



# Becoming a PMP® Certified Professional

---

A study guide to mastering project management for the PMP® exam



J. Ashley Hunt

PMP, CAPM, Project +, CSM, PMI-ACP

WOW! eBook  
[www.wowebook.org](http://www.wowebook.org)



# Becoming a PMP® Certified Professional

A study guide to mastering project management  
for the PMP® exam

**J. Ashley Hunt**  
PMP, CAPM, Project +, CSM, PMI-ACP

**Packt**

BIRMINGHAM—MUMBAI

# Becoming a PMP® Certified Professional

Copyright © 2021 Packt Publishing

*All rights reserved.* No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, without the prior written permission of the publisher, except in the case of brief quotations embedded in critical articles or reviews.

Every effort has been made in the preparation of this book to ensure the accuracy of the information presented. However, the information contained in this book is sold without warranty, either express or implied. Neither the author, nor Packt Publishing or its dealers and distributors, will be held liable for any damages caused or alleged to have been caused directly or indirectly by this book.

Packt Publishing has endeavored to provide trademark information about all of the companies and products mentioned in this book by the appropriate use of capitals. However, Packt Publishing cannot guarantee the accuracy of this information.

**Group Product Manager:** Ashwin Nair

**Publishing Product Manager:** Pavan Ramchandani

**Senior Editor:** Keagan Carneiro

**Content Development Editor:** Divya Vijayan

**Copy Editor:** Safis Editing

**Project Coordinator:** Kinjal Bari

**Proofreader:** Safis Editing

**Indexer:** Manju Arasan

**Production Designer:** Nilesh Mohite

First published: February 2021

Production reference: 1260221

Published by Packt Publishing Ltd.

Livery Place

35 Livery Street

Birmingham

B3 2PB, UK.

ISBN 978-1-83898-930-9

[www.packtpub.com](http://www.packtpub.com)

*To my mother, who has given everything so willingly and asked for nothing in return. You are my inspiration to keep on keeping on.*

*To my daughter, Izabella, I am so proud of everything you have accomplished. Keep on keeping on!*

*To my husband, Chris, for understanding the hours it takes to write and work full-time. Thank you for your love and patience.*

*Finally, thank you to my students. You make all of this worthwhile. Thank you for choosing me to help guide you on your professional journey.*

# Contributors

## About the author

**J. Ashley Hunt** is currently the senior project management instructor at StormWind Studios for Waterfall and Agile project management. A nationally and internationally renowned subject-matter expert in the areas of project management and professional development, she has created training offerings for, and delivered project management training to, more than 10,000 people working for enterprise clientele around the world. Ashley has developed an admirable reputation as a consultative trainer and engaging speaker in several disciplines, consistently receiving exemplary evaluations from her students and clientele. This is her second published study guide. Her relevant technical experience includes PMP®, Project+, PMI-ACP®, CSM, MCAS, and LSSGBC certified.

## About the reviewers

**Mahjooba Bianchi** is the CEO of Three T Institute Inc., an innovative professional development training company that focuses on providing an e-learning and classroom experience that is personable, hands-on, and effective.

The "3T System" approach enables busy professionals to understand, retain, and recall learned information to pass the certification exams at their first attempt.

Ms. Bianchi has over 15 years of project management experience, and an MBA in IT project management, with an undergraduate degree from George Mason University in government and international relations. Her passion in life is to drive motivation and enable individuals to reach their career heights through education.

**Manickavel Arumugam** has more than two decades of experience in the construction industry, with an emphasis on project management and site control. He has managed several prestigious projects, including the construction of underground metro rail stations and cut-and-cover tunnels in tricky environments. He also has extensive hands-on experience of precast component fabrication and installation.

He is an enthusiastic project management trainer, consultant, and blogger. He regularly conducts training programmes for candidates aspiring to obtain the industry-recognized Project Management Professional (PMP) certification. He has given several guest lectures and conducted training programmes at prestigious institutions and organizations.

He is a certified Project Management Professional (PMP) and Risk Management Professional (PMI-RMP).



# Table of Contents

## Preface

---

## Section 1: Introduction to Project Management and People

### 1

#### Introduction to the PMP® Exam

---

Why get a Project Management Professional (PMP)® certification?	4	What are the qualifications for the PMP® exam?	16
What will you learn about?	5	What does project management education mean?	17
Who is this book for?	6	I took a PMP® boot camp 4 years ago, does that count?	17
Frequently asked questions	9		
Who exactly is the PMI®?	9		
What is <i>The PMBOK® Guide – 6th Edition</i> ?	9	<b>How to apply for the exam</b>	18
I heard Agile is included – what is the deal with that?	9	What if the organization has closed or the people I worked with are gone and I can't find them?	18
Predictive and adaptive? What does that mean?	10	The application	19
I heard the PMP® exam is super difficult, is that true?	11		
Can I cram for this exam? I have like zero time to study	11	<b>What to expect on exam day – if you take the exam at a testing center</b>	26
100 hours of study???	12	What to expect on exam day if you take your PMP® exam online at home... in your pajamas...	30
Will your practice exams match my exam?	12		
Am I going to pass the exam the first time?	13	<b>Common questions you may be thinking to yourself after all of that</b>	31
Do I need other study materials?	15		
I heard the application is difficult. Are you going to cover that in this guide?	16		

Do I need to be proficient in everything? How will I know?	31	I have zero time to study and that study for 100 hours bit is making me nervous. How can I still work and have a life, but also still study?	32
Will anyone be able to see my results?			
As in, will PMI® post my results anywhere?	31	Study tips	34
If I get below target in any domain, will I fail the exam?	32	<b>Learning styles</b>	36
What score should I be aiming for in practice exams?	32	The seven learning styles	38
		<b>Summary</b>	41
		<b>Assessment exam</b>	41

## 2

### Introduction to Project Management

---

<b>What are process groups?</b>	50	<b>Organizational process assets and enterprise environmental factors</b>	61
<b>Overview of knowledge areas</b>	52	Enterprise environmental factors	62
<b>Introduction to the 49 processes</b>	56	Organizational process assets	63
<b>Inputs, tools/techniques, and outputs</b>	58	<b>The documents and plans</b>	65
Inputs – what do I need before I can make a PB&J?	59	The project management plan and project documents	67
Tools and techniques – what tools/techniques will I use to create my sandwich?	60	<b>Summary</b>	71
Outputs – what will I have when I am finished?	61	<b>Assessment exam</b>	72

## 3

### Pre-Project Initiation

---

<b>Defining a project</b>	78	Spot check exercise answers	86
Temporary	79	<b>Types of project management</b>	86
Unique	80	Predictive or waterfall project management	87
What is a program?	82	Adaptive or agile project management	87
What is a portfolio?	83		
Key phrases that pay	83	<b>Project and development life cycles</b>	89
<b>What is project management?</b>	84		
<b>Spot check exercise</b>	85		

<b>Project phases</b>	<b>90</b>	<b>Key project stakeholders</b>	<b>106</b>
Phase gates	91	Project management offices (PMOs)	107
Spot check exercise	92	Change control board (CCB)	109
Spot check exercise answers	92	Sponsor	109
		Spot check	110
		Spot check answers	110
<b>Project management data and information</b>	<b>93</b>	Functional manager	111
Work performance data	93	Procurement administrator/vendors	111
Work performance information	93	Customers/end users	112
Work performance reports	93	Key phrases that pay	112
Key phrases that pay	94		
<b>Project selection techniques</b>	<b>94</b>	<b>Understanding organizational structures</b>	<b>112</b>
Creating a case for business	95	Organizational structures and their elements	114
Constrained optimization	101	Spot check exercise	121
Expert judgment	102	Spot check exercise (possible) answers	122
Spot check exercise	102		
Spot check exercise answers	103		
Feasibility analysis	103	<b>The role of the project manager</b>	<b>123</b>
The business case	104	<b>Summary</b>	<b>124</b>
Key phrases that pay	105	<b>Assessment exam</b>	<b>124</b>

## 4

### Charters and Stakeholders

<b>Politics, power, and leadership</b>	<b>132</b>	<b>Spot check</b>	<b>145</b>
Leadership versus management	134	<b>Criteria of a project charter</b>	<b>146</b>
<b>Spot check</b>	<b>136</b>	Typical headings in a project charter	148
Personality traits	136	<b>Agile project charters</b>	<b>151</b>
		Typical heading on an Agile charter	151
<b>The project manager and project integration</b>	<b>137</b>	<b>Project stakeholder management</b>	<b>154</b>
The process level	138	<b>Identifying the stakeholder's process</b>	<b>156</b>
The cognitive level	138	Project coordinator	157
The context level	138	Scheduler	157
<b>Goals and objectives of a project charter</b>	<b>139</b>	Project team	158
<b>Documenting high-level requirements</b>	<b>144</b>	Project Management Office (PMO)	158

Change Control Board (CCB)	158	Salience model	164
Functional managers	159	Directions of influence	164
Sellers, vendors, and suppliers	160	Prioritization	165
Procurement managers	161	<b>Stakeholder register</b>	165
<b>Data analysis</b>	162	<b>Spot check</b>	167
<b>Data representation</b>	163	<b>Wrapping up</b>	168
Power/interest grid, power/influence grid, or impact/influence grid	163	<b>Summary</b>	170
Stakeholder cube	164	<b>Assessment exam</b>	171

## 5

### Introduction to Agile Considerations

---

<b>The history of Agile and the Agile Manifesto</b>	177	Inspection	194
		Adaptation	194
The Agile Manifesto	181	<b>Agile team roles</b>	195
Key phrases that pay	184	The product owner	196
The 12 principles of the Agile Manifesto	185	The development team	199
<b>Scrum and empirical process control</b>	188	Scrum master/coach/Agile project manager	199
<b>Spot check</b>	188	<b>The Agile life cycle</b>	200
Spot check solution	189	Sprint planning	200
<b>Agile versus predictive project management</b>	189	The Sprint	201
The benefits of using Agile approaches in any industry	191	Daily Scrum or stand-up meetings	201
The Agile mindset	192	Sprint reviews	202
<b>Scrum overview</b>	193	The retrospective	202
Transparency	194	<b>Summary</b>	202
		<b>Assessment exam</b>	203

## 6

### Creating and Leading a Team

---

Interpreting the source and stage of the conflict	210	Analyzing the context of the conflict	211
		Conflict resolution strategies	212

Collaborate and problem-solve	213	Fairness – mandatory standards	222
Compromise/reconcile	213	Honesty – aspirational standards	222
Smooth/accommodate	214	Honesty – mandatory standards	222
Force/direct	214	<b>Value servant leadership</b>	<b>223</b>
Withdraw/avoid	214	<b>Inspiring, motivating, and influencing</b>	<b>226</b>
Negotiate	215	<b>Motivational theories</b>	<b>230</b>
<b>Setting a clear vision and mission</b>	<b>215</b>	Maslow's hierarchy of needs	231
Leadership	216	Douglas McGregor's Theory X and Theory Y	233
Team-building	217	Dr. William Ouchi's Theory Z	234
Communication	217	Frederick Herzberg's theory of hygiene	235
Active listening	218	David McClelland's theory of needs	236
<b>Supporting diversity and inclusion</b>	<b>218</b>	<b>Reward and recognition</b>	<b>238</b>
Responsibility – aspirational standards	220	<b>Analyzing team members' and stakeholders' influence</b>	<b>242</b>
Responsibility – mandatory standards	220	<b>Key phrases that pay</b>	<b>243</b>
Respect – aspirational standards	221	<b>Summary</b>	<b>243</b>
Respect – mandatory standards	221	<b>Assessment exam</b>	<b>244</b>
Fairness – aspirational standards	221		

## Section 2: Project Management Processes

### 7

#### Scope Management

<b>Key concepts and scope management trends</b>	<b>252</b>	<b>The Work Breakdown Structure</b>	<b>264</b>
Tailoring considerations	253	The WBS dictionary	270
Agile considerations	254	<b>Monitoring and controlling scope</b>	<b>273</b>
<b>Developing a scope and requirements management plan</b>	<b>255</b>	The Validate Scope process	274
Collecting requirements	257	The Control Scope process	275
Defining the scope and creating the scope statement	261	<b>Key phrases that pay</b>	<b>276</b>
		<b>Summary</b>	<b>277</b>
		<b>Assessment exam</b>	<b>277</b>

**8****Schedule and Cost Management**

---

<b>Key concepts for schedule management</b>	<b>284</b>	Critical path	305
Trends and emerging best practices in scheduling	284	Critical chain	310
Tailoring considerations for scheduling	285	Monte Carlo technique	311
Considerations for Agile and adaptive environments	285	Schedule compression	311
		Resource optimization	313
<b>Developing a schedule management plan</b>	<b>286</b>	<b>Schedule baseline</b>	<b>313</b>
Schedule management plan considerations	286	<b>Key concepts for project cost management</b>	<b>314</b>
		Trends and emerging best practices of cost management	315
		Tailoring considerations for cost management	315
<b>Define activities</b>	<b>287</b>	Considerations for Agile and adaptive environments	315
<b>Sequencing activities</b>	<b>289</b>	<b>Plan cost management</b>	<b>316</b>
Dependencies	289	<b>Estimating costs</b>	<b>316</b>
<b>Relationships</b>	<b>290</b>	<b>Determining budget</b>	<b>319</b>
Finish to Start relationships	291	<b>Controlling schedule and budget</b>	<b>321</b>
Start to start relationships	292	Tracking and reporting cost/schedule performance	321
Finish to finish relationships	293	Earned value management (EVM)	322
Start to finish relationships	294	<b>Key phrases that pay</b>	<b>335</b>
<b>Lead and lag time</b>	<b>295</b>	<b>Summary</b>	<b>336</b>
<b>Estimating durations</b>	<b>297</b>	<b>Assessment questions</b>	<b>336</b>
Dates	297		
Effort	298		
Duration	299		
<b>Developing the project schedule</b>	<b>304</b>		

**9****Quality Management**

---

<b>Key concepts for quality management</b>	<b>346</b>	Precision versus accuracy	346
Quality versus grade	346	Other considerations for quality management planning	347

<b>Trends and emerging practices in quality management</b>	<b>350</b>	Joseph Juran	<b>360</b>
		Vilfredo Pareto	360
<b>Tailoring considerations</b>	<b>351</b>	Bill Smith	360
<b>Agile/adaptive environments – retrospectives</b>	<b>352</b>	Phillip Crosby	361
		Genichi Taguchi	361
<b>Spot check</b>	<b>354</b>	<b>Key phrases that pay</b>	<b>362</b>
<b>Planning for quality management</b>	<b>355</b>	<b>The Manage Quality process</b>	<b>362</b>
		<b>The Control Quality process</b>	<b>364</b>
Data representation	356	Histograms	366
The quality management plan	357	Fishbone diagrams	368
Quality metrics	358	Pareto diagrams	369
Quality checklists	358	Run charts	371
		Scatter diagrams	372
<b>The gurus of quality management</b>	<b>359</b>	Control charts	373
W. Edwards Deming and Walter A. Shewhart	359	<b>Summary</b>	<b>374</b>
		<b>Assessment exam</b>	<b>374</b>

## 10

### Resources and Communication Management

<b>Key concepts in resource management</b>	<b>384</b>	<b>Supporting your team's performance</b>	<b>405</b>
<b>Trends and emerging best practices</b>	<b>386</b>	Peter Drucker's MBO	405
<b>Resource management planning</b>	<b>387</b>	<b>Controlling resources</b>	<b>408</b>
Plan resource management	388	<b>Key concepts in communications management</b>	<b>410</b>
Key phrases that pay	394	Trends and emerging best practices	413
		Tailoring	415
<b>Estimating activity resources</b>	<b>394</b>	Agile considerations	416
Key phrases that pay	397	<b>Communication considerations</b>	<b>417</b>
<b>Acquiring resources, developing, and managing a team</b>	<b>398</b>	<b>Communications management planning</b>	<b>418</b>
Acquiring resources	398	Key phrases that pay in communications management	420
Developing and managing a team	401	<b>Spot check</b>	<b>421</b>

Managing communications	421	Summary	423
Monitoring communications	422	Assessment questions	424

## 11

### Risk Management

---

Key concepts for risk management	430	Performing qualitative risk analysis	445
Trends and emerging best practices in project risk management	430	Key phrases that pay	447
Non-event risks	431	Performing quantitative risk analysis	448
Tailoring considerations for risk management	433	Expected monetary value (EMV)	448
Considerations for Agile and Adaptive environments	434	Plan risk responses	452
Plan risk management	434	Creating risk responses for threats	452
The risk management plan	436	Opportunity responses	454
Identify risks process	439	Strategies for overall project risk	456
Root cause analysis	441	Issue logs	457
SWOT analysis	442	Spot check	458
Prompt lists	444	Spot check answers	458
Creating the risk register	445	Implement risk responses	459
The risk report	445	Secondary risks	461
		Residual risk events	461
		Monitor risks	461
		Summary	464
		Assessment exam	464

## 12

### Procurement Management

---

Key concepts for procurement management	472	Planning procurement management	474
Trends and emerging best practices in project procurement management	473	Contract types	475
Considerations for Agile/Adaptive environments	473	Roles in procurement	479
		Key phrases that pay	486
		Conduct procurements	487
		Bidder conferences	488

Proposal evaluation	489	<b>Control procurements</b>	<b>493</b>
<b>Partner-centric procurement documents</b>	<b>490</b>	Claims administration	494
Letter of intent	491	Data analysis	495
Memorandum of Understanding (MOU)	491	Inspections and audits	495
Breach of contract	491	Seller surveys	495
Service Level Agreements (SLAs)	492	Warranty	496
Purchase Order (PO)	492	Waivers	496
Nondisclosure agreement (NDA)	492	<b>Summary</b>	<b>497</b>
Cease and desist letter	492	<b>Assessment questions</b>	<b>498</b>

## 13

### Stakeholder Engagement

Planning stakeholder engagement	506	Monitoring stakeholder engagement	511
Managing stakeholder engagement	510	<b>Summary</b>	<b>513</b>
		<b>Assessment questions</b>	<b>513</b>

## 14

### Integration Management

Developing the project management plan	518	Performing integrated change control	527
Directing and managing project work	520	Closing the project or phase	530
Managing project knowledge	522	Spot check	534
Monitoring and controlling project work	524	<b>Summary</b>	<b>535</b>
		<b>Assessment questions</b>	<b>535</b>

## Section 3: Revision

## 15

### Next Steps and Study Tips

Why project management certification?	542	Where can I find the information?	543
		Other changes and information	545

<b>Study tips</b>	<b>547</b>	Organizational structure types	552
<b>Stuff to know about projects</b>	<b>548</b>	Other important terms to be aware of	553
Why projects are necessary	549	<b>Final thoughts</b>	<b>559</b>
What is the difference between a portfolio, program, and project?	550	On exam day	559
Project management documents	551	Question types	560
Skills of a project manager	551	<b>Summary</b>	<b>560</b>

## 16

### Final Exam

---

<b>Questions</b>	<b>561</b>	<b>Answers</b>	<b>623</b>
<b>Assessment</b>			

Assessment exam answers (Chapter 1)	701	(Chapter 8)	744
Assessment exam answers (Chapter 2)	709	Assessment exam answers (Chapter 9)	753
Assessment exam answers (Chapter 3)	714	Assessment exam answers (Chapter 10)	763
Assessment exam answers (Chapter 4)	722	Assessment exam answers (Chapter 11)	768
Assessment exam answers (Chapter 5)	728	Assessment exam answers (Chapter 12)	773
Assessment exam answers (Chapter 6)	733	Assessment exam answers (Chapter 13)	779
Assessment exam answers (Chapter 7)	738	Assessment exam answers (Chapter 14)	783
Assessment exam answers		Why subscribe?	789

### Other Books You May Enjoy

---

### Index

---

# Preface

*Congratulations on beginning your journey toward PMP® certification! This guide will prepare you to take and pass your exam as well as providing you with an understanding of the best practices and processes of predictive and Agile project management.*

## Who this book is for

*This book is for experienced project managers looking for a common language and best practices in the project management space and who wish to gain certification and improve their careers and growth potential. A minimum of 5 to 7 years of experience in leading and directing projects in a variety of industries will be useful for understanding the best practices and processes as well as providing the necessary experience to apply for and sit the PMP® exam.*

## What this book covers

*Chapter 1, Introduction to the PMP® exam, provides an overview of the process in terms of applying for and sitting the exam, as well as useful information and answers to common questions.*

*Chapter 2, Introduction to Project Management, provides an overview of project management best practices and terminology.*

*Chapter 3, Pre-Project Initiation, provides an overview of project selection techniques and how organizations determine which projects to charter.*

*Chapter 4, Charters and Stakeholders, explains how the proper kick-off of a project begins with a project charter and the identification of stakeholders. This chapter will review the best practices for both.*

*Chapter 5, Introduction to Agile Considerations, goes through everything you need to know about Agile project management.*

*Chapter 6, Creating and Leading a Team, focuses on the people side of project management and best practices to reward, recognize, and build an effective team of individuals.*

*Chapter 7, Scope Management*, focuses on collecting requirements, creating a scope baseline, and gaining formal acceptance of the deliverables.

