control process for the new build project and what is their role in the change control process?
  2. The carpenter informs you that the window and door installation will have a significant delay and is asking for a change in subsequent schedule dates. What action should you take first?
    - Coordinate changes across knowledge areas.
    - Document the change request in a change control system.
    - Update the project plan to reflect changes.
    - Bring the information to the stakeholders for evaluation and approval.
  3. The carpenter contacted the window and door supplier and was able to secure half of the windows before the next regularly scheduled shipment. Based on your change control process, what further action, if any, should you take?
  4. How do you ensure all functional areas are aware of the requested changes that may affect them?

# TOPIC G

## Manage Project Issues

Projects do not always go smoothly, and situations can arise which have the potential to affect the scope, schedule, or cost if left unattended. These situations are called issues, and this topic addresses how to handle them.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Recognize when a risk becomes an issue. (ECO 2.15.1)
- Attack the issue with the optimal action to achieve project success. (ECO 2.15.2)
- Collaborate with relevant stakeholders on the approach to resolve the issues. (ECO 2.15.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<i>Deliverables</i>	<i>Tools</i>
No specific deliverables.	No specific tools.

### Issues

An *issue* is defined as a current condition or situation that may have an impact on the project objectives. In other words, it is an action item that the project team must address.

Issues can arise in many project management processes, most often in monitoring and controlling. Common areas include:

- Scope change control.
- Schedule control.
- Cost control.
- Project variance analysis.
- Quality.
- Risk.
- Procurement.
- Communications.

### Risks and Issues

In the discussion of risks, there is a big difference between risks and issues. A risk is generally defined as an event that might impact a project, whereas an issue is a risk that has happened and will impact the project. The following table addresses the differences between these terms.

<i>Term</i>	<i>Characteristic</i>
Risk	<ul style="list-style-type: none"> <li>• Focused on the future</li> <li>• Can be positive or negative</li> <li>• Is documented in the Risk Register</li> <li>• Response is called a “risk response”</li> </ul>

Term	Characteristic
Issue	<ul style="list-style-type: none"> <li>Focused on the present</li> <li>Will always be negative</li> <li>Is documented in the Issue Log</li> <li>Response is called a “workaround”</li> </ul>

Here are a few examples of risks that have become issues:

Risk	Issue
The project manager might leave the project.	The project manager resigns.
A supplier might go on strike.	A supplier has gone on strike.
A snowstorm might close the plant and delay the project.	A major snowstorm closes the plant.

The goal of a risk assessment is to list every risk that a project might face, and then to develop responses to each risk. However, in the real world this is not possible, and unforeseen events happen that take the project from "all is well" to "we have a big problem." They then immediately become issues. An unannounced wildcat strike by a supplier falls into this category.

## Issue Log

The **issue log** is a document where information about issues is recorded and monitored. It is used to track problems, inconsistencies, or conflicts that occur during the life of the project and require investigation in order to work toward a resolution.

A typical issue log might look like the following:

ID	Description	Opened	Due Date	Priority	Owner	Response	Status	Comments
25	Truck strike	10/15/20xx	11/01/20xx	High	R. Smith	TBD	Open	Tasks are on the critical path

The due date represents the date by which the issue should be resolved. Your goal is to close every issue before the project is closed, but this might not always happen—the issue might be outside of the project manager's control. For example a strike might last so long that the project objectives cannot be met and the project must be closed without reaching a successful conclusion.

An issue should be assigned to only one person, who will act as the focal point for resolving it. In this case, think of the issue owner as similar to a work package owner.

An issue log is not a to-do list (for example, take the out-of-town client to dinner). If in doubt about whether something belongs in the issue log, re-visit the definition of an issue and confirm if it applies to the situation at hand.

## Issue Resolution

When an issue arises, it should be promptly added to the issue log. Each issue should have an owner who is responsible for tracking the progress of the workaround and reporting back to the project manager. The due date should be realistic, and every reasonable attempt should be made to meet it.

Issues should be a regular topic of every status meeting, with the goal to keep the number of open issues to a manageable number. Don't hesitate to escalate an issue to the project sponsor if it begins to have a major effect on the project.

## Guidelines to Resolving Issues

To resolve issues, follow these guidelines:

- Use your organization's Issue Log template, or in the absence of one, create an Issue Log.
- Train project team members to promptly report potential issues to the project manager, who will determine if they belong in the Issue Log.
- Enter the issue into the Issue Log, and assign an owner and a due date.
- Monitor progress, and discuss each open issue at every project status meeting.
- Develop a response (also known as a workaround) to the issue.
- Assess the impact of the response.
- Approve the response.
- Close the issue.

## ACTIVITY 3–8

### Managing Project Issues

#### Scenario

The 234 West Adams project is nearing completion, and the Andrews family should take possession of their new home in about a month. Several unforeseen things have happened within the past week, and they are the subject of discussion at the weekly project status meeting. You need to decide if these are risks or issues, so you can react accordingly.

1. **Describe the differences between a risk and an issue.**
  
2. **What should an issue log contain?**
  
3. **Which of the following items are issues for the 234 West Adams project?  
(Choose two.)**
  - A letter from the bank stating that the mortgage rate will increase in three weeks.
  - The Andrews family's camping trip, which is scheduled during the time they are to close on the house.
  - A possible decrease in the price of the landscaping work.
  - Next week's scheduled building inspection.

# TOPIC H

## Ensure Knowledge Transfer for Project Continuity

It is important for project team members to obtain the right knowledge at the time when they need it to do their job. Therefore, as the project manager, you need to know how to collect, consume, and use the knowledge so that the team is prepared and ready. You should also know how to transfer this knowledge to other projects, so they can benefit from it.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Maintain team and knowledge transfer. (ECO 1.6.4)
- Discuss project responsibilities within team. (ECO 2.16.1)
- Outline expectations for working environment. (ECO 2.16.2)
- Confirm approach for knowledge transfers. (ECO 2.16.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
No specific deliverables	No specific tools

### Types of Knowledge

Knowledge can be divided into two main types: explicit and tacit. **Explicit knowledge**\* is knowledge that can be codified using symbols such as words, numbers, and pictures. **Tacit knowledge**\* is personal knowledge that can be difficult to articulate and share such as beliefs, experience, and insights. As the project manager, you are concerned with managing both types of knowledge to take advantage of the knowledge, skills, and experiences that your project team members have gained throughout the project.

Although collecting and gathering explicit knowledge is relatively easy to do, there is the risk of capturing only the facts and not the context surrounding the facts. Knowledge management is more than keeping track of what is known and then distributing it to the team and the project stakeholders. Additionally, while some of knowledge management deals with the lessons learned, it is broader and more encompassing than just that portion of the project.

For managing tacit knowledge, the key is to create and maintain trust among those involved in the project so they are willing to share their experiences with everyone else. By obtaining those personalized experiences of the project, the team is able to more fully understand and leverage the knowledge.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 100.

### Knowledge Management

**Knowledge management** of projects exists on three levels: individual, project, and organization.

At the individual level, each team member needs to know how to perform their work in accordance with each assigned task's scope, schedule, and cost—all while maintaining an acceptable level of

quality. If a person does not possess the required knowledge for a particular task, they must acquire it by one of three methods:

- Research the topic to learn what they do not know.
- Collaborate with other team members to fill in the knowledge gap.
- Examine the project's or organization's knowledge repository.

At the project level, the focus is on achieving the goals of the current project. The project manager will solicit knowledge from project managers or project leaders involved with other projects. Their experience can then be applied to the current project. The Project Management Office (PMO) is also an excellent source of knowledge, as it exists for the purpose of defining and maintaining standards for project management within an organization.

The organizational level of knowledge is about managing programs or portfolios. The program manager or portfolio manager can seek information from peers who manage other programs or portfolios, in an effort to adapt this knowledge to their specific need.

## Lessons Learned

Knowledge gained during a project can be useful to subsequent phases of a project and to other projects, and this knowledge is referred to as lessons learned. It can take the form of both positive and negative experiences that occur throughout the project life cycle.

"Reinventing the wheel" is both time-consuming and costly. The amount of time and effort used to document what went well and what did not happen as planned can pay big dividends long into the future.

## Considerations of Lessons Learned

During administrative closure, project managers should take into account the following considerations of lessons learned.

<b>Consideration</b>	<b>Description</b>
Scheduling lessons learned	These include any relevant scheduling problems or issues. They also document the management strategies implemented to deal with schedule or resource constraints. These capture beneficial approaches to implement as new best practices.
Conflict management lessons learned	These include any issues that arose within the team or between the team and customers. They include documentation of the nature and source of the conflict and the impact the conflict had on the project. The documentation should also specify how management intervened in response to the conflict.
Vendor lessons learned	New seller experience and performance should be documented and provided to the procurement department.
Customer lessons learned	If a customer is excessively litigious or unreasonable to work with, that information should be conveyed to the sales and legal departments and documented in the lessons learned repository. If the customer experience is positive, then capture the potential for future sales or working together.
Strategic lessons learned	Strategic lessons learned are those that typically affect some aspect of the organization's project management methodology or significantly improve a template, form, or process. These address the questions: Can we reuse this project's artifact to get more done with the same resources and deliver work sooner?

<b>Consideration</b>	<b>Description</b>
Tactical lessons learned	Tactical lessons learned are those that answer the question: If you were to do this type of project again, what should you stop, start, and continue so you can execute the project flawlessly? These types of lessons learned focus on developing recommendations, reviewing recommendations with other managers in other departments, developing implementation plans, and implementing those plans.
Other aspects of lessons learned	Project managers should take into account scope, schedule, cost, quality, and customer satisfaction and any corrective action taken in response to issues, as well as any new practices to adopt.

### Auditing vs. Debriefing

**Auditing** is an examination of a project's goals and achievements, including adequacy, accuracy, efficiency, effectiveness, and the project's compliance with applicable methodologies and regulations. It tends to be a formal, one-sided process that can be extremely demoralizing to team members.

**Debriefing** is a less formal, more cooperative means of discussing the positives and the negatives of the project, what worked, and what will be done differently next time. This discussion includes technology issues, people issues, vendor relationships, and organizational culture.

## Lessons-Learned Register

At the beginning of a project, you will create a **lessons-learned register**\*, which is a project document used to record knowledge gained during a project so that it can be used in the current project and entered into the lessons learned repository. As the project progresses, you will continuously add information to the lessons-learned register to help identify specific strengths as well as areas of improvement. The lessons-learned register can be formal or informal, depending on the organizational norms or requirements.

A lessons-learned register can take many forms. The simplest register is a document that team members can add their observations to in real time. Another form is a notebook with tabs or digital document with folders for topics—scope, schedule, cost, conflict, etc.—that team members can enter observations into. This provides more structure, and will prompt users to enter their comments into appropriate categories.

An even more sophisticated register is a cloud-based digital document with folders that is available to all team members. This is particularly useful for a project team that is located in several locations.

At the conclusion of the project, a team member can edit and compile the information into a cohesive document. It can be discussed in the project closure meeting, and archived for future reference.

A lessons-learned register is created for each project, and then compiled into an all-encompassing **lessons-learned repository**\*, which is a store of historical information about lessons learned in projects. This repository will become an organizational process asset for current and future project teams. They will be able to capitalize on the organization's knowledge base about work that has already been done and avoid repeating mistakes, and also leverage the ongoing organizational learning.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 104.

## Project Responsibilities Within the Team

The project manager has several interpersonal skills that are used to manage knowledge. These include:

- Leadership to communicate the organization's vision and inspire the project team to focus on the goals of the project.
- Facilitation to effectively guide a group to a successful solution to a problem.
- Political awareness to keep the project manager aware of the organization's political environment.
- Networking to facilitate relations among project stakeholders so that knowledge is shared at all levels.

Some members of the project team may be called upon to use these same interpersonal skills to various degrees, as they are assigned by the project manager to manage tasks, lead meetings, etc.

All project team members should be skilled at active listening, to reduce misunderstandings and improve communication and knowledge sharing.

## Working Environment Expectations

The project manager is responsible for the successful sharing and transfer of project knowledge. Early in the project, the project manager should set expectations of how this is to occur. The project kickoff meeting is an excellent venue for this to take place, because key members of the project team will be present—either in-person or virtually.

Typical expectations for sharing and transferring project knowledge at the kickoff meeting include the following:

- Knowledge is not constant: what you knew yesterday can change based on what you did today.
- Continuously evaluate the project environment for new risks, and follow the risk management plan to proactively address them before they become issues that will affect the project objectives.
- Don't hoard knowledge; follow the communications management plan and inform stakeholders when something changes that might affect their work.
- Use appropriate tools to share knowledge with stakeholders:
  - Face-to-face during formal meetings
  - Face-to-face during informal meetings and discussions
  - Telephone
  - Email
  - Wikis
  - Intranet
  - Printed documents

## Knowledge Transfer Approach

Knowledge transfer consists of connecting individuals, in person or virtually, to share tacit knowledge and collaborate together. This can be accomplished by a number of techniques, including:

- Networking.
- Facilitating special interest groups.
- Meetings, seminars, and various other types of in-person and virtual events that encourage people to interact and exchange ideas and knowledge.
- Training that involves interaction between attendees.
- **Work shadowing** and reverse shadowing provide a more individualized method to the exchange of specialized knowledge.

## Guidelines to Maintain Team and Knowledge Transfer

To effectively maintain the transfer of project knowledge, follow these guidelines:

- If your organization has a Project Management Office, follow its guidelines on documenting new knowledge.
- Be alert to new sources of project knowledge, and follow the communications management plan to convey that knowledge to stakeholders.
- Proactively seek new knowledge.
- Compile a lessons-learned register throughout the project's lifecycle, and add it to a lessons-learned repository with registers from other projects.

## ACTIVITY 3–9

### Ensuring Knowledge Transfer for Project Continuity

#### Scenario

The 234 West Adams project is only one of many low-income home-building projects that you will manage during the next several years. During the project, you and your project team will "learn as you go" with the intent of using this knowledge to improve the next project—and so on for all future projects.

#### 1. When should transfer of knowledge take place?

- At the end of the project
- At the end of each phase of the project
- When the lessons-learned register is archived
- Throughout the project

#### 2. What are examples of tacit knowledge?

- Beliefs, experience, and insights
- Words, numbers, and pictures
- Anything of value to another person
- Only knowledge about the project scope, schedule, and budget

#### 3. Management of project knowledge exists on three levels. What are they?

- Technical, administrative, and procedural
- Individual, project, and organization
- Scope, schedule, and budget
- Practical, theoretical, and actual

#### 4. When is the lessons-learned register created?

- At the conclusion of the project, after all tasks have been completed
- After completion of the first phase of work
- At the beginning of project execution
- At the beginning of the project

#### 5. Who is ultimately responsible for transferring knowledge learned during the project?

- Sponsor
- Project manager
- Work package owners
- All stakeholders

## Summary

In this lesson, you managed the project team as it executed the project with the urgency required to deliver business value. This included managing communications, engaging stakeholders, creating project artifacts, and attacking issues with the optimal action to achieve project success. Finally, you settled on an approach to capture and transfer project knowledge for the future.

The learning goals for this lesson were:

- Assess and manage risks.
- Execute the project with the urgency required to deliver business value.
- Manage communications.
- Engage stakeholders.
- Create project artifacts.
- Manage project changes.
- Attack issues with the optimal action to achieve project success.
- Confirm approach for knowledge transfers.

**What aspects of executing the project plan have you found to be the most challenging? Why?**

**What tools will you use to effectively execute projects in the future?**



**Note:** Check your CHOICE Course screen for opportunities to interact with your classmates, peers, and the larger CHOICE online community about the topics covered in this course or other topics you are interested in. From the Course screen you can also access available resources for a more continuous learning experience.

# 4 Keeping the Team on Track

**Lesson Time:** 6 hours 30 minutes

## Lesson Introduction

Now that the project team has been assembled and is doing the work of the project, you need to ensure that the team stays on track. As the project manager, you need to demonstrate the type of leadership that facilitates collaboration among the team and stakeholders, manages conflict, removes obstacles, and supports the team's performance. In this lesson, you will keep your project team on track.

This lesson addresses tasks from the People domain of the PMP® Exam Content Outline (ECO).

## Lesson Objectives

In this lesson, you will:

- Inspire, motivate, and influence team members and stakeholders. (ECO Tasks 1.2, 1.6)
- Appraise team performance against key performance indicators. (ECO Tasks 1.3, 1.4)
- Determine, prioritize, and remove impediments, obstacles, and blockers for the team. (ECO Task 1.7)
- Investigate and interpret the source and stage of a conflict and recommend an appropriate conflict resolution solution. (ECO Tasks 1.1, 1.10)
- Evaluate stakeholder engagement needs and influence stakeholders to accomplish project objectives. (ECO Task 1.9)
- Recognize mentoring opportunities and mentor relevant stakeholders. (ECO Tasks 1.3, 1.13)
- Promote team performance through the application of emotional intelligence. (ECO Tasks 1.3, 1.14)

# TOPIC A

## Lead a Team

There are many ways to lead a team. No one approach is perfect for every situation. The appropriate leadership style depends on the situation, the project, the stakeholders, your skills, and many other factors. A project manager must be astute in various leadership styles to apply the most suitable technique for the moment.

Teams are made up of individuals with different skill sets, backgrounds, experiences, and attitudes. Cohesive, collaborative teams typically are more productive and effective. A project manager must cultivate the optimal project environment best suited for the team. You must help the team appreciate the project's objectives, mission, and goals, as well as see their value in achieving those aims.

## Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Set a clear vision and mission. (ECO 1.2.1)
- Support diversity and inclusion. (ECO 1.2.2)
- Value servant leadership. (ECO 1.2.3)
- Determine an appropriate leadership style. (ECO 1.2.4)
- Inspire, motivate, and influence team member/stakeholders. (ECO 1.2.5)
- Analyze team members and stakeholders' influence. (ECO 1.2.6)
- Distinguish various options to lead various team members and stakeholders. (ECO 1.2.7)
- Maintain team. (ECO 1.6.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b><i>Deliverables</i></b>	<b><i>Tools</i></b>
Vision / Mission document	Diversity awareness
Charter	Leadership styles
Product box	Influence matrix
Reward and Recognition Plan	Salience model
	Power grids
	Behavior modeling
	Challenge status quo
	Recognize contributions
	Remove impediments
	Communicate vision

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## Vision and Mission

There is no one in the project better suited to convey the vision and goals of the project, while also speaking about the team's progress toward those goals, than the project manager. A project manager serves as a visionary leader who helps by educating the team and other stakeholders of the value

achieved or targeted, promoting teamwork and collaboration, assisting with project management tools and techniques, removing roadblocks, and articulating the project's mission.

Promoting the project's mission and value inspires the team to remain focused and feel pride. Seeing and guiding the project towards near and long term goals keeps the project moving forward and aligned to the end users' and customers' expectations.

## Diversity Awareness and Cultural Competencies

Not all team members and other stakeholders are motivated and inspired the same way. Recognize and act upon the most suitable and reasonable approach to lead the project team. Whether that approach is to take charge and rile the troops or quietly work behind the scenes, a project manager must adapt the leadership style to the situation and the stakeholders. This demands awareness of individual and team aims and working relationships.

Cultural and diversity aspects are important elements to implementing effective leadership modes. The motivations and working styles of individuals and groups vary greatly based on their experiences, age, culture, job roles, and many more influencers. Communication and openness to learn from others builds trust and improves the optimal options to lead various team members and stakeholders. Your competencies in this area become more global and diversified as you work on more projects involving more diverse locations, industries, organizations, stakeholders, working styles, and cultures.

## Leadership Styles

As a project manager, you must possess and apply leadership skills that enable a good working environment, and guide your project team toward accomplishing the desired result. This requires a balance of ethical, interpersonal, and conceptual skills that help you analyze situations and interact appropriately. Because project managers work with and communicate with a number of different people throughout the life cycle of a project, having strong leadership skills is critical. The ability to manage relationships, build trust, collaborate with others, solve problems, exhibit integrity, and guide the team toward a successful project close are some of the qualities and skills necessary in an effective leader.

Depending on the project manager's personality and a project's environment, the leadership style that is used can vary from a hands-off approach to a more involved style. Leadership and management are sometimes used interchangeably; however, the two terms are different. Leadership refers to guiding the team by using discussion and an exchange of ideas, whereas management refers to directing the team by using a prescribed set of behaviors.

Demonstrating and modelling the behavior you expect of others and the project stakeholders displays leadership every day. Lead as you would like to be led.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 60.

## Servant Leadership

Rather than manage projects and teams, trying to keep the project on plan and the team in line, servant leaders help teams develop and grow as a group and as individuals. They facilitate the team's work by providing coaching and training, remove blocks that impede work progress, either from people or processes, and focus on team accomplishments rather than team misfires. To help reflect this change in orientation, many organizations use the term project leader rather than project manager.

In some project organizations, especially in agile teams, the necessity of a project manager assigning and directing individuals is not as important as a project manager facilitating and guiding individuals.

**Servant leadership** means leading by supporting the team and addressing their needs. This style aims to understand the team's needs and take action to enable the team to perform and deliver.

Typically, enablement is done by seeking ways to support the project holistically so the team can accomplish objectives in a conducive environment and look for a servant leader to lead with communication and negotiation with outside stakeholders, such as removing distractions or roadblocks.

You are working for the team; the team is not working for you. Therefore, you must focus on their needs. Being a servant leader requires skills such as active listening, coaching, awareness, and facilitation. The team members have the technical skills; they look for a servant leader to lead with communication and negotiation with outside stakeholders, such as removing distractions or roadblocks.

## Challenge the Status Quo

Just because something is the way things have always been done or the way the products were made in the past does not necessitate that is the way things are to go for this project. Challenging the status quo can open new ideas and perspectives. Challenging the way things were done, or are being done, at the present time assures all involved that this is the best approach and the best product. It also breaks complacency and blind acceptance. Encouraging healthy skepticism on all aspects of the project and its vision helps stakeholders not overlook anything and assume too much.

The challenge of the status quo is an important part of reviewing the current environment in crafting a vision statement. A simple, short, vision statement is an effective tool that can inspire the project team.

## Influence Matrix

Much of how you lead, or cannot lead, a team is based partially on your influence and the influence of the other project stakeholders. Influence goes in many directions. The direction is often dictated by roles or titles—such as upwards (senior management), downwards (team or specialists), outwards (external), sideward (project manager's peers)—although the classification model can also distinguish influence based on prioritization, urgency, and other aspects.



**Note:** For more information, check out the Spotlight on **Successful Persuasion** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Salience Model

A **salience model** is a classification model that groups stakeholders on the basis of their level of authority, their immediate needs, and how appropriate their involvement is in terms of the project.

## Power Grids

Two-dimensional grids, or classification models, enable you to group stakeholders based on two factors. Some grids might be:

- **Power/interest grid:** groups stakeholders on the basis of their levels of authority and interest in the project.
- **Power/influence grid:** a classification model that groups stakeholders on the basis of their levels of authority and involvement in the project.

You can use the two-dimensional grids such as the power/interest grid as a classification method for documenting the stakeholder analysis results. Classifying your stakeholders in terms of their power, influence, and impact on your project is useful when it comes to communications and engagement.

For example, in the following figure, Jane has high levels of both power and interest and must be managed closely to maintain a good relationship with her during the project. While Joe's level of interest is lower than Jane's, you still make sure that Joe is satisfied with the project's progress and

status. For those stakeholders with lower levels of power, Amy needs to be kept informed while Frank requires less effort throughout the project.

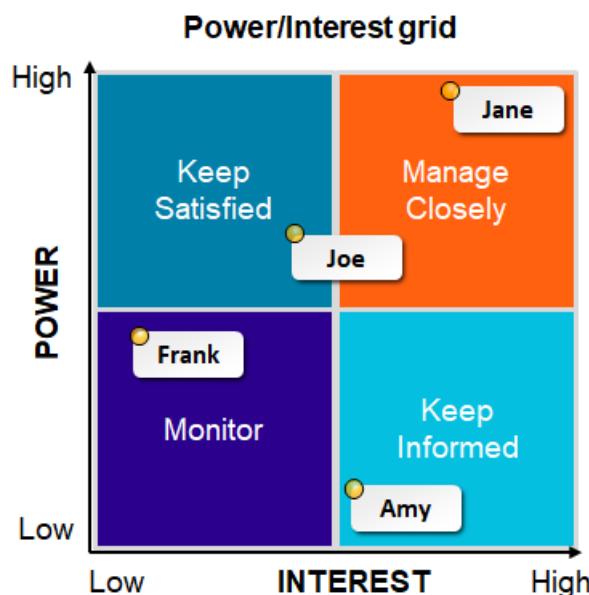


Figure 4-1: Example of a power/interest stakeholder grid.

## Team Building

Project teams perform better when there is increased cohesion and solidarity. Good project leadership facilitates the bonding between project team members. Facilitating team building activities builds unity, but also builds trust, empathy, and focus on the team over the individual.

## Reward and Recognition Plan

A **reward and recognition plan** is a formalized way to reinforce performance or behavior. Reward and recognition plans are generally standardized throughout an organization and approved through corporate channels. The purpose is to motivate the team to perform well.

Rewards can include monetary gifts, additional vacation time or other perks, company plaques or trophies, or small gifts. Although it's common for the terms "reward" and "recognition" to be used interchangeably, they are different. You can recognize a person without giving them a reward. However, you should never reward a person without recognizing them.

- **Rewards** are tangible, consumable items that are given to a person based on a specific outcome or an achievement. Rewards can also have a defined start and finish, or fixed time, and are usually expected when the specified goal is achieved or attained; for example, receiving a bonus after a successful year is a reward.
- **Recognition** is a more personalized, intangible, and experiential event that focuses on behavior rather than outcome. Recognition is not restricted to a set time, is usually unexpected by the receiver, and is intended to increase an individual's feeling of appreciation; for example, receiving public acknowledgement and appreciation for helping another department that was short staffed is recognition.



**Caution:** Rewarding or recognizing a team member for working overtime due to poor planning or in an effort to receive extra pay is not an effective reward and recognition plan because it does nothing to motivate the team to perform well or to improve team morale.

## Guidelines to Manage a Team



**Note:** All of the Guidelines for this lesson are available as checklists from the **Checklist** tile on the CHOICE Course screen.

Using good management skills to manage your project team results in a solid staffing management plan, updated and submitted change requests, resolution of issues, and good lessons-learned documentation, as well as productive team members. To effectively manage a project team, follow these guidelines:

- Use emotional intelligence and other style-typing methods to enable you to flex your behavior to a style that works best for each stakeholder.
- Establish good communication among team members, internally and externally.
- Monitor performance of team members on an ongoing basis.
  - Monitor progress of team members by speaking with them one-on-one. Don't wait for the emails or monthly reports. Get out there and see for yourself what progress is being made by the team, and what intangibles (such as morale, engagement, or cynicism) are at play.
  - Develop a set of metrics for each project to measure team performance. Establish tolerances for each so that corrective actions can be taken when needed. Use a management-by-exception approach to avoid micromanaging the team.
  - Provide constructive feedback to team members on a frequent basis. Team members need to know they are either on track or need to take steps to get back on track. Performance reviews can be formal or informal. If disciplinary actions are taken, these must be in writing to avoid any misunderstanding.
  - Consider additional training for those team members who need to improve their performance.
- Manage conflict by using the appropriate approach based on the circumstances and the individuals involved. Regardless of the approach, apply the following principles:
  - Allow people to have their say. Make sure you give both sides a chance to state their case. Demonstrating respect and acknowledging people's different positions is necessary to address conflicts effectively.
  - Listen hard to what people are telling you. Paraphrase or ask questions to be sure everyone understands what is being said.
  - Find those areas at issue where both sides are in agreement.
  - Encourage both sides to find a win-win resolution to the problem. Restate the resolution and get agreement from both parties.
  - Focus on the reasons that the group has come together: to find a resolution to the problem.
  - To help avoid unnecessary conflict, set expected ground rules in the beginning. The team must operate with these based on the communications management plan.
  - During the project life cycle, follow established project management practices. Refer to your communications management plan for guidance.
  - When conflict occurs among team members or between the team and other organizational entities, it may be effective to implement the conflict management approach of confrontation —focusing on the problem. It may be advantageous to try to defuse conflicts early to avoid escalation.
  - As results are being obtained during the implementation phase, establish an issues log to track and assign project issues. This log is useful for regular follow-up with the project team. Hold specific team members accountable for resolution of issues.

# ACTIVITY 4–1

## Leading a Team

### Scenario

A seasoned project manager is leading a software project commissioned to update an existing tool used by the business to manage their inventory and stockrooms. The business is anxious to get parts of the new system and its new user interface (UI) in the hands of their inventory staff at facilities worldwide. They are frustrated that after a couple of months there is no sign of progress.

Your development team is worried because they don't think the business understands the behind the scenes backend work required. Additionally, the development team is delayed because the design team is taking a long time researching and making their prototypes and images perfect.

- 1. What benefit, if any, is there for the project manager to get all the various stakeholder groups—the business, the inventory staff, the developers, and the design team—to understand the project's vision and mission?**
  
  
  
  
  
  
- 2. What can a project manager do to bridge the gap between business and development? (Choose three.)**
  - Communicate to the business the work and effort needed from the development team and their progress.
  - Communicate to the development team the needs and desires of the business.
  - Require the business to analyze the gap using company approved software.
  - Arrange collaborative sessions for the business team and development team to work on ideas and issues.
- 3. Which best represents the servant leadership style of the project manager?**
  - She helps make the coffee for the business team.
  - She asks difficult questions to get the development team thinking.
  - She serves up new possibilities that could be used by the design team.
  - She takes care of the administrative reporting when the team is focused and on a roll.
- 4. In their extensive research, the design team discovers that inventory staff enter a lot of information that is never used by any of their activities or by any other team. When the inventory staff is asked why that information is captured, the response was, "We just always have. No one knows why." How is challenging of the status quo going to support the project's aim of delivering value?**

# TOPIC B

## Support Team Performance

You want to get the most from your team. There are many ways to support the efforts and performance. In this topic, you will explore a few practices to determine appropriate feedback that provides the best support for the team.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Appraise team performance against key performance indicators. (ECO 1.3.1)
- Support and recognize team growth and development. (ECO 1.3.2)
- Determine appropriate feedback approach. (ECO 1.3.3)
- Verify team member performance improvements. (ECO 1.3.4)
- Support team task accountability. (ECO 1.4.2)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
RACI matrix	RACI matrix
Management by Objectives	Task boards
Benchmarking	Performance tracking tools
Performance reports	Information Radiators
	Burnup charts
	Earned Value
	Throughput metrics
	Cycle time
	Value stream map

### Key Performance Indicators

To match team performance with the project vision and objectives, **key performance indicators (KPIs)** can be set. These KPI metrics can help give the team assurance that they are progressing towards project goals. There are a few core (key) examples (indicators) to let the team and others know that what they are doing (performance) is feeding into project success.

When it comes to defining useful KPIs, it's important to remember the SMART acronym. To be valuable measurement tools, KPIs need to satisfy the SMART criteria: specific, measurable, achievable, relevant, and time-bound.

Although there are varying interpretations of the SMART acronym, within the context of project management:

- **Specific** means the goal is appropriately focused and targeted, not overly general or vague. The target must be specific to the objective at hand; many targets that are too general could be affected by dozens of factors not associated with the improvement.

- **Measurable** means the change can be quantified and assessed on that basis. You must be able to measure the target; this means figuring out how to get accurate data to assess current and future performance.
- **Achievable** means that it is plausible and realistic. Ensure the target is a realistic one; you need to be able to achieve it within the size and scope of proposed improvement.
- **Relevant** ensures that the KPI is meaningfully related to its associated critical success factor(s). The target needs to be relevant in the context of the larger objectives and critical success factors.
- **Time-bound** means the goal is not open-ended but can be assigned a specific target duration. The timescale used needs to assess whether the improvement has achieved the desired results.

## Team Culture and Empowerment

In projects, the team is the most important part. Without a good unified team, the project falls apart and project management becomes insufficient. The team needs to be empowered to make decisions without burden and in a timely manner. This increases the team's responsibility to deliver a product with complete ownership. You should remember that any interference with the team is disruptive, and it reduces the members' motivation to work.

Encourage the team to foster team collaboration and decision making. The team does not depend on heavy-handed discipline. The team must recognize the power and influence they possess. As an empowered cohesive unit, they depend on each other to make decisions and solve problems to deliver targeted value quickly.

Another important aspect of team empowerment is that the team should be a part of clarifying and prioritizing requirements, splitting requirements into tasks, and estimating the effort. This is essential to ensure the commitment of the entire team even at the beginning of the project. In case of any challenges during the course of the project, this involvement leads to an increased sense of ownership among team members.

## Team Structure and Workspaces

The environment and location of a project team are extremely important elements to leading and managing projects. In agile projects, meaningful interaction is a core tenet. To encourage frequent, free flowing interaction, the team structure and workspaces must be conducive to this need. You need a team that can contribute everywhere and at any time. Anyone on the team is involved and leveraged throughout. Being involved and engaged encourages meaningful interactions. No one should be boxed into a singular role or engaged only when someone tells them to be. Everyone is engaged all the time and can take initiative whenever needed.

Setting up the physical environment supports the whole team engagement. Co-locating all involved in a shared workspace fosters more informal and immediate collaboration and exchange of information. Even the passive information that is absorbed from the surroundings—such as ad hoc discussions, side conversations, whiteboard drawings, physical body language—have value. Being immersed in the team physically and mentally improves the team's ability to work faster, more collaboratively, and more unified.

Establishing a culture of fluid communication and engagement in a workspace that promotes those positive interactions makes leading and managing teams much easier. The teams inherit many of the leadership and management needs.

## Team Building Activities

To foster team building within a project team, a project manager might ask each of the veteran employees on the team to partner with a less experienced team member, offering coaching as needed and sharing knowledge, information, and expertise. Working collaboratively toward a shared goal is a great way for team members to help each other reach a higher level of performance.

**Team-building activities** are the specific functions or actions taken to help the team to develop into a mature, productive team. They can be formal or informal, brief or extended, and facilitated by the project manager or a group facilitator.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 341.

## Team Performance Assessments

All project team members have their own areas of expertise that, if identified and used appropriately, can help in completing the project successfully. Project team performance assessment is performed to assess and identify the potential of each team member in order to help improve interaction between team members, solve issues, and deal with conflicts.

A team's technical success is measured on the basis of meeting the project objectives and finishing the project on time and within the decided budget. Continual formal or informal evaluations of the team's performance is an effective way to improve the skills and competencies of project team members and increase team cohesiveness.

You can follow these guidelines to assess team performance.

- Ask key questions of the team members. Questions may include their work experience, likes and dislikes about the projects assigned to them, tasks that they are confident about, and project tasks they will prefer to do.
- Speak to team members frequently through one-to-one meetings and regular project meetings wherein the team may talk about project cost and schedule adherence, milestones, deliverables, change management, risk management, and quality management.
- Provide constructive criticism and acclaim to team members, as necessary. Team successes should be announced publicly while reprimanding should be done in private.
- Encourage knowledge transfer. Provide team members with convenient, reliable methods for storing and accessing project knowledge and assess them on how well they provide and retrieve that information.
- Evaluate individual performance. Project managers must listen to the team members before responding and must be objective and flexible when necessary.
- In situations where a team member is not performing at the desired level, it may be necessary to remove them from the team and reassign his or her work to another resource. If this is not possible due to the workload and expertise of the other team members, it may be necessary to replace the under-performing resource and to assign his or her work to the new resource.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 343.

## Performance Assessment Tasks

You can use performance assessment to accomplish a number of tasks, including:

- Comparing performance to goals.
- Re-clarifying roles and responsibilities.
- Delivering positive as well as negative feedback.
- Discovering unknown or unresolved issues.
- Creating and monitoring individual training plans.
- Establishing future goals.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 342.

## Team Development Stages

When it comes to managing the dynamics of your project team, it is useful to refer to "Tuckman's Stages of Group Development." Teams might occasionally get stuck in a particular stage, or even revert to an earlier one. As the project manager, you can use these stages to lead the team as it develops.

<b>Stage</b>	<b>Description</b>
1. Forming	Team members are wondering whether the decision to join the team was a wise one. They are making initial judgments about the skills and personal qualities of their teammates, as well as worrying about how they personally will be viewed by the rest of the team. During this stage, conversations tend to be polite and noncommittal, as people hesitate to reveal too much about their personal views. In addition, team meetings tend to be confusing, as the team tries to figure out who is in charge.
2. Storming	Team members begin to assert themselves and control issues as they emerge. Personality differences begin to arise. Conflicts result as team members differ on the way they want to do the project work, or the way they want to make decisions.
3. Norming	The team begins to work productively, without worrying about personal acceptance or control issues. There are still conflicts; however, they tend to be focused on process issues rather than personality differences. The team begins to operate off mutual dependence and trust.
4. Performing	The team is working at optimum productivity. It is collaborating easily, communicating freely, and solving its own conflict problems. Team members feel safe in reporting problems, trusting their fellow team members to help them create the best solution for the team as a whole.
5. Adjourning	The team members complete their assigned work and shift to the next project or assigned work. This phase is sometimes known as "mourning."

The process of forming, storming, norming, performing, and adjourning is not done in a "lock step" fashion by the team. Team members keep coming in and going out of the team. Whenever a new member joins, forming takes place; even if the rest of the team has already crossed the forming stage. So, these stages are not followed one after the other but rather are situational.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 338-339.

## Effective Teams

The team members should work in a collaborative way to ensure project success. It is the responsibility of the project manager to build an effective project team and foster teamwork. Managers should give opportunities that challenge the team members' abilities, provide support and timely feedback, and recognize and reward good performance. To achieve the best team performance, managers should use effective communication methods, develop trust among team members, manage conflicts, and promote collaborative decision making and problem solving.

Project managers should seek support from upper-management or the appropriate stakeholders to effectively build project teams. This will help improve people skills, advance technical competencies, build good team environment, and increase project performance.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 337-338.

## Management by Objectives

Teams are typically more productive and driven when they have clear objectives to meet. Project managers can support the team by setting objectives collaboratively with the team. Project managers and the team can determine joint objectives that are challenging, yet attainable. Objective setting can be conducted at the start of a project or phase, but is commonly done throughout the project life cycle, such as in an Iteration Planning session in which the team sets the targets and commitments for the upcoming time period.

## Feedback

To learn, adapt, and grow requires constructive feedback. Continuous feedback is essential for agility and responsiveness. Regular feedback is crucial for the team in all project management methodologies and team environments. Discovering the most appropriate and timely feedback is a responsibility of a project manager.

For instance, agile methods follow iterative and incremental development, and within each iteration, the product improves. With every iteration, the team members provide feedback and assistance to each other and a working product is demonstrated to the customer for feedback and direction. That feedback feeds the subsequent iterations and the product backlog. Regular customer input gives the team the opportunity to improve on the product before the final deliverable is sent to the customer, instead of when it may be too late.

## Performance Tracking Tools

The following table defines some common tools that can be used to track the team's performance.

Tool	Description
Scrum/Agile/Kanban boards	Based on the Kanban management method of using cards, physical or electronic boards can track work as it progresses across various stages or categories.
Throughput Metrics	Measurement of the team's work that has moved from one stage to another stage over a certain time.
Cycle Time	Measurement of work that has progressed all the way from plan to completed or delivered.
Quality Metrics	Various measurements to track quality deliverables, defects, and acceptable output.
Earned Value	Tracking cost and effort performance against a planned value.
Bar Charts (Gantt)	Using the project schedule to track performance over time.
Velocity	Measurement of total output from an iteration to attempt to predict future iteration outputs.

## Earned Value Management (EVM)

**Earned Value Management (EVM)\*** is a methodology that combines scope, schedule, and resource measurements to assess project performance and progress during project execution. You can measure project progress by comparing actual schedule and cost performance against planned performance as laid out in the schedule and cost baselines. Assessing the value of work requires first determining what work has actually been performed and therefore what value it has contributed to the project. These performance reviews are usually included in each project status review meeting.

During planning, project work is broken down into work packages and activities. Each work package is assigned a budget and a schedule. Because each increment of work is time-phased, a

schedule variance results when work is not completed when it was scheduled to be completed. It is valuable to understand the monetary value of work contribution.

## Cost and Schedule Performance

The EVM approach to monitoring cost and schedule performance provides metrics that show variances from the baselines. Armed with this information, the project manager can identify appropriate corrective actions. When cost and schedule variance analysis is conducted at the appropriate time intervals and levels, it can be effective in controlling against further cost and schedule problems.

## EVM Variables

EVM involves determining three independent variables to assess and monitor project cost and schedule performance progress. These three variables are used to provide measures of whether or not work is being accomplished as planned and to forecast project cost at completion. The variables are:

- Planned Value (PV)
- Earned Value (EV)
- Actual Cost (AC)

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 226, 261-268.

## Planned Value

**Planned Value (PV)\*** is the authorized budget assigned to scheduled work. This amount is specified in the project's cost baseline. In simpler terms, PV indicates the value of work scheduled to be done during a particular time period.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 261.

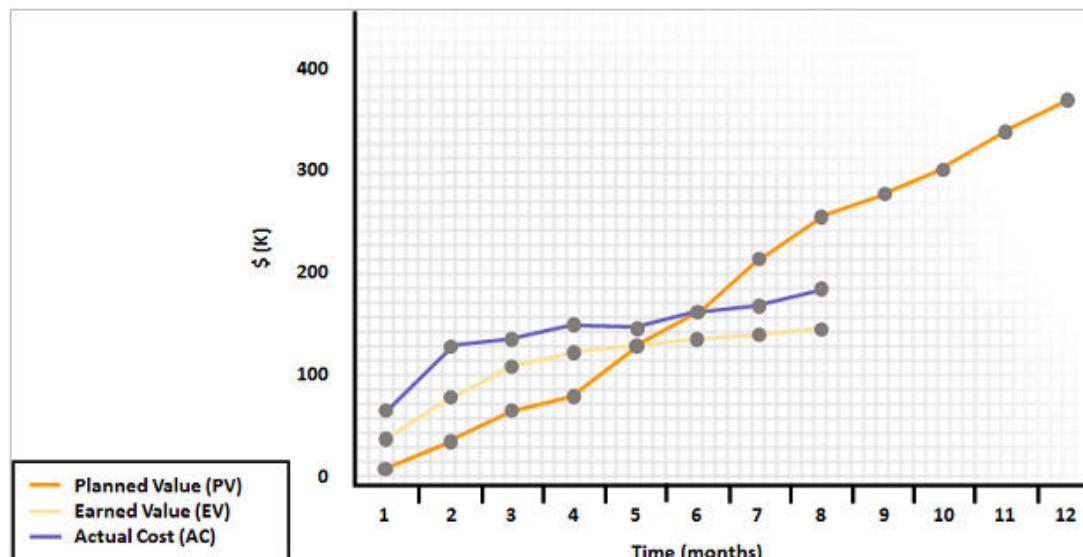


Figure 4–2: An illustration of planned value, earned value, and actual cost.

### Example: Evaluating Planned Value

A project to build a shed was proposed. It involved three tasks to be done: flooring, drywalling, and roofing. Flooring was budgeted at \$200 and will take two days to complete. The task of drywalling was budgeted at \$800 and will take four days to complete. Roofing was budgeted at \$600 and will take three days to complete. The total budget for building the shed came to \$1,600. The total budget

calculated for the first six days of work, involving two days of flooring and four days of drywalling, will be  $\$200 + \$800 = \$1,000$ . Therefore, the PV of this project for six days is \$1,000.

## Earned Value

**Earned Value (EV)\*** is the measure of work performed expressed in terms of the budget authorized for that work. In other words, EV is a composite measurement of both cost and time performance in relation to scheduled or planned cost and time performance. EV is calculated by multiplying the percentage of work completed by the budgeted cost for the activity as laid out in the cost baseline.

$$\text{Earned Value (EV)} = \% \text{ completed} \times \text{Planned Value (PV)}$$

In order to determine the EV of the project work to date, you will have to look back at the cost baseline to determine how costs were assigned originally. If the PV was determined by the percentage completed to date method, you will apply the same method of assessing the EV. In other words, EV indicates the value of work actually performed during a particular time period.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 261.

### Example: EV Calculation for the Shed Project

The manager of the shed building project receives a project report at the end of day six, which says that the flooring task (\$200) is 100% complete and the drywalling task (\$800) is 75% complete. To calculate the EV for the completed work, you apply the following formula. Therefore, the calculated EV for the project at the end of day six is \$800.

$$\begin{aligned} \text{EV} &= (100\% \times \text{Flooring budget}) + (75\% \times \text{Drywalling budget}) \\ \text{EV} &= (100\% \times 200) + (75\% \times 800) \\ \text{EV} &= 200 + 600 \\ \text{EV} &= \$800 \end{aligned}$$

## Actual Cost

**Actual Cost (AC)\*** is the realized cost incurred for the work performed on an activity during a specific time period. AC refers to the total amount of costs incurred while performing work, either during completion of a schedule activity or during the completion of a WBS component. Actual cost is calculated and documented once the work is complete. In other words, AC indicates the actual money that has been spent for work that has been completed.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 261.

### Example: AC Calculation for the Shed Project

The shed building project report also states that the actual money spent on flooring is \$180 and on drywalling is \$700. So, the actual cost for the project as of day six is \$880.

## EVM Measures for Schedule Control

The most commonly used EVM measures for schedule control are:

- **Schedule Variance (SV)\*** is a measure of schedule performance expressed as the difference between the earned value and the planned value. ( $SV = EV - PV$ )
  - A positive SV indicates that the project is ahead of schedule.
  - A zero SV indicates that the project is on schedule.
  - A negative SV indicates that the project is behind schedule.
- **Schedule Performance Index (SPI)\*** is a measure of schedule efficiency expressed as the ratio of earned value to planned value. ( $SPI = EV / PV$ )

- An SPI number greater than 1.0 indicates that the project is ahead of schedule.
- An SPI of 1.0 means the project is on schedule.
- An SPI number less than 1.0 indicates that the project is behind schedule.



**Note:** Content related to schedule and costs has been dealt with as separate topics in this course. For detailed information on Cost Variance (CV) and the Cost Performance Index (CPI), refer to the "Control Project Costs" topic.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 262, 263.

## EVM Measures for Cost Control

The most commonly used EVM measures for cost control are:

- **Cost Variance (CV)\*** is the amount of budget deficit or surplus at a given point in time, expressed as the difference between the earned value and the actual cost. ( $CV = EV - AC$ )
  - A positive CV indicates that the project is performing under budget.
  - A zero CV indicates that the project is on budget.
  - A negative CV indicates that the project is performing over budget.
- **Cost Performance Index (CPI)\*** is a measure of the cost efficiency of budgeted resources expressed as the ratio of earned value to actual cost. ( $CPI = EV / AC$ )
  - A CPI number greater than 1.0 indicates that the project is under budget.
  - A CPI of 1.0 means the project is on budget.
  - A CPI number less than 1.0 indicates that the project is over budget.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 262-263, 267.

## Estimate at Completion Analysis

The current projected final cost of the project is referred to as the **Estimate at Completion (EAC)\***. It is based on the current spending efficiency (the CPI), and is calculated from the following formula, where **Budget at Completion (BAC)\*** is the sum of all budgets established for the work to be performed.

$$EAC = \frac{BAC}{CPI}$$

Figure 4-3: The EAC formula.

## Estimate to Complete Analysis

During execution, you might need to know how much more money you will need to complete the project. This amount is called the **Estimate to Complete (ETC)\***. It is based on the current spending efficiency of the project, and is calculated from the following formula.

$$ETC = EAC - AC$$

Figure 4-4: The ETC formula.

## ACTIVITY 4–2

### Using Earned Value Management

#### Scenario

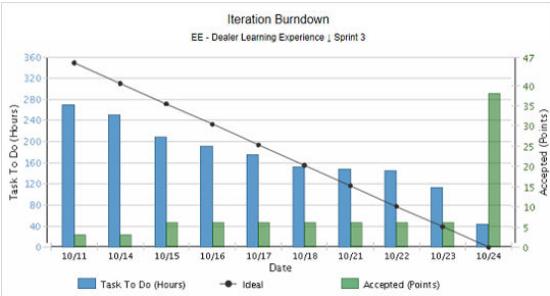
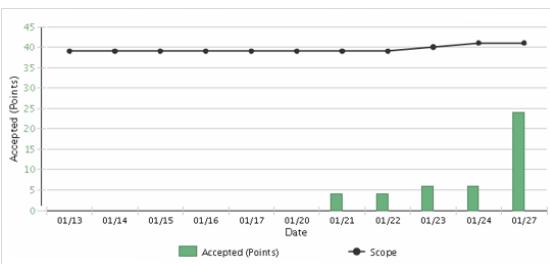
Your office building is undergoing minor renovations. The entire project is scheduled to last 16 weeks at a total cost of \$25,000. It is eight weeks into the project and your manager asks you whether the project is on schedule. You plan to use various analysis techniques to determine the status.

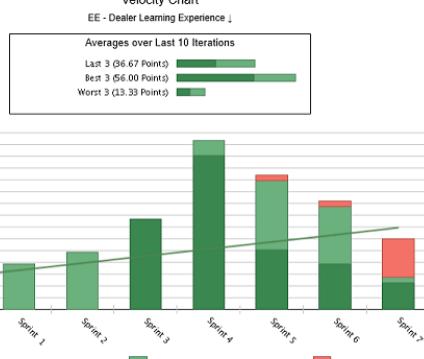
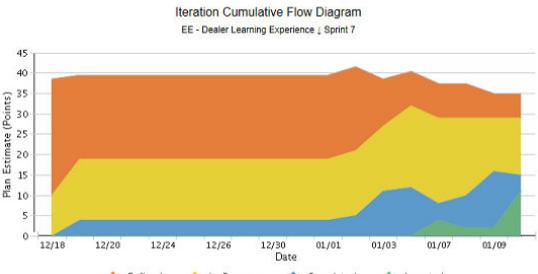
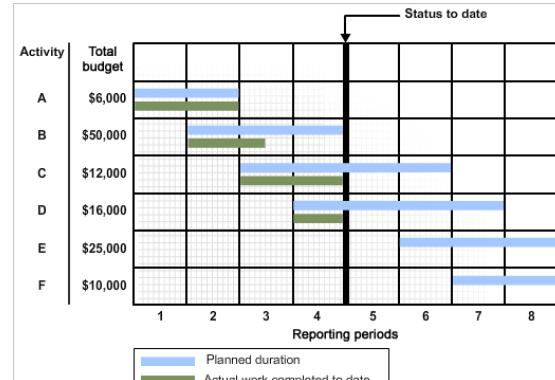
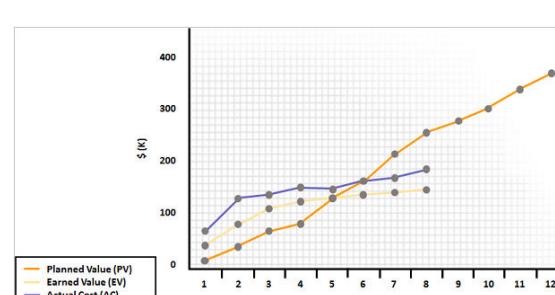
1. You plan to measure project progress by comparing the actual performance against planned performance as documented in the schedule and cost baselines. What method will you use?
  - EV
  - AC
  - PV
  - EVM
2. According to your baselines, you expected to complete \$15,000 worth of work by the end of the eighth week. What is the term for this information?
  - AC
  - EV
  - PV
  - SV
3. According to your status reports, you've completed 48% of the work so far. Based on this information, what is the EV and how did you calculate it?
4. How do you determine the AC for your project?
5. Given the PV, EV, and SV values that you know, what actions should you take at this point? (Choose two.)
  - Bring it to the attention of the CCB with some possible solutions.
  - Use it to decide whether a corrective action is needed.
  - Investigate the root cause of the variance.
  - Bring it to the attention of project stakeholders.
6. What is the SV for your project, how did you calculate it, and what does it indicate?

7. What is the SPI for your project, how did you calculate it, and what does it indicate?
  
8. What should you do with the results of your performance measurement analysis?

## Performance Reports

Reporting and displaying team progress and what the team is accomplishing is extremely important for the team, but also for communicating to others on the great work of the team.

Type	Description	Examples																																				
Information Radiators	Big visual boards to display in high traffic public locations about the project and the advancement of the project. The aim is to radiate information to all about the project work.	Posters on a hallway wall showcasing team progress and printed out examples of work.																																				
Burndown chart	A graph to show the progress by plotting the burning down of work during an iteration or other time period.	 <p>The chart displays the progress of an iteration burndown. The left Y-axis represents 'Task To Do (Hours)' from 0 to 360. The right Y-axis represents 'Accepted (Points)' from 0 to 47. Blue bars show the remaining tasks per day from October 11 to October 24. A black line with dots shows the ideal burndown rate. Green bars at the end of each day represent accepted points. The actual progress follows the ideal burndown line until October 23, after which tasks remain and points are accepted.</p> <table border="1"> <caption>Estimated Data for Iteration Burndown Chart</caption> <thead> <tr> <th>Date</th> <th>Task To Do (Hours)</th> <th>Accepted (Points)</th> </tr> </thead> <tbody> <tr><td>10/11</td><td>250</td><td>5</td></tr> <tr><td>10/14</td><td>240</td><td>5</td></tr> <tr><td>10/15</td><td>210</td><td>10</td></tr> <tr><td>10/16</td><td>190</td><td>10</td></tr> <tr><td>10/17</td><td>170</td><td>10</td></tr> <tr><td>10/18</td><td>150</td><td>10</td></tr> <tr><td>10/21</td><td>130</td><td>10</td></tr> <tr><td>10/22</td><td>120</td><td>10</td></tr> <tr><td>10/23</td><td>110</td><td>10</td></tr> <tr><td>10/24</td><td>100</td><td>40</td></tr> </tbody> </table>	Date	Task To Do (Hours)	Accepted (Points)	10/11	250	5	10/14	240	5	10/15	210	10	10/16	190	10	10/17	170	10	10/18	150	10	10/21	130	10	10/22	120	10	10/23	110	10	10/24	100	40			
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Burnup chart	A graph to show the progress and gains made by the project team over time.	 <p>The chart displays the progress of a burnup chart. The Y-axis represents 'Accepted (Points)' from 0 to 45. A green bar chart shows daily accepted points. A black line with dots represents the cumulative scope. The scope remains flat at approximately 40 points until October 23, after which it begins to rise again, reaching about 42 points by October 27.</p> <table border="1"> <caption>Estimated Data for Burnup Chart</caption> <thead> <tr> <th>Date</th> <th>Accepted (Points)</th> <th>Scope</th> </tr> </thead> <tbody> <tr><td>01/13</td><td>0</td><td>40</td></tr> <tr><td>01/14</td><td>0</td><td>40</td></tr> <tr><td>01/15</td><td>0</td><td>40</td></tr> <tr><td>01/16</td><td>0</td><td>40</td></tr> <tr><td>01/17</td><td>0</td><td>40</td></tr> <tr><td>01/20</td><td>0</td><td>40</td></tr> <tr><td>01/21</td><td>2</td><td>40</td></tr> <tr><td>01/22</td><td>2</td><td>40</td></tr> <tr><td>01/23</td><td>5</td><td>40</td></tr> <tr><td>01/24</td><td>5</td><td>42</td></tr> <tr><td>01/27</td><td>25</td><td>42</td></tr> </tbody> </table>	Date	Accepted (Points)	Scope	01/13	0	40	01/14	0	40	01/15	0	40	01/16	0	40	01/17	0	40	01/20	0	40	01/21	2	40	01/22	2	40	01/23	5	40	01/24	5	42	01/27	25	42
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Type	Description	Examples
Velocity chart	Graphs the completion rate of the team over time and helps predict future iterations.	 <p>A Velocity Chart titled "EE - Dealer Learning Experience   Sprint 7". The Y-axis is labeled "Velocity (Points)" ranging from 0 to 75. The X-axis shows sprints 0 through 7. Each bar is stacked: green for "Accepted during iteration" and red for "Not Accepted". A trend line is drawn through the bars. A legend at the bottom right identifies the colors: green for "Accepted during iteration", light green for "Accepted after iteration", and red for "Not Accepted".</p>
Iteration Cumulative Flow Diagram	Graphs the throughput of work in the various defined stages during a timeboxed period.	 <p>An Iteration Cumulative Flow Diagram titled "Iteration Cumulative Flow Diagram EE - Dealer Learning Experience   Sprint 7". The Y-axis is "Plan Estimate (Points)" from 0 to 45. The X-axis is "Date" from 12/18 to 01/09. The flow is divided into four stages: Defined (orange), In-Progress (yellow), Completed (blue), and Accepted (green). A legend at the bottom identifies the stages: orange for Defined, yellow for In-Progress, blue for Completed, and green for Accepted.</p>
Earned Value Management Reports	Graphs and values based on the earned value management (EVM) equations.	 <p>An Earned Value Management Gantt chart titled "Status to date". The Y-axis lists activities A through F with their total budgets. The X-axis shows reporting periods from 1 to 8. Blue bars represent "Planned duration" and green bars represent "Actual work completed to date". A vertical arrow points from the top to period 5. A legend at the bottom identifies the colors: blue for Planned duration and green for Actual work completed to date.</p>
Variance Analysis Reports	Graphs and their analysis comparing actual results to planned or expected results.	 <p>A Variance Analysis Report graph titled "Planned Value (PV)", "Earned Value (EV)", and "Actual Cost (AC)". The Y-axis is "\$ [k]" from 0 to 400. The X-axis is "Time [months]" from 1 to 12. Three data series are plotted: PV (orange line with circles), EV (yellow line with circles), and AC (blue line with circles). The AC line is consistently above the EV line, indicating cost overrun.</p>

Type	Description	Examples
<b>Work performance reports*</b>	The physical or electronic representation of <b>work performance information*</b> compiled in project documents, intended to generate decisions, actions, or awareness.	Status reports, memos, justifications, information notes, recommendations, and updates.
Quality Reports	Charts and reports based on the quality metrics collected.	Control charts, Pareto diagrams, run charts, and histograms.
Dashboards	Physical or electronic summaries of the progress, usually with visuals or graphics to represent the larger data set.	A collection of charts and reports aggregated into a single workbook.
Task Boards	Physical or electronic depictions of the work that must be done and their current state.	Kanban boards, To-Do lists, procedure checklists, and Scrum boards.



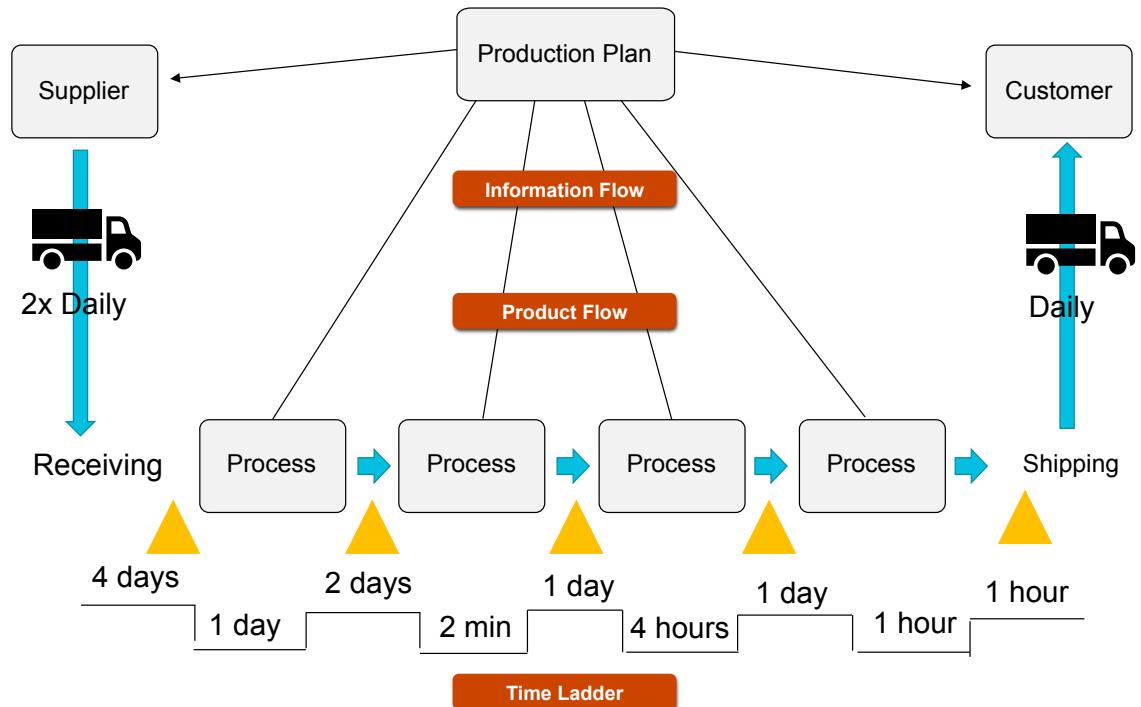
**Note:** For more information, check out the Spotlight on **Project Status Reports** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Value Stream Map

Teams and their work must flow and be fluid. Bottlenecks, slowdowns, delays, or other forms of non-value effort creates waste and distraction. Anything not delivering or attributing to value is wasteful. Producing a Value Stream Map can call out how information and materials in the project and between team members may be diluted, clogged, or otherwise wasted of its value. The Value Stream Map presents visual representation of a process and the actions in each step to spot efficiencies as well as wasteful efforts.

The PMI® *Agile Practice Guide* defines **value stream\*** as an organizational construct that focuses on the flow of value to customers through the delivery of specific products or services. **Value stream mapping\*** is a lean enterprise technique used to document, analyze, and improve the flow of information or materials required to produce a product or service for a customer.

Reference: Project Management Institute, *Agile Practice Guide*, Project Management Institute, Inc., 2017.



*Figure 4-5: An example of a value stream map.*

## Retrospectives and Lessons Learned

Supporting the team's performance also extends beyond the measurement tools and feedback forums and methods. Gather lessons learned constantly and/or at set times throughout the project. Apply that learning into supporting actions to improve the performance and project environment.

In agile projects, retrospectives are the most important practice for gathering lessons learned from the team on how to improve and recognize success. Retrospectives occur after every iteration and at the end of every project. Conducting a retrospective encourages the team to review what went well and what could have been done better. This assessment includes the work on the product, but also the processes, team dynamics, and other areas that influence the effectiveness of the team.

Retrospectives are not just about capturing those lessons learned; retrospectives are also about how to take those lessons learned and analyze and apply them moving forward. To do this productively, in the spirit of agile, you can involve everyone and respect everyone's input. These sessions are not blame games; they are learning and growth opportunities. The output of the retrospective is a plan on how to make improvement in the ensuing iteration and beyond. You must facilitate the retrospectives to seek improvements and recognize successes. Often there are more lessons learned that can be implemented. Stack rank the opportunities by importance and urgency. Then incorporate tasks to realize these improvements in the ensuing iterations or apply some of the ideas to the team environment where appropriate.

### Example of a Retrospective Meeting

The team has completed an iteration and Andrea Lea, the Project Manager, has convened a closure meeting. She has invited David Long, a Scrum Master for a different project, to facilitate this meeting. She has booked the conference room and invited the Product Owner to attend the meeting. Further, she has prepared two large sheets and a lot of self-stick notes for the team to record their feedback. She has also marked on a Product Backlog the items that were part of this iteration and drawn the timeline for the iteration. She has markers to write on the sheets. She has the minutes from the review meeting and has highlighted additional items on the Product Backlog. Also, she has briefed David on the review meeting outcome. Finally, she has sent in a reminder to the team to identify any technical requirements for the next iteration.

## Guidelines for Conducting a Retrospective

Here are some suggested steps to conduct a retrospective and address improvements and changes:

1. Prepare mentally or prepare some notes with some ideas or areas of focus in case the team needs some inspiration or ideas.
2. Place two large sheets marked “What Went Well” and “What Could Be Improved” on a board.
3. Ask the attendees to identify items that went well in the iteration and add them to the first sheet.
4. Ask them to identify items that could be improved and add them to the second list.
5. Allow each participant to identify the reason for the improvement.
6. Ask the moderator to look for common items that need improvement and mark them.
7. Narrow the list down to one or two areas to improve upon and bring value in the next Sprint.
8. Get team consensus on the plan improvement.
9. Update these tasks to the Product Backlog after a discussion with the Product Owner.
10. Implement changes.

## ACTIVITY 4–3

### Supporting Team Performance

#### Scenario

A motorcycle company is rolling out a brand new all electric motorcycle. Your project is to get all the employees at the motorcycle dealerships to be ready to display and sell the new vehicles. Since there is a lot to learn and prepare for, the project must deliver regularly over a 9 to 12 month period.

1. First, to ensure the various teams involved in the project are not wasting any time or encountering any unnecessary bottlenecks or wasteful efforts, what would be helpful to identify potential issues in their processes?
  - A value stream map
  - A velocity chart
  - A Kanban board
  - A kickoff meeting
2. As the team is progressing in the project, what charts or graphs would be useful to help keep the team on track?
3. At the end of the first month, the project team wants to gather for an hour to hold a retrospective session. What is the objective of this session and what typically occurs in such a gathering?

# TOPIC C

## Address and Remove Impediments, Obstacles, and Blockers

Throughout the project, there are impediments, obstacles, or constraints restraining, slowing down, or blocking the team's progress towards the project's objectives. The interference can range from minor to catastrophic. The team may be inconvenienced to being outright stopped. Any hindrance on the project team or any member of the team reduces productivity and ability for the project to meet its objectives. Any actions a project manager can take to address and remove the conditions or causes restricting the team's productivity helps the team and the project produce value.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Determine critical impediments, obstacles, and blockers for the team. (ECO 1.7.1)
- Prioritize critical impediments, obstacles, and blockers for the team. (ECO 1.7.2)
- Implement solutions to remove impediments, obstacles, and blockers for the team. (ECO 1.7.3)
- Re-assess continually to ensure impediments, obstacles, and blockers for the team are being addressed. (ECO 1.7.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Reprioritize backlog	Daily standup
Updated risk lists	Sprint reviews
Action plans	Risk reviews
Updated impediment task board	Backlog assessment

### Impediments, Obstacles, and Blockers

Projects can be blocked for many reasons. Project team members can encounter many obstacles that obstruct or slow down their efforts. The type of impediments vary greatly based on industry, stakeholders, the project and business environment, and the project itself.

An **impediment**\* is an obstacle that prevents the team from achieving its objectives. The terms can be synonymous, but generally speaking:

- Impediments reference situations, conditions, and actions that slow down or hinder progress. (For example, the team not coming to a decision on a file saving location.)
- Obstacles reference barriers that should be able to be moved, avoided, or overcome with some effort or strategy. (For example, the construction crew is unable to arrive at the work site before permits are signed.)
- Blockers reference events or conditions that cause stoppages in the work or any further advancement. (For example, the company has halted the use of any products in a certain firm until a new contract is signed.)

The number and weight of impediments may vary throughout a project. The variation may even fluctuate throughout the day. The team identifies the impediments and brings them to the attention of others on the team. The project manager assists in facilitating the evaluation of the impediments and how they could or could not impact the team's abilities to deliver value. Based on those

judgements, the team figures out how to address the impediments. Often, the resolution—or occasionally the research—is performed by the project manager to enable the team to focus on more meaningful, productive tasks.

Over time, the obstacles may become more or less cumbersome. The blockage may become unblocked. Due to the dynamic nature of projects, the impediments, obstacles, and blockers, as well as any effort undertaken by you and the team to address them, must be re-assessed continually throughout the project. This also includes recognizing new impediments, such as those that emerged because of the actions and efforts used to address other impediments.

Reference: Project Management Institute, *Agile Practice Guide*, Project Management Institute, Inc.

## Backlog Assessment

Impediments and obstacles may block work or planned efforts from moving forward. As a result, the product backlog, scheduled activities, and other lists of work items must be assessed in reference to the hindrances. Evaluating the impediments against the pending work forces the team and business stakeholders to assess the backlogged work in terms of value and priority. Backlog assessment and refinement can also explore alternatives to overcome or avoid the risk; or in some instances, remove the work item or blockage altogether.

## Daily Standup

One practice to assist with uncovering the impediments impacting the team in a timely manner is a Daily Standup meeting.

Also known as a Daily Scrum, the **Daily Standup** is a short, 15-minute meeting in which the complete team gets together for a quick status update while standing in a circle. Ideally, the standup meetings should be conducted at the start of working hours, and the presence of all team members involved in the Sprint is mandatory. During the meeting, these questions are answered:

- What has been done since the last meeting?
- What needs to be done before the next meeting?
- What does anyone need help with?

## Tracking Impediments

Project teams tracking impediments as they are raised, addressed, and resolved enables increased communication and proper oversight. There are various ways to track impediments.

Impediments task boards can be as simple as sticky notes denoting impediments, potential causes, responsibilities, and status posted on a whiteboard or wall near the project team's co-location to a sophisticated software capturing greater detail and communication features. In whatever format works best for the team, the board must convey the status and efforts associated with the identified impediments.

## Risk Reviews / Risk List

Impediments may be due to or as a result of project risks or issues. Risks that are raised during the daily standup meetings, iteration reviews, and other meetings, as well as everyday conversations, are added to the risk list. A rigorous review of project risks ensures that risks are identified and documented. Newly identified and existing risks on the project risk list must be updated based on the current knowledge and situation.



**Note:** Assessing and managing risks is discussed in more detail in the lesson titled "Doing the Work."

## Handling Impediments as Servant Leaders

Project managers serving as servant leaders aim to clear an unobstructed path for the project team so they may contribute and deliver. Project managers want to optimize the workplace to be free of obstacles and other impediments. This extends from the physical team space to shielding the team from non-value activities. Removing distraction, randomization, and other confusion enables the project team to be more effective and efficient. Project managers can take on most of the burden of addressing and removing impediments so the team can do their best work on the project to achieve its desired objectives.

## Guidelines for Working with External Stakeholders, Other Projects, and Work Demands

Impediments emerge from the internal project team, but also from external sources. Here are guidelines to work with external stakeholders.

- Discuss with the team to assess and evaluate the impediment.
- Review efforts previously attempted or considered.
- Discuss impact and solutions.
- Relay the impediment to the external source.
- Establish a single point of contact (SPOC) within the team, typically the project manager or person with the most subject matter knowledge. Shield the rest of the team as appropriate so they may focus on other work.
- Create action plan and schedule.
- Follow up and communicate per agreements.
- Document resolution and lessons learned for future reference.

## Guidelines to Prioritize Critical Impediments, Obstacles, and Blockers

Guidelines to prioritize impediments, obstacles, and blockers are as follows:

- Define the categories or levels of prioritization appropriate for your team, project, and/or organization. Redefine levels as needed.
- Anchor the priority levels with real examples.
- Clarify the new and still open impediments.
- Review the impact or potential impact to the team and to the project objectives.
- Assign a priority to each impediment as a team or a selected sub group based on connection to the impediment. Use any technique suitable for the team and allotted time, such as, but not limited to:
  - Fist to five—Participants give a priority level from 0 (fist) to 5 (full hand).
  - T-Shirt sizes—Participants repurpose the t-shirt sizing estimation to the priorities.
  - Unique naming—Team designs their own unique naming conventions for scale that works for their needs and associations.
  - Planning Poker—Participants repurpose the estimating technique for priorities.
- Communicate the priorities levels in an easily accessible area, such as a software tool, information radiator posted on a wall, or communal message board.
- Begin creating action plans for the highest priority impediments.
- Reassess continually to ensure impediments, obstacles, and blockers for the team are being addressed.

## ACTIVITY 4–4

### Addressing Impediments

#### Scenario

The project you are working on requires cross functional teams to work together to roll out a new system to be used organization wide. Most of these teams and departments have never worked together.

1. The Procurement department needs to acquire the equipment from a third party vendor but cannot finalize the details of the RFP until the Finance department releases the budget. The IT department cannot install and configure any of the equipment, causing them to be at a standstill in this project. The Education Services department continues to build training content although progress is slow because details on the process are constantly being updated. Based on the information provided, what would you consider as an impediment, obstacle, and blocker?
  
2. As project team members bring impediments to light, how can the efforts to overcome these impediments be tracked or monitored?
  
3. Minor impediments may interfere with or slow down day-to-day progress. Which tool or practice can be used to bring attention to those impediments on a regular basis?
  - Annual conferences
  - Daily standups
  - Kanban boards
  - Lessons learned

# TOPIC D

## Manage Conflict

Working as a team and with a variety of stakeholders, there are bound to be conflicts. Conflict in projects is inevitable. Conflict is natural. Conflict can be a positive benefit to the project and its outcomes, if managed and cultivated properly.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Interpret the source and stage of the conflict. (ECO 1.1.1)
- Analyze the context for the conflict. (ECO 1.1.2)
- Evaluate/recommend/reconcile and track effectiveness. (ECO 1.1.3)
- Identify the root cause of the misunderstanding. (ECO 1.10.1)
- Investigate potential misunderstandings. (ECO 1.10.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Updated working agreement	Conflict management theory
Updated RACI matrix	Change management theory
	Conflict management models
	Conflict resolution strategies
	Emotional Intelligence
	Active listening
	Empathy

### The Project Manager's Role

Managing conflict is a responsibility of all stakeholders. The direction and handling of conflict is heavily influenced by the project manager. Your interpersonal and team skills play a major role in assuring the results of positive aspects of conflict rather than the negative aspects. Skills such as empathy and emotional intelligence are primary examples.

In agile projects, the project manager may assist in facilitating conflict resolution sessions or the team is empowered to resolve conflicts as they best see fit. As a servant leader, a project manager can assist in the removal of impediments or sources of conflict to support the team's performance.

### Causes of Conflict

Conflict arises in most groups and working situations. Causes of conflict include:

- Competition.
- Differences in objectives, values, and perceptions.
- Disagreements about role requirements, work activities, and individual approaches.
- Communication breakdowns.

Project managers should be aware of certain characteristics of conflict that will help them effectively handle conflicts when they arise. Conflict is natural and forces the need for exploring alternatives. It is a team aspect, and openness about the situation or opinions can resolve conflicts. While resolving conflicts, focus should be on the issues and not on individuals—on the present situation and not on the past.



**Note:** While most people think of conflict in negative terms, there can be positive aspects of conflict such as forcing people to address an issue and breaking up "group think" to allow other ideas to bubble to the surface.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 348.

## Conflict Management

**Conflict management** is the application of one or more strategies for dealing with disagreements that may be detrimental to team performance. Effective conflict management can lead to improved understanding, performance, and productivity. Conversely, ineffective or nonexistent conflict management can lead to destructive behavior, animosity, poor performance, and reduced productivity—all of which threaten successful completion of the project's deliverables. There are certain conflict resolution methods, and the need to follow a particular method includes the intensity and importance of the conflict, the time given to resolve the conflict, the positions of the conflicting parties, and the motivation to resolve conflicts on a short-term or long-term basis.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 348-349.

## Change Management Theory

Any changes—whether small like a rescheduling change or large like a major organizational change—can cause conflict, and managing changes in projects and organizations may require different strategies depending on circumstances, people involved, timing, etc. You might find the organizational change management models, such as Lewin's McKinsey 7-S Model and Kotter's Theory, to be useful tools for handling organizational change.

It is just as important to have a robust theory and approach to change management when you are supporting the business goals and needs of the larger organization as it is within the other practice areas of professional project management. Embracing change as a strategy can help organizations balance investment and risk, become more flexible, and ensure that they reap the benefits of any project to ensure maximum return on investment (ROI). Thus, change management is an essential ingredient in using project management as the vehicle for delivering higher-level organizational strategy. Change management is an essential organizational capability and a significant professional practice in its own right. A more extended discussion can be found in the PMI® publication *Managing Change in Organizations: A Practice Guide* (©Project Management Institute, Inc., 2013).

## Conflict Management Approaches

According to the *PMBOK® Guide – Sixth Edition*, there are five basic approaches for handling conflicts; each is effective in different circumstances.

Approach	Description
Withdraw/Avoid	<ul style="list-style-type: none"> <li>• Retreating from an actual or potential conflict situation.</li> <li>• Postponing the issue to be better prepared or to be resolved by others.</li> </ul>

<b>Approach</b>	<b>Description</b>
Smooth/Accommodate	<ul style="list-style-type: none"> <li>Emphasizing areas of agreement rather than areas of difference.</li> <li>Conceding your position to the needs of others to maintain harmony and relationships.</li> </ul>
Compromise/Reconcile	<ul style="list-style-type: none"> <li>Searching for solutions that bring some degree of satisfaction to all parties.</li> <li>Temporarily or partially resolving the conflict through compromise.</li> </ul>
Force/Direct	<ul style="list-style-type: none"> <li>Pursuing your viewpoint at the expense of others.</li> <li>Offering only win/lose solutions, usually enforced through a power position to resolve an emergency.</li> </ul>
Collaborate/Problem Solve	<ul style="list-style-type: none"> <li>Incorporating multiple viewpoints and insight from differing perspectives.</li> <li>Enabling cooperative attitudes and open dialogue to reach consensus and commitment.</li> </ul>

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 349.



**Note:** For more information, check out the Spotlight on **Dealing with Difficult People** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Team Charter

One technique that supports a productive and collaborative project environment is documenting a **team charter**\*. A team charter is defined as a document that records the team values, agreements, and operating guidelines as well as establishing clear expectations regarding acceptable behavior by project team members.

Having a working agreement for the team that articulates what the team values, how the team works together, and how they make decisions enables the team to have ground rules and aid in collegial conflict resolution. The format and detail of a team charter varies based on the expectations and culture of the team.

In the context of managing conflict, it's important to update the working agreements like the team charter and other team documents to provide guidance for how the team should move forward.

## ACTIVITY 4–5

### Managing Conflict

#### Scenario

The new system upgrade project has been running smoothly, thanks in large part to the efforts of the transition manager, Sarah. She has been instrumental in getting all the teams working together to meet their tight deadlines. During a crucial phase in the project, Sarah falls ill. A less-experienced manager, Kevin, is brought in to replace her. Confusion increases. Team members are arguing about timing and expectations of the transition activities.

- 1. As the project manager, what can you do to mitigate the negative effects of a staffing change?**
  - Put the project on hold until Sarah returns from sick leave.
  - Rebuild the schedule to include additional time for Kevin to complete his tasks.
  - Closely monitor Kevin's work to assess any possible risk.
  - Require all decisions to go through you until Sarah returns.
- 2. What can be done to help the project team with the transition activities?**
- 3. You sit in a meeting being led by Kevin and team members working on the transition activities. The conversation gets passionate and intense about how to best implement a technical feature in which you have little knowledge or experience. What is your best option as project manager in this situation?**
  - Force Kevin to make a decision before the meeting is over.
  - Avoid involving yourself as a decision maker.
  - Halt the meeting and take control before things become more intense.
  - Side with your favorite, most trusted subject matter expert from the group to finalize a decision.
- 4. Which of the following is typically included in a team charter? (Choose three.)**
  - Team values
  - Team agreements
  - Team personality assessments
  - Team operating guidelines
  - Team motivation

# TOPIC E

## Collaborate with Stakeholders

Project success depends on engagement and appropriate collaboration of project stakeholders. The more collaboration and alignment, the better ability for the project to deliver value and progress towards those ends. Working collaboratively requires constant effort and balance. The tighter the collaboration, the more aligned and accurate the deliverables.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Evaluate engagement needs for stakeholders. (ECO 1.9.1)
- Optimize alignment between stakeholder needs, expectations, and project objectives. (ECO 1.9.2)
- Build trust and influence stakeholders to accomplish project objectives. (ECO 1.9.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Stakeholder Registers	No specific tools
Stakeholder Engagement Plan	

### Collaboration

Effective collaboration builds trust between all parties. The open dialogue and meaningful communication optimizes the understanding of the aims, as well as the expectations of the results and what needs to be done in order to realize those expectations. Everyone's involvement and engagement in the project may fluctuate or remain constant. That level of engagement is evaluated and reevaluated throughout the project.

Keeping discussions transparent ensures appropriate stakeholders are knowledgeable and expectations are set. Engagement also builds appreciation for others' needs and constraints. Communication skills, interpersonal skills, feedback, meeting management, among other management skills, are leveraged to maximize the feedback loop and engagement between stakeholders.

### Project Stakeholders

Stakeholders can be involved in various levels of a project and can have partial oversight of a project. Examples include customers, suppliers, product end users, the general public, sponsors, or the recipients of the project's deliverables. Stakeholders are those who may affect or be affected by a decision, activity, deliverable, or outcome of a project.

It is important to understand that project stakeholders are always emerging throughout a project's life cycle. As new requirements are added, as project constraints change, new stakeholders will emerge and it is your job to make sure that they are identified as early as possible.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 507-508



**Figure 4–6: Potential project stakeholders.**

## Stakeholder Identification

Stakeholders should be identified early in the project so that their needs and expectations can be met. They are also the people best able to help the project succeed, as they have a specific interest in the project objectives and its success. Identifying project stakeholders is performed regularly throughout the project lifecycle. This is done by analyzing and documenting relevant information regarding their interest, involvement, interdependencies, influence, and potential impact on project success.