*Chapter 8, Schedule and Cost Management*, includes the best practices of breaking requirements to the activity level, sequencing, estimating, and creating a schedule and baseline. Many techniques are covered, overlapping with cost estimating and budgeting to produce a cost baseline.

*Chapter 9, Quality Management*, offers a review of planning for quality requirements, managing the execution of the process to produce deliverables within specifications, and controlling defects through quality control.

*Chapter 10, Resources and Communication Management*, explains how effective resource management and communication is an integral piece of project management. This chapter will cover the best practices in each area.

*Chapter 11, Risk Management*, explains how any moment during a project may entail risk, and so planning for risk and analyzing and creating responses to risk will allow better management of threats and opportunities.

*Chapter 12, Procurement Management*, focuses on best practices for agreements and contracts, including the project manager's responsibilities in procurement management.

*Chapter 13, Stakeholder Engagement*, reviews best practices for stakeholder engagement, given that keeping your stakeholders happy and informed is a large part of what project managers do.

*Chapter 14, Integration Management*, puts everything covered thus far into a project management plan that will be executed, and includes formal change control best practices as well as closing out the project or phase.

*Chapter 15, Next Steps and Study Tips*, is designed to help you prepare for your studying and plan for exam day, as well as tips and tricks to help you pass the exam first time.

*Chapter 16, Final Exam*, puts all of your knowledge to the test as you take the final exam. The higher your score, the closer you are to passing the PMP® exam!

## To get the most out of this book

This book is based on the 6th edition PMBOK Guide. The 7th is not out yet and is not expected until Summer, this will not change the exam. It will be a supplemental guide of standards.

It is best to work your way through the chapters in the order they occur when reading this book for the first time. This will give you a project management framework and allow you to focus on each section's review questions. Then, after completing each chapter's assessments, you can go back and review what you missed before moving on to other chapters. After completing the final exam, you can then go back and review those areas where your knowledge is lacking. Study what you don't know, not what you do! Good luck!

## Conventions used

There are a number of text conventions used throughout this book.

**Bold:** Indicates a new term, an important word, or words that you see on screen.

Tips or important notes and references

Appear like this.

## Get in touch

Feedback from our readers is always welcome.

**General feedback:** If you have questions about any aspect of this book, mention the book title in the subject of your message and email us at [customercare@packtpub.com](mailto:customercare@packtpub.com).

**Errata:** Although we have taken every care to ensure the accuracy of our content, mistakes do happen. If you have found a mistake in this book, we would be grateful if you would report this to us. Please visit [www.packtpub.com/support/errata](http://www.packtpub.com/support/errata), selecting your book, clicking on the Errata Submission Form link, and entering the details.

**Piracy:** If you come across any illegal copies of our works in any form on the internet, we would be grateful if you would provide us with the location address or website name. Please contact us at [copyright@packt.com](mailto:copyright@packt.com) with a link to the material.

**If you are interested in becoming an author:** If there is a topic that you have expertise in and you are interested in either writing or contributing to a book, please visit [authors.packtpub.com](http://authors.packtpub.com).

## Reviews

Please leave a review. Once you have read and used this book, why not leave a review on the site that you purchased it from? Potential readers can then see and use your unbiased opinion to make purchase decisions, we at Packt can understand what you think about our products, and our authors can see your feedback on their book. Thank you!

For more information about Packt, please visit [packt.com](http://packt.com).

# Section 1: Introduction to Project Management and People

In this part, we will take a deep dive into the exam experience and provide an overview of project management best practices. Then, we will begin to suss out project selection methods and what happens prior to a project kicking off. Once that has been done, a project charter can be created and we can begin to identify who the stakeholders are for the project we have been assigned to. Since the new exam is 50% Agile best practices, understanding Agile life cycles and team roles is an integral section for review. The last chapter in this section focuses on people and how a project manager can create and lead a team successfully.

This section comprises the following chapters:

- *Chapter 1, Introduction to the PMP® Exam*
- *Chapter 2, Introduction to Project Management*
- *Chapter 3, Pre-Project Initiation*
- *Chapter 4, Charters and Stakeholders*
- *Chapter 5, Introduction to Agile Considerations*
- *Chapter 6, Creating and Leading a Team*



# 1

# Introduction to the PMP® Exam

Congratulations on deciding to begin your journey toward your **Project Management Professional (PMP)®** certification! In this chapter, we'll explore an overview of this study guide and what to expect before you take the PMP® certification exam, as well as answer some of the most common questions about the certification process. Much of this information can be found online at the Project Management Institute's (PMI)® website ([www.pmi.org](http://www.pmi.org)), as well as numerous other sites.

This information is important to understand before diving into the content that you will be tested on so that you can avoid having to search for the correct information. This guide is based on the *Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017* and is for the current PMP® exam's content outline beginning January 2, 2021.

## Reference

*The Project Management Professional (PMP), the PMBOK Guide and the Project Management Institute Agile Certified Practitioner (PMI-ACP), Certified Associate in Project Management (CAPM), and the Agile Practice Guide are a registered trademark of the Project Management Institute, Inc.*

In this chapter, you will cover the following topics:

- An overview of the PMP® exam process
- How to apply for the exam
- What to expect on exam day
- Study tips
- Assessment test

## Why get a Project Management Professional (PMP)® certification?

Above and beyond the fact that the PMP® is the most prestigious non-technical certification in the world, the certification is also proof of a lot of hard work, project management experience, and passing a very difficult exam – not impossible, but difficult. Why even enter it? Having one or multiple project management certifications shows your willingness to learn, try new things, and improve your organization's projects, which in turn provides value to the organization. Congratulations on taking the first step toward career improvement! Currently, project management is in high demand globally, and that growth shows little chance of slowing down. Project managers make anywhere between \$70,000 and \$150,000 annually, based on their location and targeted project management categories.

There isn't a one-size-fits-all approach to project management in any industry and much of the time, our organizational processes and corporate cultures influence our projects the most. But what if you had multiple tools and knowledge at your disposal to adapt and adjust as needed to meet the demands of your projects? What if you could adapt those best practices to conform to your organizational processes and industry? That would provide you with the knowledge and flexibility to determine what tools your project needs and allow you to make determinations and adjustments when certain techniques aren't working in your current environment.

You may see some things in this guide and in your exams that will not align with your organization's best practices or simply won't work in your current environment. That is totally okay! You will need that information to answer questions correctly in your exams and maybe as you progress through your career, you'll find a need for some of those best practices down the line.

Having a set of best practices that have been proven over and over again to work but that are adaptable to your environment is one of the main reasons why the PMP® certification exists. Throughout this guide, you will find that I compare perfect-world project management to real-world project management. The reason I'll be doing this is to help solidify content in a way that may resonate with your current experiences. Those experiences are potentially *not* a perfect world. I know, right? I've been there – actually, I'm still there! Where is this perfect world and how do I get there? I feel your pain.

There will be concepts that will need to be adapted to suit your current projects, and therein lies the importance of *The PMBOK® Guide – 6th Edition*. It isn't a step-by-step handbook; it is a guide to determining what will work within your own unique projects and what will not. Much like when you travel with a tourist guidebook filled with all sorts of things you could see and do, you have decisions to make along the way. Should we see this site or that site? You can't see them all, so you will need to decide what worked for your own unique travel experience. Project management is quite similar. Should we do this or that? The answer to that question depends on many different situations, industries, corporate cultures, and the like. Sometimes, you just wing it in the real world and hope it works.

## What will you learn about?

Everything covered in this guide is based on the PMP® exam content outline. You may have heard that the exam changed, and that is true! The exam content outline was most recently updated in June 2019 and influences the exam that began in January 2021.

The reason the exam content outline was updated is due to the diligence of the **Project Management Institute (PMI)**® to make sure that the most up-to-date best practices that are being utilized around the world are found in your exams. They do this by performing a Role Delineation Study after the updates to *The PMBOK® Guide* are made. That allows them to really survey project managers and determine what needs or doesn't need to be covered in the exams and how to better align this with the real-world aspects of best practices. These studies inevitably change the exam content outline but not *the PMBOK® Guide* at this time. There are rumors of the 7th edition coming to a bookstore near you. If I had to guess, I would say 2021 will be the year. I could be wrong, so always check the PMI® website for the most up-to-date information.

You'll want to review the topics that you'll be tested on and what each domain weighs as far as your score is concerned. The following is an overview of what you will learn in this guide, and all the chapters in this book contain review questions pertaining to that chapter's content to help target your exam studies. This will also provide you with an understanding of the best study tips and tricks you'll need to pass the exam the first time around.

## Who is this book for?

There are some very specific requirements you'll need to have met if you wish to sit the PMP® exam and if you can go through the following questions and say to yourself, "yep, that sounds like me," then you are well on your way to a PMP® certification:

Question 1: Have you been leading and directing projects as a project manager for at least 3 to 5 years?	
Question 2: Is it important for you to learn and absorb newer ways of approaching projects?	
Question 3: Are you prepared to not only review the content but to also set aside time for studying?	
Question 4: Are you open to looking at the information in a different way rather than determining that it won't work for your organization?	

Still with me?

Good!

Take a look at the following questions. If you say "nope, that isn't me" to any of these questions, then this book is also for you:

Question 1: Are you new to project management? (The PMP® exam requires a certain amount of qualifying hours - we'll cover that in just a minute.)	
Question 2: Are you stuck in the same old way of doing things in your organization?	
Question 3: Are you already certified with your PMP®?	

If you answered no to the preceding questions, then we are moving in the correct direction.

### Note

By the way, if you are new to project management, there may still be a way to use this book for certification. That certification is the *Certified Associate in Project Management certificate*, or CAPM®. The CAPM® was designed for project coordinators who also need to be able to understand the techniques and concepts to best assist the project manager. It's a different exam but you could use this guide to help you prepare, as the content is the same, but the exam content outlines are not. Be sure to check the CAPM® section at [www.pmi.org](http://www.pmi.org) to download a copy for your exam.

The PMP® exam is based on the best practices and processes found in *The PMBOK® Guide – 6th Edition* and other study materials. The exam is scored on three domains – people, process, and business environment – and that is also how the study guide is presented. *The PMBOK® Guide – 6th Edition* is presented in the order of the different knowledge areas found in most projects and includes topics such as scope, schedule, resources, and risk.

The process chapters are a comprehensive review of all the topics that can be found for all of the scope processes, all of the schedule processes, and so on. The issue most learners have with that way of learning is that they can't see the project through the trees. They can't put all the pieces of the puzzle together because they just don't see how they all fit together. It's kind of like mixing multiple metaphors – it just doesn't make a lot of sense to learn that way.

Instead, I want you to imagine putting together a puzzle you have never seen before. Some of it looks familiar, but you don't have the puzzle box and a picture of success to begin putting everything together. It would be really difficult to do that. Is it easy to put corners with corners and color-code piles? Sure. Could you put it all together without anything to reference? I'm guessing no – unless you are a jigsaw puzzle champion. If so, carry on! For the rest of us, it's tough to see what success looks like if it is so compartmentalized. That can lead to some confusion in your understanding.

With that being said, I realize that some of you may prefer to look at all aspects of each chapter as a singular entity and prefer to learn that way. Trust me, I totally get it! Otherwise, the Project Management Institute (PMI)® would have adapted their approach over the years to present it in the order of process groups. Where is the disconnect? *The PMBOK® Guide – 6th Edition* is set up like a cookbook. Want to make a dessert? That can be found in *Chapter 10*. Want to make a salad? That can be found in *Chapter 2*. That way, everything is compartmentalized for a better understanding of the categories of best practices across the entire project. Want to make an entire five-course meal? It's best to start at the appetizers and work your way through. I tend to look at cooking as a project I don't actually enjoy working on but use a lot of food references to explain things. I know – weird, right?

One of the reasons that PMI® sets the content up that way is because there isn't a suggestion of the order in which to do things. If you don't use procurement, you don't need procurement best practices. If you were using it as a companion in your day-to-day work and just needed to remind yourself what a scope statement is, then it's easy to find. However, the exam questions are all mixed up. There isn't an order. The hardest part of the exam is determining where you are in the life cycle and answering the questions accordingly.

The main point is that, in some cases, you need that compartmentalization to fully understand the concepts and in others, you need to make sure you understand how everything works together. There are 5 distinct process groups and 10 knowledge areas. All of these will be reviewed in *Chapter 2, Introduction to Project Management*, at a high level. How they work together is presented throughout the guide.

There is so much overlap with processes throughout this project that it would impossible for anyone to say, "go exactly in this order" – step one, do this; step two, do that. This is because every single project is unique and may have a need for a different order or configuration and maybe fewer processes. Thus, *The PMBOK® Guide – 6th Edition* is a way to present all the best practices without designating an order they must be done in. The same thing goes for this book. As I write this guide, it is only in a logical order if that is how you run your projects. Otherwise, it is simply organizing the best practices and processes by the group they are in, rather than me saying, "this is project management and always do it in this order."

The following diagram shows all the process groups and how they are all connected as a cycle, rather than a straight line:



Figure 1.1 – Process groups

Before we get too involved with process groups and knowledge areas, I think it's a good time to answer some of the questions I usually get in my classes.

## Frequently asked questions

There is a lot to know and understand about the entire certification process. I totally get the anxiety that occurs when presented with an opportunity to achieve a goal. Any goal. There is so much information out there and it can get confusing. I'd like to wade through some of the questions I typically get in my classes right about now, and hopefully, it will clear up some burning questions you may have as well. Later in this chapter, we'll go through the exam-specific questions I always get.

### Who exactly is the PMI®?

The Project Management Institute (PMI)® is a global non-profit organization that has collected and provided the required standards and best practices based on years of study and professional standards. They adapt to the changing global market by making updates to the guide and exams. Project management became really influential in the 1960s, also known as the industrial age of building skyscrapers, railroads, and mass production facilities.

#### Reference

*The Project Management Professional (PMP), PMBOK Guide, Certified Associate in Project Management (CAPM), the Project Management Institute Agile Certified Practitioner (PMI-ACP), and the Agile Practice Guide are a registered trademark of the Project Management Institute, Inc.*

Today, PMI® represents multiple project management certifications, including the PMP®, The Project Management Institute's Agile Certified Practitioner (PMI-ACP)®, the Certified Associate in Project Management (CAPM)®, and several others. PMI® also has over 800,000 PMP® certified practitioners to date in over 80 countries and they are still growing. Pretty impressive, right? That is why the PMP® is in the top five certifications to have, even above some of the high-tech certs such as Cisco and Microsoft certifications.

### What is *The PMBOK® Guide – 6th Edition*?

It is a collection of best practices, processes, tools, and techniques that can be used for any project organized by knowledge areas.

### I heard Agile is included – what is the deal with that?

You heard correctly! When the 6th edition was published, it came with a companion document called *the Agile Practice Guide*®. This was due to a collaboration between PMI® and the Agile Alliance®.

Those of us who have been immersed in both sets of vastly different types of project flow did a happy dance because this was the first time there was even a bit of cross-over.

This is how PMI® adapts to the ever-changing landscape of project management and how not every project is a one-size-fits-all approach to project management. The practice guide was written for those project teams in that messy middle ground between predictive and Agile or adaptive types of project life cycles. Don't worry – we'll cover it. This new exam is approximately 50% Agile and 50% predictive best practices.

The other big news is the acquisition of the **Disciplined Agile (DA)** approach by PMI®.

So, yes, Agile is here to stay! The Disciplined Agile influence hasn't affected the PMP® exam at the time of writing as they have their own certifications you can check out. I have two of the DA certs and I highly recommend you check them out as well – I think you'll really like them! At least, that is what my crystal ball says anyway.

## Predictive and adaptive? What does that mean?

Great question! In the following section, you can see the main differences at a high level, as well as how this all unfolds throughout this guide. I can't give away all the good stuff right away, right?

### Predictive project management – PMP® and CAPM®

Being able to predict the result makes it easier to build a front-loaded project management plan. This is sometimes referred to as waterfall project management.

If you know the outcome is a bridge, it's a pretty good assumption that when you are finished, you will have a bridge. That makes it a more complete scope of work from the beginning.

Knowledge of the result doesn't mean things will go exactly as planned (I see you nodding your heads). It just means that a plan is in place and if something changes, then there is a formal change control procedure taking place and updates are made to the plans as needed.

#### Note

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

## Adaptive or Agile project management – The Agile Practice Guide® and PMI-ACP®

These were created originally for software development when the predictive processes were not working in the context of software development.

Developing software needed a more flexible process due to the ever-changing scope of work. You may know you are developing an app for a client to help them pass their PMP® exam, but you may not know exactly how it is going to unfold – yet.

Agile isn't just for software anymore, and there is room in some projects for a variety of best practices, regardless of the scope of work. Staying flexible in planning and how the project is approached is more relevant today in the technological age. You are able to adapt faster and practice agility. Make sense? If not, I have a bunch of good Agile information for you as we proceed through this guide.