Identifying and revising your assessment of the project stakeholders can be accomplished in a variety of ways. Here are a few tools and techniques that can be used.

Tools & Techniques	Description
Expert judgment	Expert judgment used to help identify stakeholders could be obtained from senior management, identified key stakeholders, project managers, SMEs, industry groups, consultants, and professional and technical associations.
Data gathering	Techniques that can be used to gather information about stakeholders might include: <ul style="list-style-type: none"> <li>• Questionnaires and surveys</li> <li>• Brainstorming as well as brain writing, which is a form of brainstorming that gives participants time to gather their thoughts before jumping into the group participation activity.</li> </ul>
Data analysis	As stated in the <i>PMBOK® Guide</i> , <b>stakeholder analysis</b> is a technique of systematically gathering and analyzing quantitative and qualitative information to determine whose interests should be taken into account throughout the project. <ul style="list-style-type: none"> <li>• Stakeholder analysis</li> <li>• Document analysis</li> </ul>

Tools & Techniques	Description
Data representation	<p>Stakeholder mapping/representation is a technique that can be used to categorize stakeholders based on factors such as their level of authority, interest, and influence on the project. Common methods might include:</p> <ul style="list-style-type: none"> <li>• Two-dimensional grids, or classification models, that enable you to group stakeholders based on two factors. Some grids might be: <ul style="list-style-type: none"> <li>• <b>Power/interest grid</b>: groups stakeholders on the basis of their levels of authority and interest in the project.</li> <li>• <b>Power/influence grid</b>: a classification model that groups stakeholders on the basis of their levels of authority and involvement in the project.</li> <li>• <b>Influence/impact grid</b>: a classification model that groups stakeholders on the basis of their involvement in and impact on the project.</li> </ul> </li> <li>• <b>Stakeholder cube</b>: A three-dimensional classification model that builds on the previous two-dimensional grids to group stakeholders.</li> <li>• <b>Directions of influence</b>: A classification model that groups stakeholders on the basis of how they influence the project: upwards (senior management), downwards (team or specialists), outwards (external), sideways (project manager's peers), and prioritization.</li> </ul>
Meetings	<p>As stated in the <i>PMBOK® Guide</i>, a meeting is a gathering of people for a business purpose.</p>

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 511-514.

## Stakeholder Register

Stakeholder involvement and management is often documented in a **stakeholder register\***. The stakeholder register is a project document including the identification, assessment, and classification of project stakeholders. Some registers might also include additional stakeholder information such as potential influence over the project or a specific phase of the project, and their classification based on stakeholder analysis completed during the identification process.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 514.

## STAKEHOLDER REGISTER

Name	Organization	Project Role	Major Requirements	Expectations	Influence	Areas of Interest	Internal/External	Supporter?
Linda Michaels	CEO	Sponsor	Budget, schedule, quality	Community involvement	Major	Community	Internal	Yes
Ron Gordon		Mortgage lenders		Growth	Major	Development	External	Yes
	Community		Neighborhood improvements		Minor	House	External	Yes
Andrews family		Homeowners		Engage family and friends				Yes
	Lumber warehouse	Vendor			Major	Locally sourced supplies		
		Project Manager		Project goes as planned	Major	All	Internal	Yes

**Figure 4-7: A sample stakeholder register.**

## Collaboration Activities

Stakeholders collaborate every day in a project. Some stakeholders may be engaged less frequently; for example, a Project Sponsor who gets updates monthly or a Product Owner who only engages with the development team three or four times during an iteration.

The frequency of engagement is based on mutual needs and expectations. Nearly constant engagement amongst the core project team is common. Encouraging that regular collaboration can be supported by daily stand up meetings and co-locating teams near each other for more face-to-face communications. More infrequent collaboration can be supported by scheduled sessions such as milestone reviews, backlog grooming sessions, and project update meetings. Determining and optimizing collaboration activities is an ongoing team effort spearheaded by the project manager.

## Guidelines for Facilitating a Meeting

Meetings are quintessential to almost every project. Guidelines for facilitating a meeting are as follows:

- Making certain that the meetings are appropriate to the stakeholder's engagement in the project. Appropriateness is determined by an array of variables, such as, but not limited to:
  - timing
  - context
  - stakeholders' experiences, knowledge, input
  - location
  - technology
  - urgency
- Set and distribute an agenda prior to the meeting start.
- Projects are managed with a sense of urgency. Meetings should support that sense of urgency by starting promptly.
- Review the agenda set prior to the meeting and make amends as stakeholders deem necessary.
- Allow others to speak and share as appropriate.
- Take notes or record the meeting, with permission.
- Keep the meeting discussions on topic. Save outside discussions for after the meeting or for another scheduled meeting with appropriate stakeholders.
- Recap the meeting and any action items to follow the meeting.
- Thank everyone for attending.
- Adjourn the meeting per the scheduled time or earlier.
- Distribute the meeting notes or recording as agreed.

## Stakeholder Engagement Plan

The **stakeholder engagement plan**\* is a component of the project management plan that identifies the strategies and actions required to promote productive involvement of stakeholders in project or program decision making and execution. Keeping stakeholders engaged is crucial to the success of your project. With their support, you can determine a project's requirements quicker and know that they are accurate.

Documenting a stakeholder engagement plan:

- Provides a clear, actionable plan that will be used when interacting with project stakeholders to support the project's interests.
- Documents how the project will interact with the identified project stakeholders for the life of the project.
- Identifies the management strategies required to effectively engage stakeholders.

Project managers should be aware of the sensitive nature of the stakeholder engagement plan and take appropriate precautions when distributing the plan to other team members.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 522.

In addition to the data gathered in the stakeholder register, the stakeholder engagement plan often provides additional stakeholder information such as:

- Desired and current engagement level of key stakeholders.
- Scope and impact of change to stakeholders.
- Identified interrelationships and potential overlap between stakeholders.
- Stakeholder communication requirements.
- Information to be distributed to stakeholders.
- Reason for the distribution of that information and the expected impact to stakeholder engagement.
- Time frame and frequency for the distribution of required information.
- Method for updating and refining the stakeholder engagement plan.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 518, 522.

## Guidelines to Develop a Stakeholder Engagement Plan

Guidelines to developing, executing, and validating a strategy for stakeholder engagement are as follows:

- Review the project management plan for information such as life cycle selected for the project, description of how work will be executed, description of how resource requirements will be met, how changes will be monitored and controlled, and the need and techniques for communication among stakeholders.
- Review the stakeholder register for information needed to plan appropriate ways to engage project stakeholders.
- Review the organizational culture, structure, and political climate to help in determining the best options to support a better adaptive process for engaging stakeholders.
- Review the lessons-learned database and historical information, as they provide insight on previous stakeholder engagement plans and their effectiveness.
- Use expert judgment to decide upon the level of engagement required at each stage of the project from each stakeholder.
- Hold meetings with experts and the project team to define the required engagement levels of all stakeholders.
- Use analytical techniques to classify the level of engagement for stakeholders.
- Document the stakeholder engagement plan.

## ACTIVITY 4–6

### Collaborating with Stakeholders

#### Scenario

You work for a small development company that builds homes for low-income families. The home-build program's purpose is to build a two- or three-bedroom home for each qualifying family. Under the sponsorship of Linda Michaels, your company is getting ready to build a new home for the Andrews family. The family has qualified for the home-build program and is the next family on the home list. You have been assigned to manage this project. Each new build project is named by the address and the next available lot is located at 234 West Adams Street.

The West Adams project has faced several challenges, including staffing changes and construction problems. Although you have consistently informed stakeholders of all changes by using the protocols outlined in the communications plan, several stakeholders have expressed concern that the project has gotten off track.

- 1. Stakeholders are worried about the current state of the project. How should you handle their concerns?**
  - Send an email justifying your position.
  - Take corrective action.
  - Conduct a face-to-face meeting with a clear agenda targeting their specific concerns.
  - Document lessons learned.
  
- 2. Two stakeholders are out of town on a business trip and are available sporadically. A third person has an extremely busy schedule and can't squeeze another lengthy meeting into his day. You believe it's important to have regular face-to-face interaction with each stakeholder. How can you accommodate their needs? (Choose two.)**
  - Use video conferencing.
  - Send a memo via email.
  - Use an instant messaging service.
  - Hold a brief summarization meeting.
  
- 3. During the face-to-face meeting with project stakeholders, you explain the need to remove an external resource from the project. It became necessary to add another internal resource to the team, which resulted in changes to the project cost baseline. While you are talking about this issue, you notice that one of the stakeholders continually looks down at the floor and rapidly taps her pen against the table. What does her behavior indicate? What might you do?**

**4. When are lessons learned sessions conducted?**

- At the end of a project
  - At the end of a phase
  - Throughout the project in both predictive, iterative, and agile life cycles
  - Throughout the project in only iterative life cycles
-

# TOPIC F

## Mentor Relevant Stakeholders

Project management is an art and a science. The discipline gets better with practice, learning, and experience. You learn from others every day. You are learning from this course. Likewise, there are plenty of opportunities for you to share your knowledge and experience with others.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Allocate the time for ongoing mentoring. (ECO 1.13.1)
- Recognize and act on mentoring opportunities. (ECO 1.13.2)
- Determine appropriate feedback for effectiveness. (ECO 1.3.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<i>Deliverables</i>	<i>Tools</i>
Training and mentoring plan	Group coaching
Effective assessment	Teaching and training
Training schedule	Facilitation
	Transformation skills

### Coaching and Mentoring

Beyond simply paying it forward, coaching and mentoring others helps them become more proficient team members. More proficient team members makes for a more proficient team. Raising the abilities of the team increases their output and their value. That increased knowledge spreads throughout the organization and across the discipline. Project management is constantly growing and refining the best practices that make us all successful. Increasing the knowledge base and the skill sets of all project stakeholders sets up for more successful and effectively managed projects. That cascading effect is a benefit to all – directly or indirectly.

To contribute to the benefit of better project management knowledge and practice, you must guide, coach, share, and mentor others whenever possible or appropriate. Time and resources are limited, therefore you must make sacrifices on how much and how to mentor others. At a core, you mentor relevant stakeholders associated with your projects and expand from there as you can. Even the little things you do every day can make positive improvements to an individual's action and to the practice as a whole.

### Transformation Skills

The project organization, the business, and the world are constantly changing and evolving. Supporting the transformation that project stakeholders must undergo as they progress from one way of doing things or understanding to another level requires patience and compassionate mentoring. This is most noticeable in teams that are transforming from one project management approach to another. Remember, the skill set you and your project team hold, or utilize, today may be obsolete or limited tomorrow, especially in a digital world.

As listed in the *PMBOK® Guide – Sixth Edition*, common leadership styles that project managers can adopt include transformational, charismatic, transactional, interactional, laissez-faire, and servant

leader. Through the application of these leadership styles, project managers can mentor relevant stakeholders using effective communication tools and techniques. A mentor needs to set aside time to communicate to those they are mentoring during the project and beyond. A leader will recognize and act on opportunities to coach a team member with discretion to build trust.

## Determining Relevant Stakeholders

Determining who is a relevant project stakeholder to mentor varies from project to project and possibly within a project. Information, lessons, and best practices can be shared in many situations. What is determined is who can benefit from mentoring activities relevant to the process, task, or circumstance. For instance:

- When refining the backlog, mentoring the product owner on grooming best practices.
- When onboarding a new project team member, guiding her on the processes used by the team.
- When a team member must purchase material for the project, showing them the procurement best practices and process for the organization.

## Individual Mentoring and Coaching

Mentoring and coaching relevant stakeholders can come in many forms. The expansive range of project management knowledge – in academic, explicit form and in experience based tacit form – can be passed onto others in various modes.

<b>Process or Task One-on-One Mentoring</b>	<b><i>Sharing explicit knowledge with an individual while performing a task</i></b>
Encouraging others to take the lead on activities	Encouraging self-organization and initiative
Facilitating meetings and sessions	Facilitating opportunities for others to practice project management tasks
Practice taking on new roles	Coaching individuals on how to contribute in other project roles
Informal opportunities	Coaching an individual with tacit knowledge
Formal opportunities	Leading formal training sessions
Transferring skills	Passing on and practicing skills
Modeling behaviors	Demonstrating desired skills and best practices every day
Teammates assisting each other	Self-organizing teams coach and mentor each other every day in their work

## Mentoring and Coaching as a Group

Mentoring and coaching also occurs in whole team settings. When project managers are demonstrating the best means to complete a project management task, all involved in the activity are learning. Project managers can call out and explain what is happening and why. Others in the group can contribute and guide the practice. The entire team learns and grows as a unit. All on the team are relevant stakeholders.

## Training and Sharing Plans

When there is a project environment that encourages and values learning and knowledge sharing, all stakeholders gain. Setting aside time for sharing and learning can increase the opportunities to capitalize on mentoring.

Formal or informal plans can be established for training and sharing. Set times during meetings – such as at the end of a status meeting or project review session – can be ideal times to share what has been learned. Retrospectives and lessons learned sessions can be leveraged to call out successes and failures in the management and operation of the project. In projects where the emphasis is on self-organizing and supportive teams, a few minutes every day can be set aside for mentoring and coaching.

Scheduling training sessions formalizes the mentoring and coaching. These sessions can be facilitated by anyone. You, as project manager, can train others on the project management best practices. A process owner can guide others on the best practices for that process.

## Facilitation

Project managers generally take the lead when it comes to facilitating project management activities. Modeling good project facilitation skills is observed and internalized by all. Encouraging participation from stakeholders in the activities builds their knowledge and comprehension. Guiding and offering advice provides relevant feedback and confidence in what they are doing. Increasing the abilities of all project stakeholders increases the shared understanding and efficiency of project tasks and practices. When all contribute, all gain.

## ACTIVITY 4-7

### Mentoring Stakeholders

#### Scenario

As a project manager who has worked for the company for a long time, you are often asked to lead sharing sessions and document some of the best practices in the PMO's knowledge management system. However, this year you learn that your department is transitioning to an agile based project management organization.

1. As a veteran project manager, what are some ways you can mentor junior project managers?
  
  2. Now that your organization is transitioning to agile based project management, how can you be mentored and supported during this transformation?
-

# TOPIC G

## Apply Emotional Intelligence to Promote Team Performance

To get anything accomplished in a project, you need people. Every person is different. People act differently in different settings and times. Being able to read, interact, and sense what people are thinking, feeling, and projecting are powerful aspects of working with people. These people also must work with you. So understanding how others read you is equally important to how you read them. In this topic, you will appreciate the vast aspects that play into promoting team performance via emotional intelligence and related interpersonal skills.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Support and recognize team member growth and development. (ECO 1.3.2)
- Assess behavior through the use of personality indicators. (ECO 1.14.1)
- Analyze personality indicators and adjust to needs of key stakeholders. (ECO 1.14.2)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Personality Profile Assessments	Emotional Intelligence
Communications plans	Empathy
Motivation triggers	Listening skills
Performance reports	Transparency
Risk lists	Problem solving
	Motivational models

### Emotional Intelligence

An important interpersonal skill of all project managers is Emotional Intelligence (EI). EI helps you understand your emotions and those of others to help minimize conflict. The notion of EI evolved in the 1990s and is now recognized as a key set of personal and interpersonal skills. The personal side includes self-awareness, self-regulation, and motivation, whereas the interpersonal side comprises social skills and empathy.

- Self-awareness measures how well you know your own emotions in a variety of situations.
- Self-regulation defines how well you can control those emotions.
- Motivation describes your intrinsic reasons for achievement.
- Social skills address how well you build relationships and rapport with others.
- Empathy is how well you read and understand the emotions of others.

Being able to read the emotions and feelings of others, as well as recognizing how your emotions and behaviors positively or negatively affect others, is crucial for effective management and team performance. The following sections describe the elements of the five EI skills.



**Note:** For more information, check out the Spotlight on **Using Social Skills to Build Relationships** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Self-Awareness Elements

Each emotional intelligence skill is made up of, or influenced by, a number of components. Self-awareness elements include the following.

<b>Element</b>	<b>Description</b>
Emotional awareness	<ul style="list-style-type: none"> <li>Knowing which emotions you're feeling and the root cause, or causes, of those feelings.</li> <li>Being aware of the connections between your feelings, thoughts, and behavior.</li> <li>Recognizing how your emotions affect your performance.</li> <li>Being conscious of, and living by, your guiding values and goals.</li> </ul>
Accurate self-assessment	<ul style="list-style-type: none"> <li>Perceiving your strengths and weaknesses.</li> <li>Becoming aware of your blind spots.</li> <li>Knowing which scenarios trigger your emotional reactions.</li> </ul>
Self-confidence	<ul style="list-style-type: none"> <li>Expressing opinions that may not be popular.</li> <li>Willing to take risks for what you believe is right.</li> <li>Displaying poise, self-assurance, and charisma.</li> <li>Having a firm knowledge of your self-esteem and proficiencies.</li> <li>Being decisive, even when facing opposition and resistance.</li> </ul>

## Self-Regulation Elements

Being aware of your feelings and what causes them provides a foundation that enables you to manage and channel your emotions in constructive, positive ways—to practice behavior that will strengthen your relationship with your associates and your company. Here are self-regulation elements.

<b>Element</b>	<b>Description</b>
Self-control	<ul style="list-style-type: none"> <li>Remaining cool, calm, and even-tempered under pressure.</li> <li>Staying focused and quick-witted in a stressful environment.</li> <li>Effectively controlling your rash and destructive emotions.</li> </ul>
Trustworthiness	<ul style="list-style-type: none"> <li>Acknowledging your own errors, and challenging immoral conduct in others.</li> <li>Establishing confidence through your reputation for honesty and credibility.</li> <li>Standing by your principles, even if others don't share your beliefs.</li> <li>Behaving in a morally correct way, above suspicion.</li> </ul>
Conscientiousness	<ul style="list-style-type: none"> <li>Having a well-ordered, meticulous approach to work.</li> <li>Being accountable for fulfilling your goals.</li> <li>Satisfying obligations and delivering on promises.</li> </ul>
Adaptability	<ul style="list-style-type: none"> <li>Adjusting your strategies and responses to adapt to changing events.</li> <li>Interpreting events in a flexible way.</li> <li>Easily handling numerous demands and changing priorities.</li> </ul>

<b>Element</b>	<b>Description</b>
Innovation	<ul style="list-style-type: none"> <li>• Producing fresh ideas.</li> <li>• Considering innovative answers to problems.</li> <li>• Embracing new approaches and possibilities in their logic.</li> <li>• Looking for novel ideas from a wide range of sources.</li> </ul>

## Motivation Elements

Motivation is the third EI skill associated with your personal, internal abilities. It's about raising your ambition to attain peak performance.

<b>Element</b>	<b>Description</b>
Achievement drive	<ul style="list-style-type: none"> <li>• Setting tough goals and taking chances.</li> <li>• Driving hard to get results and satisfy, or exceed, aspirations and ideals.</li> <li>• Discovering how to upgrade your capabilities.</li> <li>• Striving to minimize uncertainty and discovering ways to improve.</li> </ul>
Commitment	<ul style="list-style-type: none"> <li>• Relying on your team's core principles to make decisions.</li> <li>• Realizing a benefit in a comprehensive quest.</li> <li>• Gladly sacrificing to fulfill a substantial company goal.</li> <li>• Enthusiastically searching for opportunities to help achieve the team's mission.</li> </ul>
Initiative	<ul style="list-style-type: none"> <li>• Working toward goals beyond what's essential or anticipated.</li> <li>• Inspiring others through extraordinary, resourceful feats.</li> <li>• Cutting through official rules and processes, when required, to finish the job.</li> <li>• Being prepared to grab opportunities.</li> </ul>
Optimism	<ul style="list-style-type: none"> <li>• Hoping to succeed instead of fearing failure.</li> <li>• Seeing reversals as caused by controllable factors instead of a personal defect.</li> <li>• Steadily working toward goals regardless of barriers and glitches.</li> </ul>

## Empathy Elements

Empathy is a critical emotional intelligence skill that profoundly affects your ability to relate to, and establish a rapport with, others.

<b>Element</b>	<b>Description</b>
Understanding others	<ul style="list-style-type: none"> <li>• Being of service to others based on their particular needs and emotions.</li> <li>• Readily observing emotional cues and listening carefully.</li> <li>• Displaying tact and appreciating, or sharing, others' points of view.</li> </ul>
Service orientation	<ul style="list-style-type: none"> <li>• Happily providing proper help.</li> <li>• Understanding a customer's point of view; serving as a faithful guide.</li> <li>• Looking for strategies to increase consumers' contentment and loyalty.</li> <li>• Recognizing consumers' needs and matching them to products or services.</li> </ul>

<b>Element</b>	<b>Description</b>
Developing others	<ul style="list-style-type: none"> <li>Recognizing and rewarding your associates' talents and achievements.</li> <li>Providing helpful criticism and determining people's development needs.</li> <li>Coaching and mentoring, when appropriate, and providing tasks that stretch and nurture a person's abilities.</li> </ul>
Leveraging diversity	<ul style="list-style-type: none"> <li>Appreciating various life philosophies, and being conscious of group contrasts.</li> <li>Viewing variety as favorable circumstances, establishing conditions where different types of groups can thrive.</li> <li>Showing consideration for and connecting with people from diverse groups.</li> <li>Objecting to discrimination and bigotry.</li> </ul>
Political awareness	<ul style="list-style-type: none"> <li>Understanding the political truths and realities of companies.</li> <li>Grasping the influences that determine opinions and behaviors of clients, consumers, or rivals.</li> <li>Recognizing critical social systems.</li> <li>Correctly interpreting crucial power connections.</li> </ul>

## Social Skills Elements

Social skills draw on the other four emotional intelligence skill sets to build strong relationships with people and effect change in the organization.

<b>Element</b>	<b>Description</b>
Communication	<ul style="list-style-type: none"> <li>Managing tough problems directly.</li> <li>Effectively exchanging information, and adjusting your message based on emotional cues you're perceiving.</li> <li>Cultivating clear communication and being open to both unfavorable and positive news.</li> <li>Achieving a mutual awareness by listening carefully and sharing information without reservation.</li> </ul>
Building bonds	<ul style="list-style-type: none"> <li>Building and maintaining friendly connections with colleagues.</li> <li>Establishing and maintaining large, casual networks.</li> <li>Keeping others informed.</li> <li>Searching for mutually rewarding relationships.</li> </ul>
Collaboration and cooperation	<ul style="list-style-type: none"> <li>Fostering an amiable, collaborative environment.</li> <li>Recognizing and cultivating options for cooperation.</li> <li>Balancing job duties and professional relationships.</li> <li>Working together and sharing strategies, knowledge, and assets.</li> </ul>
Change catalyst	<ul style="list-style-type: none"> <li>Challenging the current situation to appeal to the need for change.</li> <li>Advocating for change and recruiting others to strive for the transformation.</li> <li>Appreciating the importance of change and doing away with obstacles.</li> <li>Exhibiting the change anticipated of others.</li> </ul>

<b>Element</b>	<b>Description</b>
Conflict management	<ul style="list-style-type: none"> <li>Detecting possible clashes, moving disputes into the open, and helping to reduce them.</li> <li>Managing difficult individuals and stressful scenarios with finesse and sensitivity.</li> <li>Urging open discussion of issues.</li> <li>Engineering a resolution that is advantageous to both sides.</li> </ul>
Influence	<ul style="list-style-type: none"> <li>Appealing to listeners by polishing presentations.</li> <li>Winning people over skillfully.</li> <li>Coordinating impressive events to convincingly sell an idea.</li> <li>Building solidarity and approval through intricate strategies.</li> </ul>
Leadership	<ul style="list-style-type: none"> <li>Expressing and stimulating interest for a collective vision and goal.</li> <li>Modeling effective leadership.</li> <li>Taking on a leadership role based on necessity, regardless of official title.</li> <li>Directing others' performance while maintaining their accountability.</li> </ul>
Team capabilities	<ul style="list-style-type: none"> <li>Building team character, camaraderie, and dedication.</li> <li>Attracting group members into committed and passionate involvement.</li> <li>Displaying team characteristics such as civility, supportiveness, and collaboration.</li> <li>Safeguarding the team and its good name.</li> </ul>

## Interpersonal and Team Skills

The following table describes some of the interpersonal skills that can be helpful in keeping a project team on track.

<b>Item</b>	<b>Description</b>
<i>Active listening</i>	A communication technique that involves acknowledging what you hear, and clarifying the message to confirm that what you heard matches the message that the sender intended.
<i>Communication styles assessment*</i>	A technique to identify the preferred communication method, format, and content for stakeholders for planned communication activities. This is a useful technique when stakeholders are less than supportive and you need to ensure that they are engaged.
<i>Emotional intelligence (EI)*</i>	The ability to identify, assess, and manage the personal emotions of oneself and other people, as well as the collective emotions of groups of people.
<i>Influencing</i>	The ability to influence people can be a powerful tool when managing a team. Influencing can result in positive outcomes when resolving an issue because you can state a good case and explain why an idea, decision, or problem should be handled a certain way without resistance from other individuals.

<b>Item</b>	<b>Description</b>
<b>Motivation</b>	Motivation skills are key in any management role. Motivation is what keeps people involved and wanting to complete excellent work on time. Every team member will be driven by different factors such as job satisfaction, achievement and recognition in the workplace, the room to grow, and finally, financial compensation. Understanding how these factors can play into a team member's motivation will help you provide the support they need while completing project work.
<b>Nominal group technique*</b>	A technique that enhances brainstorming with a voting process used to rank the most useful ideas for further brainstorming or for prioritization.
<b>Political awareness</b>	The ability to recognize the power structure internal to the organization, and the ability to navigate the relationships.
Transparency	Project managers earn and sustain trust and confidence from stakeholders by acting in good faith in an open fashion; not withholding or aiming to hide or shield information, errors, praise, or any other aspect of the project.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 80

## Active Listening

Active listening is a communication technique that involves acknowledging what you hear and clarifying the message to confirm that what you heard matches the message that the sender intended. There are different aspects to active listening that will help you communicate more effectively with your stakeholders.

- **Reflecting:** Most people are aware of the reflecting aspects of active listening, which includes repeating the gist of a message to clarify you understood it correctly.
- **Attending:** To show that you are paying attention to the speaker, you can lean slightly toward them, stay at the same eye-level, and maintain eye contact without staring.
- **Following:** To demonstrate your understanding of the conversation, you can respond with a non-verbal gesture such as nodding your head, or a verbal word or phrase, such as "yes," or "um-hmm." You can also ask occasional open questions or provide silent pauses so the speaker can collect their thoughts.

## Personality Profile Assessments

If time and resources are available for your team to leverage formal personality assessments, you could assess the personalities of your team via scientific and propriety assessments. Many assessments are commercially available, such as the Myer-Briggs Type Indicator (MBTI) and the Winslow Personality Profile. These assessments can help gauge and present a personality profile of each individual. The results can also suggest ways to communicate and work with the personality types to best suit the desires and styles of all involved.

Although each person is unique, studies throughout the past century have shown that people can be grouped into what are referred to as communication and/or personality styles. Some of the available communication and personality style assessments are described in the following table.

<b>Assessment</b>	<b>Description</b>	<b>Developed by</b>
Theory of Psychological Types	Carl Jung is generally credited as the "father" of these style-typing methods, and his theory categorizes people as either introverts or extroverts. Jung theorizes that people experience the world using four principal psychological functions: Intuition, Thinking, Sensation, and Feeling, and one of these functions is dominant for each person.	Carl Jung
Myers-Briggs Type Indicator (MBTI)	This self-assessment helps people understand the psychological types developed by Jung. Based on their answers to the personality test, a person can identify which of the 16 possible types is their dominant type.	Katharine Cook Briggs and Isabel Briggs Meyers
DiSC Model	This behavior assessment tool can help people understand themselves and others by identifying four behavioral types: Dominant, Inspiring, Supportive, and Cautious.	Walter Vernon Clarke
True Colors Methodology	This personality assessment contains four major personality types. Each type has a color name and is described with three words. Orange is energetic, spontaneous, and charming. Gold is punctual, organized, and precise. Green is analytical, intuitive, and visionary. Blue is empathetic, compassionate, and cooperative.	Don Lowry
Social Style Model	This assessment model contains four styles: Driving, Expressive, Amiable, and Analytical. By observing people, you can identify which style a person seems to prefer when communicating and interacting with others. Once you know which social style a person prefers, you can modify your behavior to foster successful communications and interactions.	TRACOM Group
Whole Brain Thinking	This model categorizes the way people think into four styles: Analytical, Experimental, Structural, and Relational. The theory is that understanding thinking leads to business-level success.	Ned Herrmann

While you are not expected to become an expert in each of these methods, it is important to understand the basic premise behind all of them, which is that up to 75% of the people you communicate with regularly will have different styles than you do. You will have to learn to judge their styles, formally or informally, and flex your communications to be compatible with their styles.

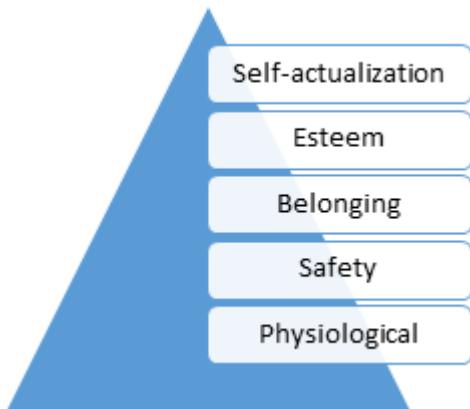
## Organizational Theory

**Organizational theory** is the study of how people, teams, and organizations behave. It is used to look for common themes for the purpose of maximizing efficiency and productivity, problem solving, motivating people, and meeting the stakeholder requirements of a project.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 318.

### Common Organizational Theorists

**Maslow's Hierarchy of Needs** is a popular theory that places the needs of an individual in a pyramid or triangle. The theory states that a lower-level need must be satisfied before a higher-level one can be addressed.



**Figure 4–8: Maslow's Hierarchy of Needs.**

**McGregor's Theory X and Theory Y** apply to the management of labor. Theory X states that people generally do not like to work, and are not motivated to work. Management feels the need to supervise labor to maintain productivity. Theory Y is essentially the opposite: people want to work and enjoy it, and management does not need to "hover" and constantly supervise. Sometimes, Theory X is called the "old-school" approach, and Theory Y is a more modern approach.

**McClelland's Achievement Theory** has three components: achievement, power, and affiliation. Achievement relates to success, power to influence other people, and affiliation to belonging to a team.

**Herzberg's Motivation Theory** says that success in the workplace is based upon two elements. Hygiene factors relate to working conditions, a stable job, and good relationships with management and co-workers. Motivating factors relate to feelings of achievement, recognition, and career advancement. Herzberg said that people are not generally motivated by money.

## Guidelines for Building Emotional Intelligence with Key Stakeholders

Here is a guideline to build your emotional intelligence with key stakeholders:

- Recognize your own emotions and behaviors.
- Assess how your emotions, attitudes, actions, behaviors control you.
- Observe how your emotions affect those around you.
- Take note of physical nonverbal cues of others, such as a shrug or smile.
- Interpret those cues against the context, situation, and your emotions.
- Remain mindful of the emotions of others.
- Mirror the behaviors of others when suitable to become better connected.
- Practice controlling or changing your emotions to better suit the situation.

## ACTIVITY 4-8

### Applying Emotional Intelligence

#### Scenario

A leading customer support firm has commissioned a project to increase the effectiveness of their customer support team members. Based on the last three months of customer surveys, the average satisfaction rate has continuously averaged below company targets. The project sponsor is stressing that the project's mission is to increase that customer satisfaction metric and overall employee satisfaction and retention.

1. During requirement gathering interviews with customer support team members, there is a common thread that managers do not listen to them, value them, or empathize with challenges they face. How would emotional intelligence training help in this situation based on these findings?
  
2. A project team is put together to implement some solutions to improve the customer satisfaction metrics. There are many ideas and perspectives shared by your project team. There is skepticism amongst the project team that you are considering the various options and are bent on pushing forward your own pre-determined solutions. How can you change that false perspective?
  
3. Work with one or more fellow learners to practice expressing some ideas for what could be done in this project.
  - a) Pay close attention to your active listening skills.
  - b) Try some active listening skills or techniques that you have not used before or want to practice.
  
4. Which aspects of active listening were demonstrated during this exercise and what were the results of this activity?

## Summary

In this lesson, you addressed the variety of tools that are available to monitor a team's performance, investigate the source or cause of issues and conflicts, and finally motivate them to meet the project's objectives. Through collaboration between the project team and stakeholders, you are able to help keep the team moving forward and on track.

The learning goals for this lesson were:

- Inspire, motivate, and influence team members and stakeholders.
- Appraise team performance against key performance indicators.
- Determine, prioritize, and remove impediments, obstacles, and blockers for the team.
- Investigate and interpret the source and stage of a conflict and recommend an appropriate conflict resolution solution.
- Evaluate stakeholder engagement needs and influence stakeholders to accomplish project objectives.
- Recognize mentoring opportunities and mentor relevant stakeholders.
- Promote team performance through the application of emotional intelligence.

**What aspects of managing the project team have you found to be the most challenging? Why?**

**What types of experiences have you had with project stakeholders? And, how did the stakeholders impact the project?**



**Note:** Check your CHOICE Course screen for opportunities to interact with your classmates, peers, and the larger CHOICE online community about the topics covered in this course or other topics you are interested in. From the Course screen you can also access available resources for a more continuous learning experience.



# 5

# Keeping the Business in Mind

**Lesson Time: 3 hours 30 minutes**

## Lesson Introduction

Projects don't exist in a vacuum. Internal and external business environments can influence and affect the work of a project. As the project manager, you need to manage compliance requirements and ensure that the project is delivering benefits and value. Keeping a handle on the changes in both the internal and external business environments are the project manager's responsibility. Employing a continuous process improvement plan will ensure that the project's success can be consistently repeated within your organization. In this lesson, you will keep the business in mind during the life of the project.

This lesson addresses tasks from the Business Environment domain of the PMP® Exam Content Outline (ECO).

## Lesson Objectives

In this lesson, you will:

- Determine necessary approach and action to address compliance needs. (ECO Task 3.1)
- Evaluate delivery options to achieve benefits and value. (ECO Tasks 1.10, 3.2, 3.4)
- Continually review internal and external business environment for impacts on project scope/backlog. (ECO Task 3.3)
- Evaluate the impact of the project to the organization and determine required actions. (ECO Task 3.4)
- Assess the existing continuous improvement framework and execute continuous improvement steps.

# TOPIC A

## Manage Compliance Requirements

As part of managing a project, it will be necessary to maintain visibility into compliance requirements and to ensure that they are effectively managed throughout the project. In this lesson, you will determine the necessary approach and actions to address compliance needs.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Confirm project compliance requirements. (ECO 3.1.1)
- Classify compliance categories. (ECO 3.1.2)
- Determine potential threats to compliance. (ECO 3.1.3)
- Use methods to support compliance. (ECO 3.1.4)
- Analyze the consequences of noncompliance. (ECO 3.1.5)
- Determine necessary actions to address compliance needs. (ECO 3.1.6)
- Measure the extent to which the project is in compliance. (ECO 3.1.7)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Risk Register	Risk Register
Configuration Management System	Risk Response Plan
Execution reports	Variance analysis
Nonfunctional requirements	Configuration Management System
Signoffs / Approvals	Tolerances
QA Outputs	Escalation procedures
Quality Management Plan	Audits
	Sampling
	QA tools

### Compliance Requirements

Most projects have aspects of their solutions that are subject to legal or regulatory constraints, and as such the requirements for compliance must be identified, tracked, and managed throughout the project. These can include requirements for specific practices, privacy laws, handling of sensitive information, and many other areas.

### Risk Register

During the project you have tracked and managed risks using a [risk register](#)\*. Some of the risks that need to be tracked relate to compliance with legal and regulatory requirements, and should include:

- The identified risk
- Risk owner

- Impact if the risk is realized
- Risk responses (potentially including avoidance, transfer, mitigations, and acceptance of residual risk)

Suitable testing and validation plans should be created to ensure that the project's deliverables meet compliance requirements. As the project's deliverables are created, compliance validation should be assured. While many projects perform a summary check of compliance at the end of the project, it is recommended not to wait until then as any disparities identified may cause project time and cost overruns. Where possible, legal and regulatory compliance for all deliverables should be validated on an ongoing basis throughout the project.

## Configuration Management System

All of the project's deliverable components should be tracked in a configuration management system, which describes the deliverable, defined key attributes of the deliverable, and allows for tracking, versioning, and control. This configuration information should be handed over along with project deliverables and will continue to be tracked in the customer's configuration management system. One of the key attributes you will want to track is compliance information, including proof of validation for each deliverable that it meets the identified compliance requirements.

## Risk Responses

After risks and their potential impacts have been identified, the project manager along with other stakeholders needs to determine an appropriate response. Risk responses may be determined in a number of ways, but often can be grouped as follows:

- **Avoidance**—The customer determines that the level of risk associated with the deliverable is too high relative to the level of value it will deliver, so chooses to scope it out.
- **Transfer/Sharing**—If the risk is a financial risk, the customer can consider buying a bond or insurance from a third party that will assume the financial risk. Alternatively, some of the financial risk may be shared among stakeholders.
- **Mitigation**—Responses can be taken to reduce its likelihood, reduce the impact it would have if the risk were realized, or to reduce a potential vulnerability. If the risk is a positive risk, we can also take actions to potentially improve our likelihood of realizing the positive risk and gaining the benefits from it.
- **Acceptance**—Once the risk responses have been implemented, the remaining risk is called residual risk. This risk is what is accepted and managed. Ongoing actions should be taken to continue to manage these risks and identify additional responses as needed.



**Note:** Risks and risk responses are covered in detail in the "Assess and Manage Risks" topic in the "Doing the Work" lesson.

## Compliance Categories Classification

Relative to the legal and regulatory constraints a particular organization or solution must meet, different compliance categories may be appropriate. There are many different types of compliance categories that may be necessary based on a particular industry and solution scope. Some of the areas may include:

- Environmental Risk
- Workplace Health and Safety
- Corrupt Practices
- Social Responsibility
- Quality
- Process Risks

The appropriate categories for your project could be different based on your unique legal and regulatory exposure.

## Execution Reports

Project managers regularly provide an execution report related to project activities, deliverable status, and overall progress. Included in your execution report should be the status of risks and risk management, including compliance-related risks and actions taken to manage the risks. These might include testing and validation activities, audits, or other actions to verify deliverable compliance with any legal or regulatory constraints.

## Variance Analysis

Along with reporting on execution, project managers will regularly report on any project variances, along with actions taken to control the project and keep things on track. Variances related to compliance are critical as they could potentially impact the usability of the project's deliverables. The variance analysis should detail the variance identified, plans for bringing the project or deliverable back into compliance, along with any proposed changes required in order to meet compliance requirements.

## Potential Threats to Compliance

There are many potential threats to compliance. These might include:

- Identification of new vulnerabilities.
- Changes in legal or regulatory requirements.
- Errors in testing and validation to confirm compliance.
- Errors or bugs in deliverables.
- Lack of awareness of compliance requirements.

Successful project managers need to ensure that compliance requirements for the project are continually identified, communicated, and managed, and that as changes to compliance requirements are identified, impact is assessed and the project planning is updated to reflect the changes.

## Nonfunctional Requirements

Business solutions tend to focus on the functional requirements; what people need to be able to do to carry out work using the project deliverables. However, there are other considerations as well. Nonfunctional requirements are used to help stipulate the level of service warranty of the deliverables; in other words, can you count on this product or service to be usable. There are many types of nonfunctional requirements; some of these may include:

- **Availability**—How and when is the service available? If the service were to become unavailable, how quickly can it be restored to working?
- **Capacity**—What level of service performance, speed, and throughput is required? Given the number of stakeholders using the service, is there enough supply to meet demand?
- **Continuity**—If there were a disaster of some kind, how quickly could the service be recovered to support operations?
- **Security**—How well is the service and its information protected from security risks and threats, and how do you guarantee the confidentiality, integrity, and availability of the information?

The project manager may find certain compliance requirements are documented as nonfunctional, and thus need to be tracked and managed to ensure that the solution provides not only the expected functionality but also the needed level of warranty.

## Sign-offs and Approvals

For each of the compliance requirements, the necessary stakeholders must be identified to sign-off and approve that the solution, and the different deliverables within it, meet the compliance requirements. This may be a very long list, depending on the type of project and the scope of approvals and sign-offs required.