### Note

*The Project Management Professional (PMP), PMBOK Guide and the Project Management Institute Agile Certified Practitioner (PMI-ACP), and the Agile Practice Guide are a registered trademark of the Project Management Institute, Inc.*

## I heard the PMP® exam is super difficult, is that true?

Yes, it is true. I say that not to scare you but to be honest with you. The PMP® exam is the most difficult non-technical certification exam in the world. Yes, you read that correctly. In the world! That is why the PMP® is also one of the most prestigious certifications in the world. Don't worry – you'll be well prepared.

## Can I cram for this exam? I have like zero time to study

That is a resounding nope, no, and no. This is not an exam you can cram for. In fact, the majority of the questions are situational. "You are a PM and this happens – what do you do or what do you *not* do?"

Because of the structure of the exam, rote memorization will not help you in a lot of the content and questions. The experts recommend that you need about 100 hours of study to be properly prepared to pass the exam the first time around.

## 100 hours of study???

Yes, yep, and absolutely! I realize that sounds like a lot, but I'll be there with you to help out, give advice, and provide exam tips throughout. It is your exam, and it is your study time, so with that all being said, if you are ready in 50 hours, then go for it! I'm quoting the experts here – oh wait, that's me. I'm attempting CYA here – covering my assets, if you will.

## Will your practice exams match my exam?

That is a resounding nope, no, and no as well. Here's the deal with practice exams: they are meant to help you conceptualize information and solidify it. I'll do my best to get as close as possible, though!

If you are scoring over 90% on these practice exams, it is time to move on to other practice exams. The reason I say that is because these (and all practice exam questions, everywhere) are different from the actual exam questions. If you answer these questions often enough, you will start to memorize the correct answer. Not knowing why it is the correct answer but because you have done it enough times that you recognize "3" is the correct answer spells disaster for the exam.

"Okay, I get that," you say to yourself, "but this is supposed to be an exam prep guide. Why can't you, the author/expert, get closer to the real questions?"

That is a great question as well. There is a test pool of questions for the exam that range anywhere from 10,000 to 20,000 floating around out there and growing as new information is presented. When you sit down to take your exam, the computer selects 180 questions from that pool. Those questions are written by hundreds of different volunteers, with different voices, different ways to present information, and different writing styles.

You could be sitting next to everyone in your organization taking the PMP® or the CAPM® exam and chances are they would all get a different group of questions. It's a lot to ask to have one or several people try to generate everything you might see in your exams.

I've been around this content for so many years and teaching it to a variety of different fantastic people around the world for so long that I have knowledge of the concepts that you will be tested on. I know the most important topics and what people can expect to see presented in their exams, as outlined by the most current exam content outline. What I can't do is predict exactly how many scope questions you will get compared to how many formula questions you will get, how those questions will be structured, and so on. I can only provide the content you will be tested on, based on the exam content outline and the content of *The PMBOK® Guide – 6th Edition*.

So, if you are planning on using a variety of study guides and study aids and you read a review that states in no uncertain terms that the practice questions were nothing like they were in their exam, ignore it. Everyone's questions will be different in the exam. Some will be better than others for sure. Read the reviews for the content presented and whether the guide was understandable and cohesive or not.

The soapbox has now been firmly put away.

## Am I going to pass the exam the first time?

I certainly hope so! But that depends on how you study, how many practice exams you take, and your understanding of the materials. I know my students' pass rates are in the high 90s the first time out of the gate, but some people do fail the exam the first time.

Yikes! What are the main reasons people fail the first time, so I don't fail my exam?

I'll answer that question with a question of my own. How many of you skim content when you read? If you appear to be playing video games on your Kindle when you read because you hit the next page button too quickly, you may fall under that skimmer status. If you are just trying to get the gist of the news online but not the actual details, you may be a skimmer. The number one reason why people don't pass the first time is that they don't read carefully. For the skimmers, *read carefully!* Trust me – I'm in the same boat and I have to force myself to study differently than I would if reading a novel.

"The sky was bright that day, the winds brushed the trees like they were butterflies flapping their wings, and creating hurricanes somewhere around the world."

Wait... what? All I saw was hurricanes and I wrote it! I'm a skimmer too, so I know the importance of reading the questions and all of the answers carefully so that I don't inadvertently choose the wrong answer. In fact, one thing I did a bit differently and still do during exams is read the answers from the bottom up. 4, 3, 2, 1. Why? Because I'm a bit neurotic... err... a skimmer and it forces my brain to stop and read all of the answers. This is important because it may appear that there are two correct answers and if the first feasible answer is answer #2 and I choose it, I may have missed the actual answer, which could be #4. It's just something that works for me, so I'm throwing it out there for the skimmers. Hopefully, you skimmers actually read that sentence.

The second reason why people don't pass the exam the first time is they add a backstory to the content. I'm a huge offender here. Let's say the question is presented this way:

Doug is a project manager who is working on a large infrastructure project. He has been notified of a conflict situation between the vendor and his foreman and is deciding how best to deal with it. The foreman is the one who is working directly with the seller and is in charge of all procurements. Whose job is it to reduce the conflict situation?

1. The PM
2. The foreman
3. The sponsor
4. The project management office (PMO)

Which did you choose? Here's how people who add a backstory respond to a question like this:

"Why is there a conflict? Maybe the foreman is angry because the vendor showed up late. Maybe it's because their scope of work isn't quality. I know that if I were a PM, I'd step right in there and work it out. Wait, maybe the PMO should do it because I don't like conflict."

See where I'm going with this? Do not add anything additional to the question because the next thing you will notice is the clock ticking and you still have no idea what the answer is. By the way, the correct answer is 2. *The foreman*. I'll explain more in the control procurement section, but the reason for this is that the foreman is the person dealing directly with the seller and understands the contract better than you do. The main point is to not add anything else to the question to help it conform to your day-to-day experiences, which leads me to the next reason why people don't pass the first time.

The third reason is, forcing the way you do things into the questions or the answers. Remember that not everything is going to align with your day-to-day experiences and in this case, *The PMBOK® Guide – 6th Edition* wins every single time. You may see two answers that are seemingly correct – one that you would do and one that could be the correct answer – and you go back and forth between them. It's going to happen more times than you may expect. The best way to avoid this is to understand the concepts covered in this guide and in *The PMBOK® Guide – 6th Edition* and absorb them completely. There is only one correct answer to every question on the PMP® exam and that correct answer is aligned with *The PMBOK® Guide – 6th Edition* and the updated exam content outline. Not how Bob in IT does things.

The CAPM® exam has been updated to include multiple answers to some questions, as well as a match feature. At the time of writing, the PMP® exam does not have those types of questions.

The fourth reason people don't pass the first time is they submit the exam too soon. You have almost 4 hours to answer 180 questions. It sounds like a lot of time, doesn't it? That is 230 minutes to answer 180 questions. If you are submitting after 3 or fewer hours, you didn't read the questions carefully, and no doubt will not pass.

The fifth reason is that people go back and change their answers due to second-guessing and exam anxiety. Trust your instincts as they are better than you think they are. Do not change an answer unless you know for a fact you read the question or answers incorrectly.

Finally, I would say the sixth reason is people don't study is they think they can cram for this exam. As I already mentioned, that is a solid no.

## Do I need other study materials?

I would love to say, "oh no way, I'm the total and only expert you ever need," and that may well be the case (back firmly patted), but I am not the be-all and end-all. Am I an expert? Absolutely. Am I the only expert? Absolutely not.

I recommend having a copy of *The PMBOK® Guide – 6th Edition* on hand. You can obtain a copy from [www.pmi.org](http://www.pmi.org) or even on Amazon or other bookselling sites. Here is a way to get both the guide and *the Agile Practice Guide®* while saving yourself some money. If you choose to join the Project Management Institute, you will have access to many white papers, discussions, job boards, discounts on books, and conversation opportunities with PMs around the world for the international events done yearly. Yes, membership has its benefits.

The membership is for 1 year and you can renew as needed or wanted. The benefits include a free PDF download of *The PMBOK® Guide – 6th Edition* and *the Agile Practice Guide®*. It's searchable and highly recommended. You will also get a discount on your exams – all of that for basically the same price as your original exam costs. Always check [www.pmi.org](http://www.pmi.org) for membership costs and exam costs as things change pretty rapidly in project management. You do not need to be a member to secure the guide(s) or to sit the exam.

There are also numerous guides, practice exams, and other sites that can provide a different voice to the content that may resonate with you as well. That is totally okay. I would never suggest that this is all you need because I know how much content I give out to my classes at StormWind Studios and the recommendations I make to them. This is your learning experience, so treat it like you would any important experience. Do your homework, ask questions, investigate other options for focused study, and adapt and overcome as needed.

## I heard the application is difficult. Are you going to cover that in this guide?

You bet! I'll walk you through the entire application process and I promise you will find some great tips and support for the application. The application was recently updated in June 2020 to make it easier than ever! You can mark the total duration of projects with start and finish dates, drop-down menus, and a 500-word explanation section. You will need at least 200 words in your description of your project work. Right now, that should be the furthest thing from your mind, as you can't submit that application until certain criteria have been met. You may want to come back to this chapter when you are ready for application submission.

## What are the qualifications for the PMP® exam?

That is an excellent question and it's super important that you understand this section so that you know which exam to apply for based on your experience. You can also review this at [www.pmi.org](http://www.pmi.org), on the **Certification** tab. You can select which certification you are looking for and download a handbook that walks you through everything in the process. The following list provides you with an overview of the qualifications:

### **PMP® exam required qualifications:**

- 4,500 hours (about 3 years) of project management experience leading and directing projects if you have a college degree (BA or above) and 36 months of documented experience.
- 7,500 hours (about 5 years) if you are a high school graduate or have an associate degree or GED and 70 months of documented experience.
- 35 hours of project management education.
- Your experience can go back 8 years, meaning 3 to 5 years within the last 8 years.

### **CAPM® exam required qualifications:**

- Secondary degree (high school diploma, associate degree, or the global equivalent). The other qualifications (education hours and experience hours) were dropped in August 2019 to help CAPM®-certified people have a clearer path to the PMP®.

The CAPM® now can be maintained much like the PMP® with professional development units every 3 years. At that point, most people take their PMP®.

Note. The CAPM® and PMI-ACP® exams can now be taken at home via an online proctor.

See [www.pmi.org](http://www.pmi.org) for more information.

## What does project management education mean?

This means you would need someone like me to teach you the content for a certain amount of contact hours based on your certification choice. 1 contact hour = 1 hour of training. There are numerous programs out there, including my course at StormWind Studios and PM Guru (<https://www.stormwindstudios.com/project-management/pmp-6th-edition-certification-prep/>), as well as the many amazing colleagues I have in the business who also teach fantastic certification classes. A little homework and a check of your budget for training can go a long way to meeting those requirements. Unfortunately, self-study doesn't count toward your contact hours, so you'll need to make sure your training provider can offer the contact hours. Look for **Authorized Training Partners (ATP)** who have the ability to offer contact hours to their students. Of course, self-study is the most important way to prepare for the exam outside of a class, so it's great you are reading this guide!

## I took a PMP® boot camp 4 years ago, does that count?

Yes, those hours count and don't ever expire pre-certification. However, a word to the wise, *the PMBOK® Guide* is currently in its 6th edition. Four years ago or longer information that was provided for the earlier editions' concepts resulted in a different exam. Have things changed? Yes, they very much have changed. This edition is so much more different from the 4th or 5th editions. While you have the contact hours already, it is good you are reading this so that you have the most up-to-date information for your exams.

## How to apply for the exam

The first thing you can do to apply online at [www.pmi.org](http://www.pmi.org) is to go to the **Certification** tab and choose your exam: PMP® or CAPM®. You will want to create a username and password on the site because that is where your application will be and where you will update your progress post-certification (more on that in *Chapter 15, Next Steps and Study Tips*). Once you create a username and password, you can begin your application. Here are a few need-to-know items before we begin:

- You can start and save your progress when you use the online application. The servers will store your application for up to 90 days, so don't worry too much about getting it done in one sitting.
- You will *only* need the names and addresses of all organizations you have worked for so that you can document the hours spent working on projects *if* you were to be audited, rather than on the application itself.
- You will need the names and contact information of anyone who can validate your experience in the case of an audit.

Wait... what? Audit?? One in every four applications is randomly selected for audit. Don't take it personally, it is how the applications are quality controlled. This is designed to make sure nobody is lying on their applications. That brings us to the next need-to-know item.

- Don't lie on your applications. You must have led and directed project work for all of the hours and months you submit. I highly recommend sending your application to anyone who can validate that experience in advance. Let them know what you are doing and ask whether they are willing to validate the documented experience in the case of an audit. I often suggest to my students that they do their applications in a word processing program or spreadsheet program first. Once they are organized, they can put it all into the online application. Totally up to you.

## What if the organization has closed or the people I worked with are gone and I can't find them?

It happens and PMI® knows it's a possibility. You can either find another person you can contact and ask whether they would be willing to validate your work or use another project.

These days, it is easier to track people down via LinkedIn and the like. Do your due diligence and in the worst case, locate a customer, functional managers, other project managers, or really anyone who worked with you on that project and will respond to an audit request for information.

Once you submit your application, it will take about 5 business days for the review to occur. Once they have accepted your application, you will see a link to pay for your exams on your "My PMI" page and the next step is paying for and scheduling your exam.

Once you pay for your exam and get a confirmation, sit there for about another 5 minutes. If you get another email, you have been selected for an audit. If you are selected, PMI® will give you and your contacts up to 90 days to complete everything. If you are prepared, it won't take you that long to do. Once submitted, it will take another 5 business days to complete. *Then* you can schedule your exam. No email after payment confirmation and you are in the clear! Whew.

Now, let's focus on actually filling out the application. This is where I gently remind you to not be upset with the messenger. That would be me. The application is comprehensive and will ask you to itemize all the projects you have led and directed.

## The application

I would highly recommend you go to [www.pmi.org](http://www.pmi.org) and on the PMP® page, at the lower right, you will see a link to a handbook (<https://www.pmi.org/-/media/pmi/documents/public/pdf/certifications/project-management-professional-handbook.pdf>).

It's the same process for CAPM®, except you will need to download from the CAPM® page instead. The exam content outline can be found there as well. More on that later.

The reason I suggest reading through the handbook is that it gives you an overview of what to expect on the application and so on. I'll give you the information here as well but since things tend to change, it's best to always check the PMI® site for any updates.

With that being said, here we go. The number one thing to know is that you need both the hours and requisite months to align on your application and that you can't document overlapping projects across time. If you just read that and said, "uh... I work on multiple projects all the time. What do you mean I can't overlap??" I mean you can't overlap. In the following diagram, you can see an example of what I mean:

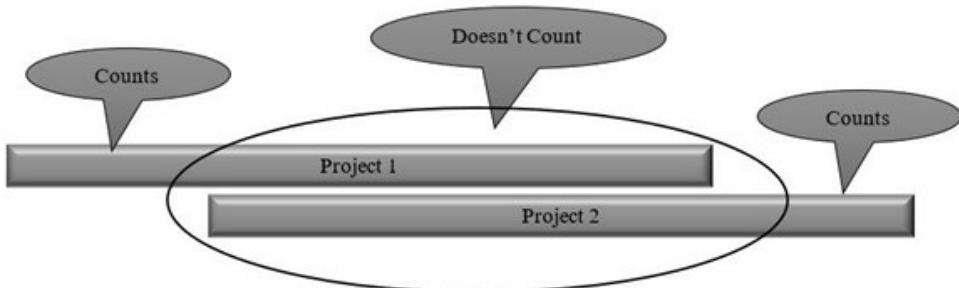


Figure 1.2 – Overlapping projects

#### Let me explain this in more detail:

- **Scenario 1:** Project 1 is longer than Project 2. I would suggest you use the project with the longest duration, even if it overlaps with another project, which in this case is Project 1. You can't use Project 2 in total because it overlaps with Project 1.
- **Scenario 2:** Use the parts of Project 1 that don't overlap and the parts of Project 2 that don't overlap, but only if it makes sense in terms of the hours and/or months you'll be spending on this.
- **Scenario 3:** Use the longest in duration and then use the beginning and/or end of the other, whichever works out the best. For example, use the entire Project 1 duration and then use the end of Project 2's duration that isn't overlapping.

I know this is confusing, but the good news is that the application will let you know what counts and what does not as you go. 60 or 36 months also have to be accommodated based on your education level, along with the hours. For example, let's say you have 4,500 hours but not the 36 months covered. Your hours will need to increase to match up with the 36-month requirement. Conversely, if you have the months but not the hours, you would need to increase the hours, which will also extend the months. Both planets have to align before you can submit the application. You will see a breakdown during the online application process of what has been calculated and how many more of each or is needed to complete the application. It isn't unusual to have more months documented to accommodate all of the hours needed.

The other consideration is that you do not have to have an entire start to finish of the documented project for every single documented item on the application. There might have been times where a project has been canceled but you spent 3 months planning. Totally count that! Projects can also count if they are in progress and there is a box you can check if that is the case. In the following figure, you can see part of a demo application that I put together. The first page is your academic education and it's fairly easy to work through:

Education

Experience

Exam Details

**Education**

**Academic Education**

Highest Level of Education	Years Attended
Bachelor Degree	1987 - 1992
Country of Institution	
United States	
Name of Institution	
OSU	
Field of Study	
Project Management	

Secondary Degree

[Edit Education](#)

Figure 1.3 – Academic education

This next section is perhaps the most important as it describes your project experience. You will do this for every project you want to document to reach your hours. The application will keep track of what counts and what doesn't and there are easy drop-down menus. The description is the most important. Notice I used the word "I." I did this to help explain my role on the project:

Experience Summary	
Organization StormWind Studios	Job Title Sr. Project Manager
Functional Reporting Area Training/Education	Organization Primary Focus Training/Education
Approach/Methodology Hybrid	Project Team Sizes 5 to 9
Project Budget Up to \$1M	Time Spent on Project to Date January, 2017 - In Progress
<b>Project Description</b> On this project, I created the project charter and identified stakeholders. After the kick-off meeting, I collected requirements, developed the WBS, the schedule, and the budget. I was assigned to select sellers after reviewing their bids. During execution, I acquired, developed, and managed my team. Iteratively identified risks and analyzed them. The project was to update and develop the new PMP program for the exam changes beginning January 2, 2021. These changes including attending the train the trainer program with PMI, updating our campus, and content. The project is still in progress and expected deliverables are assumed to be completed by the end of August. Many responsibilities included communications with PMI, application acceptance into the new program. I help daily stand-up meetings with my team, held and led retrospectives. During procurement conversations, it was determined that we needed an outside contractor to help with the implementation of the new program. We formally closed out the program in the middle of June and are still awaiting the training TBD.	
<a href="#">Remove Experience</a> <a href="#">Edit Experience</a>	

[Continue to Exam Details](#)

Figure 1.4 – Project experience

The next page is your contact information and what country you will be taking your exam in:

### Phone Number

Enter your primary phone number. Providing a mobile number will allow you to opt-in to notifications via text message.

**Mobile Phone**

Phone \*

+1

---

Home Phone

---

Work Phone

### Exam Location

Where do you intend to take this exam? \*

United States

### Exam Accommodations

Do you wish to request exam accommodations? \*

If you require exam accommodations related to a disability in order to take the examination, you must provide information about your disability as well as copy of your doctor's note describing your condition in detail prior to scheduling your exam.