While many of these approvals may not be possible until shortly before project completion, many others may be subject to testing and validation on an ongoing basis during the project. This can be very helpful as it will provide you with an early warning of potential threats to compliance, allow you to capture the variances, and determine an appropriate course of action to remediate the issue before it impacts the project timeline, causes cost overruns, or creates large project risks.

## Tolerances

**Tolerance\*** is defined as the quantified description of acceptable variation for a quality requirement. When establishing controls for a project, it is often helpful to provide tolerance levels for the project manager to effectively manage certain issues and control the project without having to escalate every issue to the project board for review and approval.

Areas of tolerance might include budget, time, quality, and nonfunctional requirements. For example, you as the project manager can control issues with a budget or time variance of less than 5%, and then be required to escalate any variances that exceed that threshold.

## Guidelines to Analyze the Consequences of Noncompliance



**Note:** All of the Guidelines for this lesson are available as checklists from the **Checklist** tile on the CHOICE Course screen.

During the project, the project manager needs to identify and manage legal, regulatory, and other compliance requirements. Guidelines for analysis include:

- Define the legal, regulatory, and other constraints, and define the business rules based on compliance requirements that will constrain the project solution and improve the likelihood of maintaining compliance.
- Define parts of the potential solution subject to compliance requirements, the scope of the compliance requirement, and the stakeholders responsible for reviewing, approving, and signing-off on compliance of the component.
- Track and manage the review and approval activities related to compliance requirements.
- Track and manage the risks and risk responses related to compliance requirements.

## Quality Assurance Outputs

As the project team produces deliverables, quality assurance (QA) will review the deliverable, verify that it meets both functional and nonfunctional requirements, and often identify and suggest potential improvements. QA will validate whether the deliverables align with compliance requirements, and provide feedback on any variances identified and potential approaches to cure any defects or other noncompliance.

As the project continues, the project manager will want to monitor the QA reporting and recommendations, and coordinate with the project team to address defects or manage any identified noncompliance issues.

## Escalation Procedures

When a noncompliance issue is identified, the next step is to determine whether it is within the tolerance level of the project manager. If it's within permitted tolerances, the project manager can work directly with the team to propose changes to resolve the variance. If the noncompliance issue exceeds the tolerance allocated to the project manager, the issue must be escalated for adjudication.

For any particular compliance requirement, you should identify the stakeholders who will review the noncompliance issue and adjudicate how the team should proceed. Given the need for timely feedback and the desire to cure the noncompliance as quickly and cost-effectively as possible, the procedures for such an escalation should be defined during project and risk planning.

## Quality Management Plan

The Quality Management Plan describes the resources and activities needed for the project team to achieve the necessary quality objectives, and is an appropriate place to set expectations for the project's quality requirements. Quality requirements might include:

- Quality standards to be used.
- Quality objectives of the project.
- Quality roles and responsibilities.
- Project deliverables and processes subject to Quality review.
- Quality Control and Quality Management activities planned for the project.
- Quality tools that will be used.
- Major procedures relevant for dealing with nonconformance, corrective action procedures, and continuous improvement procedures.

## Audits

Quality audits are used to verify compliance with organizational policies, processes, and procedures. Generally, they are conducted by a team external to the project, such as an internal audit team or PMO. Audits are generally used to do the following:

- Identify that all good and best practices are being used.
- Identify any nonconformity, gaps, and shortcomings.
- Share good practices from other projects in the organization or industry.
- Proactively offer improvements to improve productivity.
- Highlight contributions to lessons learned.

Any remediations should reduce the overall cost of quality and increase customer acceptance of the project's deliverables. They may also be used to verify implementation of change requests including updates, corrective actions, defect repairs, or preventive actions.

## Sampling

It may not be viable for quality assurance to inspect every single product or deliverable, in which case it may be appropriate to substitute a sampling of different outputs of the processes and procedures and subject the sampling instead to the quality review. An appropriate sampling approach can provide similar results in identifying quality issues and reducing the costs of quality; thus helping to better align the quality assurance costs with the overall value to the project.

## QA Tools

Quality management teams might use a number of tools and practices to identify quality issues. These types of techniques might include:

- Data gathering, which often use checklists and other lists of acceptance criteria.

- Data analysis, including alternatives analysis, document analysis, process analysis, or formal root cause analysis.
- Decision making techniques.
- Data representations such as affinity diagrams, cause and effect diagrams, flowcharts, histograms, matrix diagrams, and scatter diagrams.
- Audit reports.
- Design for X to focus on a particular value X and its impact on design quality.
- Problem solving techniques.
- Quality management methods such as Six Sigma and Plan-Do-Check-Act.

## Guidelines to Measure the Compliance of a Project

When assessing project compliance, it is useful to leverage quality management to both validate compliance and identify noncompliance issues and potential corrective actions. Some guidelines include:

- Use QA outputs to confirm deliverable and process compliance and identify the needs for corrective actions.
- Establish project tolerances and enable the project manager to either initiate corrective actions within tolerances or to quickly escalate any noncompliance outside of the tolerances.
- Establish a clear Quality Management Plan and execute it on an ongoing basis to identify any noncompliance issues as early as possible.
- Establish where external audit teams can confirm and validate use of appropriate processes and procedures and how audit results can enable the team to identify improvements.
- Leverage effective QA tools and techniques to assess quality deliverables and identify improvements, corrective actions, or defect repairs required.

## ACTIVITY 5–1

### Managing Project Compliance

#### Scenario

You are managing a project to coordinate a risk assessment for a large energy company with nuclear power plants.

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1. You become aware that the FAA is planning to change the flight paths for a major airport located just two miles from your nuclear plant. The new flight path would reduce airline noise for local residents but would require more than 50% of the air traffic to fly directly over the cooling towers. Outline the risks and the potential impacts, and then consider risk responses.
  
  2. Your company is subject to a broad array of regulatory compliance requirements for all of its operations. What would you do to gather these requirements and ensure they are properly weighted as part of your risk assessment?
-

# TOPIC B

## Evaluate and Deliver Project Benefits and Value

A project is undertaken to meet the objectives and requirements of its stakeholders, and the project manager is responsible for delivering what these stakeholders expect. A number of tools are available to assist the project manager and the project team.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Build shared understanding of project and value.
- Investigate that benefits are identified. (ECO 3.2.1)
- Document agreement on ownership for ongoing benefit realization. (ECO 3.2.2)
- Verify measurement system is in place to track benefits. (ECO 3.2.3)
- Evaluate delivery options to achieve benefits. (ECO 3.2.4)
- Inform stakeholders of value being delivered. (ECO 3.2.5)
- Evaluate impact to the organization and determine required actions. (ECO 3.4.3)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<i>Deliverables</i>	<i>Tools</i>
Benefits Management Plan	Value Analysis
EVM, ETC analysis	Cost Analysis
ROI, NPV, IRR	
Benefit Cost Analysis	
Decision Trees, EMV	
Monte Carlo	
Net Promoter Score	
A/B Testing	

### Business Value

**Business value** is an informal term that goes beyond economic value. Components of business value include:

- **Shareholder value**—in a publicly traded company, the part of capitalization that is equity as opposed to debt; for example, the number of outstanding shares multiplied by the current share price.
- **Customer value**—the value received by the customer of a product or service.
- **Employee knowledge**—an asset of the business, a frequently overlooked component of business value.
- **Channel partner value**—the value of a business's partners.

## Value Analysis

Value analysis is the process of examining each of the components of business value and understanding the cost of each one. The goal is to cost-effectively improve the components to increase the overall business value.

## Benefits Management Plan

A **benefits management plan** is a document that describes how and when the benefits of a project will be derived and measured. It typically includes the following components:

- **Target benefits**—the expected tangible and intangible business value to be realized from the project.
- **Strategic alignment**—how the benefits align with the business strategies of the organization.
- **Timeframe**—when the benefits (short-term and long-term) will be realized, usually by project phase.
- **Benefits owner**—the person or group that monitors, records, and reports the benefits.
- **Metrics**—the direct and indirect measurements of the realized benefits.
- **Risks**—the risks associated with achieving the targeted benefits.

This plan is prepared before the project is initiated, and it is referenced after the project has been completed. It is not a subsidiary component of the project management plan, but instead is a business document.

## Sprint Reviews/Demos

In an agile project, at the end of each iteration or sprint, the team will host other stakeholders and conduct a sprint review or demo. Part of the purpose of agile approaches is that the team is focused on completing whole user stories in each sprint; in other words, everything is done, and the capability is "potentially shippable."

At an early stage the team wishes to gain acceptance of the story from the product owner because it should meet all of the defined acceptance criteria and to get early feedback from other stakeholders, which may unearth changes or additional undefined requirements. The sprint review then is used to review progress on the overall product, and to get feedback early while it's still relevant if certain aspects of the solution need to be changed or enhanced in certain ways to optimize business value.

## Release Management

One of the fundamental benefits of agile projects is the ability to convert high value capabilities into delivered solutions early. Part of the job of the Product Owner in an agile project is to define the initial capabilities that make up a Minimum Viable Product; in short, enough solutions to start using it, and start generating real value for the business and real feedback for the teams.

In a traditional project, release occurs at the end, when everything is done. In practical terms, virtually all solutions have an ongoing lifecycle so the idea of being forever done with a solution is largely a mirage. Agile approaches acknowledge this and instead substitute the notion of a Minimum Business Increment (MBI). This MBI offers enough of the high-value aspects of the solution to start using it and get benefits from it. You can then define an approach to subsequent releases of the solution, which may be driven by the following:

- Availability of a certain set of features or capabilities.
- Organizational tolerance for changes.
- A time cadence specifying that subsequent releases are planned on a consistent schedule, such as one per month.

## Benefit Cost Analysis

**Benefit cost analysis**, also called cost-benefit analysis, is a systematic approach to estimating the strengths and weaknesses of alternatives used to determine options which provide the best approach to achieving benefits while preserving savings. It is frequently used to compare potential projects to determine which one to authorize, and to compare alternative approaches to the scope.

The goal in a benefit cost analysis is to select the alternative whose benefits outweigh its costs by the most amount. An alternative whose cost exceeds its benefit should never be chosen. The value of a benefit cost analysis depends on the accuracy of the estimates of cost and benefit.

## Return on Investment (ROI)

**Return on Investment (ROI)** is a financial metric of profitability that measures the gain or loss from an investment relative to the amount of money invested. It is sometimes called the rate of return, and is usually expressed as a percentage. A positive ROI is interpreted as a good investment, and a negative ROI is a bad investment.

## Present Value (PV)

The **present value (PV)** is the current value of a future sum of money or stream of cash flows given a specific rate of return. Another way to think of it is the value of something today that you need to create a certain amount of money in the future at a specific interest rate.

### Present Value Formula

Although you might not need to memorize how present value is calculated for the exam, seeing the formula will help you put the concept into perspective. PV is present value, FV is future value, r is interest rate, and n is number of periods.

$$PV = \frac{FV}{(1 + r)^n}$$

Figure 5-1: The PV formula.

For example, if you need \$3,000 in three years and can invest your money at 8 percent interest, the present value (your initial investment) is calculated as shown.

$$\$2,381.50 = \frac{\$3,000.00}{(1 + 0.08)^3}$$

Figure 5-2: Calculating the PV.



**Note:** In financial formulas, PV represents present value. In Earned Value Management, PV represents planned value.

## Net Present Value (NPV)

The **net present value (NPV)** is a financial tool that is used in capital budgeting. It is the present value of all cash outflows minus the present value of all cash inflows. The net present value

compares the value of a dollar today to the value of the same dollar in the future, after taking inflation and discount rate into account.

## Internal Rate of Return (IRR)

The **Internal Rate of Return (IRR)** is also a financial tool often used in capital budgeting. It is the interest rate that makes the net present value of all cash flow equal to zero.

## Net Promoter Score (NPS)

The **Net Promoter Score (NPS)** measures a customer's willingness to recommend a provider's products or services to another. NPS is simply calculated as the % of Promoters - % of Detractors with the resulting index of -100 to 100. Higher scores indicate customer delight and willingness to recommend the solution. For the calculation, you assign a number to the customer's self-reported satisfaction on a 0-10 scale, with 10 being the most satisfied. The reporters break up into the following.

<b>Item</b>	<b>Description</b>
Detractors (0-6)	Would be very willing to work with another provider, as some aspect of the solution left them less than satisfied.
Passives (7-8)	Somewhat satisfied, but may be willing to try competitive offerings.
Promoters (9-10)	Very satisfied, and would choose to work with the provider again. May choose to evangelize the solution to other people.

## AB Testing

Many times different approaches to solving a problem are available and the project team may want to get feedback from real users. This might mean asking for users' preferences in how to do certain things, or which approach they prefer. For example, different approaches might result in different outcomes, such as click-through rates or sales conversions.

One way to do this, borrowed from the marketing universe, is called AB testing. In **AB testing**, different sets of users are shown similar services with one difference known as the independent variable. For example, you might change the color or position of a button on a website to see if people behave differently based on the different options. As a result of the AB testing, you can optimize the solution to use the most effective approach based on the results of the experiment.

## Monte Carlo Simulation

**Monte Carlo simulation\*** is an analysis technique where a computer model is iterated many times, with the input values chosen at random for each iteration driven by the input data, including probability distributions and probabilistic branches. Outputs are generated to represent the range of possible outcomes for the project.

In more general business terms, Monte Carlo refers to not one single analysis method but to a wide class of techniques, mostly making use of sophisticated computers and inputs of random numbers, probabilities, and algorithms. It has a wide range of applications in many fields, including finance and engineering because it works effectively with large inputs of numbers. It is well suited for complex project management problems in which more than a few inputs such as costs, activity, and duration are unknown.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 433-434.

## Simulation

**Simulation\*** is a technique that uses computer models and estimates of risk to translate uncertainties at a detailed level into their potential impact on project objectives. Simulations involve calculating multiple project durations with varying sets of activity assumptions. A project simulation uses a model that translates project uncertainties into their potential impact on project objectives. The project model is run many times with different variables to calculate a **probability distribution**.

## Decision Tree Analysis

**Decision tree analysis\*** is a diagramming and calculation technique for evaluating the implications of a chain of multiple options in the presence of uncertainty. Decision trees allow decision makers to evaluate both the probability and impact for each branch of every decision under consideration, making it a useful tool for risk analysis. Solving the decision tree indicates the decision that will provide the greatest expected value when all the uncertain implications, costs, rewards, and subsequent decisions are quantified.

### Expected Monetary Value

**Expected Monetary Value (EMV)** is a method of calculating the average outcome when the future is uncertain. Opportunities will have positive values and threats will have negative values. EMV is found by multiplying the monetary value of a possible outcome by the probability it will occur. This is done for all possible outcomes and their figures are added together. The sum is the EMV for that scenario.

This technique is used in decision tree analysis; EMV must be calculated in order for the analysis to find the best outcome. The best outcome is the one resulting in the greatest amount of net gain or the least amount of net loss.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 435.

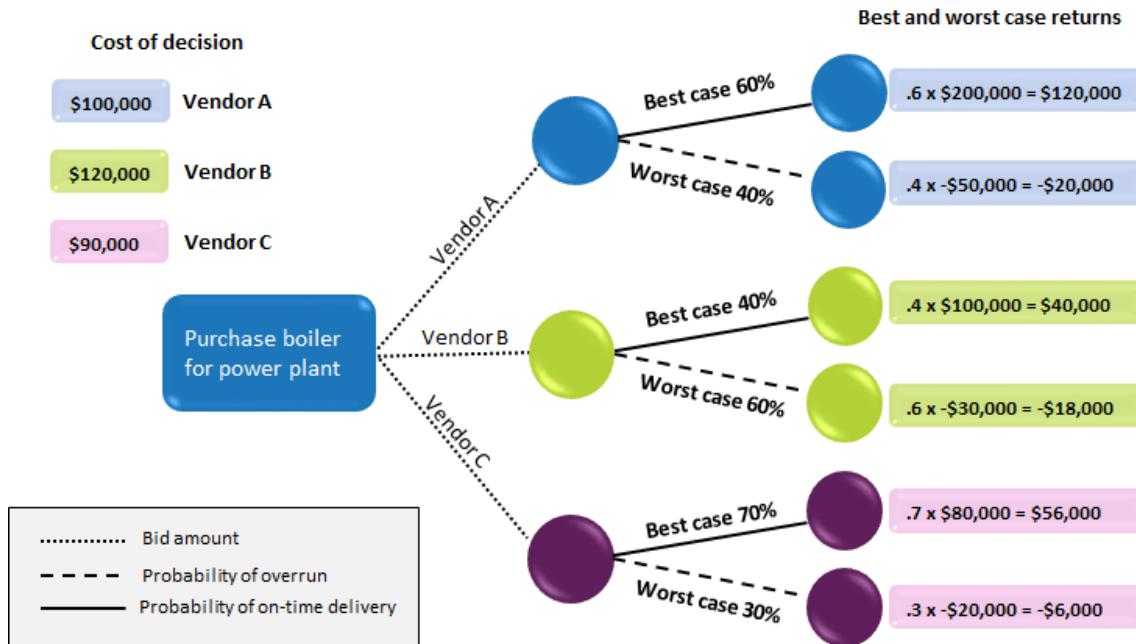


Figure 5-3: Using decision tree analysis to select a vendor.

### Example: Selecting a Vendor Using Decision Tree Analysis

As shown in the preceding figure, three vendors have provided bids on a new boiler. These bids are referred to as the cost of making a decision. Based on historical data from other projects, Vendor A has a 60% probability of on-time delivery and an impact of \$200,000. The resulting risk is \$120,000 (with the probability of 60% times an impact of \$200,000). If Vendor A is late, an impact of - \$50,000 will occur and the risk will be -\$20,000. The expected monetary value is the sum of both risks, which is \$100,000. Similar EMV calculations can be made for the other vendors (\$22,000 for Vendor B and \$50,000 for Vendor C).

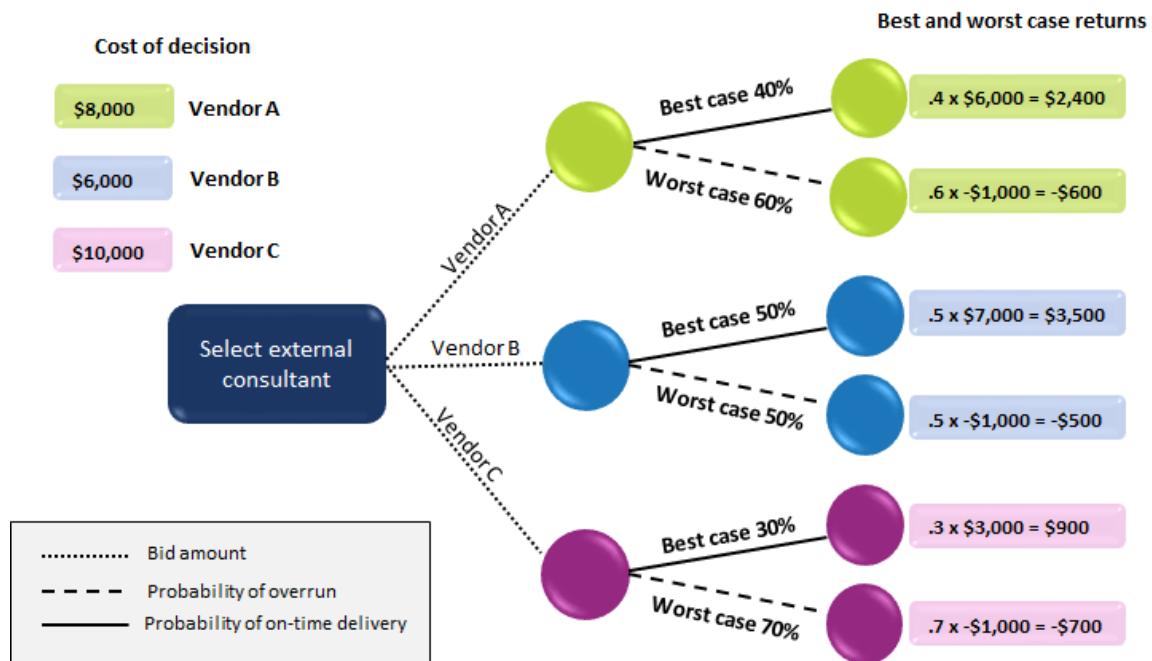
Vendor A would be the preferred choice, because it has the highest risk in terms of EMV. A secondary choice would be Vendor C.

# ACTIVITY 5–2

## Using Decision Tree Analysis

### Scenario

The new shopping center project needs an external consultant to assist with the town's zoning application. Three vendors have provided you with their quotes for the work, and you refer to these values as the cost of making a decision. Your team assessed each consultant's rate of success in providing advice based on previous projects, and estimated the impact that this advice would have on the project. (For example, if Vendor A delivers on time, the project would realize a \$6,000 benefit; if it is late, the project would realize a \$1,000 penalty.) You plotted the results as shown.



1. Which analysis technique was used in the image to determine the most cost-effective choice of an external consultant?

- Decision tree
- Simulation
- Delphi
- Diagrammatic

2. What is the probability that Vendor A will complete the project on time?

- 60%
- 50%
- 40%
- 70%

3. What is the probability that Vendor B will run over the allotted time for the project?
    - 50%
    - 60%
    - 70%
    - 40%
  
  4. What is Vendor C's expected monetary value?
    - \$10,300
    - \$1,700
    - \$0
    - \$200
  
  5. Your team combines each vendor's EMV and costs. You want to choose the vendor bid with the most economic advantage for your organization. Based on this number, which vendor should your team choose?
    - Vendor A
    - Vendor B
    - Vendor C
    - Vendor A and Vendor C
-

# TOPIC C

## Evaluate and Address Internal and External Business Environment Changes

Projects don't exist in a vacuum. As the project commences and progresses, there are often changes in the internal and external business environment that may impact the project value and the desired scope/backlog. In this lesson, we will explore how to manage the project in the context of broader business environment changes.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Survey changes to internal and external business environment. (ECO 3.3.1)
- Assess impact on scope/backlog based on changes in business environment. (ECO 3.3.2)
- Recommend options for changes (e.g., schedule, cost changes). (ECO 3.3.3)
- Reprioritize work/actions.
- Review business environment for impacts on scope/backlog. (ECO 3.3.4)

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Update Baselines	Change Control Boards
Configuration Management System	Backlog Reprioritization
Reprioritize Backlog	Product Owner Duties
Updated Roadmaps	Release Planning
	Governance

### Internal Business Environment

Organizational changes can dramatically impact the scope of a project. They may change organizational structures, roles and responsibilities, workflows, and how certain aspects of the project's deliverables still make sense in the business context. As a project progresses, the project manager and other key project stakeholders such as the project sponsor need to have visibility into business plans, reorganizations, process changes, and other internal business activities that may impact the project's business case. These internal business changes may create the need for new deliverables, reprioritization of existing ones, or the elimination of ones that are no longer required.

### External Business Environment

In the same way that potential internal business environment changes can affect the project's value, external factors can also affect the value and desired outcomes of the project. Many best practice frameworks refer to these as PESTLE factors. It is critical that project managers are aware of PESTLE factors that can impact their project's business case and need to be prepared to adapt accordingly.

The PESTLE factors are described in the following table.

<b>Factor</b>	<b>Description</b>
<b>Political</b>	Changes in the political landscape may affect governmental policies, financial models, and the viability of certain business strategies.
<b>Economic</b>	Changes in economic conditions may affect a project's ROI model, the desirability of certain solutions, and even the most basic assumptions of the project's viability.
<b>Social</b>	Changes in social behaviors, norms, and actions may affect the project's perception and desirability.
<b>Technical</b>	Changes in technical capabilities may make newer approaches to solving business problems possible, and may alter both the viability of projects and the approach the organization may use to enabling solutions.
<b>Legal</b>	Changes in legal and regulatory requirements may fundamentally alter what is needed for the project's products to meet compliance requirements, and may increase costs, reduce benefits, or both.
<b>Environmental</b>	Increasingly companies are being asked as part of their social responsibility practices to consider environmental impacts of their solutions and in many cases to alter their approaches in a way that improves the sustainability of the environment.



**Note:** For more information, check out the Spotlight on **Handling Pressure from Outside Your Team** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Update Baselines

In a traditional project plan, once the initial plan is completed, it is baselined. This anticipates that there will be required changes at various times in the project lifecycle, and that the baseline will need to be updated as changes occur. As the project manager tracks any changes to the internal and external business environments, it is likely that needed changes to the project will be identified, and that the project will need to be rebaselined.

## Change Control Boards

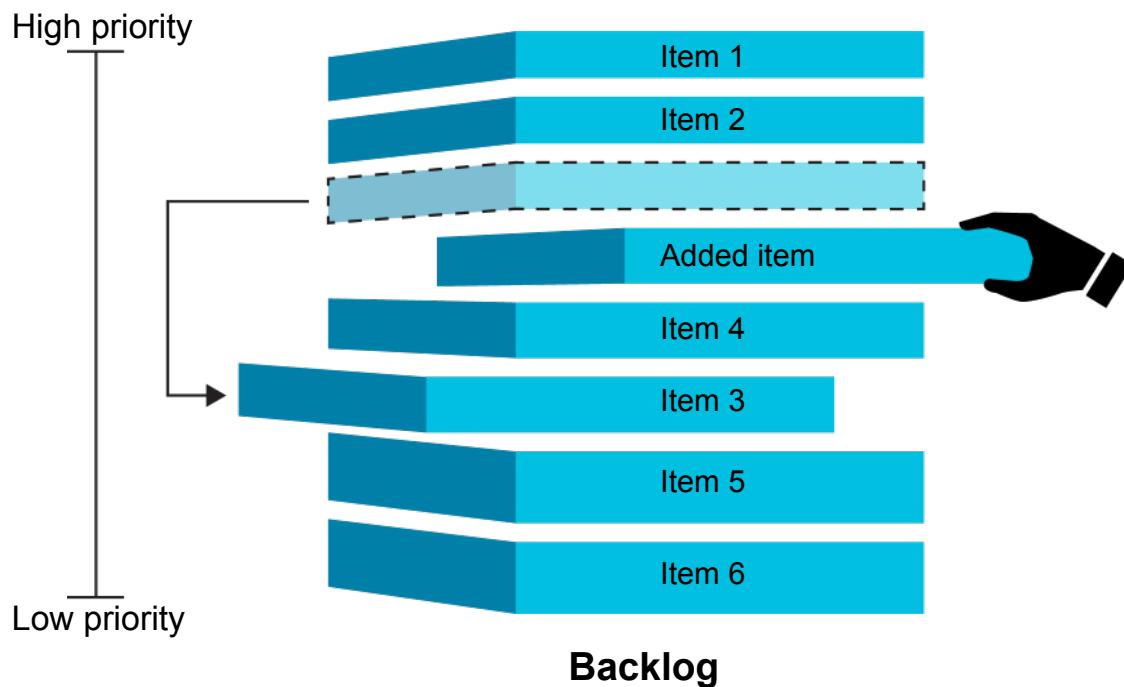
The project should use a Change Management Plan to track and manage requested changes. Change Management is discussed in more detail later in this lesson. When a change to the project is requested, the usual approach is to form a Change Control Board (CCB). The purpose of the CCB is to represent key stakeholders and assess the change in terms of cost, risk, and value impact, and then make recommendations for whether the change should be approved. Based on the scope of the proposed change, the approver may be the project manager if the scope of the change is within agreed tolerances or it may need to be escalated to the project board or sponsor if it is outside the tolerance thresholds.

## Configuration Management System

The **Configuration Management System**\* is a collection of procedures used to track project artifacts and monitor and control changes to these artifacts. Changes to a project generally result in updates being made to the Configuration Management System. The Configuration Management System is intended to maintain a change history of all components being tracked. This enables you to effectively maintain control of the versions of all components.

## Backlog Reprioritization

In an agile project, the introduction of changes or the reprioritization of existing deliverables can be managed more easily using the product backlog. New changes are written up as new user stories, and the product owner is tasked with identifying and prioritizing the new stories along with the existing stories in the backlog. If the changes are high enough in business value, they could jump straight to the top of the list, or be integrated further down if the relative value or risk is lower.



**Figure 5–4:** An illustration of a backlog being reprioritized when new items are added.

## Product Owner Duties

In an agile project, the role of a product owner is to help the project team prioritize the work based on the value that the capability will provide to the business. The product owner is from the business, and is accountable for the ultimate business value of the solution the project team produces. The product owner creates and socializes the product vision, and serves to coordinate different business needs from different stakeholders together into one prioritized product backlog.

The product owner is responsible for defining and prioritizing the user stories in the product backlog. This should reflect highest business value (and risk) first, with lower value stories on the bottom. As the project progresses, the product owner continues to provide guidance to the team on the prioritization of the stories, defines acceptance criteria (often with the help of the teams), and accepts stories as they are completed and delivered.

The other key roles for the product owner is answering questions from the team about the needed solution, and providing timely feedback to the team on potential solution approaches.

## Recommended Options for Changes

When a change is proposed, the focus from the product owner should be on the intended business value of the change. Subject to modification, user stories—whether for initial requirements or for changes—use the following pattern: "As a *name of role*, I want to *do something* so that I get a result *I want*."

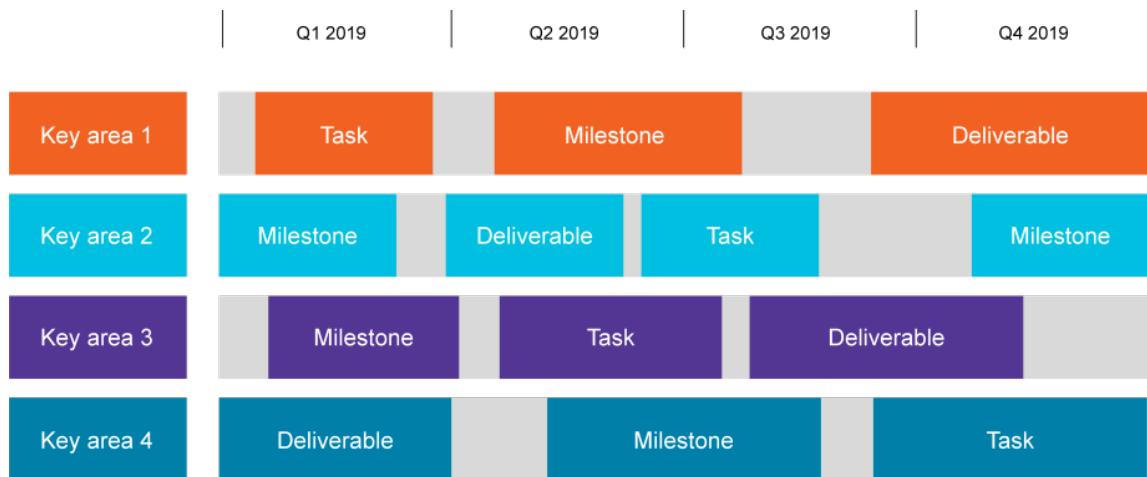
Notice that the user story approach focuses on the stakeholder, the need, and the desired outcome and not on a particular solution approach. Generally it is best practice to give the project team discretion to consider the change and identify potential solution options. Then, the team can vet the options with the product owner to come up with an agreed-on approach.

## Updated Roadmaps

Roadmaps are used to provide high-level visibility into the overall project, key deliverables, immutable project dates, and how and when certain capabilities may be made available, at least in a Minimum Viable Product. Note that a roadmap is not intended to be anywhere near as detailed as a traditional project plan that includes detailed schedules, work packages, and timelines stretching out for a year or more.

Instead, an effective roadmap is high-level, ensures that stakeholders are all clearly aware of key high-level needs and milestone dates, but does not provide the level of granular detail around exactly when certain features will be done because this will likely change as the product owner adds and reprioritizes needs over the project lifecycle.

As the project progresses, typically every month the roadmap should be updated. The roadmap will reflect changes made to the backlog, whether through adding new desired capabilities or reprioritizing existing ones based on changing business needs. This ongoing iterative process ensures that the project team is always working on the highest value items, is delivering the highest value components of the solution first, enables early delivery of the high value items, and generates feedback that will help the team and the product owner to surface additional needs.



*Figure 5–5: An illustration of a swimlane project roadmap.*

## Release Planning

In a typical project plan, release occurs at the end of the project. In an agile project, it is likely possible to have multiple releases of different aspects of the solution as they are ready. Because agile backlogs use value-based prioritization, during relatively early stages of the project, enough of the high-level, high-value deliverables are completed and available for use. By establishing a Minimum Business Increment (i.e., enough of the solution to start really using it), you mitigate project risks and start to gain real value from the solution early. You also begin to generate real feedback from real users of the solution which may unearth new high-value solution needs that may get reprioritized above many of the leftover requirements and improve the overall value of the solution.

Release planning begins once the initial attempt at the product backlog has been completed. Based on the initial prioritized list, the product owner is encouraged to identify where Minimum Business Increment (MBI) can be achieved, and an actual release of the solution can be planned.

After MBI has been achieved and an initial release has been executed, the product owner may identify when additional releases of the solution may occur. This decision may be driven by organizational tolerance for changes, readiness, and the incremental value of enabling the next set of capabilities. Releases may be planned based on accomplishing a certain set of features, or planned at a regular time cadence. For example, a release could be planned after every two sprints.

Release planning should be driven by the ability to enable business value, but will need to take into account impacts it may have on the business environment. A release may result in the implementation of new processes, reallocation of roles and responsibilities, or changes in organizational workflows. Proper training and knowledge transfer will need to be planned and executed in order to ensure customer readiness for the release.

## Governance Steering Committee

One of the most important parts of project initiation and planning is defining the overall governance or steering committee coordinating the project. A Project Board might include the sponsor, a senior user, and perhaps PMO resources. The project's governance board is responsible for clarifying the project charter and objectives, and allocating to the project manager the resources—people, money, time, etc.—to carry out and deliver on the project's objectives.

Having a clear governance structure becomes critical when there are project changes driven by changes in the internal or external business environments. If these changes are within the project manager's tolerance levels, they may be able to coordinate the changes directly. If the changes are beyond tolerance levels, escalation will be required, and the project's governance or steering committee may need to assess the change, understand the scope and impact of the change, and make decisions about how to proceed.

## Guidelines for Assessing the Impact on Project Backlog Based on Business Environment Changes

Projects are often impacted by larger changes in the business environment, either internally or externally. The project manager must maintain broad awareness of the potential impacts of these business changes and how they affect the overall business case and value of the projects being managed. Here are a few basic guidelines.

- Understand the project's organizational context. Which organization(s) will be using the solution? How does the overall workflow work? What defined roles and responsibilities are there in supporting the workflow? How might those be impacted by an internal business activity like a reorganization?
- Understand the external factors that may impact your project. Are there political risks or issues? What would the economic impact of a downturn be on your project's value proposition? What technical innovations might impact your solution approach? What types of legal or regulatory changes are being considered by your city/state/country that could impact your solution?
- How is your project's work prioritized? If you are running an agile project, does your backlog get regularly reviewed and refined to reflect current business priorities? Do you have an engaged Product Owner who is ensuring that the backlog is correct, and who is available to answer questions from the team to help them stay on track?
- What is the project's governance model? What are the levels of tolerance delegated to the project manager, and what issues must be escalated to the governance or steering committee?

## ACTIVITY 5-3

# Addressing Internal and External Business Environment Changes

## Scenario

Project managers are expected to manage changes throughout the lifecycle of their project. In a traditional project, you baseline the project at the beginning and again as you make meaningful changes to scope, time, and/or resources. In an agile project, you use a prioritized product backlog to manage and prioritize (or reprioritize) as changes commence.

1. You are managing a traditional project and need to establish a change management process. What aspects do you need to consider?
  2. You are managing an agile project and need to establish a change management process. What aspects do you need to consider?
  3. You are coaching the business product owner. Since you are running a project using an agile approach, early delivery of the highest value aspect of the solution is possible, and you want the product owner to work together with their stakeholders to assess when enough of the solution is available to launch a Minimum Viable Product. What considerations should you take, and how would you socialize this idea with the customer and their stakeholders?

# TOPIC D

## Support Organizational Change

Projects and project management take place in an environment that is broader than that of the project itself, and an organization's culture, style, and structure influence how projects are performed. Understanding this broader context helps ensure that work is carried out in alignment with the organization's goals and managed in accordance with the organization's established practices.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Assess organizational culture. (ECO 3.4.1)
- Evaluate impact of organizational change to determine required actions. (ECO 3.4.2)
- Evaluate impact of the project to the organization and determine required actions. (ECO 3.4.3)
- Recommend, plan and facilitate the changes.

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Change Management Plan	Project Management Plan updates
Roll Out Plan	EEFs
Training Plan	OPAs
Training Artifacts	Demos
	PM / PMO org structures

### Organizational Cultures and Styles

Organizations are companies or governmental departments that are in place to accomplish a purpose such as providing health care to patients. Every organization develops a unique culture and style that represents its cultural norm and affects how projects are performed. For example, flex hours versus an 8-to-5 work day can directly affect how a project manager schedules resources and how the team interacts. Culture is shaped by people's common experiences such as:

- Shared visions, missions, values, beliefs, and expectations.
- Regulations, policies, methods, and procedures.
- Motivation and reward systems.
- Risk tolerance.
- View of leadership, hierarchy, and authority relationships.
- Code of conduct, work ethic, and work hours.
- Operating environments.

A project manager should understand that cultures have a strong influence on a project's ability to meet its objectives. He or she also needs to know which individuals in the organization are the decision makers or influencers and work with them to increase the probability of project success.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Page 38.

## Organizational Structures

An organizational structure dictates how the various groups and individuals within the organization interrelate. The organizational structure also affects how much authority the project manager has, as well as the availability of resources and how projects are performed.

Organizations will typically be configured in one of the main structural implementations: functional, matrix, projectized, or composite. The structural model used by an organization will have a huge impact on how project managers interact with team members and stakeholders. In many cases, a project manager will interact with various levels in an organization such as middle management, operations, strategic functions, and senior management.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 45-46.

## Types of Project Management Organizational Structures

An organizational structure dictates how the various groups and individuals within the organization interrelate. The organizational structure also affects how much authority the project manager has, as well as the availability of resources and how projects are performed.

Organizations will typically be configured in one of the main structural implementations: functional, matrix, projectized, or composite. The structural model used by an organization will have a huge impact on how project managers interact with team members and stakeholders. In many cases, a project manager will interact with various levels in an organization such as middle management, operations, strategic functions, and senior management.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 45-46.

The following table describes the four types of organizational structures: functional, projectized, matrix, and composite.

<i>Organizational Structure</i>	<i>Description</i>
<b>Functional*</b>	<ul style="list-style-type: none"> <li>Each department is responsible for carrying out a specific, similar set of activities.</li> <li>Multiple people perform each type of activity.</li> <li>Reporting is hierarchical, with each individual reporting to a single manager.</li> <li>The project manager's authority is low, relative to the functional manager's authority.</li> </ul>
<b>Matrix*</b>	<ul style="list-style-type: none"> <li>A blend of functional and projectized structures in which individuals report upward in the functional hierarchy, but they also report horizontally to one or more project managers.</li> <li>The matrixed reporting scheme may be permanent or temporary.</li> <li>This structure may be characterized as weak, balanced, or strong, depending on the relative authority of the project manager to the functional manager. An organization is said to have a strong matrix when the project manager's authority is higher than that of the functional manager.</li> </ul>

<b>Organizational Structure</b>	<b>Description</b>
<b>Projectized</b>	<ul style="list-style-type: none"> <li>The project manager and a core project team operate as a completely separate organizational unit within the parent organization.</li> <li>Core team members are responsible for the work of extended team members in their functional area.</li> <li>Team members are often co-located.</li> <li>The project manager reports to a program manager and has a significant amount of authority and independence.</li> <li>Some projectized organizations may contain their own support systems such as a separate procurement or personnel department, or share support systems with the parent organization.</li> </ul>
Composite	<ul style="list-style-type: none"> <li>Most modern organizations involve all these structures at various levels. It is a combination of all the other types of organizations.</li> </ul>

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 45, 47.

## Relative Authority in Organizational Structures

**Relative authority** refers to the project manager's authority relative to the functional manager's authority over the project and the project team. In a purely functional organizational structure, the project manager's authority is low relative to that of the functional manager. Conversely, in the project-based organizational structure, the opposite is true.

The following table illustrates the relationships found in each organizational structure.

<b>Relationship</b>	<b>Functional</b>	<b>Matrix</b>	<b>Projectized</b>
Team members are loyal to	Functional department	Conflicted loyalty	Project
Team members report to	Functional manager	Both functional manager and project manager	Project manager
Project manager's role is	Part-time	Full-time	Full-time
Team members' role is	Part-time	Part-time	Full-time
Control of project manager over team members is	Low	Medium	High



**Note:** To examine effective leadership strategies for project managers, you can access the Spotlight on **Leading Without Authority** presentation from the **Spotlight** tile on the CHOICE Course screen.

## Project Management Office (PMO)

As stated in the *PMBOK® Guide – Sixth Edition*, a **project management office (PMO)**\* is a management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques. PMOs are more common in larger organizations because of the number of projects that can be in process at the same time. A PMO

can offer assistance and guidance for all projects in progress. PMI® does not provide official guidelines or standards for a PMO, so large organizations must use PMI principles and best practices to implement their PMO. There are several types of PMO structures, each varying in the degree of control and influence they have on projects within the organization:

- **Supportive PMOs** provide a consultative role to projects by supplying templates, best practices, training access to information, and lessons learned from other projects.
- **Controlling PMOs** provide support and require compliance through various means. Compliance may involve adopting project management frameworks or methodologies; using specific templates, forms, and tools; or conforming to governance.
- **Directive PMOs** take control of the projects by directly managing the projects. A relatively small number of PMOs fall into this category.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 48-49.

## Organizational Process Assets (OPAs)

**Organizational process assets (OPAs)\*** are plans, processes, policies, procedures, and knowledge bases that are specific to and used by the performing organization. Assets can be broken into two types: processes and procedures, and corporate knowledge base.

Process assets can include the lessons an organization has learned from previous projects and activities, and general historical information preserved by the organization.

### Organizational Processes and Procedures

The organization's processes and procedures for conducting project work are intended to facilitate the project process. Assets can be resources, plans, processes, policies, procedures, and knowledge bases specific to and used by the performing organization. Organizations must comply with many of these set conditions. Some examples include:

- Guidelines and criteria for aligning an organization's standard processes and procedures to meet the needs of each project initiated.
- Specific organizational standards. This can include any number of policies and procedures that will need to be referenced for a specific project. For example, if you are working within the health care field, you may need to refer to and adhere to the HIPAA standards when planning your project.
- Organizations may develop and manage a set of standard templates that you will be required to use throughout the project.
- Processes and procedures for the following: change control, financial control, risk control, procurement, and issue and defect management.
- Organizational communications requirements.
- Procedures for prioritizing, approving, and issuing work authorizations.
- Standardized guidelines, work instructions, proposal evaluation criteria, and performance measurement criteria.
- Specific procedures or requirements for officially closing a project. This can include anything from documenting the lessons learned during the project to conducting a post-project audit or evaluation to verify that what the project intended was carried out successfully.

### Corporate Knowledge Base

The corporate knowledge base is a repository for storing and retrieving useful information. There is a wide variety of information that can be available:

- Configuration management knowledge bases that can include baselines of performing organizational standards, policies, procedures, and documents.
- Financial databases that include historic financial information.
- Government and industry standards such as regulations, codes of conduct, and quality standards.

- Project files such as scope, cost, schedule, and quality baselines.
- Infrastructure documentation and reference materials such as network diagrams and hardware and software inventory information.
- Personnel administration information such as staffing and retention guidelines.
- Human resources documentation and standards.
- Marketplace or industry conditions.
- Company work authorization systems.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 39-40.

## Enterprise Environmental Factors (EEFs)

**Enterprise environmental factors (EEFs)\*** are the conditions, not under the immediate control of the team, that can influence, constrain, or direct the project, program, or portfolio. These factors can either support or limit the project management options, act as inputs for planning processes, and have a negative or positive influence on a project outcome. Organizations must comply with many of these set conditions. In some cases, they may even be considered overhead to the project. Examples of EEF might include:

- Organizational culture, structure, and governance.
- Geographic distribution of facilities and resources.
- Government or industry standards.
- IT infrastructure.
- Existing human resources.
- Personnel administration.
- Company work authorization systems.
- Marketplace conditions.
- Stakeholder risk tolerances.
- Political climate and situations.
- Organization's established communications channels.
- Commercial databases.
- Project Management Information Systems.
- Languages, time zones, and other countries' holiday schedules.

Reference: Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, Project Management Institute, Inc., 2017, Pages 38-39.

## Change Management Plan

The culture of the organization has a direct influence on how the organization manages changes to a project. An organization that exists in a highly regulated environment will tend to have a formal and rigid culture, which will be reflected in how it deals with changes.

## Roll Out Plan

Once a change is approved and built, the project manager needs to plan for its successful implementation. Roll out plans enable the project manager to define the knowledge transfer, training, and readiness activities required to implement the change. Depending on the size and scope of the change, the affected parties may include both the project team and potentially customer and user stakeholders. Depending on the nature of the change, substantial training and early life support activities may need to be planned to support the stakeholders as the change is adopted.

## Project Management Plan Updates

Based on the scope of the change, the project management plan may need to undergo substantial updates. These may include changes in scope, timelines, work packages, and even individual team member assignments. If the project is agile, impact may be limited to lower-value deliverables being moved out of scope to make room for the change to be adopted.

## Training Plan

Changes to the project plan likely will impact the training plan. The changes may include changes in the scope of the training and knowledge transfer required, changes in roles and responsibilities of the stakeholders, and changes in the timeline for when training will be provided to the relevant stakeholders.

## Training Artifacts

Changes to the plan and deliverable set mean that there will be necessary changes to the training artifacts, which may include:

- Changes to training courseware.
- Changes to lab configurations and exercises.
- Changes to knowledge requirements and potentially to credentials if certification of skills is expected.
- Training updates for the trainers to gain the necessary knowledge transfer they require to deliver the updated training.

## Demos

Changes to software solutions may require demonstration of the changed configurations, processes, workflows, and roles and responsibilities. These demonstrations should be reviewed by the key customer and user stakeholders and feedback provided to ensure the changes work as intended and do not otherwise impact the workflow of the solution. Early feedback to the changed solution allows for adaptation while the feedback is still immediately relevant and should have the effect of improving the quality of the change while reducing overall cost and risk.

## Guidelines to Recommend, Plan, and Facilitate Changes

Here is a set of key guidelines for managing changes:

- Establish a single way changes are requested with a description of the proposed change, the business value of the change, any risk and risk mitigation recommendations, and the likely cost of the change.
- Ensure that there is a Change Control Board that can assess the change's cost, risk, and value, other potential impacts to the project, and make recommendations.
- Based on the size of the change and the project's tolerances, the project manager may approve the change, or may be required to escalate the change for review and approval or disapproval by the project's governing Board.
- Changes are not made only to hardware, software, or other systems; they affect people, workflows, roles and responsibilities, and the entire organization. Organizational change management best practices should be followed, including building a compelling case for change, getting the buy-in and commitment of key members of the stakeholder group, communicating the change vision, and enabling other stakeholders to engage. Quick wins should be sought, and consolidation and institutionalization of the change should be reinforced.
- Ensure changes are properly aligned and updates to other project artifacts, such as the project plan, training plans, training artifacts, and software configurations or demonstrations.

## ACTIVITY 5–4

### Discussing Organizational Influences on Projects

#### Scenario

Senior management asked you to consider the types of organizational structure and working styles that might be followed at your development company that builds homes for low-income families, and the possible impact on the projects you will be managing. Your organization has departments for donations, construction, marketing, volunteers, and finance. But before you start working on it, you need to verify your knowledge on the organizational structures and functions.

1. In addition to the departments listed in the scenario, your company also has a manager of project management to oversee all of the ongoing projects. As one of the project managers, you report directly to the project management department but share staff with other departments. What type of organizational structure does this describe?
  - Functional
  - Projectized
  - Matrix
  - Composite
  
2. Choose the organizational structure where the authority of the project manager is the highest.
  - Functional
  - Projectized
  - Matrix
  - Composite
  
3. Which organizational structure is a combination of all the other types of organizations?
  - Functional
  - Projectized
  - Matrix
  - Composite
  
4. Describe the organizational culture, style, communication, and structure of one of your projects.

5. Describe the OPAs you have used on past projects.
  
  6. Describe any EEFs that you have experience with or factors that you can see coming across in the future as a project manager.
-

# TOPIC E

## Employ Continuous Process Improvement

Project managers should always look for ways to continuously improve the processes they use to complete their project deliverables and meet the expectations of their shareholders.

### Enablers, Deliverables, and Tools

This topic addresses various enablers from the ECO.

- Assess existing organization continuous improvement framework.
- Plan continuous improvement methods, procedures, and tools.
- Recommend and execute continuous improvement steps.

The following deliverables and tools are relevant to the enablers addressed in this topic. Some of these might be covered in detail in other sections of the course.

<b>Deliverables</b>	<b>Tools</b>
Update processes and standards	Quality Theory methods CI approaches Lessons learned Retrospectives Experiments

### Continuous Improvement

**Continuous improvement (CI)** can be defined as an ongoing effort to improve products, services, or processes. This effort can look for small incremental improvements or large "breakthrough" improvements. The Institute of Quality Assurance's definition of continuous improvement includes improving business strategy, business results, and customer, employee, and supplier relationships.

Continuous improvement is a business strategy that is developed at the organizational level for projects to adopt and use. It may also be implemented by an organization's Project Management Office (PMO).

### Culture of Continuous Improvement

Continuous improvement has been used in business for nearly three-quarters of a century. W. Edwards Deming was an early leader in the field of process improvement, beginning with his work in post-World War II Japan. He taught four concepts that have been the foundation of the continuous process improvement movement:

- Better design of products to improve service.
- Higher level of uniform product quality.
- Improvement of product testing in the workplace and in research centers.
- Greater sales through global markets.

Deming's philosophy was that improving quality would reduce expenses, increase productivity, and thus increase market share. His views on quality control and quality management increased worldwide demand for Japanese products, and soon gained popularity in the United States and worldwide.



**Note:** As part of your quest to further your project management skills, you should consider investigating some of the major motivational and leadership theories that are a key part of serious project management efforts today. Many organizations are increasingly using project-based continuous improvement approaches; the work of W. Edwards Deming provided the foundation for this effort. Deming's 14 Points for Management, included in his book *The New Economics for Industry, Government, Education*, provides a systematic and pragmatic approach to transforming a western style of management in industry, education, or government to one of optimization. For further reading, see *Out of the Crisis* by W. Edwards Deming.

## Quality Theory Methods

**Total Quality Management (TQM)** is an approach to improve business results through an emphasis on customer satisfaction, employee development, and processes rather than functions. TQM should be viewed as a long-term, ongoing process rather than a one-time event. The following table describes various TQM implementations by different quality theorists.

Theorist	Approach
W. Edwards Deming	The Deming cycle focuses on continuous process improvement in which quality must be continuously improved to meet customer needs.
Joseph M. Juran	The Juran trilogy breaks quality management into quality planning, control, and improvement. Quality improvement leads to breakthrough improvement, meaning improvement that raises the quality bar to an unprecedented level.
Philip Crosby	This method focuses on four absolutes: <ul style="list-style-type: none"> <li>• Quality is conformance to requirements rather than a measure of how good a product or service is.</li> <li>• Quality is achieved by prevention rather than inspection.</li> <li>• Everyone in the company must work to a standard of zero defects.</li> <li>• Quality can be measured by determining the cost of quality.</li> </ul>
Genichi Taguchi	The Taguchi method emphasizes that quality should be designed into the product so factors that cause variation can be identified and controlled.
William (Bill) Smith, Jr.	Six Sigma emphasizes responding to customer needs and improving processes by systematically removing defects. Originally developed by Motorola, Inc., engineer Bill Smith, Six Sigma is now closely associated with General Electric, Inc., and other major industrial companies such as Eastman Kodak.

## Continuous Improvement Approaches

**Agile project management** contains small development cycles that are used to develop the product by feature and receive client feedback on each feature. This allows teams to adapt to change and, in the process, reflect and learn, thus leading to continuous improvements in features in subsequent development cycles. When the product is developed in small development cycles, agile teams frequently go through the complete development process, which gives the teams the opportunity to make continuous improvements in development procedures, team communications, and customer interactions.

### Kaizen

The Kaizen implementation of continuous improvement was developed in Japan in the 1980s. Its key features include:

- Improvements are based on many small changes.
- Small changes are less likely to require major expenditures of capital than major process changes.
- Ideas come from the workers themselves, rather than from expensive research, consultants, or equipment.
- All employees should continually try to improve their own performance.
- Workers should be encouraged to take ownership of their work, thus improving worker motivation.

## **Plan Do Study Act (PDSA)**

This continuous improvement methodology, sometimes called the Deming cycle, involves systematically testing possible solutions, assessing the results, and implementing those that work. The cycle is then repeated to further improve a process or product.

The four steps in this methodology are:

1. **Plan:** Define objectives and processes to deliver a set of desired results.
2. **Do:** Execute the plan and collect data to determine the effectiveness of the processes.
3. **Study:** Evaluate the data and compare the results to expected outcomes.
4. **Act:** Identify issues with the process, determine their root causes, and modify the process to improve it. Planning for the next cycle can then proceed.

## **Continuous Improvement Tools**

As discussed in earlier lessons, the following tools can be used to facilitate continuous improvement:

- Lessons Learned Registers
- Retrospectives
- Experiments

### **Lessons Learned Register**

The Lessons Learned Register should be an important component of each project, as discussed previously in this course. However, it is sometimes filed away and not used as a source of improving the processes used in other projects. Lessons Learned Registers from previous projects should be used as a source of continuous improvement ideas throughout a project.

### **Retrospectives**

Retrospectives were originally used in agile projects but have become more common overall in project management as discussed throughout this course. Retrospectives are held at the end of each iteration to help the team look back at an iteration and plan improvements for the next one.

### **Experiments**

One method of improving project performance is by conducting experiments. These may be identified as part of AB Testing, as team feedback in a sprint review or retrospective, or simply as part of identifying lessons learned. Teams should constantly be identifying one to two experiments to try to improve team efficiency and effectiveness. Some of these experiments will be successful, and others will not, but ultimately in order for the team to achieve real improvements over time, they must try different things. It is critical to limit the amount of experimentation at any one time to be able to isolate the results; if the team is experimenting on too many things at once, it will be unclear which improvement or combination of improvements caused an improved (or degraded) result, and so it makes adopting better practices more challenging.

## Update to Process and Standards

Lessons learned at the project level can apply to the organization's continuous improvement process, in addition to the project management processes. These lessons should be escalated and evaluated for consideration at the organizational level.

## Guidelines to Execute Continuous Improvement Steps

To get the most out of continuous improvement, follow these guidelines:

- Review the organization's continuous improvement strategy.
- Develop a continuous improvement approach for your project, keeping in mind the project goals and the expectations of the stakeholders.
- Use lessons learned from your project, as well as from other projects, as sources of continuous improvement.
- For agile projects, use retrospectives as opportunities to improve the next iteration of the project.
- Use lessons learned at the project level to improve the organization's continuous improvement process.

# ACTIVITY 5–5

## Employing Continuous Process Improvements

### Scenario

The company you work for builds and operates large shopping centers throughout the United States, and its culture is committed to continuous improvement. You are about to embark on managing your first shopping center project, and your sponsor is testing your knowledge about continuous process improvements.

- 1. Which of the following are key attributes of continuous improvement?  
(Choose three.)**
  - Better design of products to improve service
  - Exceeding customer expectations
  - Striving to always lower costs
  - Higher level of uniform product quality
  - Increasing sales through global markets
  - Minimizing changes to the project
  
- 2. Which of the following individuals is often cited as the father of Total Quality Management?**
  - Crosby
  - Smith
  - Kaizen
  - Deming
  
- 3. Which continuous improvement approach is built upon ideas coming from the workers themselves and improvements coming from many small changes?**
  - TQM
  - Kaizen
  - Plan Do Check Act
  - Deming cycle
  
- 4. How is the Lessons Learned Register used in continuous improvement?**

## Summary

In this lesson, you considered the internal and external business environments that factor into the planning, execution, and delivery of project deliverables. This included ensuring that compliance requirements were met, and the project delivered benefits and value to your organization.

Throughout the project, you supported the resulting changes and verified their alignment with the organization's goals. To maintain positive changes, you recommended and executed continuous improvement steps.

The learning goals for this lesson were:

- Determine necessary approach and action to address compliance needs.
- Evaluate delivery options to achieve benefits and value.
- Continually review internal and external business environment for impacts on project scope/backlog.
- Evaluate the impact of the project to the organization and determine required actions.
- Assess the existing continuous improvement framework and execute continuous improvement steps.

### Why is it important for a project to conform to an organization's culture?

### What are some of the challenges you have encountered when employing a continuous improvement process?



**Note:** Check your CHOICE Course screen for opportunities to interact with your classmates, peers, and the larger CHOICE online community about the topics covered in this course or other topics you are interested in. From the Course screen you can also access available resources for a more continuous learning experience.

# Course Follow-Up

Congratulations! You have completed the *PMI® Authorized PMP® Exam Prep* course. You have successfully discovered how to manage projects by applying the generally recognized project management knowledge and processes acknowledged by the PMI®. You now have the skills and knowledge you need to successfully manage projects in your organization by applying a standards-based approach to most projects, most of the time, across industry groups. You can use these widely recognized tools and techniques on the job to effectively initiate, plan, execute, control and monitor, and close projects across application areas and industries.

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**Note:** To explore the benefits of PMP® Certification, you can access the Spotlight on **Preparing for the PMP® Exam** presentation from the **Spotlight** tile on the CHOICE Course screen.



# A Mapping Course Content to the Project Management Professional (PMP)<sup>®</sup> Examination Content Outline

Obtaining *PMP<sup>®</sup> Certification* requires candidates to pass exam *PMP<sup>®</sup> Certification*.

To assist you in your preparation for the exam, Logical Operations has provided a reference document that indicates where the exam objectives are covered in the Logical Operations *PMI<sup>®</sup> Authorized PMP<sup>®</sup> Exam Prep* course.

The Examination Content Outline (ECO) governs the content of the exam, including percentages of questions allocated to each exam domain. The ECO is periodically updated by the Project Management Institute (PMI)<sup>®</sup>.

- The PMP<sup>®</sup> Certification exam aligns with the June 2019 version of the ECO as of July 1, 2020.

The exam-mapping document is available from the **Course** page on CHOICE. Log on to your CHOICE account, select the tile for this course, select the **Files** tile, and download and unzip the course files. The mapping references will be in a subfolder named **Mappings**.

This updated ECO is the most radical change to the exam in more than twenty years. It changes the test domains from the five process groups of Initiating, Planning, Executing, Monitoring and Controlling, and Closing to three completely different domains titled People, Process, and Business Environment. This means that 42%, or 84 questions, will now fall into the People domain, 50%, or 100 questions, in the Process domain, and the remaining 8%, or 16 questions, in the Business Environment domain. Be sure to review the map to the new ECO to understand more about this change.

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# Mastery Builders

Mastery Builders are provided for certain lessons as additional learning resources for this course. Mastery Builders are developed for selected lessons within a course in cases when they seem most instructionally useful as well as technically feasible. In general, Mastery Builders are supplemental, optional unguided practice and may or may not be performed as part of the classroom activities. Your instructor will consider setup requirements, classroom timing, and instructional needs to determine which Mastery Builders are appropriate for you to perform, and at what point during the class. If you do not perform the Mastery Builders in class, your instructor can tell you if you can perform them independently as self-study, and if there are any special setup requirements.

# Mastery Builder 1–1

## Reviewing Creating a High-Performing Team

**Activity Time:** 20 minutes

### Scenario

The following questions are meant to test your knowledge of the content from this lesson.

- 1. What are some techniques that a project manager can use to appraise the skills of a potential team member? (Choose two.)**
  - Ability tests
  - Focus groups
  - Kanban boards
  - RACI matrix
  
- 2. What does it mean if you are identified as an R in a RACI chart?**
  - You are accountable for the result.
  - You should be engaged to provide needed inputs.
  - You should be kept up to date on the status.
  - You are responsible for the activity's execution.
  
- 3. Which of the following are components of a Resource Calendar? (Choose two.)**
  - Working days
  - Training Strategies
  - Availability of physical resource
  - Recognition Plans
  
- 4. Which of the following are part of an effective team charter? (Choose two.)**
  - Shared values
  - Project objectives
  - Resource assignments
  - Conflict resolution

5. In which of the following situations would brainstorming be an appropriate technique?

- Conflict resolution
- Sprint reviews and demos
- Identifying and prioritizing options
- Running a standup meeting

6. Which of the following is not a reason that PMI publishes a Code of Ethics? (Choose two.)

- Set expectations for the project manager and the team.
- Create commitment to honesty, integrity, and commitment.
- Ensure compliance with rules and laws.
- Provide specific guidance on conflict resolution.

7. Which of the following should be included in a project charter? (Choose two.)

- Measurable objectives
- Detailed deliverables list
- Key stakeholders list
- Change request form

8. What are the rules about the length of a Sprint?

- 1 week
- 2 weeks
- 1-4 weeks
- Up to 12 weeks

9. Which of the following is not a technique for estimation?

- Planning Poker
- T-Shirt Sizing
- Product Box
- Modified Fibonacci

10. Which of the following are components of a project agreement? (Choose two.)

- Pricing and payment terms
- Incentives and penalties
- Team members
- Complete product backlog

11. Which of the following are methods to prioritize project objectives and deliverables? (Choose two.)

- Paired Comparisons
- Planning Poker
- First In, First Out
- MSCW (Moscow) Analysis

**12.Which of the following are types of project metrics that may be appropriate for a given project? (Choose two.)**

- Percentage of work completed
- Defects
- Subcontractor approvals
- Process compliance

**13.Which of the following is the best approach to estimating effort?**

- The project manager estimates all of the work.
- A team lead estimates all of the work.
- The work is estimated by the people who will be asked to do it.
- The estimates are inflated to avoid second guessing from the customer.

**14.What is self-organization? (Choose two.)**

- Asking teams to assess and agree to work goals as a group.
- Allocating all resources before they get assigned to a different project.
- Using a pull-based approach to ensure effective use of team resources.
- Having the project manager stipulate roles and responsibilities and assign all the work to individual team members.

**15.What are some objectives of running a Retrospective? (Choose two.)**

- Provide the stakeholders access to the team.
- Generate insights.
- Agree to 1-2 experiments to try to improve team performance.
- Get feedback on the product.

**16.Which of the following are vehicles for training delivery? (Choose two.)**

- Virtual classroom
- Self-paced e-learning
- Prior knowledge
- Testing and validation

**17.Which of the following should not be considered as part of training cost estimates?**

- Logistics and venue costs
- Employee salaries
- Courseware printing and distribution
- Instructions

18.Which of the following will the project manager need to ensure before effective training can take place? (Choose two.)

- Training is successfully resourced and scheduled.
- The final project sign-off has been received.
- Reminders should be planned and executed to ensure trainees are aware of the training and confirm their participation.
- Billing for the training should have taken place.

19.Which of the following is a good practice for the use of collaboration tools?

- Select tools with the best features.
- Select tools that the team lead has experience using.
- Define team goals and practices before consideration of what tools the team will need.
- Use the tools that the previous project used.

20.Which of the following are examples of virtual team collaboration tools?  
(Choose two.)

- Shared task boards
- Your laptop hard drive
- Social media
- Team chat boards

21.Which of the following should be included in a Communications Plan?  
(Choose two.)

- How and when team meetings are run.
- Equipment assigned to each team member.
- Project Charter.
- Preferred communications approaches with external stakeholders.

# Mastery Builder 2-1

## Reviewing Starting the Project

Activity Time: 25 minutes

### Scenario

The following questions are meant to test your knowledge of the content from this lesson.

- 1. Which is the best elicitation technique to use when your project team wants to facilitate a discussion with a certain set of users to get a better understanding on how they might use your project's product?**
  - Document analysis
  - Focus group
  - Benchmarking
  - Plurality
  
- 2. The project team is reviewing the requirements documentation that they are responsible for working on. Which project artifact can they reference to see the connection between the requirements and the business and project objectives?**
  - Requirements traceability matrix
  - RACI Chart
  - Project charter
  - Scope management plan
  
- 3. Months into the project, work on a planning package needs to be further broken down and scheduled. Which of the following should be done by the project team?**
  - Keep the original WBS dictionary unchanged.
  - Use the work packages that were defined at the start of the project for the planning package.
  - Update the WBS dictionary as the planning package is converted to work packages.
  - Obtain a change request for the planning package from the change control board.

**4. An architectural firm has spent a great deal of time and effort creating the design and blueprints for the building. They had to purchase materials and hire consultants and have been working on this project for six months. They have submitted all the invoices for the money they have spent on the work, as well as an invoice for the fee of \$5,000. What type of contract was this?**

- Time and materials
- CPIF
- FPEPA
- Cost-reimbursable

**5. When can the contract closeout occur?**

- At the end of a project only.
- Whenever a contract is completed and accepted.
- At the end of a project only, unless the project is terminated early.
- Whenever a seller is selected.

**6. What are the goals of contract closeout? (Choose three.)**

- To arrange for final settlement of seller payments and claims.
- To verify work was done and delivered to specification.
- To provide performance evaluation of seller staff.
- To update contract records and documents.

**7. In what situation would you not perform the Close Project or Phase process?**

- When a project is terminated.
- When a project phase is complete.
- When the customer validates the interim deliverables.
- When a project is complete.

**8. If the project was terminated early, why would the project manager insist that the team perform the Close Project or Phase process?**

- To document the reasons why the project was terminated early, and how to transfer the finished and unfinished deliverables to others.
- The project manager should insist this is a waste of the team members' time since no one wants the project or its output any longer.
- To make sure everyone knows that the reason for project termination was his fault or the fault of the team.
- To document lessons learned so mistakes won't be repeated in future projects.

**9. The project manager wants to make sure all team members understand the importance of the whole closing process and asks if there are any more questions. One team member asks, "What would happen if this process was not done?" How should the project manager answer that question?**

- The customer would not be obliged to pay for the project.
- The next related activity, phase, or project might not get started.
- The stakeholders would not have any faith in the project team for future projects.
- The team members would not be allowed to be assigned to future projects.

**10. In a large organization that utilizes a Project Management Office (PMO), who is responsible for managing the governance of projects?**

- The project managers of the individual projects within the PMO.
- The PMO.
- The organization's Governance Committee.
- The organization's Change Control Board.

**11. In a multi-phase project, when are assumptions validated and risks analyzed?**

- At the end of the project.
- At the beginning of each phase.
- At the end of each phase.
- As specified in the Project Governance document.

**12. In a multi-phase project, which of the following terms refers to a decision to continue with the next phase or to end the project? (Choose two.)**

- Kill point
- Phase gate
- Threshold
- Go/No go point

**13. What are activity cost estimates made up of?**

- Supporting data or additional information needed to justify the cost estimates.
- Estimates on probable costs necessary to finish project work, including direct costs, labor, materials, equipment, facilities, services, information technology, and contingency reserves.
- Estimates on probable costs necessary to finish project work based on the responsive bids obtained from vendors.
- Estimates on probable costs necessary to finish project work, including direct labor, materials, equipment, facilities, services, information technology, contingency reserves, and indirect costs.

**14. What is the process to create a project budget?**

- Take the ROM and decompose it into the cost of work packages.
- Combine all individual activity cost estimates and aggregate them for the entire project. Submit this to the sponsor, and modify it if necessary. The agreed-upon final cost estimate is the budget.
- Estimate costs necessary to finish project work, including direct costs, labor, materials, equipment, facilities, services, information technology, and contingency reserves.
- Create an S-curve with cost on the Y axis and time on the X axis.

15. The project manager is using the time-phased budget to measure the cost performance. What is that budget called?

- Cost baseline
- Cost estimate
- Rough Order of Magnitude
- Cost consolidation

16. Your company is designing a game for families. In order to test to see if the game is easy enough for children, the team creates a prototype and then establishes their test criteria. Then the team establishes test groups of 100 boys and 100 girls, all between the ages of 3 and 5, at 50 different elementary schools across 30 states. The prototype will then be modified and rolled out across the country. What are they engaged in?

- Benchmarking
- Design of experiments
- Statistical sampling
- Force field analysis

17. What is the main focus of quality assurance and what does it result in?

- Quality assurance is focused on process and procedures used, and it results in improved quality.
- Quality assurance is focused on measuring the output of the work package, and it results in improved quality.
- Quality assurance is focused on measuring the output of the work package, and it results in better metrics.
- Quality assurance is focused on process and procedures used, and it results in a shorter schedule.

18. The project manager is reviewing the quality control chart with the project team and the product owner. The response times have been going down over the iterations, but are still above the upper control limit. What does that mean?

- The project's quality is outside the quality standards set for the project.
- The project's burndown rate is above normal.
- The project's standards are too high.
- The project's quality is above expectations.

19. What is the purpose of decomposing the project work into a hierarchical WBS structure?

- To create smaller more manageable chunks, which can be better estimated for cost, time, and resources, and help control the project.
- To create a sequence of work that can be used to track progress through the life of the project, ensuring the project deadline can be met.
- To select the requirements that will be included in the project to the satisfaction of the stakeholders and the project sponsor.
- To draw out potential options to complete the work so the stakeholders and the team members agree on the methods used.

**20.Which of the following is the correct definition of the critical path?**

- The critical path is the fastest path through the network diagram which represents the longest time in which the project can be completed.
- The critical path is the shortest path through the network diagram which represents the longest time in which the project can be completed.
- The critical path is the earliest path through the network diagram which represents the latest time in which the project can be completed.
- The critical path is the longest path through the network diagram which represents the shortest time in which the project can be completed.

**21.A team member who is new to the organization and working on projects has several questions. He asks the project manager to meet with him to discuss these items so he can understand the project planning process. The project manager is delighted that this new team member is taking so much interest. The team member asks, "If we must complete the software code before we can create the user manual, what type of dependency exists between these two work packages?" How should the project manager reply?**

- Finish to Finish
- Finish to Start
- Start to Finish
- Start to Start

**22.Integrating the project management plan, what is a primary component?**

- Outputs of the planning process.
- When the product will be phased out.
- When the project will be chartered.
- Administrative duties of the project manager.

**23.The product owner is on vacation. A decision must be made on project change. What should the team reference to determine next steps?**

- Project Charter
- Change management plan
- Project timeline
- Configuration management plan

**24.You are working on a project that is part of a program. All the projects within this program are being managed in an agile way. What is a good technique to get the project teams aligned?**

- Hold one daily standup meeting for all the projects.
- Assign one customer point of contact for all projects.
- Develop one project management plan.
- Conduct a Scrum of Scrums.

25. You inform the project sponsor that the project management plan will continuously increase in the level of detail as the project moves forward. In project management, what is this process known as?

- Life cycle
- Progressive elaboration
- Resource planning
- Scope creep

26. The organization is exploring a new project where there are many unknowns and most of the work to be done is designing software to build the best solution in collaboration with the customer. Which project management approach is best suited for this project?

- Agile
- Plan driven
- Phased
- Waterfall

27. The business determines that the project you are managing must be based on a plan driven project management approach. This is partially due to the SMART objectives the steering committee has set for the project. In the acronym SMART what does the A stand for?

- Awesome
  - Accepted
  - Achievable
  - Adjusted
-

# Mastery Builder 3-1

## Reviewing Doing the Work

Activity Time: 25 minutes

### Scenario

The following questions are meant to test your knowledge of the content from this lesson.

1. The project team does not feel confident that they can complete the work for the next set of deliverables of the project and would rather spend more time exploring deliverables expected many months down the line. What can a project manager do to get the team focused on the near term deliverables?
  - Change the scope of the deliverables.
  - Group the near term deliverables into one deliverable.
  - Create a sense of urgency.
  - Make one person accountable for the deliverables.
2. The business is unclear on the direction and when features are to be expected for an agile managed project. What project artifact helps communicate the goals, milestones, and potential deliverables, releases, or other work outputs?
  - Product roadmap
  - Project charter
  - Requirements documentation
  - Configuration management plan
3. The business is anxious to get a portion of the project's creations out into the marketplace to get end user feedback and impressions before the entire product is finished. What must the project team establish for their release to end users?
  - The minimal viable product
  - The sprint cycle
  - Velocity
  - Transition plan

**4. A list of stakeholders who will receive communications about the project will appear in which of the following documents?**

- Communications Requirements Analysis
- Communications Management Plan
- Stakeholder Register
- Communications Requirements Analysis and Communications Management Plan

**5. Which of the following is not a component of the Communications Management Plan?**

- The initiator and receiver of project information.
- The Stakeholder Register.
- The collection and transfer of institutional knowledge.
- The frequency of each communication.

**6. After integrating the communications management plan into the overall project plan, what would be the next logical step?**

- Determining whether there will be changes to the proposed technology before the project is over.
- Creating a schedule for the production of each type of communication.
- Creating a description of stakeholder communication requirements.
- Distributing the plan to all the stakeholders.

**7. Which one of these is a risk?**

- We have determined that our schedule is not going to meet the required deadline.
- We think it is possible there will be a sale on parts and we could spend less money than we originally thought.
- There are not enough resources to complete the work on time.
- The change in the prime rate has caused our funding source to be unable to provide the money we need in the upcoming project phase.

**8. Which of the following is a good example of mitigating the probability of the risk of becoming overcome with smoke on a project?**

- Install smoke detectors.
- Install fire-proof components.
- Hire another company to do the part of the work that could result in a fire.
- Keep the phone number of the fire department handy.

**9. What is the difference between avoiding a threat and mitigating it?**

- Avoid means to reduce the impact or probability, and mitigate means to change the management plan to remove the risk.
- Avoid means to outsource the work to remove the risk, and mitigate means to reduce the impact or probability.
- Avoid means to change the management plan to remove the risk, and mitigate means to reduce the impact or probability.
- Avoid means to change the management plan to remove the risk, and mitigate means to accept the impact or probability.

**10. Engaging with stakeholders is time-intensive during project planning. The sponsor would like to know what all the fuss is about and get an explanation from the project manager about what is taking so long. The project manager explains the need for a stakeholder engagement strategy with which of the following statements?**

- To effectively engage stakeholders in project decisions and execution based on the analysis of their needs, interests, and potential impact.
- To ensure the stakeholders are receiving the reports in the format they would like.
- To effectively place the right people in the correct role to support achieving the project objectives on time and within budget.
- To be able to document which stakeholder is unaware, neutral, leading, or supportive.

**11. Which of the following statements best describes the Stakeholder Engagement Assessment matrix?**

- It describes the level of involvement of each stakeholder.
- It describes the past performance of each stakeholder.
- It compares the current and desired levels of engagement of each stakeholder.
- It compares the current and desired levels of engagement for the project team members.

**12. Which of the following individuals is not a stakeholder in a project?**

- Someone opposed to the project.
- The project manager.
- Someone who is not interested in the project.
- The president of the company.

**13. What does configuration management address?**

- Activities such as keeping track of all the changes the customer makes to the product plans.
- The way in which the product is configured for use to satisfy the end users and how that develops as it is being built.
- Documentation of the management of configuring the product for use and how changes to the product will be incorporated into the overall project plan.
- Activities such as how version control of project documents and changes to the product will be initiated, analyzed, and traced.

**14. Which of the following is concerned with revisions to project documents?**

- Version control
- Configuration management
- Both version control and configuration management
- Document control

**15.Your project team holds weekly status meetings. Should the notes from last week's meeting be considered a project artifact?**

- This decision is up to the project manager.
- Yes, if significant project issues were discussed.
- Yes, even if the meeting resulted in only routine topics.
- No, meeting notes are not artifacts.

**16.A problem occurs during the project execution. It is not a big problem, but it does bother some of the stakeholders. The project manager requests that it be added to the issue log. What would be the reason for this?**

- The issue log serves as a place to document problems that occur and to track their resolution.
- The issue log will be reviewed by the risk team at its next meeting to develop a contingency plan.
- The issue log will be submitted to the change control board for a change approval.
- The issue log serves as a place to document the unidentified risks.

**17.Which one of the following statements about issues is correct?**

- Stakeholders use the issue log to manage an issue.
- An issue should be assigned to only one person.
- There must be no open issues when the project is closed.
- Only issues that are behind schedule need to be discussed during project status meetings.

**18.How does a risk become an issue?**

- The project manager judges the risk to be significant enough that it is stipulated to be an issue.
- The risk has a high probability of happening in the immediate future.
- The risk has happened.
- The risk owner escalates the risk to an issue.

**19.How do you describe an effective change control system?**

- An effective change control system includes the forms, tracking methods, processes, and approval levels required for authorizing or rejecting requested changes.
- An effective change control system includes the documented procedures for authorizing or rejecting requested changes in a project.
- An effective change control system specifies how the project scope will be controlled, changed, and approved.
- An effective change control system integrates all of the changes for a project.

**20.The project manager is working with the team as they perform the work to create the project deliverables. Some adjustments need to be made to the project plan and the baselines. What would be needed in order for the project manager to allow such changes?**

- Change requests.
- Input from stakeholders that their needs have adjusted from what was originally planned.
- Approved change requests.
- The sponsor decides on a different way to accomplish the work.

**21.What are some of the reasons for performance variations in a project? (Choose four.)**

- Specification changes
- New regulations
- Missed requirements
- New changes to the project plan
- Inaccurate initial estimates

**22.What is true of lessons learned during the project?**

- Should be documented only in the closeout report.
- Should consist of only project data.
- Should be documented throughout the project.
- Should consist of only things that went well during project execution.

**23.A team member asks you where she can find a set of building codes. Which type of knowledge is this?**

- Implicit
- Explicit
- Tacit
- General

**24.What is the difference between a lessons-learned register and a lessons-learned repository?**

- The two terms mean the same thing.
  - The register applies to a single project, and the repository applies to many projects.
  - The repository applies to a single project, and the register applies to many projects.
  - The register contains only areas that need improvement in future projects, and the repository contains areas of improvement as well as positive findings.
-

# Mastery Builder 4-1

## Reviewing Keeping the Team on Track

Activity Time: 20 minutes

### Scenario

The following questions are meant to test your knowledge of the content from this lesson.

- 1. What is a document that outlines how the team will operate and work together?**
  - Team charter
  - Resource management plan
  - Project charter
  - Team acquisition plan
  
- 2. Which conflict management approach is best suited for a situation where much is not known and currently the time to research and resolve the conflict is not available?**
  - Compromise/reconcile
  - Accommodate/smooth
  - Withdraw/avoid
  - Force/direct
  
- 3. Which is true about conflict in projects?**
  - Too much conflict reflects poorly on the team.
  - Too much conflict reflects poorly on the project manager.
  - Conflict is inevitable.
  - Conflict is to be addressed only when it disrupts the project.
  
- 4. Which of the following best describes project stakeholders?**
  - Anyone affected by the project, its outputs, and its operation.
  - Anyone making money from the project.
  - Customer paying for the project's output.
  - The organization delivering the project's products.
  
- 5. Which of the following would be least likely to be included in a stakeholder management plan?**
  - List of identified project stakeholders.
  - Documentation of the relationships between project stakeholders.
  - Amount of money invested by the project stakeholders.
  - Actions to be used interacting with project stakeholders.

**6. Why is stakeholder collaboration important to a project?**

- Creates more reporting.
- Requires more meetings.
- Aligns expectations.
- Encourages teams to do more than expected.

**7. Which of the following statements most reflects the approach of servant leadership?**

- Lead by supporting the team needs.
- Lead by assigning the tasks of team members.
- Lead by micromanaging the team activities.
- Lead by facilitating the team reviews.

**8. Which of the following is the best example of recognition?**

- Monetary bonus
- Praise for effort
- Additional time off
- Meeting starting on time

**9. When leading a project team, what is the best leadership style to use?**

- Totalitarian
- Servant
- Democratic
- Most fitting for the team

**10. The Product Owner is unavailable to make a decision about a product feature. What is this considered?**

- Work request
- Impediment
- Backlog refinement
- Priority

**11. What is a technique used by project teams to bring everyone together on a set reoccurring basis to share what may be blocking or impeding on their work or plans?**

- Daily standup meeting
- Iteration review
- Retrospective
- Project kickoff

**12.Which of the following is the best example of a blocker?**

- The team cannot decide when to schedule the next iteration review.
- The demonstration is not ready for the iteration review.
- The clearance from another team to use content for the demo won't be ready within the current iteration.
- The demonstration fails in front of the product owner during the iteration review.