View the [Exam Accommodations page](#) for more information.

- I agree to the [terms and agreements](#) \*
- All information that I have provided is accurate and complete \*

Figure 1.5 – Contact information

Then, on the last page, you will document where you got your 35 contact hours of training:

### Professional Education

Enter your Professional Education courses related to this certification, starting with the most recent.

**PMP Exam Prep**

Provider Name	Stormwind Studios
Course Dates	Hours
January 2013 -	35
January 2013	

[Remove Education](#)   [Edit Education](#)

### Professional Summary

PMP Exam Prep	35 Hours
<hr/>	
Total	<input checked="" type="checkbox"/> 35 Hours

[Continue to Experience](#)

Figure 1.6 – Professional education

**Note**

*The Project Management Professional (PMP), PMBOK Guide and the Project Management Institute Agile Certified Practitioner (PMI-ACP), the Agile Practice Guide, the PMP® application are a registered trademark of the Project Management Institute, Inc.*

Now that you have seen the majority of the application, be aware that you will need to do the hours and add explanations for every single project until you meet the criteria, as well as where you obtained your 35 hours of project management education.

**Here are some pointers to keep in mind while applying:**

- Go in chronological order. This helps with the documentation and making sure nothing is missed. Either go from present to past or past to present. Whatever works for you.
- Have a robust explanation planned and point out the best practices you used that align with the best practices on the exam.

- Be sure to make each description unique. If you work on similar projects, it is sometimes difficult to document in a unique way. If you have two projects you would like to use where you are installing servers across multiple locations for totally different clients, you may want to choose what was unique about each, as in the following example:
  - a) **Project 1:** I created the project charter and engaged stakeholders.
  - b) **Project 2:** I assessed risk and created responses, as well as created the formal scope statement and gained approvals.
- Be honest. Don't fudge the hours and if you did work 50 hours a week on one project, then by all means, document that. Just do not pad your numbers to get through this quickly. If you get audited, it could be a long, painful process trying to explain that.
- Try to gather all of the information you need first. Perhaps build everything out in Excel or Word before adding it to the online application, and then email your contacts the breakdown and ask them whether everything looks legit. If so, they will be well prepared in advance for the audit and nobody will be surprised by a person they haven't seen in 3 years asking for documentation.
- Don't worry too much about this now. If you haven't attended a training class or even begun this process yet, then this should be the last step aside from paying for and scheduling your exams.

One final piece of advice. Don't worry – it sounds worse than it is. I offer application support to my students and I review their applications. Red flags for me and PMI® are overlapping projects, too many hours for the timeframe listed, the descriptions being vague and not using the language of *the PMBOK® Guide*, or you do not list yourself as the project manager. This is as important as the months. You must be leading and directing projects. Not a coordinator, not a contributor, but a project manager or leader. If, in fact, you were only a contributor, then you will need to look for projects that you managed instead. This does not apply for the CAPM® exam because the assumption is you are a coordinator and therefore do not need to prove you managed projects.

As I mentioned previously, this is probably not the time to fill out your application unless you are beginning the process of studying after taking a prep class. Otherwise, it may be best to circle back to this chapter once you are ready to go. In *Chapter 15, Next Steps and Study Tips*, I will revisit some of the items in this chapter to help you get your best start. Remember that it's a marathon, not a sprint. Don't worry, though – you've got this, I promise!

## What to expect on exam day – if you take the exam at a testing center

Here's to hoping the world is back to normal (following the COVID-19 pandemic) as you read this. If not, you can take your exam from home through a proctored process. Pretty much what you would need for a Zoom meeting is the extent of how complicated it will be. But let's go back to hoping the world is back to normal and you can leave the house!

Let's assume you have submitted your application, been approved (avoided an audit), and are ready to schedule your exams. Here are a couple of items to consider:

- If you are a morning person, try to schedule your exam in the morning or in the afternoon if you wake up after lunch. You will be tired and brain strained after taking the exam and it's even worse if you schedule it during a time when you are not alert or at your best. Most hosting sites have multiple time slots and days when you can schedule your exams. Some may even have weekend or evening hours. If not, you'll need to plan accordingly with your work schedule. It's about a 6-hour round trip event if you need to travel to the testing site or a 4-hour event if you take it at home.
- Pearson VUE is the host of the exams and for those taking the PMP® exam, you will need to search your area to find the best location for you and find out whether a center is even open in your area right now. If you are in a large city, you should have several to choose from. If you are on the outskirts, you may have to travel an hour or so. Make sure when you schedule your exam, you take into consideration rush hour traffic and the like. PMI® will provide you with a link and instructions on where to go and what to do to schedule through Pearson's system.

Print out the email from PMI® that states you have been approved to sit the exam.

### Note

The exam used to be hosted by Prometric but is now hosted by Pearson VUE. The reason for changing vendors was because Pearson VUE had more locations globally and had the capacity to host more exams online. The Pearson VUE process may be different and/or change as they take on the new exams, so always make sure to read all the information carefully. PMI® will provide you with the information you need after your exam is paid for and you are ready to schedule. It's always best to have hard copies of the communications, whether Pearson VUE asks to see them or not. You're a project manager and you probably already know that being prepared is the way to go.

Make sure you have two forms of identification with you when you go to the exam location. You will need to present these to the person checking you in. I used a passport and driver's license because it had my full and correct name. For some reason, credit card companies and airlines just can't get it right. I suppose it's the J. Ashley throwing them off. J. Edgar Hoover never had these problems! You can't use social security cards as identification, but you can use your company identification badge if it has a current picture and your name, plus you will also need one additional main type of identification.

The night before your exam, double-check your route. I always advise calling the site the day before or checking their website to see whether the parking is on-site or a parking garage. Is there any construction you need to worry about? Maybe even do a drive-by of the site to make sure you know what to expect. Taking an exam is stressful enough without being late, or stuck in traffic, or parking on the 15th floor of a parking garage without an elevator. I speak from experience on that one.

I am chronically early to everything, much to the chagrin of my husband and friends, but for every exam I take and arrive early for (all of them), I am typically able to get right into the testing area. If they have an open computer, they will get you in early.

When you arrive and after your check-in, the front desk will ask you to put everything in a locker. By everything, I mean everything. I literally had two Advil in my pocket, knowing full well I would need to take them immediately post-exam. They made me put them in the locker. Not sure who thinks every possible answer could be documented on two little green gel caps, but I digress for good reason. No smartphones or smartwatches, no food or water in the testing area, nothing in your pockets, no bags or backpacks. Nothing except you and only you can enter the testing room. I know some of you read that no food or water comment and thought I was kidding. Unless you have a medical issue with a doctor's note, you may not have anything to eat or drink with you.

Once you have put your precious Red Bull, Grande Frappuccino no whip, a granola bar, plus your Advil in the locker, you will be taken to another room and swiped with a metal detector. It's a lot like going through security at an airport. You can keep your shoes on, though. You will also have your picture taken. Trust me when I say that this is the most painful part for me. I looked like I had just survived a tornado in my picture. They do this for a reason: so that when you pass, they know for sure it is you, and so you have a terrible picture to remember the experience by.

#### Note

Something to note is that this was my experience and that I took my PMP® exam and my PMI-ACP® at a Prometric site. I took my CAPM® with Pearson VUE and it wasn't as traumatic... except the picture part. Be prepared either way.

Once you are seated at your computer desk, you will be given something to write on and write with. Don't even think about opening the booklet or starting to write anything down until the exam begins. The proctor will soundly reprimand you.

You will have the option of going through a tutorial before you begin the exam. This tutorial will provide information such as *the next button will take you to the next question*, *the previous button will take you to the previous question*, and more. I use the tutorial time to practice deep breathing. While I sound like I'm kidding, I'm totally serious. I had no idea the previous button would take me backward through the exam. Right, I'm kidding. I am trying to make light of a stressful situation so that you know that it can be survived.

The scratch paper is there for you to use for math questions or to jot down information you don't want to forget or to use if something needs to be worked out on paper before selecting the correct answer. Do not spend more than 1 minute of precious exam time writing things down. You may also get a dry erase board, which is a nightmare for lefties like me.

The exam is highly proctored as well. You are on camera, you are being audiotaped, and you have a proctor with heavy shoes walking behind you. You will also be in the room with other test-takers. They may not be so privileged to be able to click a mouse for next and previous, and they may actually have to type their answers. Click, click, cough, sneeze, sigh, cry, snort, and a variety of emotions and human noises will prevail. I want you to know this because if you are easily distracted by noise, this can throw you off your game. Occasionally, they will give you headphones to drown out the noise. Mine were too large and I spent much of my time looking like I was flagging planes in for a landing. I took them off after the first plane landed.

You will be given access to a calculator for math questions, and that calculator is probably embedded in the math questions. You will click the calculator button and use your mouse to navigate the math questions. (What?? Math?? Yes, I'm sorry. I mean I'm really sorry.) There isn't a ton of math, so that is the good news. The better news is you don't have to do the calculations in your head. I can hear the cheers from the mathematically challenged. Oh wait, that was me...

You will have a timer so that you can see how much time you have left. Try not to be a clock watcher as it tends to stress you out, but be sure you know how your pace is going. The good news is, you will have studied super hard and will have taken practice exams. You will know how long it takes you to answer 180 questions. Also, in case you thought you could take a break during the exam and slam your Red Bull, take two Advil, and cram a granola bar in your mouth, unfortunately, you cannot. There are two 10-minute scheduled breaks but you cannot go to your locker. If you need a bio break before then, you can raise your hand like at kindergarten and go through the preceding process in reverse and then forward again. The clock will still be ticking. I try very hard not to leave the terminal until the bitter end.

You can mark questions for later review. I marked about 25 on my PMP® exam. Some I marked because I wanted to review the question again to make sure I selected the correct answer. Some I marked because I literally had no idea what the answer was. The rest were math questions I chose to ignore until I was running out of time. I'm the type that prefers to eat ice cream before green beans. I'm weird like that! Whatever your strategy is, you can click a button to return to just the marked questions – unless, of course, you want to use the highly touted previous and next buttons, but that can be a major time-waster.

The exam will not take away credit for incorrect answers. You only get credit for correct answers. Woohoo – they don't cancel each other out! The exam is also not adaptive, meaning it doesn't know you aren't that great at math and then give you more math questions. It may feel that way to you but the 180 questions you get are the 180 you get.

Now, the big question of the day. What is the passing score? This is a more difficult question than you might think. The PMP® exam used to be scored with a percentage. You got 82%! Since 2007, things have changed a bit. Now, the exam is scored using proficiency levels in each domain. I'll let PMI® explain. Insert legalese here...

*"The PMP® passing score for all PMI® credential examinations is determined by sound psychometric analysis. PMI® uses subject matter experts – project professionals from around the world and many different disciplines – to determine how many questions you must answer correctly to pass the exam. Each scored question in the exam is worth one point, and your final score is calculated by totaling the points you have earned on the exam. The number of questions you answer correctly places you within one of the performance rating categories you see in the report."*

To explain that a little bit more, the questions you will get are different from someone else's questions, as mentioned earlier. If you get a ton of easy questions, they are weighted less than difficult questions, meaning the easier the questions are, the more you need to answer correctly. The more difficult, the fewer you need to get correct. Which is a good thing, I think.

The score and proficiency ratings are weighted toward the different process groups. The following table shows the current breakout for the exam based on the percentage of questions in each domain:

Domain	% of Questions
People	42%
Process	50%
Business Environment	8%

Here is some good news. The exam score is based on 175 questions, not 180. "So, why the heck are there 180 questions?", you may be asking yourself. Five questions don't count for your score and are considered pre-test questions, which actually is a misnomer because they aren't the first five questions you get. They are mixed in with the rest. The reason why this is done is to test newer questions in the test bank and to gain data on how people respond. It helps PMI® build out their ever-growing test bank and to test new concepts. You will need to answer all 180 questions though because you don't know what counts and what doesn't.

Even if you don't know the answers, you have a 25% chance of getting them correct, so go for it! There may also be some out-of-the-blue questions. Real head-scratchers. They may be the pre-test questions you were looking for. They also may not be the pre-test questions. Either way, you will know whether you have passed within about 30 seconds after submission, provided you choose to skip the survey.

There is a survey at the end that you can choose to take to give feedback about the exam. I would love to be a fly on the wall when those are read out loud. "This beep, beep, beepity, beep exam was too hard!" and other such proclamations of an exhausted test taker. Your choice! If you choose not to take the survey, you can submit your exam for scoring. If you are like me, you will stop breathing for about 30 seconds while the blue screen of death hits your terminal and then... Congratulations, you have passed! (That is my assumptive close.) While you burst into tears and fist pump or whatever works as your celebratory happy dance, the proctor will be printing out a piece of paper with a "you passed" statement on it, a breakdown of your target/proficiency levels, and the awesome (driver's license-like) picture of you, plus a handy-dandy notary stamp making the pass totally legit. Now, you can take your Advil, call your boss, change your email signature to include PMP (you don't need the registered trademark symbol after if it represents your PMP designation), dump the melted Frappuccino, and head out to grab a large adult beverage to celebrate your success! Congrats in advance!

## **What to expect on exam day if you take your PMP® exam online at home... in your pajamas...**

You will need a very quiet place to take your exam. By quiet, I mean no kids running in and out of your room, and no cats on your keyboard! A dedicated quiet space. You will need everything you would need for a Zoom call. A microphone, a webcam, and a computer with internet. Best to be plugged in and not wireless.

You may be asked to take everything off the walls behind you. Anything that looks like it may help you pass is a no-no.

You will have a proctor staring at you, which can be unnerving for some. Be prepared for that.

You will have a calculator and an online whiteboard. Most people hate it, so make sure you can work with something like that. No scratch paper.

Plan about 5 hours for the entire experience. The exam is 4 hours with two 10-minute breaks, yes; however, there has been some chatter that the proctors may not show up on time. It's frustrating but you need to expect the worst and hope for the best.

Do NOT, I repeat do NOT, whip out your phone to take a picture of your passing score. They will cancel your exam and you will have to take it again. True story.

Follow ALL their rules and you should be fine. I prefer taking my exam in a center but ya know, COVID-19 and such. You can determine whether there is a center near you that is open and how safe you feel going there. You have options. Yay!

## **Common questions you may be thinking to yourself after all of that**

Okay – at this point, you have a lot of information to process. This is about the time my students start asking questions about the actual exam and what they need to do to pass it, as well as some other common questions. I highly encourage my classes to get all the most worrisome questions out of the way as soon as possible. That way, they know what to expect and can move on through the content with those burning questions answered. Here are several of those types of questions.

### **Do I need to be proficient in everything? How will I know?**

Not at all. You could be moderately proficient in everything and pass. That is the equivalent of about 75%. Scores are broken down into Above Target, Target, Below Target, and Needs Improvement.

### **Will anyone be able to see my results? As in, will PMI® post my results anywhere?**

Only you know how you did. *Passed* is all anyone needs to know unless you decide to leave your results sheet laying around the breakroom. Otherwise, none the wiser.

## If I get below target in any domain, will I fail the exam?

The easy answer is yes, and it depends. If you are below target in the business environment domain category and above or on target in the rest, the score should balance out.

## What score should I be aiming for in practice exams?

My best advice is to consistently get between 75% and 85% on 180-question practice exams (remember to take out five questions to get your real score). For the first practice exam I took, I got 35%. Yes, that number is correct! I was horrified! But as I took more and more practice exams, I got better and better.

You'll have good scores and bad scores. The key is to understand why the answer you chose is incorrect and review the content. Study what you don't know, not what you do know. Take practice exams with the book open at first – that way, you can look up the information you need. That is also part of tactile learning and helps solidify your knowledge.

Don't get demotivated by a low score. Instead, look at it as an opportunity to shift your focus to those processes that aren't as clear.

## I have zero time to study and that study for 100 hours bit is making me nervous. How can I still work and have a life, but also still study?

Listen, I would rather clean my garage than sit down and take a 4-hour practice exam on a Saturday, and my garage is a total disaster. I get it, I really do. I can give you a strategy – my strategy – which may or may not work for your learning style or time constraints. Toward the end of this chapter, I'll review common learning styles and give you some advice on how to utilize them for study purposes:

- I took 10 practice questions in the morning over coffee, instead of reading the news, chasing my dog around the house, trying to convince my daughter that wearing a Princess Jasmine dress to third grade probably wasn't the best idea, and other such distractions. I would take the 10 and then go back and score myself. Any question I got wrong, I would go back through those sections in *the PMBOK® Guide* and locate the correct answer. I would think about the concepts while dropping Princess Jasmine off at school and then attempt to incorporate the best practices mentioned in the questions in my projects.

- When I got home after work, I would take those 10 questions again, plus another 10 different questions, and perform the same process of checking answers and understanding why I got them correct/incorrect. Those evening study sessions were much easier for me since the wine opener was placed directly next to my study materials.
- This is your study time. You break it down how you need to. If I had time during the weekend, I would take a 180-question practice exam and score it. The next weekend, I would go through it and determine why I got those questions correct/incorrect.
- Some prefer to take a full-blown practice exam of 180 questions right out of the gate to get a baseline and go from there. Totally up to you. There will be practice questions after every single chapter in this guide. I would say take those practice exams after you read through each chapter the first time. See how you do. Go back through that chapter to pick up anything you may have missed conceptually and take it again until you score 100%. Then, move on to the next chapter and so on. That is a good strategy to begin with.

## **How will I know I am ready to schedule my exam?**

For sure I recommend not scheduling your exams too far out. Much of this information is use-it-or-lose-it stuff unless you are using many of the best practices already. I wouldn't wait longer than 3 to 4 months after your prep course to sit the exam. With that being said, do not schedule your exam until you feel you are ready.

When your passing scores are consistent with different exams and questions, you are most likely ready to go. Once you schedule your exam, it is difficult to unring that bell, and there may be costs associated with rescheduling. You'll need to review the Pearson VUE policies on that. Otherwise, this process shouldn't take longer than 6 months max. Currently, PMI® isn't charging for reschedules for those of you who have scheduled your exams and need more time. Always check [www.pmi.org](http://www.pmi.org) for the most up-to-date information.

## **How many times can I take the exam?**

You can take the PMP® exam up to three times in one year. Each time, it costs you money. It's less the second and third time, but who wants to pay for it twice, let alone go through it thrice? If you take it three times and fail, you will have to wait an entire year and then start the entire process again. By the way, I have yet to hear of or meet anyone that took the exam three times. Twice yes, but not three times.

## My training company has a "first-time pass guarantee" – is that for real?

With first-time pass guarantees, I want you to read that as "we'll give you a refund if you fail." There isn't any way that any training company (mine included) can guarantee you'll pass. We have no idea how hard you worked or how much you study. We figure you are all adults and want the cert for professional reasons.

If you fail and were given all of the information you needed to pass, then that is on you. Sorry, but it's true. It could be for a variety of reasons, as mentioned in the six common reasons people fail the exam, and it isn't the end of the world either. Dust yourself off and change how you study.

Unless, of course, your training course was terrible, which happens. I'll go out on a limb here and very clearly state that boot camps do not work very well. Much to the shock and horror of those instructors doing boot camps, I'm sure. Although authorized training providers still need to present the content created by PMI® and most run it in a boot camp style. Don't say I didn't warn you. The firehose of information is forthcoming!

This information is extensive – it's a ton of information. Faster isn't always better. A PMP® boot camp is the equivalent of learning 800 statistical formulas in 1 week and then being asked to take an exam on everything you just learned at the end of the week. Those that are good at statistics will prevail. Those that are not will fail. It's that simple. This is why they offer a money-back guarantee: because they know some of you will fail. Something else to consider is that if your instructor is reading out of *the PMBOK® Guide* slowly and without purpose, you need a new instructor.

By the way, you will *not* be learning 800 statistical formulas. If that were the case, I wouldn't even have my PMP®. You'll be learning about 10 formulas and they are algebraic, so yay!

## Study tips

It's probably pretty obvious that taking and retaking practice exams is one of the best ways to test your knowledge. But is that really the place to begin your studying journey? Well, that depends on you and how you learn. We will get to that in a minute. The following list is certainly not exhaustive, but it does provide a good overview of some really important items to consider:

- Read *The PMBOK® Guide – 6th Edition*, this guide, and others as needed.
- Read *The Code Of Ethics and Professional Conduct*, which can currently be found at [https://www.pmi.org/-/media/pmi/documents/public/pdf/ethics/pmi-code-of-ethics.pdf?sc\\_lang\\_temp=en](https://www.pmi.org/-/media/pmi/documents/public/pdf/ethics/pmi-code-of-ethics.pdf?sc_lang_temp=en).

**Note**

You will be asked to agree to and abide by *The Code of Ethics and Professional Conduct*. We will cover this in *Chapter 6, Creating and Leading a Team*. You will get questions in your exams concerning ethics. It is a good idea to download the code and read it at some point. I'll break down everything then.

- **Read through other exam prep books:** Yes, I said it before and I'll say it again – you will need to gain information from different authors, blogs, YouTube videos, and the like to ensure you have a well-rounded approach to your studies. Be sure that everything is from *The PMBOK® Guide – 6th Edition* and follows the exam content outline. Your version is in *Chapter 15, Next Steps and Study Tips*.
- **Get used to answering questions for almost 4 hours in a row:** This can only be done if you sit for 4 hours answering exam questions.
- **Read the questions first, then the answers, then the questions again:** I'd say this is more of an as-needed situation. You'll know when you begin to study and take practice exams whether this strategy works or doesn't work for you. Just make sure you read carefully.
- **Think as PMI® thinks:** The best practices PMI® has put into their standards, exams, and guides always win during an exam. It's best to buy in early; otherwise, you may be tempted to throw your laptop out the window while taking practice exams.
- **Question types:** It used to be that the PMP® exam required you to choose one correct answer and only one. Now, it seems, they have changed that as well. This may be good news, or it may be really bad news. It depends how you feel about exams.

The question types are as follows:

- a) Drag and drop.
  - b) Hot spot questions where you click and interact with diagrams and digital graphics.
  - c) Check all that apply.
  - d) Check the best answer.
- **Review the exam content outline for your planned exam dates:** This is super important. The good news is that this was just updated and probably won't change until another iteration of *The PMBOK® Guide* is updated. Typically, that is about every 3 to 4 years. I'll cover the main points as well throughout this guide.

As we wrap up this section on all of the questions and answers, my hope is that it has provided you with enough information to get you started. Don't forget to circle back to these again after reading *Chapter 15, Next Steps and Study Tips*.

## Learning styles

I've always been fascinated by how people learn. I guess that isn't surprising considering what I do for a living, but I also had to determine how I learn. I took my first exam since university graduation (1992... shhh – don't start trying to figure out my age and such) – that exam was the PMP® exam, by the way – in 2007, just so you know I've been exactly where you are right now. Figuratively, not literally, because that would be weird. Before that, I hadn't studied anything except work-related things and learning new systems and software, but a full-blown examination? Well, that was totally new to me.

So, I took a learning style quiz online as well as the Myers-Briggs online test to determine my learning style and the careers I would fit the best in. Unsurprisingly, the Myers-Briggs type of test lists me as an advocate. When I read through the details, it was like they were creepily sitting in my living room watching everything I was doing. It was so on point I was shocked. Then, I started using these online tests with my teams to determine their style of learning and personality. Then, we all compared what we got during a meeting. It was eye-opening, to say the least, and for some, the results were unsurprising. For others, they were shocked by the results.

There are tons of free online tests out there. I liked this one for my team if you are interested: <https://www.16personalities.com/>.

Then, we did the learning styles. I was curious about how I learned and am not a believer in one size fits all. I learn just as easily from something I'm watching on Netflix as I do reading a book, or listening to a podcast. So, how could I arrange my studying around the stronger factors of my way of learning?

I have a plethora of learning styles, but for big exams, inquiring minds wanted to know. So, I went out to a different site from the one listed here, due to the fact that 2007 was 100 years ago in the lifespan of technology, but this one is very similar and gave me great insight.

I just took the learning styles test right now, this moment, in 2021, and used the link provided here. I was totally blown away. I suggest that you go to the site and take your own or something like it before you read on. It's one thing to nod along while reading but if you truly don't know your style, then it will be more difficult to try to figure it out while you're studying. Streamlining your study by using your preferred methods of learning will go a very long way!

Go to the link and check it out. Don't worry, I'll wait: <https://www.learning-styles-online.com/inventory/questions.php?cookieset=y>.

Based on my results, it appears that I learn the best when being social and verbal. The verbal aspect didn't surprise me as I'm often caught having a discussion with myself by my husband. He calls it "self-talk." I can self-talk with the best of them and I teach for a living, so I'm talking all the time. It was the social part that surprised me the most. If you asked my students and colleagues whether I'm an introvert or an extrovert, they would absolutely say I'm an extrovert. I'm not. I'm just good at working a room. Once it's over, I desperately need a nap or quiet self-talk, so solitary learning was also not surprising to me. Aural means I like having music on when I write or study, and that is true as well. The late, great David Bowie is keeping me company as I write this – on Pandora, not actually keeping me company. By the way, nothing in this section is on the exam, it's just a way to help you through the process.

What I got from my results is that I needed a combination of classroom learning with others and study groups that I could attend and discuss concepts. Then, I needed to peace out and go study on my own with music on. It works for me and still does to this day. Although, after years of taking certification exams, writing courseware, writing three books, and teaching, the social aspect of what I do has waned, replaced with studying or deep thinking. The following are the scores I got. What did you get? Were you surprised?

<b>Style Scores</b>	
<b>Visual</b>	<b>5</b>
<b>Social</b>	<b>17</b>
<b>Physical</b>	<b>4</b>
<b>Aural</b>	<b>12</b>
<b>Verbal</b>	<b>17</b>
<b>Solitary</b>	<b>14</b>
<b>Logical</b>	<b>9</b>

Figure 1.7 – Learning styles

## The seven learning styles

According to the website, the following represent the seven learning styles and their meanings:

- **Visual (spatial)**: Prefers using pictures, images, and spatial understanding
- **Aural (auditory-musical)**: Prefers using sound and music
- **Verbal (linguistic)**: Prefers using words, both in speech and writing
- **Physical (kinesthetic)**: Prefers using body, hands, and sense of touch
- **Logical (mathematical)**: Prefers using logic, reasoning, and systems
- **Social (interpersonal)**: Prefers to learn in groups or with other people
- **Solitary (intrapersonal)**: Prefers to work alone and use self-study

Now that you know your breakdown, you can decide what will work best for you when you are studying for this or any other exam. The following are some examples of types of learning styles and ways you can use them to help you study for your exam.

### Visual

Visual learners prefer to use graphics, charts, graphs, and outlines. You may also determine that using color-coding works well for you. This section is green for planning or red for closing. Using highlighters in the guide is also a good way to call out visually what you need to remember. You can also use technology such as apps with practice questions or even write out the items you want to remember and then read them back. Finally, reading guides such as this and taking practice exams is the best way to get started. I have had students that make their own flashcards and tape them up in their house so that every time they get a cup of coffee, the index card is right there with the question and the answer.

### Verbal

A little self-talk is never a bad thing and if you are verbal, saying things out loud or reading out loud can go a long way to locking in the content. Verbal learners tend to use mnemonics, keywords, and phrases to help lock in information, as well as taking copious notes to help create acronyms they can use to remember content. You may also benefit from an online pre-recorded class that you can play on your tablet while you make dinner or do other things – especially if you have a high score in auditory learning as well. I also appreciate a bit of motivational speech while I'm burning things in the kitchen.

## Logical

If you are a logical learner, chances are you are a linear thinker. You may benefit from reading *The PMBOK® Guide – 6th Edition* due to the compartmentalization of the layout. You also may benefit from brain teasers and games that allow you to solve a problem and help you learn. Writing lists and using numbered categories may help you solidify the information you are learning. Determining the cause and effect of each process, tool/technique, and the like will go a long way for you. You also are not scared of math and probably thought that learning 800 formulas of statistics is something you were planning to do this weekend. That and soundly beating someone in a not-so-quick game of chess. I envy you!

## Aural or auditory

It makes sense that auditory learners learn from listening. If you learn this way, my best advice is to get an audiobook or to use an online training course that has replay. This will allow you to listen to the instructor while you are doing other things or just plug in your headphones and grab a chair. This type of learner also enjoys interactions and conversations where they can listen to another's point of view and are vastly affected by music and tones. You may benefit from listening to music while you study or update your notes. By notes, I mean study notes, not musical notes. You may be someone who creates a song or tune about what you are learning and uses that to your best advantage. Perhaps some interpretive dance to go with it? You may find it difficult to review charts and graphs that have a lot of information on them unless someone verbally explains them. Much like the verbal learners, reading out loud can also go a long way to helping you study to your best advantage.

## Social

Social learners learn best in a group environment. Perhaps you could join a study group that is at a local PMI® chapter, or if someone else in your organization is gearing up for their PMP®, you can study together. This will allow you to bounce ideas off of others. You may also benefit from taking a live training class, either one that is highly interactive and virtual or one in a brick and mortar classroom. You need to have a group of like-minded people to discuss things with, but you are also open to other ways of viewing information. The other thing you will excel at and learn at the same time is teaching the material to others. Maybe you can hold a team-building meeting where you discuss risk management best practices using the techniques you learn about here or elsewhere. That provides the collaborative spirit you need and helps your organization protect itself from risk.

## Intrapersonal

If you are mostly an introvert and prefer to work alone, then your studying process will be solitary but structured. You will benefit from setting learning goals and will be disciplined enough to achieve the goal you have set. You would benefit the most from your ability to self-manage and determine what is working and what is not working based on your self-reflection. The best way for you to learn is to study a concept and then think about how it can be utilized on your current projects and how it ties into your day-to-day experiences. Make sure you secure a very quiet place to study with limited disruptions (if possible). Turn off the phone, the television, and the radio and dive in. You will self-police your progress and work toward your goal.

## Physical

Physical or kinesthetic learners are typically good at athletics and sports and can memorize rules and playbooks easily. With that being said, if these types of learners are stuck inside, sitting in an office trying to read, they will immediately go clean the garage and avoid the boring sedentary feeling they get from studying. Hands-on learning is great for you so that those practice exams will come in handy. You aren't reading, you are doing. You would also benefit from recorded courses that you can listen to on a run or when doing exercise of some kind. Role-playing is also beneficial to your way of learning. "This just happened, what do you do?" Basically, a day in the life of a project manager. "The project is sideways, what do we do?" You will tend to determine the best course of action quickly. Something as simple as pacing while you read or listen can help lock down the knowledge you're learning about as well. You will respond much better to graphs and charts if you copy ones from the guide and draw them out yourself. This will help with your retention, as will taking copious notes.

Hopefully, all that advice is of some benefit to you, and I will do my best to help accommodate your learning styles as we work through the content in this guide.

If you are still with me, then you have adapted to my personality a bit. That is why I started where I did: first, to get the big questions covered right out of the gate so that you are prepared to move forward with the content, and second to see whether my personality is something that will help you learn. I won't lie to you, a lot of this content could be described as dry at best, and at worst, not a beach read. So I try very hard to make things interesting and usable for your studies and for your day-to-day project work.

If you *are* still with me, then let's get this party started and prepare you to pass a big, expensive exam, gain glory and back pats for at least an hour, and potentially make a ton of money. Ready? Good! Let's get started, then.

## Summary

In this chapter, you reviewed all of the necessary information to help you get started on your way toward certification. We reviewed the big questions and answers I get during my PMP® classes, discovered what it may be like on exam day, and also what to expect with the application. You also covered different learning styles and have hopefully discovered what may suit you best. Of course, it may take some trial and error, but I think you probably identified something that resonated with you. You can always adapt your study habits at any time to something that works a bit better.

You will find some questions in the following section, entitled *Assessment exam*, that cover content you haven't covered yet. This is basically because it's an assessment to see how much you know. If you want to wait and do this after you've finished the guide, feel free to do so. It may be good to get a baseline though and determine the areas that you already know and identify the ones you don't. I *highly* suggest you download the new exam content outline as the study guide is structured according to the tasks found on it. Here is a link to it: <https://www.pmi.org/-/media/pmi/documents/public/pdf/certifications/pmp-examination-content-outline.pdf?v=149cfab8-bd04-4b7b-bacf-c4b1c5e2d164>.

Good luck on the assessment and I'll see you again in *Chapter 2, Introduction to Project Management*, where you will review different ways to study based on your learning styles.

## Assessment exam

Question 1: The definition of a project is what?

1. Progressively elaborated on and unique
2. Temporary and chartered
3. Temporary and unique
4. Unique and has a life cycle

Question 2: Which of the following is the correct order for the process groups of project management?

1. Initiation, executing, monitoring and controlling, and closing the project or phase
2. Planning, execution, monitoring and controlling, and closing the project or phase
3. Initiation, execution, and project or phase closure
4. Initiation, planning, executing, monitoring and controlling, and closing the project or phase

Question 3: Which of the following are key activities in the initiation process group?

1. Creation of the risk register and development of the business case
2. Creating a schedule baseline and budget
3. Project charter creation and identification of stakeholders
4. Development of a business case and holding a kick-off meeting

Question 4: Which of the following is the main goal of planning?

1. To create a comprehensive project management plan
2. To create a schedule baseline
3. To create a budget that meets the business plan
4. To understand the scope of work

Question 5: Which of the following process groups is where the project deliverables are produced?

1. Initiation
2. Planning
3. Monitoring and controlling
4. Execution

Question 6: In order to process a change request, which of the following departments would you most likely need to get approval from?

1. The PMO
2. The CCB
3. The sponsor
4. The customer

Question 7: You are working on a long-term project with 25 stakeholders. In the middle of the project, the customer asks for a change in scope that will impact the entire project and consequently will not align with the project charter. Which of the following is the best way to handle this?

1. Process a change request with the CCB.
2. Discuss everything with your sponsor.

3. After approvals go through, perform formal project closure for this project.
4. Explain to the customer that the change is too different from the original scope of work and can't be done.

Question 8: You have received a project charter to work on a project that involves installing data centers at multiple client sites with a very tight timeline. Based on your current team and understanding of the scope of work, the team has decided that after planning and the delivery of equipment, each team member could work in pairs at a variety of locations at approximately the same time. What type of project phase configuration would be the best?

1. Adaptive
2. Sequential
3. Overlapping
4. Predictive

Question 9: What are the major differences between predictive project management and adaptive project management?

1. Predictive projects know the full scope of work in advance, while adaptive projects typically correlate with knowledge work.
2. Predictive projects don't really know the scope of work in the beginning, while adaptive projects are only for software development.
3. Adaptive projects need formal change control, while predictive projects don't.
4. Predictive projects see the scope of work as flexible, while in adaptive projects, the scope of work is not flexible.

Question 10: What is the main goal or objective of the project charter from the project manager's perspective?

1. To explain the scope of work to stakeholders
2. To define the business case
3. To formally authorize the project manager to begin project work
4. To get it signed by the sponsor

Question 11: Which of the following represents a PMIS?

1. The project charter
2. The stakeholders involved in the project
3. The project management system or framework
4. The software and hardware used to manage communications, reporting, and performance

Question 12: Which of the following would be considered an assumption in the project charter?

1. Who the project manager will be
2. Who the sponsor is
3. Who the customer is
4. The business case

Question 13: An Agile charter differs from a project charter for which of the following reasons?

1. Offers less flexibility for the scope of work
2. Offers more flexibility for the scope of work
3. Offers more information about the software design
4. Doesn't document how the project will be run

Question 14: You are about to hold a kick-off meeting for a large group of stakeholders to announce a new project and get buy-in. What is the best document to present to everyone prior to the meeting?

1. A schedule
2. A budget
3. The names of the team members
4. An agenda

Question 15: What is the main goal of any kick-off meeting?

1. To confirm everyone understands the goals and objectives of the project
2. To get everyone's thoughts on the project

3. To assign your team to work in the charter
4. To begin planning

Question 16: Jillian is a new project manager and is not totally clear on the customer requirements. As her team kicks off the project, Jillian notices that some stakeholders are upset about the project plan she has put together. What would be the best reason for the stakeholders not buying into Jillian's plans?

1. Jillian didn't explain the way the plan works during the kick-off meeting.
2. Jillian didn't fully understand the scope of work.
3. Jillian did not practice stakeholder engagement in order to know the correct requirements.
4. Jillian knows that she will progressively elaborate on the plan and this is just the first draft.

Question 17: During a very difficult project, Sam, who is a team member, explains to the project manager that they have identified a risk event that may threaten the schedule. Sam explains that if he just had a few more people to work on the critical activities, he could get the project back to the original baseline. Which of the following schedule compression techniques is Sam describing?

1. Fast-tracking
2. Risk contingency
3. Re-baselining
4. Crashing

Question 18: Karen and Bill are two of your best software developers and they have been working together for several years. Bill is suddenly transferred to another department and another project team. Karen experiences a bit of disappointment and low motivation. Which of the following team development processes best describes Karen's reaction?

1. Forming
2. Performing
3. Adjourning
4. Mourning

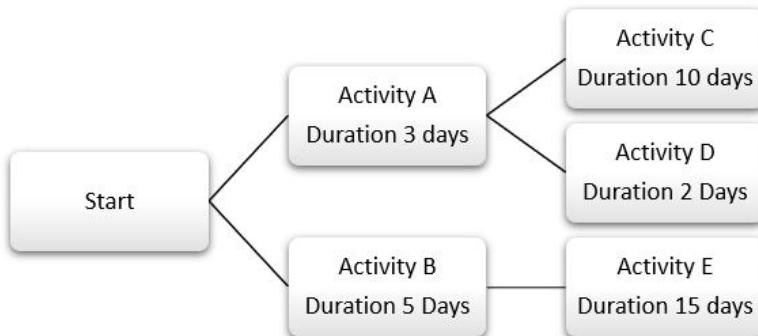
Question 19: Which of the following is at the top of Maslow's hierarchy of needs?