**13.While you are working on a SWOT analysis for a risk response, a team member asks you to show them how it's done. Which type of mentoring is this?**

- Informal
- Formal
- Scheduled
- Timeboxed

**14.You mentor a team member on leading an estimation session. Which skill are you mentoring?**

- Servant
- Facilitation
- Emotional
- Leadership

**15.The product owner is unsure on how to participate in an iteration review session. What should the project manager do?**

- Remove the product owner from the session.
- Request the product owner remain quiet and observe.
- Point the product owner to a website about iteration reviews.
- Coach the product owner on how to contribute in the session.

**16.A company was hiring for certain positions. For one position, they were asking for people with skills such as leadership, team building, motivation, conflict management, influencing, negotiating, and several others. This position would require the individual to lead efforts to satisfy specific objectives and complete them in a timely manner within budget constraints. What job position were they trying to fill and what is a description of the skills they were looking for?**

- Head of the PMO and communication skills
- Project manager and management skills
- Project manager and interpersonal skills
- Program manager and business skills

**17.A stakeholder is conversing with you regarding a potential change to a specification. Which best exemplifies active listening by you?**

- Staring intently into their eyes.
- Paying close attention to the behaviors of the other stakeholders.
- Asking relevant follow up questions.
- Correcting the stakeholder as soon as you can.

**18. During a meeting, you pay close attention to the emotions of yourself and others as the discussion gets heated. Which interpersonal skill are you leveraging?**

- Emotional intelligence
- Meeting management
- Leadership
- Influencing

**19. What is the aim of a retrospective?**

- To blamestorm problems.
- To identify who is not helping out on the team.
- To look back at all the work that was not completed.
- To identify what went well and what can be improved.

**20. Where is the ideal spot for an information radiator?**

- In the manager's office.
- In a high-traffic area.
- In an unused conference room.
- On the project manager's laptop.

**21. Key Performance Indicators (KPIs) should follow the acronym SMART. What does the A stand for in the SMART acronym?**

- Achievable
  - Awesome
  - Alert
  - Advanced
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# Mastery Builder 5-1

## Reviewing Keeping the Business in Mind

Activity Time: 15 minutes

### Scenario

The following questions are meant to test your knowledge of the content from this lesson.

**1. Who can request changes?**

- Team members and project managers
- Sponsor
- Stakeholders
- Customer

**2. A financial tool that calculates the present value of all cash outflows minus the present value of all cash inflows is referred to as which of the following?**

- Internal rate of return
- Net present value
- Benefit cost value
- Return on investment

**3. For this project, the team may develop its own set of operating procedures and operate outside the standard formalized reporting structure during the project. What organizational structure does this represent?**

- Functional
- Composite
- Projectized
- Matrix

**4. Early in the establishment of the project, the project manager spends time looking for historical data that might be helpful in planning the new project. She is looking for examples of project documents in similar projects that have been completed that she might be able to use as templates for the new project. She is also looking for information about established processes and procedures that will help the project run more smoothly. What is the term used to define these?**

- OPAs
- EEFs
- Progressive elaboration
- Organizational project management

5. The methodology used to systematically test possible solutions, assess the results, and implement those that work is known as which of the following:
  - Kaizen
  - Continuous improvement
  - Plan Do Study Act
  - Retrospective
6. Who is regarded as the father of the continuous improvement movement?
  - Crosby
  - Deming
  - Juran
  - Smith
7. A meeting that is held at frequent intervals in an agile project is referred to as which of the following?
  - Lessons-learned meeting
  - End-of-phase meeting
  - Retrospective meeting
  - Status meeting
8. Which of the following would not be part of your Quality Management Plan?
  - Quality standards and roles
  - Minimum Viable Product
  - Quality tools to be used
  - Major procedures for dealing with nonconformance
9. Which of the following are tools Quality Management teams use to identify issues? (Choose two.)
  - Audit reports
  - Planning Poker
  - Design for X
  - Kano Model
10. Which of the following are effective guidelines for measuring project compliance?
  - Tracking work completed in a Gantt chart.
  - Using QA outputs to confirm deliverable and process compliance and identify the needs for corrective actions.
  - Prioritizing effort using a Moscow (MSCW) analysis.
  - Reporting progress by conducting a Sprint Review and Demo.

11.Which of the following is not a PESTLE factor?

- Legal
- Effectiveness
- Social
- Political

12.What is the role of a Configuration Management System?

- Track Change Requests
- Prioritize the product backlog
- Control versioning of all components
- Define roles and responsibilities

13.Which of the following is not a benefit of planning for a Minimum Viable Product?

- Risk reduction
- Early feedback
- Early value from the service
- Project team disbands early

14.Last year, your company released a new service based on a project you managed. The company wants to determine if the new service has increased customer satisfaction. Which tool can measure the happiness of users of the new service based on their willingness to encourage others to use your service against those who would discourage others to use your service?

- Net promoter score
- Net value
- AB testing
- Planned value

15.Every timeboxed iteration in the project has a demo scheduled at the end during the iteration review session. What is the goal of this demo?

- To groom the iteration backlog.
- To revise the product roadmap.
- To solicit feedback from the product owner and other stakeholders.
- To establish the features to be included in the product backlog.



# Solutions

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## ACTIVITY 1–1: Building a Team

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**1. Brainstorm the key skills that you will want in the members of this team.**

A: Answers will vary, but key skills might include familiarity with the software to be migrated, experience migrating software solutions, customer service skills, the ability to create and execute a playbook to carry out a consistent process, the ability to maintain records and document actions, and troubleshooting skills.

**2. You want to be able to validate that a proposed team member has the key skills you are looking for. What types of techniques might you be able to use to assess whether the team member would be a good fit?**

A: Answers will vary, but can include any number of pre-assessment tools, including attitudinal surveys, specific assessments, structured interviews, ability tests, and focus groups.

**3. You wish to establish a resource schedule for the project. What types of information should you include?**

A: Answers could include how resources will be identified and acquired; the roles and responsibilities; the needed competencies; organization charts; training strategies and requirements; team development methods to be used; and resource controls for the management of physical resources to support the team. Also, project team resource management, including the guidance on the lifecycle of the team resources—how they are defined, staffed, managed, and eventually released. And, finally a recognition plan detailing how team members are rewarded and recognized.

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## ACTIVITY 1–2: Defining Team Ground Rules

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**1. The team decides it should produce a team charter, but is unsure of exactly what it should cover. What are some of the key areas that a good team charter should include?**

A: Your teams should identify at least some of the following key items: shared values, guidelines for communications, use of collaboration tools, decision making approach, conflict management, when the team meets, shared hours, how the team improves. Your participants may identify many additional alternatives that are effective.

2. The team realizes that it will regularly require interaction with other stakeholders who are not part of the team. What are some of the key considerations for interaction with them?

A: Any of the following answers would be appropriate: identifying the stakeholders; identifying their interests in the project; determining the appropriate communications method; determining the appropriate communications frequency; determining who on the team will engage with the stakeholder; determining how feedback from the stakeholder will be managed and aligned; and creating effective visibility for the stakeholder into project progress.

3. Many of the team members have had poor previous experiences working in project teams due to lack of trust, politics, and lack of a healthy team culture. How can you as the project manager create a healthy environment for your teams to perform successfully?

A: Answers will vary, but successful, high-performance teams have to go through the Forming, Storming, Norming, and Performing phases to get to be really high-performing. Good project managers will facilitate helping the team "storm" early, through its chartering process. Teams need to talk through how they will work together, how they will use collaboration tools to help facilitate visibility with one another, and how they will deconflict. Remember that if you have really good people on your teams, they will often disagree with one another on approaches to solve problems. Your charter should anticipate this, make this healthy, visible, and open to everyone, and set expectations up that 1) you will disagree about things and 2) when you do, here's the process you'll follow for working it out so you can move forward together.

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## ACTIVITY 1–3: Negotiating Project Agreements

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1. What are the main sections of a deliverables agreement? What are the key components you would expect to see in each section?

A: Answers will vary, but should reflect the core guidelines for analyzing the bounds of a project agreement.

2. The client has a long list of requirements, and you wish to help them prioritize their needs to help identify a Minimum Viable Product and to provide a basis for organizing the work in a backlog. What are some of the techniques you could use to help them?

A: Answers may include the Kano Model, Moscow (MSCW) Analysis, Paired Comparisons, and 100-point method.

- 3. The customer was hoping that the project team would get their requirements for the website, go and build it, and then bring it back ready to go when it's finished. You counsel them that getting much more frequent feedback is critical to ensure customer satisfaction and to help identify and prioritize different requirements that may emerge during the project. What techniques could the team use to maintain effective customer engagement?**

A: Answers may vary, but should go well beyond routine status reporting. If the project is run using Agile, regular daily engagement with a Product owner and sprint reviews at the end of each iteration should help to get feedback and course correction early. More traditional projects nonetheless need frequent feedback from the customer on progress and to ensure that new or changing requirements are identified.

## ACTIVITY 1–4: Empowering Team Members and Stakeholders

- 1. During team formation, the team may want to discuss how they will make decisions, and how they may need to deal with conflicts along the way. Describe how you would facilitate this discussion, and how you might capture the team's decisions in the team charter.**

A: Answers will vary, but encourage the participants to brainstorm different potential approaches to decision making, and to suggest approaches that have worked (and not worked) for them in the past.

- 2. The team wishes to use Agile Story Points to estimate effort. Given that this is a new team, how would you help them to facilitate benchmarking so they can estimate effectively?**

A: Answers will vary, but should focus on similar types of work with which the different team members have experience. Often the team will have a much better feel for this than trying to suggest something yourself, so encourage the team members to discuss their past work experiences on similar projects and see if they can identify a useful benchmark.

- 3. What tools can the project team use to facilitate collaboration and promote visibility?**

A: Answers will vary, but should be driven by a broader goal, ensuring stakeholder visibility and transparency for the team. For a traditional project, this might be found in the project Gantt chart; in an agile project, this might be the use of a task board for tracking and managing teamwork or even the use of standup meetings to ensure team progress and commitment.

- 4. Your team plans to have a retrospective at the end of each iteration to identify potential improvements in how the team is collaborating. While there are many, many techniques for running retrospectives, what are some of the key activities common in many retrospectives?**

A: Answers may include any number of different techniques, such as 4 Ls, Keep, Stop, Start, EHSV, and many others. In the big picture, good retrospectives should have a structure similar to this but may experiment with alternatives. Basically, you need to set the stage, gather and share data, generate insights, make decisions, and close.

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## ACTIVITY 1–5: Training Team Members and Stakeholders

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1. What types of options do you have for producing effective onboarding training? How might you deliver it? How critical is it to provide this training early to the team?

A: Answers will vary; options might include e-learning, instructor-led training, reading a cultural briefing, and other innovative options you might think of. For example, if you are near a museum with a history of a particular military branch, you might arrange a field trip!

2. Training on the software solution needs to be offered to more than 200 customer stakeholders; fortunately, their needs are relatively similar, so only one set of training materials needs to be produced. The client has people at four sites, and will need to have hands-on practice in using the solution. What are some of the key areas of focus in planning this training initiative?

A: Answers may vary, and each section that follows has a number of subset areas. Planning for this initiative will be extensive, including at least identification of the required competencies, Gap Analysis and Training Outcome requirements, Training Delivery Method, Cost Estimates, Training Calendar and Resource Planning, Post-Training Mentoring Support, and Pre- and Post-Assessments and/or Certification.

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## ACTIVITY 1–6: Engaging and Supporting Virtual Teams

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1. Your team immediately begins exploring potential tools and technologies they can use to manage the project and its deliverables. What should the team consider before making decisions about virtual tool supports?

A: Team planning and teaming agreements should precede decisions about specific tools. In short, the team should produce its team charter first, and identify key issues related to collaboration that will be exacerbated by not being co-located. These may include shared work hours, decision making, conflict management, team values, and how and when they will conduct their meetings.

2. What are some of the tooling alternatives the team could use to facilitate collaboration and communications?

A: Answers may vary, and will likely include many specific vendor tools available on the market. In broad categories, these may include shared task boards and burndown/burn-up charts to promote visibility; shared messaging and chat boards to enable quick ad hoc communications; knowledge repositories to store shared documents; and video-conferencing tools to create more opportunity for face-to-face collaboration.

3. Your team has been progressing on the project for a month now. The team is generally performing well, but you are looking to challenge them to identify areas where they can improve their collaboration and improve visibility. What are some areas you may want to monitor to ensure your teams remain engaged and collaborative?

A: Answers will vary, but should include keeping the project data up-to-date to help the other members maintain visibility. Listen for clues that team members are uncomfortable or not fully sharing blockers or other concerns. Encourage the team to use videoconferencing and maximize the "face-to-face" collaboration. Strongly reinforce that these tools and meetings are "by the team, for the team" and that they are working together to maintain their commitment to their shared goals. Make your meetings count, timebox them, and coach them to stay on track.

## ACTIVITY 1–7: Building a Shared Understanding about a Project

1. To ensure you have the necessary buy-in, commitment, and resources required to make the project a success, you offer to assist them in creating a formal project charter. What should be included, and who should sign it?

A: The charter should already be in place! However, too many projects start without a formal charter, and this sets the table for lots of misunderstandings later. Your charter at a minimum should include the project's purpose, measurable project objectives and related success criteria, high-level requirements, a project description, boundaries, and key deliverables, project risk, milestone schedules, pre-approved financial resources, key stakeholders list, project approval requirements, exit criteria, the assigned project manager and responsibility/authority level, and the name and authority of the project sponsor. Anything in the list that doesn't exist needs to be identified and agreed with the project sponsor.

2. You have decided due to the rapidly changing nature of the project's requirements that you wish to run this project using an agile approach such as Scrum. Your team is unfamiliar with the agile ceremonies and wants you to explain what they are and how they work. What are the agile ceremonies that need to be included?

A: The agile ceremonies should include Sprint Planning Meetings, Daily Standups, Sprint Reviews, and Retrospectives.

3. As your team is unfamiliar with agile, they are also unfamiliar with some of the agile practices for achieving agreement, estimation of effort, and creating a shared vision of the solution they are trying to produce. What are some methods for achieving agreement?

A: Answers could include Fist of Five, Roman voting, and consensus.

4. What are some techniques for estimation?

A: Answers should discuss the use of techniques like planning poker, and the use of T-shirt sizing, modified Fibonacci, and other techniques to size the relative level of effort.

5. What are some techniques for establishing a shared vision?

A: Answers should include the use of a product vision statement, potentially the use of an XP Metaphor or Product Box, or the use of Brainstorming and Dot Voting to identify and prioritize options.

## Mastery Builder 1–1: Reviewing Creating a High-Performing Team

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- 1. What are some techniques that a project manager can use to appraise the skills of a potential team member? (Choose two.)**
  - Ability tests
  - Focus groups
  - Kanban boards
  - RACI matrix
  
- 2. What does it mean if you are identified as an R in a RACI chart?**
  - You are accountable for the result.
  - You should be engaged to provide needed inputs.
  - You should be kept up to date on the status.
  - You are responsible for the activity's execution.
  
- 3. Which of the following are components of a Resource Calendar? (Choose two.)**
  - Working days
  - Training Strategies
  - Availability of physical resource
  - Recognition Plans
  
- 4. Which of the following are part of an effective team charter? (Choose two.)**
  - Shared values
  - Project objectives
  - Resource assignments
  - Conflict resolution
  
- 5. In which of the following situations would brainstorming be an appropriate technique?**
  - Conflict resolution
  - Sprint reviews and demos
  - Identifying and prioritizing options
  - Running a standup meeting
  
- 6. Which of the following is not a reason that PMI publishes a Code of Ethics? (Choose two.)**
  - Set expectations for the project manager and the team.
  - Create commitment to honesty, integrity, and commitment.
  - Ensure compliance with rules and laws.
  - Provide specific guidance on conflict resolution.

7. Which of the following should be included in a project charter? (Choose two.)

- Measurable objectives
- Detailed deliverables list
- Key stakeholders list
- Change request form

8. What are the rules about the length of a Sprint?

- 1 week
- 2 weeks
- 1-4 weeks
- Up to 12 weeks

9. Which of the following is not a technique for estimation?

- Planning Poker
- T-Shirt Sizing
- Product Box
- Modified Fibonacci

10. Which of the following are components of a project agreement? (Choose two.)

- Pricing and payment terms
- Incentives and penalties
- Team members
- Complete product backlog

11. Which of the following are methods to prioritize project objectives and deliverables? (Choose two.)

- Paired Comparisons
- Planning Poker
- First In, First Out
- MSCW (Moscow) Analysis

12. Which of the following are types of project metrics that may be appropriate for a given project? (Choose two.)

- Percentage of work completed
- Defects
- Subcontractor approvals
- Process compliance

13. Which of the following is the best approach to estimating effort?

- The project manager estimates all of the work.
- A team lead estimates all of the work.
- The work is estimated by the people who will be asked to do it.
- The estimates are inflated to avoid second guessing from the customer.

**14.What is self-organization? (Choose two.)**

- Asking teams to assess and agree to work goals as a group.
- Allocating all resources before they get assigned to a different project.
- Using a pull-based approach to ensure effective use of team resources.
- Having the project manager stipulate roles and responsibilities and assign all the work to individual team members.

**15.What are some objectives of running a Retrospective? (Choose two.)**

- Provide the stakeholders access to the team.
- Generate insights.
- Agree to 1-2 experiments to try to improve team performance.
- Get feedback on the product.

**16.Which of the following are vehicles for training delivery? (Choose two.)**

- Virtual classroom
- Self-paced e-learning
- Prior knowledge
- Testing and validation

**17.Which of the following should not be considered as part of training cost estimates?**

- Logistics and venue costs
- Employee salaries
- Courseware printing and distribution
- Instructions

**18.Which of the following will the project manager need to ensure before effective training can take place? (Choose two.)**

- Training is successfully resourced and scheduled.
- The final project sign-off has been received.
- Reminders should be planned and executed to ensure trainees are aware of the training and confirm their participation.
- Billing for the training should have taken place.

**19.Which of the following is a good practice for the use of collaboration tools?**

- Select tools with the best features.
- Select tools that the team lead has experience using.
- Define team goals and practices before consideration of what tools the team will need.
- Use the tools that the previous project used.

20.Which of the following are examples of virtual team collaboration tools?

(Choose two.)

- Shared task boards
- Your laptop hard drive
- Social media
- Team chat boards

21.Which of the following should be included in a Communications Plan?

(Choose two.)

- How and when team meetings are run.
- Equipment assigned to each team member.
- Project Charter.
- Preferred communications approaches with external stakeholders.

## ACTIVITY 2-1: Determining the Appropriate Project Methodology

2. The capital project is one the organization has performed many times in the past for other cities. The objective is to replace all the old metal pipes under the city streets. Which method would you recommend?

A: Predictive/Plan Driven

3. The software project is one where there are many features and functions that must be updated, as well as more learned from community feedback. The objective is to roll out features to get user feedback and drive the priorities for potential future releases in the project. Which method would you recommend?

A: Agile

4. The employees in the organization are eager for small perks to be released based on a new company-wide initiative to boost morale. The objective is to deliver small bits of value on their way to the larger goal of higher employee satisfaction. Which method would you recommend?

A: Incremental

5. The marketing project is one the organization is using to raise awareness of their new software and services. The objective is to keep repeating various marketing techniques and after a while focus on the methods or tools that appear to have the largest impact. Which method would you recommend?

A: Iterative

6. You are asked to advise on a project to update all the bathrooms in a three-story office building with new high tech and water efficient equipment. Which life cycle type makes the most sense for this project?
- Predictive life cycle
  - Incremental life cycle
  - Iterative life cycle
  - Adaptive life cycle

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## ACTIVITY 2–2: Planning and Managing Scope

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1. Why is it important to properly manage the scope of your project?  
A: Answers will vary, but should include: Because the scope determines what the project outcomes will be, you must make sure that it is constantly on track with the approved scope baseline.
2. What are some techniques you could use to elicit project requirements? (Choose four.)
  - Document analysis
  - Project Management Plan
  - Observations
  - Work breakdown structure
  - Interviews
  - Questionnaires
3. You and the project team draft a project scope statement. Which of the following is commonly part of the project scope statement? (Choose two.)
  - Scope creep
  - Acceptance criteria
  - Budget
  - Scope description
  - Schedule
4. You are creating a scope statement which includes only the smallest collection of features that can be included in a product for customers to consider it functional. What product approach are you using?
  - Release Planning
  - Progressive Elaboration
  - Minimum Viable Product
  - Horizon Planning

5. The project team decomposes the scope of the project to create a WBS. The work packages in the WBS have a dictionary with information and referenceable details. What type of details might be in a WBS dictionary for items on the WBS?

A: The WBS dictionary can include any of the following and potentially others not listed: Code of account identifier, Description of work, Assumptions and constraints, Responsible organization, Schedule milestones, Associated schedule activities, Resources required to complete the work, Cost estimations, Quality requirements, Acceptance criteria, Technical references, and Agreement information.

6. As the project team decomposes the work in the WBS, they begin to populate product backlog. When must the team have the product backlog finished?

- By the first phase of the project.
- By the first iteration.
- By the time the business signs off on the project scope statement.
- The product backlog is a living artifact that is finished at the end of the product.

7. To capture the business and end user needs and the value desired, user stories are often used to populate a product backlog. If the project seeks to make it easier for company employees to submit travel expense reports, how could you write a user story based on this need? You may use the template "As a *[user name or persona]*, I want to *[objective or intent]*, so that I can *[why the objective brings value]*."

A: Answers may vary: As a company employee who travels for work, I want to submit my travel expense reports with little hassle, so that I may get reimbursed and get back to working on more important items.

## ACTIVITY 2–3: Estimating Project Costs

1. Which estimating technique was used to come up with the \$30,000 figure for the public meeting work package?

A: Analogous estimating was used, because historical information from similar projects formed the basis of the estimate.

3. What is the estimated cost of the Conduct Planning Meetings work package?

A: The four 2-hour planning meetings involving 15 in-house people at \$80 an hour will cost \$9,600 ( $4 \times 2 \times 15 \times 80$ ), and the two catered lunches for the 15 people at \$15 per person will cost \$450 ( $2 \times 15 \times 15$ ). Therefore, the total cost of the Conduct Planning Meetings activity is \$10,050.

4. What technique did you use to estimate the cost of the Conduct Planning Meetings activity? Why is this technique beneficial?

A: Parametric modeling was used. It is reliable and can provide a high level of accuracy. However, the data used to provide the estimate must be accurate, quantifiable, and scalable.

5. Which estimating technique was used for the Arrange Staffing activity?

A: Analogous estimating was used for air travel and parametric modeling was used for the other costs.

6. Using the information in the Public Meeting Estimate document, estimate the cost of each of the activities.  
**A:** The breakdown is: Conduct Planning Meetings \$10,050; Arrange Location \$4,950 to \$5,540; Arrange Staffing \$6,700; Publicize Event \$7,800 to \$8,300; and Hold Event \$3,000.
7. What is your total estimate for the Public Meeting work package?  
**A:** The total estimate should be \$32,500 to \$33,590.
8. What is the degree of certainty of your cost estimate now?  
**A:** You now have a definitive (control or detailed) estimate that has an accuracy of -5% to +10%.
9. Do you need to take any action regarding the sponsor's target of \$30,000? If so, what action should you take?  
**A:** You can ask for more money, or if the sponsor declines your request, you can reduce the cost of one or more of the activities.

## ACTIVITY 2–4: Estimating the Cost Baseline

1. Do you have all the necessary inputs to establish a cost baseline?  
**A:** Yes, you have the WBS with cost codes assigned, the project schedule with at least start and finish dates for each activity, and the cost estimates.
2. What cost assignment method will you choose to allocate funds? Why?  
**A:** Answers will vary, but may include: the Percentage Complete rule because the milestones are clearly defined and can be easily reported on.
3. What are the weekly cost estimates for the activities in the Public Meeting work package? Use the following table to estimate the costs per week, rounding to the nearest thousand.

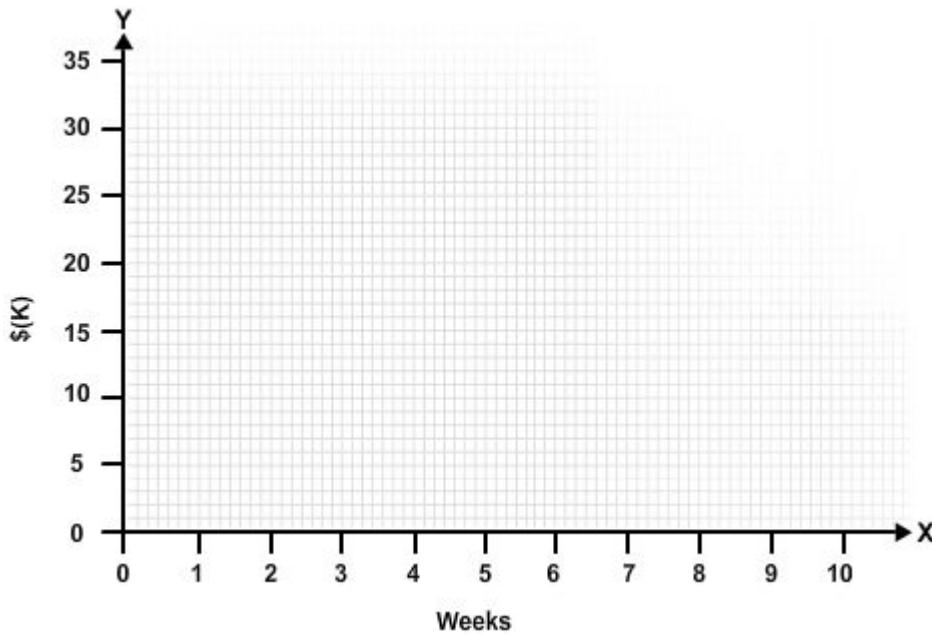
1.1.4.2	Public Meeting	Total Budgeted Cost (K)	Week									
			1	2	3	4	5	6	7	8	9	10
	Conduct Planning Meetings	10										
	Arrange Location	5										
	Arrange Staffing	7										
	Publicize Event	8										
	Hold Event	3										
	<b>Total</b>	<b>33</b>										
	Cumulative											

**A:** The allocation of costs will look similar to the table in the corresponding overhead.

5. Will you include a contingency amount?

**A:** No, because this is a relatively low-risk work package.

6. How will you plot the estimates to create an S-curve? Use the graph to plot your results. Cost (in terms of thousands) is plotted on the Y-axis and time (in terms of weeks) on the X-axis.



**A:** Based on how the costs were allocated, the answers will look similar to the graph in the corresponding overhead, which plots the S-curve based on the previous Completed Costs Per Week table.

## ACTIVITY 2–5: Creating an Activity List and a Milestone List

- The first step in creating an activity list is to gather your resource materials. Which items will be helpful in creating your list? (Choose three.)
  - The WBS
  - Cost-benefit analysis
  - The scope statement
  - Activity lists from similar projects
- You are creating your activity list, but only for the next two portions of the project. The rest of the work you are leaving at the work package level. What approach are you using?
  - Predictive life cycle
  - Brainstorming
  - Bottom up
  - Progressive elaboration

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## ACTIVITY 2–6: Sequencing Activities

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3. During a recent meeting with your project team, a decision was made to add five days between two activities—installing the plywood flooring and framing the exterior walls—due to other projects that some members of the team have already committed to. Will this be a lag or lead relationship that you should account for? Add it to the table and explain.

A: There will be a five-day lag between installing plywood flooring and framing exterior walls.

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## ACTIVITY 2–7: Planning and Managing Quality

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1. Since there are many areas where quality may be an issue, how does the product team determine what the quality standards are?

A: Answers may vary, but should include that the quality standards are set for the project by the project team taking in and setting the standards from various resources and stakeholders. This requires the team to work on determining the standards for various aspects of the project. This may come from an industry standard, or from a company standard used on all their chocolate products, or from standards researched and set by the quality department, senior leadership, or from SMEs on the project. Standards can be based on benchmarks to other projects, products, competitors, or other sources.

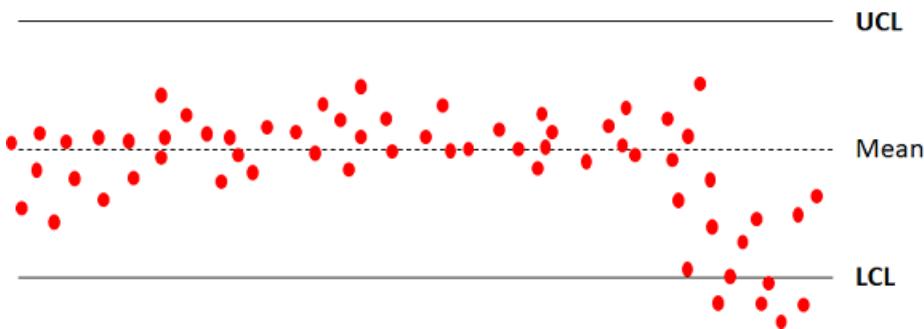
2. The project team includes quality engineers that want to include a quality check at the end of the production line to scan for foreign objects that may be in the chocolate. The scanning tool is \$30,000 to procure and install. What kind of project cost is this?

- Cost of non-conformance
- Warranty cost
- Cost of conformance
- Variable cost

3. The chocolate must not exceed a set size with a 3% tolerance in order to fit in the packages and for those packages to fit in the shipping containers. For this quality metric, how could the project team measure conformance? (Choose two.)

- By observing the amount of chocolate in the mold
- By using an electronic measuring tool
- By asking the customer to ship back any products too small or too large
- By cleaning the assembly line every 4 hours

4. During the first production run, the quality measurements were examined closely. The first 100 chocolate pandas produced were measured on a scale to assure they meet the weight requirement. The control chart from those first hundred looked like the diagram below. What can be determined based on the chart? What should have been done at certain points in the production run?



**A:** Answers should include that the quality was within control limits at the start of the run, but near the end the process was out of control. At the first point where the results went outside the control limits, there should have been an investigation and an assigned cause.

## ACTIVITY 2–8: Integrating Project Planning Activities

1. Reflecting on your project management experience, what types of project management plans have you worked with or created?

**A:** Answers will vary depending on students' experience. Project management plans can range from an informal, minimal-information-provided document to a formal, thorough, detailed document.

2. Which subsidiary plan deals with the closure of contracts, including those signed to bring in consultants?

- The scope management plan
- The procurement management plan
- The process improvement plan
- The communications management plan

3. The project team recognizes there are going to be a lot of changes to documents and procedures throughout the project. The importance of team members using the correct checklist, document, or file is key. Operating off the incorrect version can have a major impact. Which plan most addresses this project concern?

- Project charter
- Scope management plan
- Configuration management plan
- Control quality

4. You are creating a sub-plan, which describes the problems the project might encounter if government standards, municipal laws, or internal processes are not correctly followed. What plan are you working on?
  - Compliance management plan
  - Configuration management plan
  - Communication management plan
  - Quality management plan

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## ACTIVITY 2–9: Managing Suppliers and Contracts

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1. You will need six professional security guards for four hours during the evening of the public meeting. What contractual considerations are important as you select the security firm who will provide the guards? (Choose two.)
  - Cost-reimbursable contract
  - Fixed-price contract
  - Term contract
  - Completion contract
  - Cost plus incentive fee contract
2. You will rent three large monitors so meeting attendees can see the speakers. Which of the following documents should you prepare first in order to procure the monitors?
  - Procurement Statement of Work
  - Procurement Management Plan
  - Contract
  - Teaming agreement
3. Your public meeting requires approximately 5,000 square feet of space. Which of the following selection criteria are most important? (Choose two.)
  - Past performance of company that owns the space
  - Size of the company that owns the space
  - Warranty
  - References from previous renters
  - Use of two smaller rooms if one large room is not available

4. The contract to rent the monitors stipulates that you should inspect them before the meeting. You are in a hurry and forget to do this, and as the meeting begins one of the monitors does not work. Which of the following is the correct term for this situation?
- Warranty
  - Breach of contract
  - Waiver
  - Negotiated settlement

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## ACTIVITY 2-10: Determining Governance

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1. Which of the following best represents the definition of governance?

- A set of practices to help assure the success of the project.
- Phase-to-phase relationships within the project.
- The PMO directive on managing the project.
- The sponsor's directive on managing the project.

2. When should the assumptions made about a phase be verified?

- At the beginning of a phase
- At the beginning of the next phase
- At the end of the project
- Continually throughout the project

3. The decision to move from one phase to another is known as which of the following? (Choose three.)

- Kill point
- Go/No go
- Phase gate
- Phase endpoint
- Continuance threshold
- Governance gate

4. Which of the following describes the most common phase-to-phase relationship in multi-phase projects?

- Finish-to-start
- Sequential
- Orderly
- Non-overlapping

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## ACTIVITY 2–11: Closing a Project or Phase

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1. Are your project records ready for review by the project sponsor? Why or why not?

A: Yes, because you have collected performance measurement and product documentation as well as other relevant project records to archive.

2. What document will you prepare before obtaining formal acceptance from your project sponsor to officially complete the project?

A: You should prepare a final project report. You should also complete a lessons-learned report.

3. In this case, what might constitute formal acceptance?

A: Answers will vary, but may include: a formal presentation to stakeholders followed by a memo from the project sponsor that the project is complete. Formal acceptance documentation should be distributed to the appropriate stakeholders and stored with the project archives. If the customer was external, you might also need to receive their formal acceptance in writing.

4. What types of documentation or computer files should you store in the project archives?

A: Answers will vary, but may include: the project plan, project performance records, contract records, names of team members, and/or financial records.

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## Mastery Builder 2–1: Reviewing Starting the Project

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1. Which is the best elicitation technique to use when your project team wants to facilitate a discussion with a certain set of users to get a better understanding on how they might use your project's product?

- Document analysis
- Focus group
- Benchmarking
- Plurality

2. The project team is reviewing the requirements documentation that they are responsible for working on. Which project artifact can they reference to see the connection between the requirements and the business and project objectives?

- Requirements traceability matrix
- RACI Chart
- Project charter
- Scope management plan

- 3. Months into the project, work on a planning package needs to be further broken down and scheduled. Which of the following should be done by the project team?**
- Keep the original WBS dictionary unchanged.
  - Use the work packages that were defined at the start of the project for the planning package.
  - Update the WBS dictionary as the planning package is converted to work packages.
  - Obtain a change request for the planning package from the change control board.
- 4. An architectural firm has spent a great deal of time and effort creating the design and blueprints for the building. They had to purchase materials and hire consultants and have been working on this project for six months. They have submitted all the invoices for the money they have spent on the work, as well as an invoice for the fee of \$5,000. What type of contract was this?**
- Time and materials
  - CPIF
  - FPEPA
  - Cost-reimbursable
- 5. When can the contract closeout occur?**
- At the end of a project only.
  - Whenever a contract is completed and accepted.
  - At the end of a project only, unless the project is terminated early.
  - Whenever a seller is selected.
- 6. What are the goals of contract closeout? (Choose three.)**
- To arrange for final settlement of seller payments and claims.
  - To verify work was done and delivered to specification.
  - To provide performance evaluation of seller staff.
  - To update contract records and documents.
- 7. In what situation would you not perform the Close Project or Phase process?**
- When a project is terminated.
  - When a project phase is complete.
  - When the customer validates the interim deliverables.
  - When a project is complete.
- 8. If the project was terminated early, why would the project manager insist that the team perform the Close Project or Phase process?**
- To document the reasons why the project was terminated early, and how to transfer the finished and unfinished deliverables to others.
  - The project manager should insist this is a waste of the team members' time since no one wants the project or its output any longer.
  - To make sure everyone knows that the reason for project termination was his fault or the fault of the team.
  - To document lessons learned so mistakes won't be repeated in future projects.

9. The project manager wants to make sure all team members understand the importance of the whole closing process and asks if there are any more questions. One team member asks, "What would happen if this process was not done?" How should the project manager answer that question?

- The customer would not be obliged to pay for the project.
- The next related activity, phase, or project might not get started.
- The stakeholders would not have any faith in the project team for future projects.
- The team members would not be allowed to be assigned to future projects.

10. In a large organization that utilizes a Project Management Office (PMO), who is responsible for managing the governance of projects?

- The project managers of the individual projects within the PMO.
- The PMO.
- The organization's Governance Committee.
- The organization's Change Control Board.

11. In a multi-phase project, when are assumptions validated and risks analyzed?

- At the end of the project.
- At the beginning of each phase.
- At the end of each phase.
- As specified in the Project Governance document.

12. In a multi-phase project, which of the following terms refers to a decision to continue with the next phase or to end the project? (Choose two.)

- Kill point
- Phase gate
- Threshold
- Go/No go point

13. What are activity cost estimates made up of?

- Supporting data or additional information needed to justify the cost estimates.
- Estimates on probable costs necessary to finish project work, including direct costs, labor, materials, equipment, facilities, services, information technology, and contingency reserves.
- Estimates on probable costs necessary to finish project work based on the responsive bids obtained from vendors.
- Estimates on probable costs necessary to finish project work, including direct labor, materials, equipment, facilities, services, information technology, contingency reserves, and indirect costs.

**14.What is the process to create a project budget?**

- Take the ROM and decompose it into the cost of work packages.
- Combine all individual activity cost estimates and aggregate them for the entire project. Submit this to the sponsor, and modify it if necessary. The agreed-upon final cost estimate is the budget.
- Estimate costs necessary to finish project work, including direct costs, labor, materials, equipment, facilities, services, information technology, and contingency reserves.
- Create an S-curve with cost on the Y axis and time on the X axis.

**15.The project manager is using the time-phased budget to measure the cost performance. What is that budget called?**

- Cost baseline
- Cost estimate
- Rough Order of Magnitude
- Cost consolidation

**16.Your company is designing a game for families. In order to test to see if the game is easy enough for children, the team creates a prototype and then establishes their test criteria. Then the team establishes test groups of 100 boys and 100 girls, all between the ages of 3 and 5, at 50 different elementary schools across 30 states. The prototype will then be modified and rolled out across the country. What are they engaged in?**

- Benchmarking
- Design of experiments
- Statistical sampling
- Force field analysis

**17.What is the main focus of quality assurance and what does it result in?**

- Quality assurance is focused on process and procedures used, and it results in improved quality.
- Quality assurance is focused on measuring the output of the work package, and it results in improved quality.
- Quality assurance is focused on measuring the output of the work package, and it results in better metrics.
- Quality assurance is focused on process and procedures used, and it results in a shorter schedule.

**18.The project manager is reviewing the quality control chart with the project team and the product owner. The response times have been going down over the iterations, but are still above the upper control limit. What does that mean?**

- The project's quality is outside the quality standards set for the project.
- The project's burndown rate is above normal.
- The project's standards are too high.
- The project's quality is above expectations.

**19.What is the purpose of decomposing the project work into a hierarchical WBS structure?**

- To create smaller more manageable chunks, which can be better estimated for cost, time, and resources, and help control the project.
- To create a sequence of work that can be used to track progress through the life of the project, ensuring the project deadline can be met.
- To select the requirements that will be included in the project to the satisfaction of the stakeholders and the project sponsor.
- To draw out potential options to complete the work so the stakeholders and the team members agree on the methods used.

**20.Which of the following is the correct definition of the critical path?**

- The critical path is the fastest path through the network diagram which represents the longest time in which the project can be completed.
- The critical path is the shortest path through the network diagram which represents the longest time in which the project can be completed.
- The critical path is the earliest path through the network diagram which represents the latest time in which the project can be completed.
- The critical path is the longest path through the network diagram which represents the shortest time in which the project can be completed.

**21.A team member who is new to the organization and working on projects has several questions. He asks the project manager to meet with him to discuss these items so he can understand the project planning process. The project manager is delighted that this new team member is taking so much interest. The team member asks, "If we must complete the software code before we can create the user manual, what type of dependency exists between these two work packages?" How should the project manager reply?**

- Finish to Finish
- Finish to Start
- Start to Finish
- Start to Start

**22.Integrating the project management plan, what is a primary component?**

- Outputs of the planning process.
- When the product will be phased out.
- When the project will be chartered.
- Administrative duties of the project manager.

**23.The product owner is on vacation. A decision must be made on project change. What should the team reference to determine next steps?**

- Project Charter
- Change management plan
- Project timeline
- Configuration management plan

24. You are working on a project that is part of a program. All the projects within this program are being managed in an agile way. What is a good technique to get the project teams aligned?

- Hold one daily standup meeting for all the projects.
- Assign one customer point of contact for all projects.
- Develop one project management plan.
- Conduct a Scrum of Scrums.

25. You inform the project sponsor that the project management plan will continuously increase in the level of detail as the project moves forward. In project management, what is this process known as?