1. Physiological
2. Norming
3. Social
4. Esteem

Question 20: You and your team are working together to gather requirements and create your scope baseline. Which of the following best represents the documents that make up the scope baseline?

1. WBS, WBS register, and the scope management plan
2. The scope statement, WBS, and WBS dictionary
3. The scope management plan, schedule, and cost baselines
4. The requirements management plan, the project charter, and the scope statement

Question 21: Review the following network diagram and determine the critical path:



1. A C D E
2. B E
3. A B C D E
4. A C D

Question 22: Conya is trying to determine how long an activity will take. She has two team members that have differing opinions on how long it should take. The first team member identifies a risk event and thinks it will impact the duration, so she says the activity should take about 39 days. The second team member is more optimistic and thinks the activity should take about 28 days. Conya firmly believes that because she has done a similar activity in past projects, it should take 32 days. Using the beta-PERT distribution formula, how long should the activity take?

O: 28 P: 39 ML: 32

1. 48.75
2. 32.45
3. 39.25
4. 32.75

Question 23: While monitoring and controlling your schedule and cost baselines, the project manager runs an Earned Value Analysis and discovers the schedule variance is -2,300 and that the cost performance index is 1.3. How is the project performing?

1. Ahead of schedule and over budget
2. Over budget and behind schedule
3. Behind schedule and under budget
4. Ahead of schedule and under budget

Question 24: Which of the following contract types carries the most cost risk for the project team?

1. Cost reimbursable
2. Firm fixed price
3. Time and materials
4. A fixed-price incentive fee

Question 25: Which of the following best describes an organizational process asset?

1. Standard templates
2. Government regulation
3. Market conditions
4. Infrastructure



# 2

# Introduction to Project Management

In this chapter, you will go through an overview of all of the process groups; knowledge areas; inputs, tools, and techniques; and outputs of project management processes. Once you have reviewed this chapter, it will make it easier to see how all the facets of the best practices work together within the context of a project. This chapter provides an excellent overview of the information that will lay the groundwork for future chapters. I also recommend you revisit this chapter once you have completed the others.

## Reference

*The Project Management Professional (PMP), PMBOK Guide and the Project Management Institute Agile Certified Practitioner (PMI-ACP), Certified Associate in Project Management (CAPM) and the Agile Practice Guide are a registered mark of the Project Management Institute, Inc.*

In this chapter, you will cover the following:

- What are process groups?
- Overview of the 10 knowledge areas
- Introduction to the 49 processes
- Overview of inputs, tools, and techniques and how they work together
- Practice questions

Let's start with process groups, or what could be considered the life cycle of a project.

## What are process groups?

The five process groups are the following:

- Initiation
- Planning
- Execution
- Monitoring and controlling
- Closing the project or phase

Each of the process groups describes the actions that the project team will take to formally kick-off a project, plan for the needs of the project, execute the work, and update as needed until the deliverables are approved and the project or phase can be closed out formally. Process groups are not to be confused with a life cycle. Many projects have different kinds of life cycles, some of which will have a repeating series of initiations through closes until the project is completed.

Process groups can best be described as containers of individual processes and distinct ways of managing your projects based on the knowledge necessary. Yeah, that sounds confusing. Let me put it a different way. If you are looking at a home renovation project, you would need to do several things to make sure the project is successful. While this isn't an exhaustive list, it is a good overview of the processes and knowledge areas across the five process groups:

1. You would need to determine, at a high level, what success looks like (initiation).
2. You would need to identify your vendors, get permits, establish a high-level budget, and schedule milestones (initiation).

3. You would need to identify your stakeholders or those people involved in the project who have requirements (initiation and throughout).
4. You would need to put together a plan that includes a specific scope of work, a schedule, and a budgetary baseline, determine quality requirements, and assess risk (planning and throughout).
5. You would need a way to communicate effectively on the project and potentially identify, acquire, develop, and manage other resources of people, equipment, and materials (planning and throughout).
6. You would need to agree on the quality of the result and keep track of it throughout the project (planning, executing, monitoring, and controlling).
7. You may need to enter into a contractual relationship with sellers and potential workers (planning and execution).
8. The work would begin to be executed and reviewed for correctness (execution and monitoring and controlling).
9. If the work isn't going to plan, you will need to determine whether a change is necessary and identify the impacts of those changes on scope, time, cost, and quality. Then, you'd need to discover the best solution and work the changes into the plan (monitoring and controlling).
10. During the work, you will be watching to make sure that quality can be verified as correct and validate the scope of work is correct before you sign off on the projects as complete (monitoring and controlling).
11. You would close out the project, pay the workers, close out procurements, and document your lessons learned (close project or phase).

Just like the preceding simple project overview, projects are temporary and unique. There may be times when you need excessive information on the scope of work, and other times, you are doing something similar on another project and less information is required. Some projects are much larger and need in-depth planning and an integrated project management plan, while others not so much. Some projects will involve procurement, and others will not. So, you can see that projects are unique and that means you will need certain specific knowledge to appropriately initiate, plan, execute, monitor, control, and close the project or phase.

You may be asked on your exam, "what are the characteristics of a project?". The correct answer is **temporary and unique**.

Now that we are aware of what process groups are, let's cover the basics of knowledge areas.

## Overview of knowledge areas

Knowledge areas represent specific aspects of a project that are necessary to understand. Some knowledge areas will be very familiar to you: scope, schedule, and cost, perhaps. Some of you might be familiar with risk, procurement, and formal change control. Others might be better versed in communications and resource management. Our 10 knowledge areas have a variety of processes attached across multiple process groups.

While it may appear that everything is very linear, it is in fact a cycle. There are multiple areas that we will cover that are considered iterative, meaning performed over and over throughout the project. An excellent example of this would be best practices and processes in stakeholder engagement, risk management, and scope management. Why? Well, I'm sure you know from your experience that putting together a plan that you think is comprehensive and then executing it doesn't always go as you hope it will. It's essential to keep an eye on the prize and pivot and adapt as much as necessary; therefore, it would also be required to re-plan and process formal change requests to update the plans. Therein lies the importance of understanding the 10 knowledge areas as you may be quite familiar with some and maybe not others. There may be areas where you excel and areas you will need to review. At a very high level, we will cover each, and then, as you move forward, you will begin to see how they interrelate.

10 areas of expertise or knowledge could be utilized on most if not all projects. The 10 project management knowledge areas each contain specific *processes, inputs, tools, and techniques, and outputs that relate to particular areas of the project*. These knowledge areas come from *the Project Management Body of Knowledge, or the PMBOK® Guide - 6th edition*.

### Reference

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

Some project managers only work with the core constraints of scope, schedule, and cost and may not be involved in procurement activities, for example. Each project manager determines what is necessary to utilize in their unique projects. In one project, you may need a comprehensive quality management plan, and in others, you may not. It is part of the project manager's responsibility to understand the knowledge areas, best practices, and processes well enough to determine what is needed and what is not.

You will cover a variety of best practices and processes from their related knowledge areas as you move forward through this guide. This section is just an overview of each knowledge area and its role in project management. As you go through the overview, ask yourself which of these knowledge areas are part of your day-to-day projects that would need to be planned for, executed, monitored, and controlled:

- **Project integration management** involves determining what is necessary to create a comprehensive project management plan to manage the project properly. Integration is also where the project charter and deliverables are created, where project work is monitored and controlled, where formal change control lives, and where the formal project or phase closure occurs. Think of the word *integrate*. For a project to be successful, all of the chosen knowledge areas and their processes must integrate to work together effectively. Integration is like a protective bubble wrap around a priceless, breakable vase. It keeps everything in the box from sliding around and breaking but does allow for shifting in transport.
- **Project scope management** coordinates the collection of requirements for both the product and project scope of work, plans for how that work will be completed, and also includes formal signoff on the deliverable by the customer. The product scope will be planned based on the requirements of the deliverables. It's what you do during a project to make sure you have created the result that was asked for by your stakeholders. Project scope is the act of making sure you have all of the tools, techniques, resources, and so on to produce that deliverable. Project scope is what you are being tested on and what you will learn in this guide. Scope of work is a critical constraint that could very well be the main influencing factor on your schedules, budgets, resource assignments, and so on.
- **Project schedule management** is the knowledge area that deals with determining all of the activities you will perform on the project, then defining the sequence and determining what resources are necessary to help execute the work, in a logical sequence, within the assumed duration. It also involves the ability to answer the question of "how long will this project take?" and setting a baseline that seems appropriate with the current information, to produce a schedule that we can probably meet.

- **Project cost management** deals with estimating costs, budgeting costs, and controlling costs. Not all project managers manage budgets, but somebody is paying attention to the money side of things. It's essential to understand the best practices in case you are asked to manage a budget for people, equipment, or materials at some point in your career. The good news is that even if you don't work on project budgets, you surely have personal budgets that you manage, thus making this section a bit easier to succeed on the exam, except in monitoring and controlling and the formulas to control the budget. I will put off the formulas until a lot later in the guide – I can hear cheers from mathematically challenged people everywhere!
- **Project quality management** deals with best practices to produce a deliverable or result that is fit for use, and that works the way it's designed to work. Part of quality management involves planning for how to meet requirements and documenting your quality process, as well as making sure that you're managing quality during project execution and controlling the quality to prevent defects. Quality may also be another knowledge area that is not a part of your day-to-day work, but everybody is concerned with the quality of the results and therefore, this may be part of your requirements.
- **Project scope management** is the act of building the right thing, and quality management deals with building the thing right. Both have to work together to produce the result. If you were building a bicycle and the customer rides it around the block and the chain falls off, the bike isn't fit for use or a quality result. Conversely, if the bike is good quality but the color is wrong, or the customer says such things as "where did that bell come from? I didn't ask for that!" then the scope of work is not correct.
- **Project resource management** involves the people, equipment, and materials on your team. On the human side, how you acquire, develop, and manage them is always important. You also have equipment and materials that may need to be acquired throughout the project. The acquisition of some of your resources may involve procurement. Focusing on your ability as a project manager at team-building as well as manage the allocation of resources across project work is an important aspect of your day-to-day work.
- **Project communications management** is designed to determine how you will distribute information and communicate on the project. Project managers may spend 90 percent of their time communicating, so it is crucial to create a communications management plan and distribute information accordingly. Communications management is about making sure that you get the right information to the right people, in the right format, at the right time, and with the right impact. That will differ from stakeholder to stakeholder and could change many times during the project.

- **Project risk management** is perhaps one of the knowledge areas that is not attended to as frequently as necessary but is still integral to the success of a given project. Risk management processes are designed to protect project work; the product, service, or result; the budget; the schedule; procurement; and so on. Risk will be compartmentalized into two categories: threats and opportunities. While threats will impact negatively and may also be a significant focus on your projects, opportunities are good things that are often the reason why projects are undertaken in the first place. Seizing those opportunities can be a moving target, but a target nonetheless. It's important to identify your risks and analyze and create responses for them regularly, as a risk event in both categories can impact all knowledge areas.
- **Project procurement management** is concerned with contracts and agreements that may be necessary to complete the deliverables. You may not be involved in procurement at all, or the organization may have a procurement department that sets the process for which procurement-related items are carefully managed. You may be asked to determine what is needed from an external seller or vendor and also may be asked to create a procurement statement of work. That could lead to analyzing vendor responses and contribute to seller selection. Even if you're not involved in project procurement specifically, the project may begin with a contract agreement, and you would need to protect your organization from future costs or litigation by not breaching the contract/agreement and also making sure the other party doesn't violate the contract/agreement as well.
- **Project stakeholder engagement** concerns those who have a stake in the outcome of the project. They are typically those that have requirements that need to be met, or they could be end users. Either way, stakeholders are involved in the project life cycle, and as a project manager, you will need to manage their expectations, which could change throughout the project. Excellent communication is one way of effectively managing stakeholders on your project.

In earlier versions of *the PMBOK® Guide*, communications management included aspects of stakeholder management. Communications and stakeholder management were broken out into different knowledge areas due to the need to both communicate effectively and manage stakeholder engagements as their own entities. Do they work together? Absolutely! One way to separate them on the exam is to think of communications as a function of determining what information is needed, to whom it will be delivered, and in what format. Think of it as distributing information. Stakeholder engagement is building relationships and adapting to changing stakeholder requirements. While they work together, they have different processes from each other.

Now that you have an overview of the knowledge areas, let's take a high-level look at the 49 processes that you will be learning throughout the guide. These processes will include both the people and the process sections of the exam content outline.

## Introduction to the 49 processes

Now that we've defined the individual process groups and knowledge areas that are used in a project at a high level, we can look at the individual processes that are used. Each process is attached to both a knowledge area and a process group. There are 49 processes, 10 knowledge areas, and 5 process groups. For example, the *develop the project charter* process is a function of project initiation and is found under the knowledge area of *integration*.

Even though it will look overwhelming at first, it is essential to memorize this chart at some point before your exam. This way, you will be able to ask yourself, "where in the chart am I? Am I in planning? Execution?". That understanding will go a long way to knowing what has already been done and what is still left to do. I recommend being able to duplicate this chart in less than 5 minutes. With that being said, there is some contention between experts about writing out the chart on your scratch paper once you begin the exam. Some say, "For sure! Use the 5 minutes or so to write it down and refer back to it throughout the exam." Others, like myself, say, "that is 5 minutes more you would have had to answer questions, and using precious exam time to jot down something you already have memorized is a waste of time." This is coming from the person who wrote down all of the formulas because she knew she would forget them in a major way. Here is the difference. I took 1 minute and only had five formula questions. In hindsight, I would not have jotted them down at all.

I'll leave the decision up to you. It is your experience and your exam, and you do whatever is necessary to prepare and pass.

Before you review the process groups and knowledge area chart, there are a few things to be aware of to help with your studies.

*The PMBOK® Guide - 6th edition* is broken down as follows.

*Chapters 1 through 3* are the overview of project management. They cover pre-project selection techniques; different organizational dynamics; the difference between a project, program, or portfolio; and the like. You will go through all of that in this guide in *Chapter 3, Pre-Project Initiation*. These chapters can also be reviewed on pages 1–68 of the digital download of *the PMBOK® Guide - 6th edition*.

The rest of the chapters can be referenced as follows:

- *Chapter 4: Integration Management – Pages 69 – 127 of the digital download of the PMBOK® Guide - 6th edition*
- *Chapter 5: Scope Management – Pages 129 – 170 of the digital download of the PMBOK® Guide - 6th edition*
- *Chapter 6: Schedule Management – Pages 173 – 228 of the digital download of the PMBOK® Guide - 6th edition*
- *Chapter 7: Cost Management – Pages 231 – 268 of the digital download of the PMBOK® Guide - 6th edition*
- *Chapter 8: Quality Management – Pages 271 – 305 of the digital download of the PMBOK® Guide - 6th edition*
- *Chapter 9: Resource Management – Pages 307 – 357 of the digital download of the PMBOK® Guide - 6th edition*
- *Chapter 10: Communications Management – Pages 359 – 392 of the digital download of the PMBOK® Guide - 6th edition*
- *Chapter 11: Risk Management – Pages 395 – 457 of the digital download of the PMBOK® Guide - 6th edition*
- *Chapter 12: Procurement Management – Pages 459 – 499 of the digital download of the PMBOK® Guide - 6th edition*
- *Chapter 13: Stakeholder Engagement – Pages 503 – 535 of the digital download of the PMBOK® Guide - 6th edition*

The page numbers that are referenced here will help you navigate certain knowledge areas in *the PMBOK® Guide - 6th edition*. We will also review the knowledge areas and their processes in distinct areas of *Domain II: Process* in the exam content outline.

#### Reference

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Table 1-4, Pages 25*

According to the Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Page 22*, some processes interact regularly or may only be done once or at pre-defined points.

Each of the 49 processes has **inputs, tools, techniques, and outputs (ITTOs)** that allow the processes to work accordingly. In the next section, you'll see why they are an important part of understanding project management processes and knowledge areas.

## Inputs, tools/techniques, and outputs

Ah, the ITTOs, the things that generate dread and fear amongst exam-takers everywhere. "Why?", you ask yourself. "That sounds terrible! I do not, under any circumstances, want to experience fear and dread. What are these ITTOs, and why should I be concerned?"

First things first, you *do not* need to memorize the ITTOs. I say that first, so nobody gets nervous and bails. Then, I will follow that up with, there are 1,452 ITTOs. Many of these are grouped under logical headings, such as project management plan, project documents, interpersonal and team skills, and the like. I'm assuming you stopped cold at the number 1,452.

"So, let me get this straight," you may be thinking to yourselves. "There are 5 process groups, 49 processes, 10 knowledge areas, and 1,452 inputs, tools/techniques, and outputs?". Uh...yes? I'm sorry! Let me refer you back to my original statement. You do not need to memorize all of the ITTOs. The updated exam is based on domains, enablers, and tasks, rather than ITTOs... whew. I will point out the ones along the way that you may see on the exam but remember everything is based on the exam content outline and the test pool of questions you get. The exam may mostly focus on the importance of integrated management plans and the practical application of tools and techniques.

If you have not yet downloaded the exam content outline, here is a review of how all of this works. First, there are domains, tasks, and enablers:

- **Domains:** Defined as high-level knowledge areas that are essential to the practice of project management
- **Tasks:** The underlying responsibilities of the project manager in each domain area
- **Enablers:** Examples of the work associated with each task and does not include an exhaustive list, merely ideas and best practices to follow

Whew... with that out of the way, let me explain what they are and why there are so many.

First, in *Figure 2.1 – ITTOs*, you will see an overview of what they are, and then we will go through why they are essential:

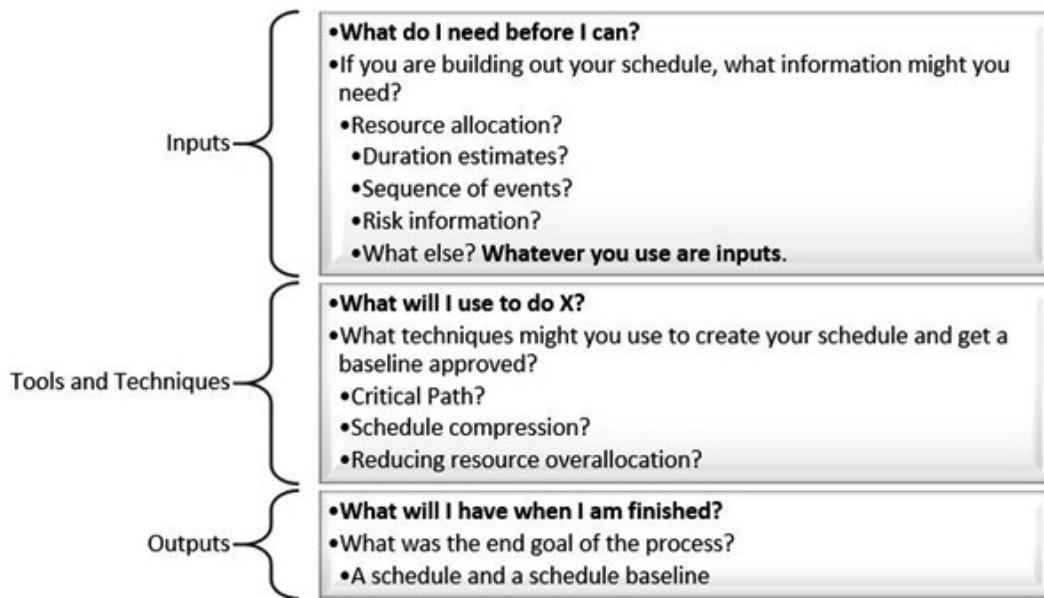


Figure 2.1 – ITTOs

I want you to imagine that you are going to the kitchen to make yourself a sandwich. What kind will you make? I'll use something simple such as peanut butter and jelly to explain my point, plus I'm a bit lazy in the kitchen.