- Life cycle
- Progressive elaboration
- Resource planning
- Scope creep

26. The organization is exploring a new project where there are many unknowns and most of the work to be done is designing software to build the best solution in collaboration with the customer. Which project management approach is best suited for this project?

- Agile
- Plan driven
- Phased
- Waterfall

27. The business determines that the project you are managing must be based on a plan driven project management approach. This is partially due to the SMART objectives the steering committee has set for the project. In the acronym SMART what does the A stand for?

- Awesome
- Accepted
- Achievable
- Adjusted

## ACTIVITY 3-1: Assessing and Managing Risks

3. Which of the following might be risks (either opportunities or threats) for this project? (Choose three.)

- Fluctuating material costs
- Finding another family for the house if the Andrews family moves to another town
- Weather
- Vandalism

**4. Would you classify the weather as a positive risk (opportunity) or a negative risk (threat)?**

A: The answer depends on the weather. Bad weather is a threat because it might cause delays to the building schedule. Good weather is only an opportunity if it enables you to work longer or more hours and finish the house ahead of schedule.

**5. What events might be considered triggers for the risks?**

A: A news story forecasting possible inflation could cause material prices to rise dramatically. The weather forecast is a trigger for the bad weather threat. The occurrence of vandalism in the neighborhood is a trigger for possible vandalism at the job site.

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## ACTIVITY 3–2: Executing a Project with Urgency

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**1. There are so many features and functions that must be designed, developed, and deployed. The assembled project team is overwhelmed and unsure where to even begin. How would a preliminary examination of the business value of some of the features and functions assist the team at this early stage?**

A: Answers may vary but could include: Exploring and examining the various features and functions of the services and products planned to be offered by the app can identify objectives of the project. The team can understand the benefits sought by the project. It can help the team appreciate and internalize the outcomes expected by their work and not be too focused on only the technical aspects of the work.

**2. What is the value of doing this before having technical discussions?**

A: Having a broad evaluation of the value, the team can recognize the needs and think about how they can design and deliver with them in mind. This means discussing the "why" before getting bogged down on the "how."

**3. As the project team gains better understanding of the value their product might deliver, they are excited to make the product a reality. Due to the volume of features and the work required, the project team decides to delivery incrementally. What are some benefits to this strategy? (Choose three.)**

- Creates a sense of urgency to deliver part of a solution.
- Allows progress to be realized.
- Makes senior leadership promote their work.
- Allows the team to discard or ignore the challenging work.
- Enables the end users to provide feedback.

4. You and the project team determine the minimal viable product (MVP) to release only one month after the project launch. Others in the organization are asking for many other features and designs to be included before it is released to the public. Should the project team hold off on the release until more features are added or should they move forward on their MVP plans?

A: The MVP is designed to deliver the minimal functionality and design to deliver some value to users. That realized value is not all the value possible or planned for the product, but does deliver some value. Having tangible outputs for the business, customers, end users, or whomever the product is released to, allows stakeholders beyond the project team to experience the outputs and provide feedback as to whether or not the product does in fact deliver the intended results and where improvement can be made. Those additional features that others in the organization are requesting will be implemented—potentially, depending on feedback—in future releases of the product.

## ACTIVITY 3–3: Planning Communications Management

1. What communication skills can be used when working with the various people?

A: Answers will vary, but could include: active listening, observation, direct questioning, coaching, resolving conflict, and educating.

2. Which item should you use to determine the communications needs of your project stakeholders?

- Stakeholder analysis data
- Research material
- Project report deadlines
- Executive board schedule

3. Given the scenario, what would be a good technology for enhancing team member interactions and building relationships throughout the life of the project?

- Team building event at project kick-off
- Project team threaded discussion board
- Use email and databases to collect and store information
- High-quality virtual teleconferencing on a semi-weekly or weekly basis

4. Which of the following is not a component of the communications management plan?

- The initiator and receiver of project communications
- The Stakeholder Register
- The collection and transfer of institutional knowledge
- The frequency of each communication

5. After integrating the communications management plan into the overall project plan, what would be the next logical step?
  - Determining whether there will be changes to the proposed technology before the project is over
  - Creating a schedule for the production of each type of communication
  - Creating a description of stakeholder communication requirements
  - Distributing the plan to all the stakeholders

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## ACTIVITY 3–4: Creating a Stakeholder Register

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2. Given the information in the scenario, who is the sponsor of the 234 West Adams project? Enter your answer in the stakeholder register.  
A: Linda Michaels
3. How are the mayor and local government involved in the building project? Enter your answer in the stakeholder register.  
A: The mayor and others in the local government might need to be consulted on zoning or other development issues. It will be important to seek their counsel as early in the process as possible to avoid disruptions once the actual construction work begins.
4. What are some of the possible expectations that the homeowners will have? Enter your answers in the stakeholder register.  
A: The homeowners will clearly be expecting to have a completed home to live in. To get to that outcome, they or their family and friends might also expect to provide "sweat equity" during the project.
5. Who are the external stakeholders involved in the actual construction of the home at 234 West Adams? Enter your answers in the first four columns of the stakeholder register.  
A: For the actual construction, the external stakeholders include the building inspector, master carpenter, plumber, electrician, and landscaper—all the people who provide specific expertise.

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## ACTIVITY 3–5: Creating a Stakeholder Engagement Assessment Matrix

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### 1. Why is it important to plan for stakeholder engagement?

A: Answers will vary, but should include: the stakeholders having a large impact and influence on a project and what the outcomes will be. They are always emerging as a project progresses, and so having a good stakeholder engagement plan will enable you to react and keep all stakeholders engaged. Because most of a project's requirements come from the stakeholders, keeping good track of them along with the stakeholder who is associated with the requirements is essential to good communication and project success.

**2. Based on the scenario, enter the stakeholders in the following table.**

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading

**3. Based on the scenario, what classification would you use for Dave's level of involvement in this project? Enter your assessment in the matrix table above.**

- Resistant
- Unaware
- Leading
- Supportive
- Neutral

**6. How would you plan to manage Dave's resistance?**

**A:** Answers will vary, but might include: asking Seth to speak one-on-one to Dave to convince him of the benefits. Additionally, letting Dave know that his accountants are neutral at the moment but will follow Dave's lead, so if he continues to be a roadblock, he's adversely affecting more than himself.

## ACTIVITY 3–6: Creating Project Artifacts

**1. Which of the following documents will you not prepare for the project to build a new house?**

- Assumptions
- Release Plan
- Acceptance criteria
- Scope Management Plan

**2. Which of the following is a tool used to manage changes to a product or service?**

- Version control
- Configuration management
- Configuration management system
- Artifact management system

**3. Which artifacts would you likely include under version control? (Choose three.)**

- Schedule Management Plan
- Lessons learned
- List of assumptions
- Stakeholder register
- Minutes of status meetings
- Project Charter

**4. Which of the following systems is used to create, store, retrieve, and distribute project documents?**

- Artifact management
- Configuration management
- Document management
- Project management

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## ACTIVITY 3-7: Managing Project Changes

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**1. Who will you involve in the change control process for the new build project and what is their role in the change control process?**

A: The change control process should involve the development company senior executives and strategic planning individuals who are the key stakeholders. Their role will be to identify what will be considered a significant enough change from each baseline to require management approval. You should also include the PMO.

**2. The carpenter informs you that the window and door installation will have a significant delay and is asking for a change in subsequent schedule dates. What action should you take first?**

- Coordinate changes across knowledge areas.
- Document the change request in a change control system.
- Update the project plan to reflect changes.
- Bring the information to the stakeholders for evaluation and approval.

**3. The carpenter contacted the window and door supplier and was able to secure half of the windows before the next regularly scheduled shipment. Based on your change control process, what further action, if any, should you take?**

A: You should document the results of installing half the windows now and the remaining when the regular shipment arrives.

**4. How do you ensure all functional areas are aware of the requested changes that may affect them?**

A: Answers will vary, but may include: implement a CCB with representatives from each functional area and send weekly email messages with reports and ask managers to approve or disapprove the requests.

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## ACTIVITY 3–8: Managing Project Issues

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**1. Describe the differences between a risk and an issue.**

A: A risk is focused on the future, it can have a positive or negative effect on the project, and it is documented in the risk register. The response to a risk is called a risk response. An issue is focused on the present, it has a negative effect on the project, and it is documented in the issue log. The response to an issue is called a workaround.

**2. What should an issue log contain?**

A: A description of the issue, when it was added to the log and when it should be resolved, its priority, an owner who will follow its resolution, the selected response, and the status (open or closed).

**3. Which of the following items are issues for the 234 West Adams project?  
(Choose two.)**

- A letter from the bank stating that the mortgage rate will increase in three weeks.
  - The Andrews family's camping trip, which is scheduled during the time they are to close on the house.
  - A possible decrease in the price of the landscaping work.
  - Next week's scheduled building inspection.
- 

## ACTIVITY 3–9: Ensuring Knowledge Transfer for Project Continuity

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**1. When should transfer of knowledge take place?**

- At the end of the project
- At the end of each phase of the project
- When the lessons-learned register is archived
- Throughout the project

**2. What are examples of tacit knowledge?**

- Beliefs, experience, and insights
- Words, numbers, and pictures
- Anything of value to another person
- Only knowledge about the project scope, schedule, and budget

**3. Management of project knowledge exists on three levels. What are they?**

- Technical, administrative, and procedural
- Individual, project, and organization
- Scope, schedule, and budget
- Practical, theoretical, and actual

**4. When is the lessons-learned register created?**

- At the conclusion of the project, after all tasks have been completed
- After completion of the first phase of work
- At the beginning of project execution
- At the beginning of the project

**5. Who is ultimately responsible for transferring knowledge learned during the project?**

- Sponsor
- Project manager
- Work package owners
- All stakeholders

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## Mastery Builder 3–1: Reviewing Doing the Work

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**1. The project team does not feel confident that they can complete the work for the next set of deliverables of the project and would rather spend more time exploring deliverables expected many months down the line. What can a project manager do to get the team focused on the near term deliverables?**

- Change the scope of the deliverables.
- Group the near term deliverables into one deliverable.
- Create a sense of urgency.
- Make one person accountable for the deliverables.

**2. The business is unclear on the direction and when features are to be expected for an agile managed project. What project artifact helps communicate the goals, milestones, and potential deliverables, releases, or other work outputs?**

- Product roadmap
- Project charter
- Requirements documentation
- Configuration management plan

**3. The business is anxious to get a portion of the project's creations out into the marketplace to get end user feedback and impressions before the entire product is finished. What must the project team establish for their release to end users?**

- The minimal viable product
- The sprint cycle
- Velocity
- Transition plan

**4. A list of stakeholders who will receive communications about the project will appear in which of the following documents?**

- Communications Requirements Analysis
- Communications Management Plan
- Stakeholder Register
- Communications Requirements Analysis and Communications Management Plan

**5. Which of the following is not a component of the Communications Management Plan?**

- The initiator and receiver of project information.
- The Stakeholder Register.
- The collection and transfer of institutional knowledge.
- The frequency of each communication.

**6. After integrating the communications management plan into the overall project plan, what would be the next logical step?**

- Determining whether there will be changes to the proposed technology before the project is over.
- Creating a schedule for the production of each type of communication.
- Creating a description of stakeholder communication requirements.
- Distributing the plan to all the stakeholders.

**7. Which one of these is a risk?**

- We have determined that our schedule is not going to meet the required deadline.
- We think it is possible there will be a sale on parts and we could spend less money than we originally thought.
- There are not enough resources to complete the work on time.
- The change in the prime rate has caused our funding source to be unable to provide the money we need in the upcoming project phase.

**8. Which of the following is a good example of mitigating the probability of the risk of becoming overcome with smoke on a project?**

- Install smoke detectors.
- Install fire-proof components.
- Hire another company to do the part of the work that could result in a fire.
- Keep the phone number of the fire department handy.

**9. What is the difference between avoiding a threat and mitigating it?**

- Avoid means to reduce the impact or probability, and mitigate means to change the management plan to remove the risk.
- Avoid means to outsource the work to remove the risk, and mitigate means to reduce the impact or probability.
- Avoid means to change the management plan to remove the risk, and mitigate means to reduce the impact or probability.
- Avoid means to change the management plan to remove the risk, and mitigate means to accept the impact or probability.

**10. Engaging with stakeholders is time-intensive during project planning. The sponsor would like to know what all the fuss is about and get an explanation from the project manager about what is taking so long. The project manager explains the need for a stakeholder engagement strategy with which of the following statements?**

- To effectively engage stakeholders in project decisions and execution based on the analysis of their needs, interests, and potential impact.
- To ensure the stakeholders are receiving the reports in the format they would like.
- To effectively place the right people in the correct role to support achieving the project objectives on time and within budget.
- To be able to document which stakeholder is unaware, neutral, leading, or supportive.

**11. Which of the following statements best describes the Stakeholder Engagement Assessment matrix?**

- It describes the level of involvement of each stakeholder.
- It describes the past performance of each stakeholder.
- It compares the current and desired levels of engagement of each stakeholder.
- It compares the current and desired levels of engagement for the project team members.

**12. Which of the following individuals is not a stakeholder in a project?**

- Someone opposed to the project.
- The project manager.
- Someone who is not interested in the project.
- The president of the company.

**13. What does configuration management address?**

- Activities such as keeping track of all the changes the customer makes to the product plans.
- The way in which the product is configured for use to satisfy the end users and how that develops as it is being built.
- Documentation of the management of configuring the product for use and how changes to the product will be incorporated into the overall project plan.
- Activities such as how version control of project documents and changes to the product will be initiated, analyzed, and traced.

**14. Which of the following is concerned with revisions to project documents?**

- Version control
- Configuration management
- Both version control and configuration management
- Document control

**15.Your project team holds weekly status meetings. Should the notes from last week's meeting be considered a project artifact?**

- This decision is up to the project manager.
- Yes, if significant project issues were discussed.
- Yes, even if the meeting resulted in only routine topics.
- No, meeting notes are not artifacts.

**16.A problem occurs during the project execution. It is not a big problem, but it does bother some of the stakeholders. The project manager requests that it be added to the issue log. What would be the reason for this?**

- The issue log serves as a place to document problems that occur and to track their resolution.
- The issue log will be reviewed by the risk team at its next meeting to develop a contingency plan.
- The issue log will be submitted to the change control board for a change approval.
- The issue log serves as a place to document the unidentified risks.

**17.Which one of the following statements about issues is correct?**

- Stakeholders use the issue log to manage an issue.
- An issue should be assigned to only one person.
- There must be no open issues when the project is closed.
- Only issues that are behind schedule need to be discussed during project status meetings.

**18.How does a risk become an issue?**

- The project manager judges the risk to be significant enough that it is stipulated to be an issue.
- The risk has a high probability of happening in the immediate future.
- The risk has happened.
- The risk owner escalates the risk to an issue.

**19.How do you describe an effective change control system?**

- An effective change control system includes the forms, tracking methods, processes, and approval levels required for authorizing or rejecting requested changes.
- An effective change control system includes the documented procedures for authorizing or rejecting requested changes in a project.
- An effective change control system specifies how the project scope will be controlled, changed, and approved.
- An effective change control system integrates all of the changes for a project.

**20.The project manager is working with the team as they perform the work to create the project deliverables. Some adjustments need to be made to the project plan and the baselines. What would be needed in order for the project manager to allow such changes?**

- Change requests.
- Input from stakeholders that their needs have adjusted from what was originally planned.
- Approved change requests.
- The sponsor decides on a different way to accomplish the work.

**21.What are some of the reasons for performance variations in a project? (Choose four.)**

- Specification changes
- New regulations
- Missed requirements
- New changes to the project plan
- Inaccurate initial estimates

**22.What is true of lessons learned during the project?**

- Should be documented only in the closeout report.
- Should consist of only project data.
- Should be documented throughout the project.
- Should consist of only things that went well during project execution.

**23.A team member asks you where she can find a set of building codes. Which type of knowledge is this?**

- Implicit
- Explicit
- Tacit
- General

**24.What is the difference between a lessons-learned register and a lessons-learned repository?**

- The two terms mean the same thing.
- The register applies to a single project, and the repository applies to many projects.
- The repository applies to a single project, and the register applies to many projects.
- The register contains only areas that need improvement in future projects, and the repository contains areas of improvement as well as positive findings.

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## ACTIVITY 4-1: Leading a Team

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**1. What benefit, if any, is there for the project manager to get all the various stakeholder groups—the business, the inventory staff, the developers, and the design team—to understand the project's vision and mission?**

**A:** Answers may vary: Having all parties appreciate and align to the project's goals and overall mission helps ensure that all understand the primary aims of the project. Drawing attention to how each group is working together to strive towards a common goal pushes for more collaboration, support, and shared understanding.

- 2. What can a project manager do to bridge the gap between business and development? (Choose three.)**
- Communicate to the business the work and effort needed from the development team and their progress.
  - Communicate to the development team the needs and desires of the business.
  - Require the business to analyze the gap using company approved software.
  - Arrange collaborative sessions for the business team and development team to work on ideas and issues.

**3. Which best represents the servant leadership style of the project manager?**

- She helps make the coffee for the business team.
- She asks difficult questions to get the development team thinking.
- She serves up new possibilities that could be used by the design team.
- She takes care of the administrative reporting when the team is focused and on a roll.

**4. In their extensive research, the design team discovers that inventory staff enter a lot of information that is never used by any of their activities or by any other team. When the inventory staff is asked why that information is captured, the response was, "We just always have. No one knows why." How is challenging of the status quo going to support the project's aim of delivering value?**

A: Answers may vary: Questioning and challenging the way things are done may validate its importance and value in which case the project can produce or enable more value. Or the status quo may be continuing unnecessary effort that produces no value (waste), in which case the project can remove inefficiencies or non-value efforts.

## ACTIVITY 4–2: Using Earned Value Management

- 1. You plan to measure project progress by comparing the actual performance against planned performance as documented in the schedule and cost baselines. What method will you use?**
  - EV
  - AC
  - PV
  - EVM
  
- 2. According to your baselines, you expected to complete \$15,000 worth of work by the end of the eighth week. What is the term for this information?**
  - AC
  - EV
  - PV
  - SV

3. According to your status reports, you've completed 48% of the work so far. Based on this information, what is the EV and how did you calculate it?

A:  $EV = \$12,000 = (0.48 \times 25,000)$

4. How do you determine the AC for your project?

A: The actual cost (AC) is not a calculated amount. Rather, it is obtained from your bank statement or checkbook register.

5. Given the PV, EV, and SV values that you know, what actions should you take at this point? (Choose two.)

- Bring it to the attention of the CCB with some possible solutions.
- Use it to decide whether a corrective action is needed.
- Investigate the root cause of the variance.
- Bring it to the attention of project stakeholders.

6. What is the SV for your project, how did you calculate it, and what does it indicate?

A:  $\$12,000 (EV) - \$15,000 (PV) = -\$3,000$ . A negative SV indicates the project is behind schedule.

7. What is the SPI for your project, how did you calculate it, and what does it indicate?

A:  $\$12,000 (EV) / \$15,000 (PV) = 0.80$ . An SPI below 1 also indicates the project is behind schedule.

8. What should you do with the results of your performance measurement analysis?

A: Now that you know the project is behind schedule, you need to determine what activity is causing the problem. Once the activity has been identified, you must then determine whether it is on the critical path. If it is on the critical path, you most likely will have to take corrective action such as fast-tracking, compression, or resource leveling to meet your milestone dates and your project deliverable deadline. Remember to analyze the impact of your corrective action on project cost and quality performance baselines. You should continue to carefully monitor the schedule performance to check the effectiveness of your corrective action.

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## ACTIVITY 4–3: Supporting Team Performance

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1. First, to ensure the various teams involved in the project are not wasting any time or encountering any unnecessary bottlenecks or wasteful efforts, what would be helpful to identify potential issues in their processes?

- A value stream map
- A velocity chart
- A Kanban board
- A kickoff meeting

**2. As the team is progressing in the project, what charts or graphs would be useful to help keep the team on track?**

A: Answers may vary, but can include burndown charts to see how items from the backlog are being completed (burned down), burnup charts showing progress towards goals or releases, velocity charts to gauge the team's production rate over time, Earned Value charts to show costs and value gained by the project, Gantt charts and other schedule tools to track progress over time.

**3. At the end of the first month, the project team wants to gather for an hour to hold a retrospective session. What is the objective of this session and what typically occurs in such a gathering?**

A: Answers may vary, but retrospectives focus on how the team can improve on their teamwork, project management, and in their processes. The team looks back on what is working well within the team and other stakeholders, celebrates those successes, and seeks ways to encourage its continuation and to improve on it. As well as the success, teams look at areas of improvement. As many ideas are generated, a few ideas are made into actionable items for the team to implement, explore, learn more about, and/or experiment with new ideas or techniques.

## ACTIVITY 4-4: Addressing Impediments

**1. The Procurement department needs to acquire the equipment from a third party vendor but cannot finalize the details of the RFP until the Finance department releases the budget. The IT department cannot install and configure any of the equipment, causing them to be at a standstill in this project. The Education Services department continues to build training content although progress is slow because details on the process are constantly being updated. Based on the information provided, what would you consider as an impediment, obstacle, and blocker?**

A: Answers may vary based on interpretation. Impediment = final decisions on equipment for training material. Obstacle = procurement getting finance budget. Blocker = IT cannot install without equipment.

**2. As project team members bring impediments to light, how can the efforts to overcome these impediments be tracked or monitored?**

A: Answers may vary: Dedicated impediment boards may be set up in a physical location where the project team is co-located or in a software tool. The status and other relative information on the impediments can also be included in Risk Lists (registers), Kanban boards, progress reports, and other tools used by the project.

**3. Minor impediments may interfere with or slow down day-to-day progress. Which tool or practice can be used to bring attention to those impediments on a regular basis?**

- Annual conferences
- Daily standups
- Kanban boards
- Lessons learned

## ACTIVITY 4–5: Managing Conflict

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**1. As the project manager, what can you do to mitigate the negative effects of a staffing change?**

- Put the project on hold until Sarah returns from sick leave.
- Rebuild the schedule to include additional time for Kevin to complete his tasks.
- Closely monitor Kevin's work to assess any possible risk.
- Require all decisions to go through you until Sarah returns.

**2. What can be done to help the project team with the transition activities?**

A: Remind all stakeholders of the vision and objectives of the project. Make certain there is clarity on how the transition activities fit within the overall purpose of the system upgrade project, as well as how short and long term transition activities fit within the project plans. Enable the team to support Kevin to get a handle on the tasks and work as a team to be self organized and address the project needs. You as a project manager can mentor Kevin in the project management best practices that Sarah was performing so well, plus some other tips.

**3. You sit in a meeting being led by Kevin and team members working on the transition activities. The conversation gets passionate and intense about how to best implement a technical feature in which you have little knowledge or experience. What is your best option as project manager in this situation?**

- Force Kevin to make a decision before the meeting is over.
- Avoid involving yourself as a decision maker.
- Halt the meeting and take control before things become more intense.
- Side with your favorite, most trusted subject matter expert from the group to finalize a decision.

**4. Which of the following is typically included in a team charter? (Choose three.)**

- Team values
- Team agreements
- Team personality assessments
- Team operating guidelines
- Team motivation

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## ACTIVITY 4–6: Collaborating with Stakeholders

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- 1. Stakeholders are worried about the current state of the project. How should you handle their concerns?**
  - Send an email justifying your position.
  - Take corrective action.
  - Conduct a face-to-face meeting with a clear agenda targeting their specific concerns.
  - Document lessons learned.
  
- 2. Two stakeholders are out of town on a business trip and are available sporadically. A third person has an extremely busy schedule and can't squeeze another lengthy meeting into his day. You believe it's important to have regular face-to-face interaction with each stakeholder. How can you accommodate their needs? (Choose two.)**
  - Use video conferencing.
  - Send a memo via email.
  - Use an instant messaging service.
  - Hold a brief summarization meeting.
  
- 3. During the face-to-face meeting with project stakeholders, you explain the need to remove an external resource from the project. It became necessary to add another internal resource to the team, which resulted in changes to the project cost baseline. While you are talking about this issue, you notice that one of the stakeholders continually looks down at the floor and rapidly taps her pen against the table. What does her behavior indicate? What might you do?**

A: Answers will vary, but may include: assessing body language provides the project manager with an opportunity to determine if the stakeholder is pleased or not with the project's progress. Based on her body language, you can determine that the project stakeholder is uncomfortable with the information you are providing to the group. Draw her into a conversation to determine what aspect of the information is unsettling to her. Her answer will tell you if there are outstanding issues to address in regard to project cost baselines, or any other issue that may be of concern to her.
  
- 4. When are lessons learned sessions conducted?**
  - At the end of a project
  - At the end of a phase
  - Throughout the project in both predictive, iterative, and agile life cycles
  - Throughout the project in only iterative life cycles

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## ACTIVITY 4–7: Mentoring Stakeholders

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1. As a veteran project manager, what are some ways you can mentor junior project managers?

A: Answers will vary. Examples can include leading more sharing sessions and documenting lessons learned. Other examples include having the junior project manager shadow you; having the new project manager ask you questions; observing and providing feedback to the PM; offering “office hours” to allow the junior PMs to visit and discuss things; and partnering with the PM on a project.

2. Now that your organization is transitioning to agile based project management, how can you be mentored and supported during this transformation?

A: Answers will vary. Examples include shadowing other project managers; working with an Agile Coach as they guide you through the various agile ceremonies; reading books, magazines, websites, and other publications; reading the lessons learned captured by colleagues or other resources in the PMO's knowledge management system; practicing or holding various roles within an agile structure; taking classes or other forms of training; asking questions and being inquisitive.

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## ACTIVITY 4–8: Applying Emotional Intelligence

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1. During requirement gathering interviews with customer support team members, there is a common thread that managers do not listen to them, value them, or empathize with challenges they face. How would emotional intelligence training help in this situation based on these findings?

A: Answer will vary. Examples include both managers and customer support team members can be more aware of the emotions of others, read the changing emotions of others, and understand their own emotions better. Recognizing and practicing empathy would build trust and connection between all team members.

2. A project team is put together to implement some solutions to improve the customer satisfaction metrics. There are many ideas and perspectives shared by your project team. There is skepticism amongst the project team that you are considering the various options and are bent on pushing forward your own pre-determined solutions. How can you change that false perspective?

A: Answers vary. Examples include being transparent about your personal aims and feelings. Communicating that you do not have a pre-conceived solution that must be enacted. Encouraging many divergent voices, inputs, and healthy debate. Challenging in constructive ways the suggestions presented, especially your own to model the positive conflict practice. Listening and acknowledging the input of all. Respecting different cultures, ages, perspectives, and other variations.

**4. Which aspects of active listening were demonstrated during this exercise and what were the results of this activity?**

**A:** Answers will vary, but might include reflecting to understand the gist of the message; attending to show that engagement; and following to demonstrate understanding with non-verbal gestures and questioning.

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## Mastery Builder 4-1: Reviewing Keeping the Team on Track

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**1. What is a document that outlines how the team will operate and work together?**

- Team charter
- Resource management plan
- Project charter
- Team acquisition plan

**2. Which conflict management approach is best suited for a situation where much is not known and currently the time to research and resolve the conflict is not available?**

- Compromise/reconcile
- Accommodate/smooth
- Withdraw/avoid
- Force/direct

**3. Which is true about conflict in projects?**

- Too much conflict reflects poorly on the team.
- Too much conflict reflects poorly on the project manager.
- Conflict is inevitable.
- Conflict is to be addressed only when it disrupts the project.

**4. Which of the following best describes project stakeholders?**

- Anyone affected by the project, its outputs, and its operation.
- Anyone making money from the project.
- Customer paying for the project's output.
- The organization delivering the project's products.

**5. Which of the following would be least likely to be included in a stakeholder management plan?**

- List of identified project stakeholders.
- Documentation of the relationships between project stakeholders.
- Amount of money invested by the project stakeholders.
- Actions to be used interacting with project stakeholders.

**6. Why is stakeholder collaboration important to a project?**

- Creates more reporting.
- Requires more meetings.
- Aligns expectations.
- Encourages teams to do more than expected.

**7. Which of the following statements most reflects the approach of servant leadership?**

- Lead by supporting the team needs.
- Lead by assigning the tasks of team members.
- Lead by micromanaging the team activities.
- Lead by facilitating the team reviews.

**8. Which of the following is the best example of recognition?**

- Monetary bonus
- Praise for effort
- Additional time off
- Meeting starting on time

**9. When leading a project team, what is the best leadership style to use?**

- Totalitarian
- Servant
- Democratic
- Most fitting for the team

**10. The Product Owner is unavailable to make a decision about a product feature. What is this considered?**

- Work request
- Impediment
- Backlog refinement
- Priority

**11. What is a technique used by project teams to bring everyone together on a set reoccurring basis to share what may be blocking or impeding on their work or plans?**

- Daily standup meeting
- Iteration review
- Retrospective
- Project kickoff

**12.Which of the following is the best example of a blocker?**

- The team cannot decide when to schedule the next iteration review.
- The demonstration is not ready for the iteration review.
- The clearance from another team to use content for the demo won't be ready within the current iteration.
- The demonstration fails in front of the product owner during the iteration review.

**13.While you are working on a SWOT analysis for a risk response, a team member asks you to show them how it's done. Which type of mentoring is this?**

- Informal
- Formal
- Scheduled
- Timeboxed

**14.You mentor a team member on leading an estimation session. Which skill are you mentoring?**

- Servant
- Facilitation
- Emotional
- Leadership

**15.The product owner is unsure on how to participate in an iteration review session. What should the project manager do?**

- Remove the product owner from the session.
- Request the product owner remain quiet and observe.
- Point the product owner to a website about iteration reviews.
- Coach the product owner on how to contribute in the session.

**16.A company was hiring for certain positions. For one position, they were asking for people with skills such as leadership, team building, motivation, conflict management, influencing, negotiating, and several others. This position would require the individual to lead efforts to satisfy specific objectives and complete them in a timely manner within budget constraints. What job position were they trying to fill and what is a description of the skills they were looking for?**

- Head of the PMO and communication skills
- Project manager and management skills
- Project manager and interpersonal skills
- Program manager and business skills

**17.A stakeholder is conversing with you regarding a potential change to a specification. Which best exemplifies active listening by you?**

- Staring intently into their eyes.
- Paying close attention to the behaviors of the other stakeholders.
- Asking relevant follow up questions.
- Correcting the stakeholder as soon as you can.

18. During a meeting, you pay close attention to the emotions of yourself and others as the discussion gets heated. Which interpersonal skill are you leveraging?

- Emotional intelligence
- Meeting management
- Leadership
- Influencing

19. What is the aim of a retrospective?

- To blamestorm problems.
- To identify who is not helping out on the team.
- To look back at all the work that was not completed.
- To identify what went well and what can be improved.

20. Where is the ideal spot for an information radiator?

- In the manager's office.
- In a high-traffic area.
- In an unused conference room.
- On the project manager's laptop.

21. Key Performance Indicators (KPIs) should follow the acronym SMART. What does the A stand for in the SMART acronym?

- Achievable
- Awesome
- Alert
- Advanced

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## ACTIVITY 5–1: Managing Project Compliance

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1. You become aware that the FAA is planning to change the flight paths for a major airport located just two miles from your nuclear plant. The new flight path would reduce airline noise for local residents but would require more than 50% of the air traffic to fly directly over the cooling towers. Outline the risks and the potential impacts, and then consider risk responses.

A: Answers may include various approaches; some may include different methods of Avoidance, Transfer, and Mitigation. You should also describe how you plan to manage Residual Risk.

2. Your company is subject to a broad array of regulatory compliance requirements for all of its operations. What would you do to gather these requirements and ensure they are properly weighted as part of your risk assessment?

A: Answers will vary to both of these, but should include detailed conversations about possible ways to reroute the flight path, assessments of potential financial (and other risks) and potential mitigation options, and how much residual risk is acceptable. The second question speaks to a large array of existing compliance requirements. These should exist in current policy documents, risk checklists, or other tools that can be leveraged and validated for this project. The project manager should avoid trying to research all of this from scratch, but instead leverage existing documentation wherever possible, subject to validation for accuracy and currency.

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## ACTIVITY 5–2: Using Decision Tree Analysis

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1. Which analysis technique was used in the image to determine the most cost-effective choice of an external consultant?

- Decision tree
- Simulation
- Delphi
- Diagrammatic

2. What is the probability that Vendor A will complete the project on time?

- 60%
- 50%
- 40%
- 70%

3. What is the probability that Vendor B will run over the allotted time for the project?

- 50%
- 60%
- 70%
- 40%

4. What is Vendor C's expected monetary value?

- \$10,300
- \$1,700
- \$0
- \$200

5. Your team combines each vendor's EMV and costs. You want to choose the vendor bid with the most economic advantage for your organization. Based on this number, which vendor should your team choose?
  - Vendor A
  - Vendor B
  - Vendor C
  - Vendor A and Vendor C

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## ACTIVITY 5–3: Addressing Internal and External Business Environment Changes

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1. You are managing a traditional project and need to establish a change management process. What aspects do you need to consider?

A: Answers will vary widely, but should include how changes are requested, how and who assesses them for cost, risk, and value, who decides whether to approve the change (and what the tolerance level of the project manager is before it would need to be escalated to the project board or sponsor), how the change is integrated into the project plan, and how assurance is validated that the change delivered the expected value once built.
2. You are managing an agile project and need to establish a change management process. What aspects do you need to consider?

A: Answers will vary but should include identification of the product owner as a funnel for requested changes from customer and user stakeholders, writing the change's user stories, scoping the change during backlog grooming and refinement sessions, team estimation of the change, and ultimately placement of the change in the prioritized product backlog. This may also affect some other project artifacts like project roadmaps.
3. You are coaching the business product owner. Since you are running a project using an agile approach, early delivery of the highest value aspect of the solution is possible, and you want the product owner to work together with their stakeholders to assess when enough of the solution is available to launch a Minimum Viable Product. What considerations should you take, and how would you socialize this idea with the customer and their stakeholders?

A: Answers will vary, but should include some education on the risk management benefits of early value delivery, early feedback to the teams, and that most agile solutions are in a constant state of iteration and improvement all the time, so the goal is to start accruing value and good quality feedback on how and what to prioritize going forward to optimize value for the customer.

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## ACTIVITY 5–4: Discussing Organizational Influences on Projects

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1. In addition to the departments listed in the scenario, your company also has a manager of project management to oversee all of the ongoing projects. As one of the project managers, you report directly to the project management department but share staff with other departments. What type of organizational structure does this describe?
  - Functional
  - Projectized
  - Matrix
  - Composite
  
2. Choose the organizational structure where the authority of the project manager is the highest.
  - Functional
  - Projectized
  - Matrix
  - Composite
  
3. Which organizational structure is a combination of all the other types of organizations?
  - Functional
  - Projectized
  - Matrix
  - Composite
  
4. Describe the organizational culture, style, communication, and structure of one of your projects.  
**A:** Answers will vary, but may include: motivation and rewards systems such as project milestone celebrations, code of conduct, work ethic, and work hours. All of these contribute to the team's work environment.
  
5. Describe the OPAs you have used on past projects.  
**A:** Answers will vary, but might include: process and procedure documentation for procuring resources, industry standards that must be followed, and project document templates.
  
6. Describe any EEFs that you have experience with or factors that you can see coming across in the future as a project manager.  
**A:** Answers will vary, but may include: the political climate (if you are working within a government organization), the existing IT infrastructure, managing employees who work remotely, and working within health care regulations such as HIPAA.

## ACTIVITY 5–5: Employing Continuous Process Improvements

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1. Which of the following are key attributes of continuous improvement? (Choose three.)
  - Better design of products to improve service
  - Exceeding customer expectations
  - Striving to always lower costs
  - Higher level of uniform product quality
  - Increasing sales through global markets
  - Minimizing changes to the project
2. Which of the following individuals is often cited as the father of Total Quality Management?
  - Crosby
  - Smith
  - Kaizen
  - Deming
3. Which continuous improvement approach is built upon ideas coming from the workers themselves and improvements coming from many small changes?
  - TQM
  - Kaizen
  - Plan Do Check Act
  - Deming cycle
4. How is the Lessons Learned Register used in continuous improvement?  
A: Lessons Learned Registers from previous projects should be used as a source of continuous improvement ideas throughout a project.

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## Mastery Builder 5–1: Reviewing Keeping the Business in Mind

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1. Who can request changes?
  - Team members and project managers
  - Sponsor
  - Stakeholders
  - Customer

2. A financial tool that calculates the present value of all cash outflows minus the present value of all cash inflows is referred to as which of the following?

- Internal rate of return
- Net present value
- Benefit cost value
- Return on investment

3. For this project, the team may develop its own set of operating procedures and operate outside the standard formalized reporting structure during the project. What organizational structure does this represent?

- Functional
- Composite
- Projectized
- Matrix

4. Early in the establishment of the project, the project manager spends time looking for historical data that might be helpful in planning the new project. She is looking for examples of project documents in similar projects that have been completed that she might be able to use as templates for the new project. She is also looking for information about established processes and procedures that will help the project run more smoothly. What is the term used to define these?

- OPAs
- EEFs
- Progressive elaboration
- Organizational project management

5. The methodology used to systematically test possible solutions, assess the results, and implement those that work is known as which of the following:

- Kaizen
- Continuous improvement
- Plan Do Study Act
- Retrospective

6. Who is regarded as the father of the continuous improvement movement?

- Crosby
- Deming
- Juran
- Smith

7. A meeting that is held at frequent intervals in an agile project is referred to as which of the following?
  - Lessons-learned meeting
  - End-of-phase meeting
  - Retrospective meeting
  - Status meeting
8. Which of the following would not be part of your Quality Management Plan?
  - Quality standards and roles
  - Minimum Viable Product
  - Quality tools to be used
  - Major procedures for dealing with nonconformance
9. Which of the following are tools Quality Management teams use to identify issues? (Choose two.)
  - Audit reports
  - Planning Poker
  - Design for X
  - Kano Model
10. Which of the following are effective guidelines for measuring project compliance?
  - Tracking work completed in a Gantt chart.
  - Using QA outputs to confirm deliverable and process compliance and identify the needs for corrective actions.
  - Prioritizing effort using a Moscow (MSCW) analysis.
  - Reporting progress by conducting a Sprint Review and Demo.
11. Which of the following is not a PESTLE factor?
  - Legal
  - Effectiveness
  - Social
  - Political
12. What is the role of a Configuration Management System?
  - Track Change Requests
  - Prioritize the product backlog
  - Control versioning of all components
  - Define roles and responsibilities

13.Which of the following is not a benefit of planning for a Minimum Viable Product?

- Risk reduction
- Early feedback
- Early value from the service
- Project team disbands early

14.Last year, your company released a new service based on a project you managed. The company wants to determine if the new service has increased customer satisfaction. Which tool can measure the happiness of users of the new service based on their willingness to encourage others to use your service against those who would discourage others to use your service?

- Net promoter score
- Net value
- AB testing
- Planned value

15.Every timeboxed iteration in the project has a demo scheduled at the end during the iteration review session. What is the goal of this demo?

- To groom the iteration backlog.
- To revise the product roadmap.
- To solicit feedback from the product owner and other stakeholders.
- To establish the features to be included in the product backlog.



# Glossary

## **80/20 rule**

A general guideline with many applications; in terms of controlling processes, it contends that a relatively large number of problems or defects, typically 80%, are commonly due to a relatively small number of causes, typically 20%.

## **AB testing**

A marketing approach used to determine user preferences by showing different sets of users similar services with one independent variable.

## **AC\***

(Actual Cost) The realized cost incurred for the work performed on an activity during a specific time period.

## **accept**

A strategy for managing negative risks or opportunities that involves acknowledging a risk and not taking any action until the risk occurs.

## **acceptance criteria**

A set of conditions that is required to be met before deliverables are accepted.

## **active listening**

A communication technique that involves acknowledging what you hear, and clarifying the message to confirm that what you heard matches the message that the sender intended.

## **activity attributes\***

Multiple attributes associated with each schedule activity that can be included within the activity list.

## **activity dependency**

A logical relationship that exists between two project activities. The relationship indicates whether the start of an activity is contingent upon an event or input from outside the activity.

## **activity duration estimates\***

The quantitative assessments of the likely number of time periods that are required to complete an activity.

## **activity list\***

A documented tabulation of schedule activities that shows the activity description, activity identifier, and a sufficiently detailed scope-of-work description so project team members understand what work is to be performed.

## **activity\***

A distinct, scheduled portion of work performed during the course of a project.

## **administrative closure**

Involves verifying and documenting project results to formalize project or phase completion.