## Inputs – what do I need before I can make a PB&J?

Let's make a list:

- Bread
- Knife
- Peanut butter
- Jelly
- Plate
- Napkin

These inputs are all found in my kitchen, but they are in different areas. The knife is in the cutlery drawer, the bread is in the bread box, the peanut butter in the pantry, the jelly in the refrigerator, and so on. I may have to pull my inputs from a variety of different places. The same can be said for the ITTOs by the process. For example, the schedule; I may need several items from lots of different knowledge areas:

- **Agreements:** Procurement management
- **Scope baseline:** Scope management
- **Activities defined and sequenced:** Schedule management
- **Duration estimates:** Schedule management
- **Estimated resources:** Resource management
- **Estimated costs:** Cost management
- **Potential schedule risks:** Risk management
- And so on

## Tools and techniques – what tools/techniques will I use to create my sandwich?

The tools and techniques that are presented in *the PMBOK® Guide – 6th edition* are suggestions of best practices you can use for a variety of different processes. Expert judgment is one of the most common tools/techniques in project management, which also applies to sandwich making. PMI® isn't suggesting that it's their way or the highway. It's more to the point that they are providing different ways to create the result.

If I put the peanut butter on the left piece of bread, wash the knife, and put the jelly on the right piece of bread, cut it diagonally, and cut the crusts off, is that the best and only way to make my sandwich? Have I cornered the market on something totally new and not thought of before? In my mind, yeah, but in yours, you may be making an L out of your thumb and index finger while placing it on your forehead mouthing *loser*. So, you see there are many different ways of doing the same things, and many differing opinions on the right way to do things. PMI® is only suggesting that as project managers, we have a lot of techniques and tools that are available to us at any given moment for a variety of processes and outputs. Those best practices have come from thousands of project managers around the world. We pick and choose what works for our projects and organizational dynamics.

## Outputs – what will I have when I am finished?

A sandwich. Lunch. It is the result of the actions I have taken and the techniques I have used to produce the finished items. They could be a schedule baseline, quality management plan, the WBS, the final result/deliverables, or a variety of outputs we will go through. Depending on the process and the knowledge area, you will produce a lot of documents and outputs that help you get to where the project needs to be. Will you use everything? Nope. Will you maybe discover something new you can use? Absolutely!

Now, to confuse things further, outputs can be inputs to other things. In the schedule example, I mentioned estimating durations. Those durations will be curated based on the list of activities, the sequence of events, the estimated resources, and the duration estimates. Those duration estimates are outputs of their process and then inputs to develop a project schedule and the baseline, much like lunch is an input to nap time. Not that that is something I know anything about; what is a nap? Something I wish I had more of is probably the best answer to that question!

Two of the most common inputs and updated outputs are the **organizational process assets** or OPAs and the **enterprise environmental factors** or EEFs, which is what we will look at next.

## Organizational process assets and enterprise environmental factors

The importance of these two things is that we may all be in different industries, have different best practices or policies, and the culture of our organization affects the politics and who the organization is. The easiest way to remember these is to look at the middle words: **process** and **environment**. This refers to how your organization does things and who your organization is. The reason they are considered inputs for almost every single process is that PMI® is not insinuating that you have to do any of the best practices. The consideration of your current organizational processes and environment needs to be present and accounted for in every project. If you learn something new that can benefit your organization, then by all means, update both as needed.

Keep in mind that you are learning standards and not regulations. There isn't any *have to* on the exam (except for a project charter and formal closure for the exam). PMI® is saying refer to your organization first and add things that could work for your projects from the other processes, knowledge areas, and ITTOs, which is also an excellent exam tip! If any answer says, "you must," "you have to," "you would never," or something similar, it is the wrong answer. Anything absolute in project management is regulation, not standards, or best practices.

I tend to look at both like this. On the first day of a new job, you walk in and are maybe given a handbook or training into the way the organization does things. Those are OPAs. Then, you go to lunch with a new work buddy, and they tell you how "it really is," nudge, nudge, wink, wink. Those are your EEFs. But on a more specific level, I'll break down what you need to know for the exam and how to differentiate between them.

Both the OPA and EEF definitions are found in *the PMBOK® Guide* in *Chapter 2: The environment in which projects operate*, on pages 37–40.

## Enterprise environmental factors

EEFs are something we all experience in our organizations every single day. Even people that aren't doing projects are affected by the enterprise environment. Specifically, for project teams, the EEFs are things we can't control; there are things in project management we can't control. I know, I'm surprised too! Not really, though. We experience a lack of control often in projects from outside forces. The environment in which we work can influence, place constraints, and may even be grabbing the project by its hand and dragging it along based on the will of the organization. Not all EEFs majorly impact our projects in a negative way. Some EEFs benefit our projects. *Section 2.2.1 of the PMBOK® Guide - 6th edition* (Pages 38-39) describes EEFs that are internal and external to the organization. Please review all of these before your exam.

### Let's have a look at what comes under internal EEFs:

- Organizational culture, structure, and governance
- Geographic location and distribution of facilities and resources
- Infrastructure
- Information technology software
- Availability of resources
- Employee capability, skills, and specialized knowledge

### We will now see what comes under external EEFs:

- Marketplace conditions
- Social and cultural influences and issues
- Legal restrictions
- Commercial databases
- Industry studies, publications, and benchmarking results

- Government or industry standards/regulations
- Financial considerations for inflation rates, exchange rates, tariffs, and geographic locations
- Physical environmental elements such as weather and working conditions

## Organizational process assets

According to *the PMBOK® Guide - 6th edition*, **organizational process assets** include the following:

- Plans, policies, or knowledge of all performing organizations (yours or your customer's)
- Processes, policies, and procedures
- Organizational knowledge bases

All can be established by the **Project Management Office (PMO)** or some other driving process from outside of your organization.

You will cover the different types of PMOs in the next chapter, *Chapter 3, Pre-Project Initiation*. For now, if you aren't familiar with a PMO, they are the governing body over all projects in the organization and have specific processes that must be used on all projects.

As you review the *PMBOK® Guide - 6th edition*, it is essential to read through *Section 2.3.1 Processes, Policies and Procedures (Pages 39-41)* for the complete list of assets. Many of the organizational process assets are related to conducting project work and are generally not updated unless the organization goes through formal changes to improve corporate business. Otherwise, these are the guidelines and rules, if you will, that govern projects and project management.

### Those items include the following:

- Initiating and planning the following:
  - a) Guidelines for tailoring your projects
  - b) Organizational standards and policies
  - c) Project and product life cycles
  - d) Templates and metrics
  - e) Preapproved seller lists for procurement needs

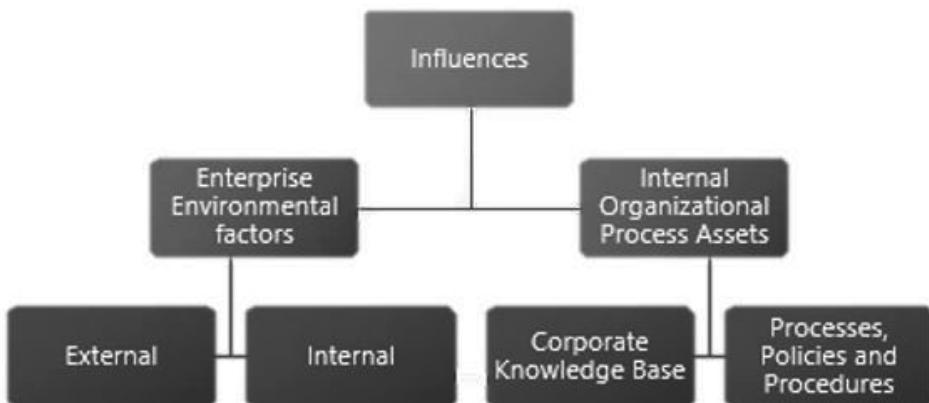
- Executing, monitoring, and controlling the following:
  - a) Formal change control procedures
  - b) Financial controls outside of project budgetary processes
  - c) Issue and defect management
  - d) How your resources are assigned and their availability
  - e) Communication requirements organizationally that may affect your project communications
  - f) How the scope of work is formally accepted, verified, and validated
- Closing the following:
  - a) All project closure requirements, including transferring the result to operations, how contracts are closed out and resources are reassigned, and knowledge transfer of project documents and lessons learned.

*Section 2.3.2, Organizational Knowledge Repositories in the PMBOK® Guide 6th edition* are also OPAs and are generally where the updates to documentation are made due to lessons learned or core templates that may be useful to other projects. You may be using SharePoint, corporate servers, or a cloud-based storage solution to store and retrieve information as well.

**This could include the following:**

- Configuration management
- Financial data
- Historical information and lessons learned
- Defect and issue management
- Metrics
- Project files from past projects

All of this could be useful to your next projects but are probably not going to be identical, hence the updates as outputs. In *Figure 2.2 – The operating environment of the project*, you can see the influences the OPAs and EEFs have over project work at a high level:



Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Page 37.*

Figure 2.2 – The operating environment of the project

Let's take a look at the documents and plans that support project work.

## The documents and plans

There are numerous documents and plans that we will be reviewing throughout, but I wanted to give you an idea as to what those documents are, what needs to be updated regularly, and what needs to be updated with change control. As you review the documents, pay very close attention to what must go through change control and what can be updated without a formal process. After the documents, I'll explain what I mean by that. In *Table 2.1 – Project management plan and project documents*, you will see a breakdown of each document you will see on your exam and hopefully some that you use or will use in the future:

Knowledge Area	Change Control	Iterative Updates
Integration	Project Charter Assumption Log Integrated Project Management Plan (all management plans, including Change Management Plan and baselines) Life Cycle Approach	Issue Log Lessons Learned Register Work Performance Reports

<b>Knowledge Area</b>	<b>Change Control</b>	<b>Iterative Updates</b>
Scope	Scope Management Plan Requirements Management Plan Scope Statement Scope Baseline (Scope Statement, WBS, and Dictionary)	Requirements Documentation Requirements Traceability Matrix
Schedule	Schedule Management Plan Schedule Baseline	Activity List Activity Attributes Milestone List Project Schedule Network Diagrams Duration Estimates Schedule Data Project Schedule Project Calendars Schedule Forecasts
Cost	Cost Management Plan Cost Baseline	Cost Estimates Basis of Estimates Cost Forecasts
Quality	Quality Management Plan	Quality Metrics Quality Report Quality Control Measurements
Resources	Resource Management Plan	Team Charter Resource Requirements Resource Breakdown Structure Resource Assignments Physical Resource Assignments Team Resource Assignments Resource Calendars

Knowledge Area	Change Control	Iterative Updates
Communications	Communications Management Plan	Project Communications
Risk	Risk Management Plan	Risk Register Risk Report
Procurement	Procurement Management Plan	Bid documents  Agreements (once signed would need procurement change control to update. Until then it's in negotiation.)
Stakeholder	Stakeholder Engagement Plan	Stakeholder Register

Table 2.1 – Project management plan and project documents

## The project management plan and project documents

It's probably safe to say that after perusing the list of plans and documents, you may have noticed a trend in the second column of *management plans and baselines*. These documents will become the integrated project management plan and subsequent baselines that are created in planning and maintained during execution, and if a change is needed due to monitoring and controlling results, you will need formal approvals to update or change those plans. In the last column, under **Iterative Updates**, are the project documents; these are living, breathing, updatable documents that you use regularly. Why or why not change control? Let me break this down a bit more, so you know why that is the case. Permit me to explain using YouTube.

What is the last how-to video you watched on YouTube? Was it how to fix something on your car or an appliance in the home? Was it how to cook something? Was it a DIY project? Something on software? Whatever it was, I want you to hold that in your mind. Then, I want you to ask yourself whether the video you chose worked and whether you were able to do what you needed or wanted to do. Got it? Okay, this is why I attribute that practice to the project management plan and baselines, which need to be updated formally with change control.

Let's say you were attempting to learn how to run a formula in Excel. You are trying to split the text from one cell to separate columns. So, you pull up YouTube and search. There are probably thousands of videos that could teach you that. You watch a video and try to duplicate what they are showing you with your work. If it works, great! You can refer to that same video numerous times until you have the skills down and that video will always provide the same steps, presented in the same way, to get there. It doesn't change. Now, if it didn't work, what would you do? Change to another video, right? See whether that one works and so on. The project management plan is an integrated video channel for project management. There is a how-to channel for scope, schedule, cost, quality, and all of the other knowledge areas. If I want to know how to update my schedule, I'll look at the schedule management plan. If I'm tracking schedule performance, I'll refer to my baseline. If either of those plans and baselines is no longer working or isn't getting the team where they need to be, it is time to change those plans through formal change control and hope this time it will work, much like changing the video to find something better that works more effectively for your needs. The plans are *how-to guides* for the project. If they don't work, formally and with purpose, change the channel.

The *project documents*, on the other hand, get updated daily, bi-weekly, or weekly. Can you imagine that every single time you identified a potential risk, you had to obtain permission to update your risk register through formal change control? That would be all you ever did!

The exam assumes that your organization has a **change control board (CCB)**. These folks are also assumed to work in your organization but could also represent an external customer's change process. The CCB resources are key stakeholders overseeing changes throughout the projects in the organization and are the governing body over seeing formal changes.

"Uh, hi again, CCB. I know it's the twentieth time today, but I've found another potential risk event, or I'm doing some cost estimates and need approvals." That would be a monumental waste of time and energy. When we review formal integrated change control in *Chapter 14, Integration Management*, we will delve much deeper into the concept of formal change control. For now, assume you will need to follow that process for any changes to management plans and baselines.

With that being said, there are a ton of documents we will cover, and many people look at all of that and say to themselves, "there isn't any way I would ever need or want all of those documents. It looks excessive; my projects are only about 3 to 6 months long on average. I'd spend that long just creating the documents."

I totally understand and feel much the same way. But there is another assumption on the exam, and that is the projects you will be analyzing for correct answers tend to be 1 year or longer and a million US dollars or more. Some projects may be megaprojects that could span years and billions of dollars. Billions with a capital B. In that context, having a comprehensive plan with all or any of the plans and documents would be highly necessary.

Plus, another way to look at this is that PMI® doesn't assume you will use everything. It's our job as a project manager to determine what is necessary to use and what is unnecessary. If we aren't working with any procurements, then we don't need a procurement management plan, a procurement statement of work, or any bid documents. We wouldn't use them. We simply wouldn't need them. For the exam, though, you need to know about them all, and the management plans especially are found in the exam content outline and how they integrate is very testable. You'll start to see a trend as we go forward with the management plans and it will be much more apparent as you progress. If you have already taken your training class, then you know that already. If you haven't, then this guide is a great place to get the details and then go into training with that knowledge and know what to focus on for your studies. In a perfect world, we would use everything; in the real world, you probably wouldn't.

According to the *Project Management Institute, A Guide to the Project Management Body of Knowledge, (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Pages 640-642*, there are some specific rules when it comes to handling inputs and outputs, the project documents, and the project management plan. Let's take a look at these rules.

## Fundamental rules for inputs and outputs

- Inputs are any documents that are key to the process.
- Outputs should become an input to another project management process unless the output is a terminal output or is embedded within another input, such as project documents.
- Inputs should come from an output from another process unless the input comes from outside the project.

## Project documents rules

- When specific project documents are identified for the first time, they are listed as one particular output.
- Subsequently, they are listed as "project documents updates" in the output list and described in the section narrative.
- When any project document is input, the term "project documents" is listed in the specific project documents and described in the section narrative.

## Project management plan rules

- Planning processes that create a subsidiary plan, the project charter is the first input, and the project management plan is the second.
- Processes that generate a component of the project management plan list the components specifically.
- When the project management plan serves as a process input, specific elements of the project management plan that may be considered are described.

There are several documents that will be included in the project management plan, which do not have a specific process associated with them but are important, nonetheless. The following list shows those documents. They are created in the develop project management plan process:

- Change management plan
- Configuration management plan
- Performance measurement baseline
- Project life cycle approach
- Development approach
- Management reviews

## Sequencing rules

- If the project charter is an input, it is the first input.
- When the project management plan is an input or output, the subsidiary management plans are listed in the order of the sections in the PMBOK® guide, followed by baselines then any other plans.
- Project documents are listed in alphabetical order.
- Enterprise environmental factors and organizational process assets are listed last in that order.
- When updates are an output, they are listed in the following sequence: Project Management Plan Updates, Project Document Updates, Organizational Process Assets Updates.

## Rules for handling tools and techniques

Commonly used tools and techniques are grouped by their intent and are intended to be descriptors for the actions being taken:

- **Data gathering:** Includes brainstorming, focus groups, and the like to gather important data from a variety of sources.
- **Data analysis:** Reviewing the information gathered and looking for variances or additional information to point us in a better direction on the project as needed.
- **Data representation:** Charts, graphs, reporting, and how we present the information.
- **Decision-making:** A variety of techniques can be used for this category.
- **Communication skills:** We spend 90% of our time communicating on projects.
- **Interpersonal and team skills:** Leadership, reward/recognition, and team building.

These rules and the preceding overview are an excellent way to go forward and provide knowledge to keep in mind throughout the guide. The beautiful thing about having all of the overview stuff in the first two chapters is that you can always refer back to it at any time; you don't have to flip around trying to find the chart or review what an OPA is. Hopefully, this overview helped get you started and made sense. If it didn't yet, that's okay too! I don't expect anyone to jump into this process knowing everything. I've got this, and so do you. Shall we see how you do on the practice questions? Remember to try to get 100% and if you don't, no worries! You can go back and review the information any time you need to.

## Summary

In this chapter, you reviewed a ton of information about ITTOs, EEFs, OPAs, project management plans, and project documents. This information is the groundwork for all the rest of the chapters and an excellent review for you as you move forward with your studies.

In *Chapter 3, Pre-Project Initiation*, you will review many of the concepts that will also lay the groundwork for your projects: how the organization selects the projects they want to sponsor, how the organization is designed, the impacts on project management, and project selection techniques to develop a business case. Grab something caffeinated and move on to *Chapter 3, Pre-Project Initiation*, whenever you are ready to go! See you there and good luck with the practice questions; I have a feeling you'll do a great job!

## Assessment exam

Question 1: Which of the following is not an enterprise environmental factor?

1. Organizational culture, structure, and governance
2. Marketplace conditions
3. Government or industry standards/regulations
4. Organizational knowledge bases

Question 2: Kathy is a newer project manager and is attempting to determine which plans to create to manage her project effectively. She knows that she will need an integrated project management plan to understand how to manage the project. Which of the following would not be included in the project management plan and instead could be considered a project document?