## **Affinity diagram\***

A technique that allows large numbers of ideas to be classified into groups for review and analysis.

**agile life cycles\***

A project life cycle that is iterative or incremental. Also referred to as change-driven or adaptive, they work well in environments with high levels of change and ongoing stakeholder involvement in a project.

**Agile project management**

A project management methodology that uses an iterative and incremental approach that focuses on customer value and team empowerment. In agile project management, the product is developed in iterations by small and integrated teams.

**Agile release planning**

A process in which you determine the number of iterations or Sprints that are needed to complete each release, the features that each iteration will contain, and the target dates of each release.

**agreements\***

Any documents or communication that defines the initial intentions of a project. Examples include contracts, memorandums of understanding (MOUs), service level agreements (SLAs), letters of agreement, letters of intent, verbal agreements, email, or other written agreements.

**analogous estimating\***

A technique for estimating the duration or cost of an activity on a project using historical data from a similar activity or project.

**approved change requests**

Change requests that have been reviewed and approved by the change control board (CCB) and are ready to be scheduled for implementation.

**assumption and constraint analysis**

A process that explores the validity of the project assumptions within the constraints and identifies risks from any incompleteness or inaccuracy of these project assumptions.

**attribute sampling data**

Data that is counted such as the number of product defects or customer complaints.

**auditing**

An examination of a project's goals and achievements, including adequacy, accuracy, efficiency, effectiveness, and the project's compliance with applicable methodologies and regulations. It tends to be a formal, one-sided process that can be extremely demoralizing to team members.

**autocratic**

Using this group decision-making method, one member of the group makes the decision. In most cases, this person will consider the larger group's ideas and decisions, and will then make a decision based on that input.

**avoid**

A strategy for managing negative risks or threats that involves changing the project management plan to remove the risk entirely by extending the schedule, changing the strategy, increasing the funding, or reducing the scope.

**BAC\***

(Budget at Completion) The sum of all budgets established for the work to be performed.

**bar chart\***

A graphic display of schedule-related information. In the typical bar chart, schedule activities or WBS components are listed down the left side of the chart, dates are shown across the top, and activity durations are shown as date-placed horizontal bars. See *Gantt chart*.

**benchmarking\***

The comparison of actual or planned products, processes, and practices to those of comparable organizations to identify best practices, generate ideas for improvement, and provide a basis for measuring performance.

**benefit cost analysis**

A financial analysis tool used to determine the benefits provided by a project against its costs.

**benefits management plan**

The documented explanation defining the processes for creating, maximizing, and sustaining the benefits provided by a project or program.

**bidder conferences\***

The meetings with prospective sellers prior to the preparation of a bid or proposal to ensure all prospective vendors have a clear and common understanding of the procurement. Also called vendor conferences, pre-bid conferences, or contractor conferences.

**bottom-up estimating\***

A method of estimating project duration or cost by aggregating the estimates of the lower-level components of the WBS.

**brainstorming**

A technique that involves a facilitator to help a group identify project risks in a free-form session where ideas are generated, built on, and recorded.

**breach of contract**

The failure to meet some or all of the obligations of a contract.

**burndown chart**

A tool that is used to track the progress of the project by plotting the number of days of Sprint against the number of hours of work remaining.

**business case\***

A documented economic feasibility study used to establish the validity of the benefits of a selected component lacking sufficient definition and that is used as a basis for the authorization of further project management activities.

**business risk**

The inherent risk in any business endeavor that carries the potential for either profit or loss. Types of business risks are competitive, legislative, monetary, and operational.

**business value**

The net quantifiable benefit derived from a business endeavor. The benefit may be tangible, intangible, or both.

**CCB\***

(Change Control Board) A formally chartered group responsible for reviewing, evaluating, approving, delaying, or rejecting changes to the project, and for recording and communicating such decisions.

**cease and desist letter**

A document sent to an individual or a business to stop (cease) allegedly illegal activities and to not undertake them again (desist).

**change control form**

A document used to request a project change. They can also be recommendations for taking corrective or preventive actions. See also "change request."

**change control system\***

A set of procedures that describes how modifications to the project deliverables and documentation are managed and controlled.

**change management**

The process of managing project changes in a structured and standardized manner.

**change management plan\***

A component of the project management plan that establishes the Change Control Board, documents that extent of its authority, and describes how the change control system will be implemented.

**change request**

Request for change sent to the upper management or the Change Control Board (CCB) for its evaluation and approval. See also "change control form."

**checklist analysis\***

A technique for systematically reviewing materials using a list for accuracy and completeness.

**CI**

(Continuous Improvement) The ongoing effort to improve products, services, or processes.

**Close Project or Phase process\***

The process of finalizing all activities for the project, phase, or contract.

**close-out meetings**

Sessions held at the end of a project or phase; they involve discussing the work and capturing lessons learned.

**co-location\***

An organizational placement strategy where the project team members are physically located close to one another in order to improve communication, working relationships, and productivity.

**coaching**

The act of giving guidance and direction to another person so that he or she can make better decisions.

**code of accounts\***

A numbering system used to uniquely identify each component of the WBS.

**Code of Ethics and Professional Conduct**

A PMI® publication that describes the ethical and professional behavior expectations of any individual working as a project management professional.

**communication methods\***

A systematic procedure, technique, or process used to transfer information among project stakeholders.

**communication models\***

A description, analogy, or schematic used to represent how the communication process will be performed for the project.

**communication requirements analysis\***

An analytical technique to determine the information needs of the project stakeholders through interviews, workshops, study of lessons learned from previous projects, etc.

**communication styles assessment\***

A technique to identify the preferred communication method, format, and content

for stakeholders for planned communication activities.

**communication technology\***

Specific tools, systems, computer programs, etc., used to transfer information among project stakeholders.

**communications management plan\***

A component of the project, program, or portfolio management plan that describes how, when, and by whom information about the project will be administered and disseminated.

**completion contract**

A type of contract that is completed when the vendor delivers the product to the buyer and the buyer accepts the product.

**configuration management**

A tool used to manage changes to a product or service being produced as well as changes to any of the project documents such as schedule updates.

**configuration management plan\***

A component of the project management plan that describes how to identify and account for project artifacts under configuration control, and how to record and report changes to them.

**configuration management system\***

A collection of procedures used to track project artifacts and monitor and control changes to these artifacts.

**conflict management**

The application of one or more strategies for dealing with disagreements that may be detrimental to team performance.

**context diagram\***

A visual depiction of the product scope showing a business system (process, equipment, computer system, etc.), and how people and other systems (actors) interact with it.

**contingency plan**

A risk response strategy developed in advance, before risks occur; it is meant to be used if and when identified risks become reality.

**contingency reserves\***

Time or money allocated in the schedule or cost baseline for known risks with active response strategies.

**contract change control system\***

The system used to collect, track, adjudicate, and communicate changes to a contract.

**contract\***

A mutually binding agreement that obligates the seller to provide the specified project or service or result and obligates the buyer to pay for it.

**control account\***

A management control point where scope, budget, actual cost, and schedule are integrated and compared to earned value for performance measurement.

**Control Procurements process\***

The process of managing procurement relationships, monitoring contract performance, making changes and corrections as appropriate, and closing out contracts.

**controlling PMO**

A type of PMO that provides support and requires compliance through various means. Compliance may involve adopting project management frameworks or methodologies; using specific templates, forms, and tools; or conformance to governance.

**CoQ\***

(Cost of Quality) All costs incurred over the life of the product by investment in preventing nonconformance to requirements, appraisal of the product or service for conformance to requirements, and failure to meet requirements.

**cost aggregation\***

Summing the lower-level cost estimates associated with the various work packages for a given level within the project's WBS or for a given cost control account.

**cost baseline\***

The approved version of the time-phased project budget, excluding any management reserves, which can be changed only through

formal change control procedures and is used as a basis for comparison to actual results.

**cost management plan\***

A component of a project or program management plan that describes how costs will be planned, structured, and controlled.

**cost of conformance**

The money spent during a project to avoid failures. This includes prevention costs that build a quality product and appraisal costs that assess the quality.

**cost of non-conformance**

The money spent after a project is complete because of failures. This includes internal and external failure costs.

**cost-reimbursable contract\***

A type of contract involving payment to the seller for the seller's actual costs, plus a fee typically representing the seller's profit.

**CPAF contract\***

(Cost Plus Award Fee contract) A category of contract that involves payments to the seller for all legitimate actual costs incurred for completed work, plus an award fee representing seller profit.

**CPFF contract\***

(Cost Plus Fixed Fee contract) A type of cost-reimbursable contract where the buyer reimburses the seller for the seller's allowable costs (allowable costs are defined by the contract) plus a fixed amount of profit (fee).

**CPI\***

(Cost Performance Index) A measure of the cost efficiency of budgeted resources expressed as the ratio of earned value to actual cost.

**CPIF contract\***

(Cost Plus Incentive Fee contract) A type of cost-reimbursable contract where the buyer reimburses the seller for the seller's allowable costs (allowable costs are defined by the contract), and the seller earns its profit if it meets defined performance criteria.

**critical path activity\***

Any activity on the critical path in a project schedule.

**critical path\***

The sequence of activities that represents the longest path through a project, which determines the shortest possible duration.

**cultural awareness**

Understanding the cultural differences of the individuals, groups, and organizations in the project stakeholder community so you can adapt communication strategies to avoid or reduce miscommunication and misunderstandings.

**CV\***

(Cost Variance) The amount of budget deficit or surplus at a given point in time, expressed as the difference between the earned value and the actual cost.

**daily standup**

A short, 15-minute meeting in which the complete team gets together for a quick status update while standing in a circle. Also referred to as a daily scrum.

**de facto regulations**

Regulations that are widely accepted and adopted through use.

**de jure regulations**

Regulations that are mandated by law or have been approved by a recognized body of experts.

**debriefing**

A less formal, more cooperative means of discussing the positives and the negatives of the project, what worked, and what will be done differently next time. This discussion includes technology issues, people issues, vendor relationships, and organizational culture.

**decision making**

The process of selecting a course of action from among multiple options.

**decision tree analysis\***

A diagramming and calculation technique for evaluating the implications of a chain of multiple options in the presence of uncertainty.

**decomposition\***

A technique used for dividing and subdividing the project scope and project deliverables into smaller, more manageable parts.

**deliverable\***

Any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or projects.

**directions of influence**

A classification model that groups stakeholders on the basis of how they influence the project: upwards (senior management), downwards (team or specialists), outwards (external), sideways (project manager's peers), and prioritization.

**directive PMO**

A type of PMO that takes control of projects by directly managing the projects.

**discretionary dependency\***

A relationship that is established based on knowledge of best practices within a particular application area or an aspect of the project where a specific sequence is desired.

**document analysis**

A technique used to gain project requirements from current documentation evaluation.

**DoD**

(Definition of Done) A team's checklist of all the criteria required to be met so that a deliverable can be considered ready for customer use.

**DoR**

(Definition of Ready) A team's checklist for a user-centric requirement that has all the information the team needs to be able to begin working on it.

**EAC\***

(Estimate at Completion) The expected total cost of completing all work expressed as the

sum of the actual cost to date and the estimate to complete.

#### **EEF\***

(enterprise environmental factors) Conditions, not under the immediate control of the team, that influence, constrain, or direct the project, program, or portfolio.

#### **effect-based risk classification**

A way of analyzing the major risks inherent to a project that could have an impact on its success. These major risks include time, cost, quality, and scope.

#### **effort\***

The number of labor units required to complete a scheduled activity or WBS component, often expressed in hours, days, or weeks. Contrast with duration.

#### **EI\***

(emotional intelligence) The ability to identify, assess, and manage the personal emotions of oneself and other people, as well as the collective emotions of groups of people. EQ is also a commonly used abbreviation.

#### **elapsed time**

The actual calendar time required for an activity from start to finish.

#### **EMV**

(Expected Monetary Value) A method of calculating the average outcome when the future is uncertain.

#### **enhance**

A strategy for managing positive risks or opportunities that involves increasing the probability that the opportunity will happen, or the impact it will have by identifying and maximizing enablers of these opportunities.

#### **escalate**

The strategy in which you determine that a threat is outside the scope of the project or beyond the project manager's authority. You then forward the threat to a person or part of the organization at a higher level.

#### **ETC\***

(Estimate to Complete) The expected cost to finish all the remaining project work.

#### **EV\***

(Earned Value) A measure of work performed expressed in terms of the budget authorized for that work.

#### **EVM\***

(Earned Value Management) A methodology that combines scope, schedule, and resource measurements to assess project performance and progress.

#### **expert judgment\***

Judgment provided based upon expertise in an application area, knowledge area, discipline, industry, etc., as appropriate for the activity being performed. Such expertise may be provided by any group or person with specialized education, knowledge, skill, experience, or training.

#### **explicit knowledge\***

Knowledge that can be codified using symbols such as words, numbers, and pictures. This type of knowledge can be documented and shared with others.

#### **exploit**

A strategy for managing positive risks or opportunities that involves attempting to make sure that the opportunity happens.

#### **external dependency\***

Types of activity dependencies that exist between project activities and non-project activities and can be out of the project's control.

#### **facilitated workshops**

Organized working sessions held by project managers to determine a project's requirements and to get all stakeholders together to agree on the project's outcomes.

#### **facilitation**

A skill used to lead or guide an assembled group toward a successful conclusion such as making a decision or finding a solution.

**FF\***

(Finish-to-Finish) A logical relationship in which a successor activity cannot finish until a predecessor activity has finished.

**FFP contract\***

(Firm Fixed Price contract) A type of fixed price contract where the buyer pays the seller a set amount (as defined by the contract), regardless of the seller's costs.

**fixed price contract\***

An agreement that sets the fee that will be paid for a defined scope of work regardless of the cost or effort to deliver it.

**float\***

Also called slack. See *total float* and *free float*.

**focus groups\***

An elicitation technique that brings together pre-qualified stakeholders and subject matter experts to learn about their expectations and attitudes about a proposed product, service, or result.

**FPEPA contract\***

(Fixed Price with Economic Price Adjustment contract) A fixed-price contract, but with a special provision allowing for pre-defined final adjustments to the contract price due to changed conditions, such as inflation changes, or cost increases (or decreases) for specific commodities.

**FPIF contract\***

(Fixed Price Incentive Fee contract) A type of contract where the buyer pays the seller a set amount (as defined by the contract), and the seller can earn an additional amount if the seller meets defined performance criteria.

**free float\***

The amount of time that a schedule activity can be delayed without delaying the early start date of any successor or violating a schedule constraint.

**FS\***

(Finish-to-Start) A logical relationship in which a successor activity cannot start until a predecessor activity has finished.

**functional organization\***

An organizational structure in which staff is grouped by areas of specialization and the project manager has limited authority to assign work and apply resources.

**funding limit reconciliation\***

The process of comparing the planned expenditure of project funds against any limits on the commitment of funds for the project to identify any variances between the funding limits and the planned expenditures.

**Gantt chart\***

A bar chart of schedule information where activities are listed on the vertical axis, dates are shown on the horizontal axis, and the activity durations are shown as horizontal bars placed according to start and finish dates.

**IFB\***

(Invitation for Bid) Generally, this term is equivalent to request for proposal. However, in some application areas, it may be a narrower or more specific meaning. A type of procurement document that is most commonly used when deliverables are commodities for which there are clear specifications and when the quantities are very large. The invitation is usually advertised and any seller may submit a bid. Negotiation is typically not anticipated. These are sometimes used interchangeably with RFPs.

**impediment\***

An obstacle that prevents the team from achieving its objectives.

**increment\***

A functional, tested, and accepted deliverable that is a subset of the overall project outcome.

**incremental life cycle\***

An adaptive project life cycle in which the deliverable is produced through a series of iterations that successively add functionality within a predetermined time frame. The deliverable contains the necessary and sufficient capability to be considered complete only after the final iteration.

**Influence/impact grid**

A classification model that groups stakeholders on the basis of their involvement in and impact on the project.

**influencing**

The act of presenting a good case to explain why an idea, decision, or problem should be handled a certain way, without resistance from other individuals.

**information radiator**

The generic term for visual displays placed in a visible location so everyone can quickly see the latest information. In agile practice, also known as Big Visible Chart.

**insurable risk**

A risk that has only the potential for loss and no potential for profit or gain. An insurable risk is one for which insurance may be purchased to reduce or offset the possible loss. Types of insurable risks are direct property, indirect property, liability, and personnel-related.

**interactive communication**

An exchange of information between two or more people that ensures common understanding for everyone participating in that exchange.

**internal dependency**

A type of activity dependency that exists between project activities and is usually under the project's control.

**interpersonal skills\***

Skills used to establish and maintain relationships with other people.

**interview\***

A formal or informal approach to elicit information from stakeholders by talking with them directly.

**IRR**

(Internal Rate of Return) The interest rate that makes the net present value of all cash flow equal to zero.

**issue**

A current condition or situation that may have an impact on the project objectives.

**issue log**

A document where information about issues is recorded and monitored.

**iteration\***

A timeboxed cycle of development on a product or deliverable in which all of the work that is needed to deliver value is performed.

**iterative life cycle\***

A project life cycle where the project scope is generally determined early in the project life cycle, but time and cost estimates are routinely modified as the project team's understanding of the product increases. Iterations develop the product through a series of repeated cycles, while increments successively add to the functionality of the product.

**JAD**

(Joint Application Design) Specialized workshops that include both SMEs and the development team together to discuss and improve on the software development process.

**job shadowing**

See *observations*.

**Kanban board\***

A visualization tool that enables improvements to the flow of work by making bottlenecks and work quantities visible.

**knowledge management**

Connecting individuals, in person or virtually, to share knowledge and collaborate together.

**KPI**

(Key Performance Indicator) A set metric used to evaluate a team's performance against the project vision and objectives.

**lag\***

The amount of time whereby a successor activity will be delayed with respect to a predecessor activity.

**lead\***

The amount of time whereby a successor activity can be advanced with respect to predecessor activity.

**leadership**

The ability to step up and guide others to achieve results. Leadership abilities are gained through experience, building relationships, and taking on initiatives.

**lean**

An agile method used primarily in manufacturing that focuses on achieving outcomes with little or no waste.

**lessons-learned register\***

A project document used to record knowledge gained during a project so that it can be used in the current project and entered into the lessons-learned repository.

**lessons-learned repository\***

A store of historical information about lessons learned in projects.

**majority**

A group decision-making method in which a majority of group members agree on the course of action to take.

**make-or-buy analysis\***

The process of gathering and organizing data about product requirements and analyzing them against available alternatives including the purchase or internal manufacture of the project.

**make-or-buy decisions\***

Decisions made regarding the external purchase or internal manufacture of a product.

**management reserves\***

An amount of the project budget or project schedule held outside of the performance measurement baseline (PMB) for management control purposes, that is reserved for unforeseen work that is within the scope of the project.

**mandatory dependency\***

A relationship that is contractually required or inherent in the nature of the work.

**matrix organization\***

An organizational structure in which the project manager shares responsibility with the functional managers for assigning priorities and for directing the work of persons assigned to the project.

**MBI**

(Minimum Business Increment) The smallest amount of value that can be added to a product or service that benefits the business.

**milestone charts**

A type of project schedule bar chart that only includes milestone or major deliverables as points in time.

**milestone list**

A document that contains the significant points or events in a project.

**milestone\***

A significant point or event in a project, program, or portfolio.

**mind mapping\***

A technique used to consolidate ideas created through individual brainstorming sessions into a single map to reflect commonality and differences in understanding and to generate new ideas.

**mitigate**

A strategy for managing negative risks or threats that involves taking action to reduce the probability of occurrence or the impact of a risk.

**Monte Carlo simulation\***

An analysis technique where a computer model is iterated many times, with the input values chosen at random for each iteration driven by the input data, including probability distributions and probabilistic branches. Outputs are generated to represent the range of possible outcomes for the project.

**motivation**

The inner drive that keeps people involved and wanting to complete work of high quality in a timely fashion.

**multi-criteria decision analysis\***

This technique utilizes a decision matrix to provide a systematic analytical approach for establishing criteria, such as risk levels, uncertainty, and valuation, to evaluate and rank many ideas.

**MVP**

(Minimum Viable Product) The smallest collection of features that can be included in a product for customers to consider it functional. In Lean methodologies, it can be referred to as "bare bones" or "no frills" functionality.

**negotiated settlements**

Are undertaken to arrive at a final equitable settlement of all outstanding issues, claims, and disputes by negotiation.

**negotiation**

An approach used by more than one individual to come to an agreement or resolution.

**nominal group technique\***

A technique that enhances brainstorming with a voting process used to rank the most useful ideas for further brainstorming or for prioritization.

**NPS**

(Net Promoter Score) Measures a customer's willingness to recommend a provider's products or services to another on a scale of -100 to 100.

**NPV**

(Net Present Value) The present value of all cash outflows minus the present value of all cash inflows.

**observations**

The techniques used to gain knowledge of a specific job role, task, or function in order to understand and determine project requirements. This is also known as job shadowing.

**OPA\***

(organizational process assets) Plans, processes, policies, procedures, and knowledge bases that are specific to and used by the performing organization.

**opportunity\***

A risk that would have a positive effect on one or more project objectives.

**organizational theory**

The study of how people, teams, and organizations behave to look for common themes for the purpose of maximizing efficiency and productivity, problem solving, and meeting the stakeholder requirements of a project.

**outsourcing**

Moving beyond the organization to secure services and expertise from an outside source on a contract or short-term basis.

**overlapping relationships**

A type of phase-to-phase relationship that contains phases that start prior to the previous phase ending.

**parametric estimating\***

An estimating technique in which an algorithm is used to calculate cost or duration based on historical data and project parameters.

**Pareto chart**

A histogram that is used to rank causes of problems in a hierarchical format.

**PDM\***

(Precedence Diagramming Method) A technique used for constructing a schedule model in which activities are represented by nodes and are graphically linked by one or more logical relationships to show the sequence in which the activities are to be performed.

**phase gate\***

A point review at the end of a phase in which a decision is made to continue to the next phase, to continue with modification, or to end a project or program.

**planning package\***

A WBS component below the control account with known work content but without detailed schedule activities.

**plurality\***

Decisions made by the largest block in a group, even if a majority is not achieved.

**PMIS\***

(Project Management Information System) An information system consisting of the tools and techniques used to gather, integrate, and disseminate the outputs of project management processes.

**PMO\***

(project management office) A management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques. PMOs are more common in larger organizations because of the number of projects that can be in process all at the same time.

**political awareness**

The ability to recognize the power structure internal to the organization, and the ability to navigate the relationships.

**portfolio management**

The centralized management of one or more portfolios to achieve strategic objectives.

**portfolio\***

Projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives.

**Power/influence grid**

A classification model that groups stakeholders on the basis of their levels of authority and involvement in the project.

**Power/interest grid**

A classification model that groups stakeholders on the basis of their levels of authority and interest in the project.

**precedence relationship\***

A logical dependency used in the precedence diagramming methods.

**predictive life cycle\***

A form of project life cycle in which the project scope, time, and cost are determined in the early phases of the life cycle.

**probability and impact matrix\***

A grid for mapping the probability of occurrence of each risk and its impact on project objectives if that risk occurs.

**probability distribution**

The scattering of values assigned to likelihood in a sample population. It can be visually depicted in the form of a probability density function (PDF).

**procurement**

The acquisition of goods and services from an external organization, vendor, or supplier to enable the deliverables of the project.

**procurement audit\***

The review of contracts and contracting processes for completeness, accuracy, and effectiveness.

**procurement documents\***

The documents utilized in bid and proposal activities, which include the buyer's invitation for bid, invitation for negotiations, request for information, request for quotation, request for proposal, and settler's responses.

**procurement management plan\***

A component of the project or program management plan that describes how a project team will acquire goods and services from outside of the performing organization.

**procurement SOW\***

Describes the procurement item in sufficient detail to allow prospective sellers to determine if they are capable of providing the products, services, or results.

**product analysis\***

For projects that have a product as the deliverable, it is a tool to define scope that generally means asking questions about a product and forming answers to describe the use, characteristics, and other relevant aspects of what is going to be manufactured.

**product backlog**

A prioritized list of customer requirements and the first step of Scrum in which priority is based on the riskiness and business value of the user story.

**product box exercise**

A technique used to explain an overarching solution wherein stakeholders try to describe aspects of a solution in the same way a marketer might describe product features and benefits on a box.

**product owner**

An individual or an organization who is responsible for gathering inputs about a product from the customer and translating the requirements into the product vision for the team and stakeholders.

**product roadmap**

A high level visual summary of the product or products of the project that includes goals, milestones, and potential deliverables.

**program management\***

The application of knowledge, skills, and principles to a program to achieve the program objectives and obtain benefits and control not available by managing program components individually.

**program\***

Related projects, subsidiary programs, and program activities that are managed in a coordinated manner to obtain benefits not available from managing them individually. A project may or may not be part of a program, but a program will always have projects.

**progressive elaboration\***

The iterative process of increasing the level of detail in a project management plan as greater amounts of information and more accurate estimates become available.

**project artifact**

Any document related to the management of a project.

**project charter\***

A document issued by the project initiator or sponsor that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities.

**project governance\***

The framework, functions, and processes that guide project management activities in order to create a unique product, service, or result to meet organizational, strategic, and operational goals.

**project life cycle\***

A series of phases that a project passes through from its start to its completion.

**project management plan\***

The document that describes how the project will be executed, monitored and controlled, and closed.

**project management software**

A computer application that helps plan, organize, and manage project resources and develop resource estimates for activities.

**project management\***

The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.

**project manager\***

The person assigned by the performing organization to lead the team that is responsible for achieving the project objectives.

**project phase\***

A collection of logically related project activities that culminates in the completion of one or more deliverables.

**project requirements**

For a project, these are the agreed-upon conditions or capabilities of a product, service, or outcome that a project is designed to satisfy.

**project schedule network diagram\***

A graphical representation of the logical relationships among the project schedule activities.

**project schedule\***

An output of a schedule model that presents linked activities with planned dates, durations, milestones, and resources.

**project scope statement\***

The description of the project scope, major deliverables, assumptions, and constraints.

**project scope\***

The features and functions that characterize a product, service, or result.

**project team\***

A set of individuals who support the project manager in performing the work of the project to achieve its objectives.

**project\***

A temporary endeavor undertaken to create a unique product, service, or result.

**projectized organization**

A structure where a project manager and a core project team operate as a completely separate organizational unit within the parent organization.

**prototypes**

A method of obtaining early feedback on requirements by providing a working model of the expected product before actually building it.

**pull communications**

Messages that require the interested people to access the information based on their own initiative.

**push communications**

Messages that are sent out to people who need to receive the information.

**PV**

(Present Value) The current value of a future sum of money or stream of cash flows given a specific rate of return.

**PV\***

(Planned Value) The authorized budget assigned to scheduled work.

**QFD**

(Quality function deployment) Workshops that are commonly used in the manufacturing field to determine new product development requirements.

**qualified vendors**

The vendors who are approved to deliver the products, services, or results based on the procurement requirements identified for a project.

**qualified vendors list**

Contains details regarding vendors who meet the organization's requirements and to whom requests can be sent.

**qualitative risk analysis**

A technique used to determine the probability of occurrence and the impact of identified risk.

**quality audit\***

A structured, independent process to determine if project activities comply with organizational and project policies, processes, and procedures.

**quality gate**

A special type of gate located before a phase that is strongly dependent upon the outcome of a previous phase. The quality gate process is a formal way of specifying and recording the transition between stages in the project life cycle.

**quality management plan\***

A component of the project or program management plan that describes how applicable policies, procedures, and guidelines will be implemented to achieve the quality objectives.

**quality metric\***

A description of a project or product attribute and how to measure it.

**quality\***

The degree to which a set of inherent characteristics fulfills requirements.

**quantitative risk analysis**

Technique used to assess the risk exposure events to overall project objectives and determine the confidence levels of achieving the project objectives.

**questionnaires\***

Written sets of questions designed to quickly accumulate information from a large number of respondents.

**RACI chart\***

(Responsible, Accountable, Consulted, and Informed) A common type of Responsibility Assignment Matrix (RAM) that uses responsible, accountable, consult, and inform statuses to define the involvement of stakeholders in project activities.

**RAM\***

(Responsibility Assignment Matrix) A grid that shows the project resources assigned to each work package.

**RBS\***

(risk breakdown structure) A hierarchical representation of potential sources of risk.

**recognition**

A more personalized, intangible, and experiential event that focuses on behavior rather than outcome.

**regulations\***

Requirements imposed by a governmental body. These requirements can establish product, process, or service characteristics, including applicable administrative provisions that have government-mandated compliance.

**relative authority**

The project manager's authority relative to the functional manager's authority over the project and the project team.

**requirements documentation\***

A description of how individual requirements meet the business need for the project.

**requirements management plan\***

A component of the project or program management plan that describes how requirements will be analyzed, documented, and managed.

**requirements traceability matrix\***

A grid that links product requirements from their origin to the deliverables that satisfy them.

**resource calendar\***

A calendar that identifies the working days and shifts upon which each specific resource is available.

**resource leveling\***

A resource optimization technique in which adjustments are made to the project schedule to optimize the allocation of resources and which may affect the critical path.

**resource management plan\***

A component of the project management plan that describes how project resources are acquired, allocated, monitored, and controlled.

**resource requirements\***

The types and quantities of resources required for each activity in a work package.

**reward**

A tangible, consumable item that is given to a person based on a specific outcome or an achievement.

**reward and recognition plan**

A formalized way to reinforce performance or behavior.

**RFI\***

(Request for Information) A type of procurement document whereby the buyer requests a potential seller to provide various pieces of information related to a product or service or seller capability.

**RFP\***

(Request for Proposal) A type of procurement document used to request proposals from prospective sellers of products or services. In some application areas, it may have a narrower or more specific meaning.

**RFQ\***

(Request for Quotation) A type of procurement document used to request price quotations from prospective sellers of common or standard products or services. Sometimes used in place of request for proposal and, in some application areas, it may have a narrower or more specific meaning.

**risk appetite\***

The degree of uncertainty an organization or individual is willing to accept in anticipation of a reward.

**risk categorization\***

Organization by sources of risk (e.g., using the RBS), the area of the project affected (e.g., using the WBS), or other useful category (e.g., project phase) to determine the areas of the project most exposed to the effects of uncertainty.

**risk impact**

The likely effect on project objectives if a risk event occurs.

**risk management plan\***

A component of the project, program, or portfolio management plan that describes how risk management activities will be structured and performed.

**risk probability**

The likelihood that a risk event will occur or prove true during the project.

**risk register\***

A repository in which outputs of risk management processes are recorded.

**risk threshold\***

The level of risk exposure above which risks are addressed and below which risks may be accepted.

**risk tolerance**

The maximum amount of risk, and the potential impact of that risk occurring, that a project manager or key stakeholder is willing to accept.

**risk workshop**

A technique that uses a special meeting conducted for the purpose of identifying project risks. In addition to the project team members, this workshop might also include the project sponsor, SMEs, customer representatives, and other stakeholders, depending on the size of the project.

**risk\***

An uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives.

**ROI**

(Return on Investment) A financial metric of profitability that measures the gain or loss from an investment relative to the amount of money invested.

**root cause analysis\***

An analytical technique used to determine the basic underlying reason that causes a variance or a defect or a risk. A root cause may underlie more than one variance or defect or risk.

**SAFe\***

(Scaled Agile Framework) A knowledge base of integrated patterns for enterprise-scale lean-agile development.

**salience model**

A classification model that groups stakeholders on the basis of their level of authority, their immediate needs, and how appropriate their involvement is in terms of the project.

**schedule management plan\***

A component of the project or program management plan that establishes the criteria and the activities for developing, monitoring, and controlling the schedule.

**scope baseline\***

The approved version of a scope statement, WBS, and its associated WBS dictionary, that can be changed using formal change control procedures and is used as a basis for comparison to actual results.

**scope creep\***

The uncontrolled expansion to product or project scope without adjustments to time, cost, and resources.

**scope management plan\***

A component of the project management plan or program management plan that describes how the scope will be defined, developed, monitored, controlled, and validated.

**Scrum master\***

The coach of the development team and process owner in the Scrum framework. Removes obstacles, facilitates productive events, and defends the team from disruptions.

**Scrum team**

Dedicated, self-managing, cross-functional, fully empowered individuals who deliver the finished work required by the customer.

**Scrum\***

An agile framework for developing and sustaining complex products, with specific roles, events, and artifacts.

**sequential relationships**

A type of phase-to-phase relationship that contains consecutive phases that only start when the previous phase is complete.

**servant leadership**

A type of leadership style used in agile and other types of projects which encourages the self-definition, self-discovery, and self-awareness of team members by listening, coaching, and providing an environment which allows them to grow.

**SF\***

(Start-to-Finish) A logical relationship in which a predecessor activity cannot finish until a successor activity has started.

**share**

A strategy for managing positive risks or opportunities that involves allocating some or all of the ownership of the opportunity to a third party.

**simulation\***

An analytical technique that models the combined effect of uncertainties to evaluate their potential impact on objectives.

**SLA\***

(Service Level Agreement) A contract between a service provider (either internal or external) and the end user that defines the level of service expected from the service provider.

**SoS\***

(Scrum of Scrums) A technique to operate Scrum at scale for multiple teams working on the same product, coordinating discussions of progress on their interdependencies, and focusing on how to integrate the delivery of software, especially in areas of overlap.

**source selection criteria\***

A set of attributes desired by the buyer which a seller is required to meet or exceed to be selected for a contract.

**source-based risk classification**

A method of analyzing risk in terms of its origins.

**SPI\***

(Schedule Performance Index) A measure of schedule efficiency expressed as the ratio of earned value to planned value.

**Sprint backlog\***

A list of work items identified by the Scrum team to be completed during the Scrum sprint.

**Sprint planning\***

A collaborative event in Scrum in which the Scrum team plans the work for the current sprint.

**Sprint retrospective**

This critical part of the Scrum process is attended by the Product Owner, Scrum Master, and the Scrum team to analyze from a process perspective what is working well and what is not and to agree upon changes to implement.

**Sprint review**

A review at the end of each iteration with the Product Owner and other customer stakeholders to review the progress of the product, get early feedback, and review an acceptance from Product Owner of the stories delivered in the iteration. Also referred to as a Demo.

**Sprint\***

A timeboxed iteration in Scrum.

**SS\***

(Start-to-Start) A logical relationship in which a successor activity cannot start until a predecessor activity has started.

**stakeholder analysis\***

A technique of systematically gathering and analyzing quantitative and qualitative information to determine whose interests should be taken into account throughout the project.

**stakeholder cube**

A three-dimensional classification model that builds on the previous two-dimensional grids to group stakeholders.

**Stakeholder Engagement Assessment Matrix\***

A matrix that compares current and desired stakeholder engagement levels.

**stakeholder engagement plan\***

A component of the project management plan that identifies the strategies and actions required to promote productive involvement of stakeholders in project or program decision making and execution.

**stakeholder register\***

A project document including the identification, assessment, and classification of project stakeholders.

**stakeholder\***

An individual, group, or organization that may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project, program, or portfolio.

**standard\***

A document established by an authority, custom, or general consent as a model or example.

**statistical sampling process**

A process that involves dividing sampling data into two categories—attribute and variable—each of which is gathered according to sampling plans. As corrective actions are taken in response to analysis of statistical sampling and other quality control activities, and as

trend analysis is performed, defects and process variability should be reduced.

**statistical sampling\***

Choosing part of a population of interest for inspection.

**storyboarding**

The prototyping method that uses visuals or images to illustrate a process or represent a project outcome. Storyboards are useful to illustrate how a product, service, or application will function or operate when it's complete.

**supportive PMO**

The type of PMO that provides a consultative role to projects by supplying templates, best practices, training, access to information, and lessons learned from other projects.

**SV\***

(Schedule Variance) A measure of schedule performance expressed as the difference between the earned value and the planned value.

**SWOT analysis\***

An analysis of strengths, weaknesses, opportunities, and threats of an organization, project, or option.

**T&M contract\***

(Time and Material contract) A type of contract that is a hybrid contractual arrangement containing aspects of both cost-reimbursable and fixed-price contracts.

**T-shaped\***

Refers to a person with one deep area of specialization and broad ability in the rest of the skills required by the team.

 **tacit knowledge\***

Personal knowledge that can be difficult to articulate and share such as beliefs, experience, and insights.

**task board**

Used to visualize the work and enable the team and stakeholders to track their progress as work is performed during an iteration. Examples of task boards include Kanban

boards, to-do lists, procedure checklists, and Scrum boards.

### **team building**

The process of continually supporting and working collaboratively with team members in order to enable a team to work together to solve problems, diffuse interpersonal issues, share information, and tackle project objectives as a unified force.

### **team charter\***

A document that records the team values, agreements, and operating guidelines as well as establishing clear expectations regarding acceptable behavior by project team members.

### **team management plan\***

A component of the resource management plan that describes when and how team members will be acquired and how long they will be needed.

### **team resource management**

The processes necessary to organize, manage, and lead the people on the project team as well as the processes needed to procure and manage physical resources for a project.

### **team-building activities**

The specific functions or actions taken to help the team to develop into a mature, productive team. They can be formal or informal, brief or extended, and facilitated by the project manager or a group facilitator.

### **teaming agreement**

A legal contractual agreement between two or more parties to form a joint venture or any other arrangement as defined by the parties to meet the requirements of a business opportunity. The parties can be internal or external to the organization executing the project.

### **term contract**

A type of contract that engages the vendor to deliver a set amount of service—measured in staff-hours or a similar unit—over a set period of time.

### **threat\***

A risk that would have a negative effect on one or more project objectives.

### **three-point estimating\***

A technique used to estimate cost or duration by applying an average or weighted average of optimistic, pessimistic, and most likely estimates when there is uncertainty with the individual activity estimates.

### **timebox\***

A fixed period of time; for example, 1 week, 2 weeks, 3 weeks, or 1 month.

### **tolerance\***

The quantified description of acceptable variation for a quality requirement.

### **total float\***

The amount of time that a schedule activity can be delayed or extended from its early start date without delaying the project finish date or violating a schedule constraint.

### **TQM**

(Total Quality Management) An approach to improve business results through an emphasis on customer satisfaction, employee development, and processes rather than on functions.

### **training**

An activity in which team members acquire new or enhanced skills, knowledge, or attitudes.

### **transfer**

A strategy for managing negative risks or threats that involves shifting the impact and ownership of the risk to a third party and paying a risk premium to the party taking on the liability of the risk.

### **trend analysis**

An analytical technique that uses mathematical models to forecast future outcomes based on historical results.

### **trigger condition\***

An event or situation that indicates that a risk is about to occur.

**unanimity\***

Agreement by everyone in the group on a single course of action.

**unique identification code**

A specific configuration of a code of accounts that assigns a particular alphanumeric sequence of characters to each element of a WBS.

**user story\***

A brief description of deliverable value for a specific user. It is a promise for a conversation to clarify details.

**Validate Scope**

The process of formalizing acceptance of the completed project deliverables.

**value stream mapping\***

A lean enterprise technique used to document, analyze, and improve the flow of information or materials required to produce a product or service for a customer.

**value stream\***

An organizational construct that focuses on the flow of value to customers through the delivery of specific products or services.

**variable sampling data**

Data from a sample that is measured on a continuous scale such as time, temperature, or weight.

**variance analysis\***

A technique for determining the cause and degree of difference between the baseline and the actual performance.

**variance\***

A quantifiable deviation, departure, or divergence away from a known baseline or expected value.

**version control**

A system that records changes to a file, in a way that allows you to retrieve previous changes made to it.

**virtual team\***

A group of people with a shared goal who fulfill their roles with little or no time spent meeting face-to-face.

**waiver**

The giving up of a contract right, even inadvertently.

**warranty**

A promise, explicit or implied, that goods or services will meet a predetermined standard.

**WBS dictionary\***

A document that provides detailed deliverable, activity, and scheduling information about each component in the work breakdown structure.

**WBS\***

(work breakdown structure) A hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables.

**work package\***

The work defined at the lowest level of the work breakdown structure for which cost and duration are estimated and managed.

**work performance data\***

The raw observations and measurements identified during activities being performed to carry out the project work. They can be recorded in the PMIS and project documents.

**work performance information\***

The performance data collected from controlling processes, analyzed in comparison with project management plan components, project documents, and other work performance information.

**work performance report\***

The physical or electronic representation of work performance information compiled in project documents, intended to generate decisions, actions, or awareness.

**work shadowing**

An on-the-job technique that enables someone to learn about and perform a job while observing and working with another more experienced person, or mentor.

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