1. Stakeholder engagement plan
2. Issue log
3. Life cycle approach
4. Project charter

Question 3: Which of the following could be considered a commonly used tool and technique grouped by intent?

1. Decision-making
2. Project document updates
3. Performance measurement baseline
4. Risk register

Question 4: Amin has just been hired as a project manager and will be in charge of an extensive project. Which of the following is something Amin will need to understand first before progressing to planning the project?

1. What plans he will need to create
2. Who his team is
3. What stakeholders are involved
4. The enterprise environment and organizational processes

Question 5: Numerous processes interact and repeat throughout the life cycle of the project. Which of the following processes would be used once or at predefined points?

1. Acquire resources.
2. Project charter.
3. Conduct procurements.
4. Define activities.

Question 6: Karem is determining what plans may be necessary for managing risk in his project. Of the following, which document or plan would be best for Karem to include in his integrated project management plan?

1. Risk register
2. Risk report
3. Risk management plan
4. Risk audit instructions

Question 7: Antonio is a team member on a large project and is trying to understand what documents he is responsible for contributing to. As the project progresses, he determines that the stakeholder engagement plan needs to be updated. What process, if any, will Antonio need to go through to update the plan?

1. Go to the project manager and get approval to update.
2. Go to the sponsor and get approval to update.
3. Go to the stakeholders and get approval to update.
4. Go to the change control board and get approval to update.

Question 8: As a project manager, Laura knows that she will need an integrated project management plan to keep everything organized. She knows that not every single component of the plan is created in a separate process, and those she does create will be part of the develop project management plan process. Which documents would be considered part of that process?

1. Performance measurement baseline
2. Bid documents
3. Resource calendars
4. Cost forecasts

Question 9: Which of the following could be considered the best knowledge area to determine whether a product is working correctly?

1. Scope
2. Quality
3. Communication
4. Risk

Question 10: Ted wants to refer to his *PMBOK® Guide - 6th edition* to determine the best practices for communications management. In which chapter of the *PMBOK® Guide - 6th edition* could he find that information?

1. Chapter 9
2. Chapter 11
3. Chapter 5
4. Chapter 10

Question 11: Which of the following is not considered a knowledge area?

1. Scope management
2. Manage quality
3. Schedule management
4. Procurement management

Question 12: How many processes are recommended by PMI® to run a comprehensive project?

1. 48
2. 47
3. 49
4. 50

Question 13: Which of the following best describes ITTOs?

1. A specific group of information needed to plan, execute project work, and produce a result
2. A group of suggestions for use throughout the project

3. A list of items to consider during the project
4. 1,452 items to be aware of in case they are necessary for the project

Question 14: As a project manager, you are reviewing the current availability of internal resources to determine whether you'll need to look outside the organization for the resources you may need. The review of the internal resources could best be described as which of the following?

1. Organizational process assets
2. Internal enterprise environmental factors
3. External enterprise environmental factors
4. Resource management

Question 15: What is the difference between management plans and project documents?

1. Plans are updated weekly, while documents must go through change control for updates.
2. Plans are not integrated, while documents are.
3. Documents are updated weekly, while plans must go through change control for updates.
4. Both management plans and documents can be updated as needed by the project manager.



# 3

# Pre-Project Initiation

This chapter will help you learn about how projects are defined based on different organizational structures, as well as various project selection techniques that are used to charter a project. This chapter will also cover the vital stakeholders assumed to be working with you on your projects and what your role is as the project manager. This information is essential so that you understand how a project manager can begin a project effectively based on the circumstances of the organization and the leadership abilities of the project manager.

In this chapter, we will cover the following topics:

- Defining a project
- Understanding organizational structures
- Key stakeholders (PMO, CCB, and sponsor)
- The role of the project manager

Let's get started!

## Reference

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

## Defining a project

What exactly is a project? A project is defined as something *temporary and unique*, which could mean anything from building a massive highway system to building a new data center, setting up a help desk, or upgrading hardware or software for your organization. A project doesn't necessarily have to produce anything that is a tangible product; it could also produce a service or result. You may very well be updating a process in your organization or perhaps reorganizing your helpdesk. It may feel like you're fulfilling your day-to-day position while working in your organization, but if it is temporary and unique, it's a project.

Businesses are in the business of making money and often, projects are undertaken for that very reason – whether it's to develop a new product, service, or result, or to improve business practices to save the organization money.

While it may not feel temporary and unique, projects can be best defined that way. This concept is also something to tuck away for your application since projects are singular. Start thinking about those projects, even if they get transferred to the operations side of things after the project ends. The creation of the result is, in fact, a project.

Think about it this way. You and your team have been assigned the job of developing a website for your organization's human resource department. They will be using the site as an internal way to track employee time off, payroll, and tax records. As key stakeholders, they will have a specific scope of work in mind for the resulting site, they will have a timeline, and the organization will have a budget in mind. When your team completes their work, the HR department will need to review, test, and accept the results or make changes along the way. (Because THAT never happens!) Once the site has been approved, your team may train the department on the necessary features and functions and then hand it over to them so that they can use and then formally close the project. That is the exact moment the project ends, and operations begin. Operations are *continuous* and part of the organization's everyday usage. It is no longer a project – that website is now part of operations.

I want you to think about a question you may see when you take your exam. If the website needs to be upgraded or features need to be added to it after it enters operations, is that a new project or a continuation of the same project?

If you thought to yourself, "that is a new project," then you are 100 percent correct. Insert your high-five right here! Great job! If you are wondering why you didn't, don't worry! You have only reached the third chapter. I don't expect anyone to be totally clear on anything yet, as things may work differently in your organization.

The following diagram shows that once the project has been formally closed and the operations side of the business has taken over, any upgrades or changes after the fact would need to be undertaken as a brand-new project. Granted, you'll have learned lots of lessons and read familiar documentation at this point, but it is a new project nonetheless:

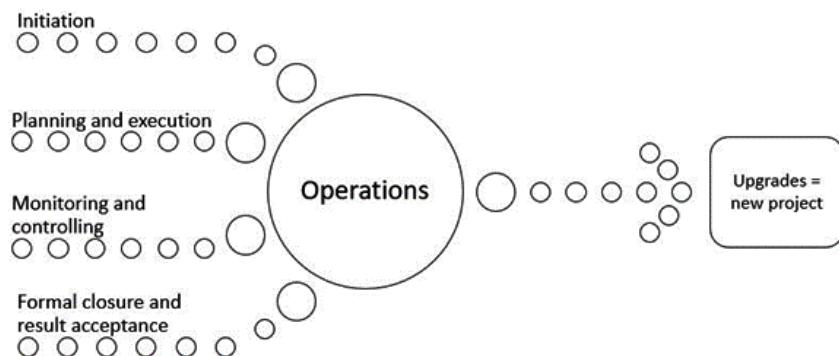


Figure 3.1 – Projects versus operations

Let's circle back on the definition of a project: temporary and unique. I know it doesn't always feel that way, but that is the best definition for a project, and there's a variety of reasons why a project might be undertaken.

**Note**

For more details on what constitutes temporary and unique, you can refer to *The PMBOK® Guide – 6th Edition, pages 4-9. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017.*

We'll take a look at and understand these two aspects of a project in the next section.

## Temporary

All projects have a beginning, middle, and end. Some projects last a couple of weeks, while others could be considered megaprojects and last for years in a global environment. No matter what, a project will always end. It may have been completed successfully or not. Some projects are even canceled in the middle of their creation due to budgetary constraints, a change in the market, or because the result is no longer relevant.

**Note**

We'll review organizational dynamics and how they impact projects a little bit later in this chapter.

## Unique

Projects produce a product, service, or result that can be considered unique. You may be thinking to yourself that you run multiple similar IT projects all the time – an installation on Monday and patches on Tuesday, a data center upgrade here, and a help desk revamp there. It seems like there isn't anything unique about it. Trust me, there is! We'll review different stakeholders and team roles later in this chapter, but until then, I will assume that you are working on multiple projects with different customers or end users who have different wants and needs for the result.

**Note**

I use the word customer loosely. They could be internal or external, end users, or management. The customer is a placeholder for those who are on the receiving end of the final product, service, or result.

There is always a reason why organizations take on a project. Sometimes, it's due to a customer request, demand in the market, updates to meet regulatory compliance, or even for the social welfare of a group or groups. The ability to manage stakeholder needs and produce the result is what projects and project management is all about.

**Tip**

You may come across a question asking you what the definition of a project is. Just remember: temporary and unique.

Another term for describing projects is **progressive elaboration**, which is a fancy term for planning for what you know today and updating it as you learn more – elaborating progressively. All projects are run this way. Even if you know what the result is supposed to be, you may not have all the information needed to plan everything out in the beginning.

All projects enable the creation of business value, whether it is tangible or not. The benefits of an organization come in all shapes and sizes, which is most likely the reasoning behind all the projects you are currently working on.

Tangible items could include the following:

- Stockholder equity
- Market share
- Tools
- Other monetary assets

Intangible items could consist of the following:

- Brand recognition
- Trademarks
- Reputation
- Goodwill

The organization is going to review its budgets for the year and determine which projects to initiate. These could be from internal and external sources. Many of the most common reasons why an organization would undertake a project are due to the necessity of meeting legal, regulatory, or social requirements.

**Tip**

Social requirements could be for the good of a cause or other charitable types of projects, including painting houses for those who can't afford to, donating corporate help, or doing pro bono work.

The most apparent reason why projects are initiated is due to a stakeholder or customer's needs or requests, or because the organization is moving toward changing some of their internal processes; for example, switching from purely completing projects using one set of best practices to an Agile way of doing things. This can also include technical updates to improve cybersecurity across the organization.

Another reason may be to update or fix products or services that haven't worked very well in the past. Think about the news reports on recalls of parts or equipment, as well as the impact of the court of public opinion; billions of dollars may have to be spent to fix the issue. The main types of projects you will be tested on include unique projects to create, as well as products, services, and processes. These could fall under many industries and under many different situations.

**Note**

The following list of items can be found in *The PMBOK® Guide – 6th Edition*, in table 1-1: Examples of factors that lead to the creation of a project.

Specific factors that lead to the creation of a project can be categorized as the following:

- New technology
- Competitive forces
- Material issues

- Political changes
- Market demand
- Economic changes
- Customer requests
- Stakeholder demands
- Legal requirement
- Business process improvements
- Strategic business opportunities or business need
- Social need
- Environmental considerations

**Tip**

It's a good idea to understand the categories that you will be tested on in the exam. This chapter's information is part of the initiation process group and will be part of *Domain III: Business environment*, of the exam.

## What is a program?

A program is a group of related projects that are managed in a coordinated way. Lots of organizations run programs because they can accomplish multiple deliverables or outputs and have a set group of best practices that can be utilized on all of them. Think about it this way: if you were building data centers at 15 locations, there would be some standard approaches you would follow at every site. This includes the process by which you order or transport materials, similar (if not the same) types of resources, how you create your process flow charts, and so on. Even if you had 15 project managers working at each location, some best practices would be applicable across all the same types of projects. You might be wondering how that could be considered unique since everything sounds the same, but remember: you are at different locations.

Different stakeholders have different needs for their data storage, different thoughts about the final result, various risk events, and even different scopes of work. One data center could be much larger than another and have different configurations. All those items make each project unique but similar enough that certain best practices and processes can be shared and implemented across the program.

## What is a portfolio?

A portfolio is a group of unrelated projects or programs. Organizations that run portfolios are typically large organizations with multiple products, services, or a rapidly growing organization that needs extensive updates for their departments and process integration. You could have one department creating the latest, most excellent software, while another could be improving the sales process and then another installing a data center at every global location. Some are temporary and unique projects, while others may be a program. It isn't outside the realm of possibility to assume that organizations that run portfolios are typically multi-billion-dollar global corporations.

Another way to look at portfolios is to imagine a stock portfolio. This could contain a variety of different items: a 401k (project), annuity stocks, tiered bond structures, and so on. You would have a portfolio manager who understands everything in the portfolio, even though everything is different for each client, who may or may not understand any or all of it. Some projects can be managed as a one-off, such as a 401k, while some are managed in a coordinated fashion as a group of related tech stocks (program), but either way, you need the portfolio manager to keep an eye on the entire thing to help you manage your money correctly.

Project and program management is most interested in completing projects and programs the right way, and portfolio management is all about determining the right projects or programs to initiate based on business or customer needs.

## Key phrases that pay

In this section and others, whenever you see any key phrases that pay, these are words or concepts that you will see in your exam. I always tell my classes that when you are reading the questions, some specific key phrases or words can point you in the direction of the correct answer.

In this section, these terms are as follows:

- Temporary
- Unique
- Program
- Portfolio
- Operations

If you can't define a project, program, or portfolio at this point, that's not a problem – you can quickly go back through this section and make sure you know the differences before carrying on.

## What is project management?

Project management can mean different things to different people based on their organizational dynamics and whether they are running projects, programs, or portfolios. In general, it is the project manager's job to utilize a set of best practices, tools and techniques, excellent communication, and coordination of all the moving parts to bring the result to successful completion. It takes a lot of skill and knowledge to manage a project effectively, which is why the majority of what you will learn about are the best practices that are specific to certain categories, such as scope, schedule, and cost. The goal is to be able to create an integrated plan that allows for effective coordination. Effective project managers have multiple skill sets in different areas.

The following isn't an exhaustive list, but an overview of some of the many skills great project managers have:

- Leadership
- Communication
- Requirement gathering
- Risk management
- Team building
- Time management
- Effective planning skills
- Solving problems
- Negotiation

If you are looking at that list and thinking you don't have experience in one or the other, don't worry! Even seasoned project managers are consistently working to achieve new skills in an ever-changing project landscape. For example, I'm not the greatest negotiator. I know this because I have a 21-year-old daughter who never fails to negotiate her way out of paying for anything! My money is her money, and her money is her money. All kidding aside, for me, negotiation improvement is an aspirational skill. I have to learn and practice. That is why having a road map of best practices you can follow enables you to learn or improve upon current or future skills, and this is also why certifications like this are so relevant. It shows you are focused on knowledge and improvement.

Other aspects of project management have to do with the life cycles of a project, which we will review in much more depth in just a bit. For now, it is essential to know that the content of *The PMBOK® Guide – 6th Edition* is **mostly considered** predictive project management, or as it is sometimes known, **waterfall project management**. There are considerations for Agile project management and tailoring best practices based on the needs of the project and organization. Plus, *The Agile Practice Guide®* is presented as a companion guide.

**Note**

*The Project Management Professional (PMP), PMBOK Guide, The Project Management Institute Agile Certified Practitioner (PMI-ACP), and The Agile Practice Guide* are registered trademarks of the Project Management Institute, Inc.

## Spot check exercise

Okay: before we go any further, I want to circle back and make sure everyone is ready to move on to the next section. Grab a pen or sheet of paper. Here is the setup: jot down at least three aspects of a project, program, and portfolio. Don't peek at the answers but keep in mind there isn't any right or wrong way to jot these down. Your answer may look similar or not. As long as you don't swap out one answer for projects and put it into programs, your take on the information can be presented in any way you like. My answers are just a way for you to keep a few things you'll need to know in mind:

Project	Program	Portfolio

## Spot check exercise answers

How did you do? The correct answers are listed in the following table:

Project	Program	Portfolio
Temporary	Group of related projects	A group of unrelated projects, or programs
Unique	Managed in a coordinated fashion	Determines the right projects, or programs for the organizations
Progressively elaborated on	May use similar processes, tools/techniques	Typically found in large organizations

**Tip**

The updated PMP® exam is 50% Waterfall and 50% Agile, so you'll need to be proficient in both to pass your exam.

Now that you know the definition of a project, we can take a look at the different types of project management and determine the differences between Waterfall and Agile project management.

## Types of project management

As a bit of a history buff, I'm always curious where some of the designations and best practices came from. This isn't in any way part of the exam, but it's interesting, nonetheless. Winston W. Royce was one of the significant influencing factors in project management. He began his career working on spacecraft projects as an aeronautical engineer. In 1970, he published a very influential article called *Managing the development of large software systems*, in which he presented several project management models, including what are known as waterfall, iterative, and agile.

The best practices you will learn about in this guide and your training program mostly fall under the category of waterfall or predictive project management. In *Chapter 5, Introduction to Agile Considerations*, you will cover some Agile best practices and standard frameworks. Why?

These days, it is a critical skill to be able to designate what best practices will work for your unique projects. The ability to tailor your best practices to your projects is a highly in-demand skill. That is why the Project Management Institute has determined that some knowledge of Agile is necessary.

I think it's realistic to cover what the differences are at a high level and then review Agile in more depth in *Chapter 5, Introduction to Agile Considerations*.

## Predictive or waterfall project management

Predictive project management is just that: you can predict what the result will be. If you are building a data center, you will end up with a data center. That doesn't mean everything will run correctly or it's in some way more natural. It isn't, except in the respect that everyone knows what the result is **supposed** to be. It is very typical for waterfall projects to have a formal change control system because we know what the expected outcome will be. Therefore, it is necessary to assess all the impacts of that change and create a solution that will probably work. These solutions need to be communicated and approved by the powers that be **before** they are implemented in the project.

Because waterfall projects are predictive, you will never see a change request that changes the scope of work exponentially from the original scope of work. If your customer wanted a bicycle but now wants a motorcycle halfway through the project, that isn't a change request, *it's a brand-new project*.

The other nuance of waterfall project management is that plans are made in advance because we can **predict** the result. Then, baselines are created, and all the work revolves around those plans until or if they change through formal change control – which, by the way, they always do. I see virtual nodding going on. I know you know what I'm talking about!

## Adaptive or agile project management

In an Agile environment, you would typically be working on highly technical projects such as developing software programs, although many organizations see the value in utilizing some of the best practices outside of software design. Mostly, Agile frameworks were designed for knowledge work, but Agile isn't just for software development anymore.

If you think of the word **agility**, which is the ability to think or move quickly, then you already understand this. Agile projects are not as predictive. You may only know in the beginning that your HR department wants a new payroll system. You have no idea what features they want yet, how they imagine the software working, and what the final result will be. Instead, you plan at the last responsible moment, and you work closely with the customer to collect requirements. If those requirements change, it's okay because you are only running in very short sprints or iterations. The team is only 1 week to 4 weeks into work at any given moment. Change is okay and is expected. Front-loaded planning isn't an aspect of Agile, and in fact, documentation without working products, services, or software is a colossal waste of time and provides no value to the organization. This is due to the rapid changes occurring regularly and the need to remain flexible. In *Chapter 5, Introduction to Agile Considerations*, we will cover the iteration cycles and critical aspects of Agile frameworks.

Another item to consider regarding the exam is some Agile concepts, Agile best practices, and predictive or hybrid methodologies. In this case, it is imperative to understand both sides of the house because there isn't a one-size-fits-all dynamic in project management – the **role delineation study (RDS)** led to the changes in the exam and the new exam content outline. That change shows a need for flexibility and having an understanding of more than just the *Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017*. This is yet another reason why working through the knowledge areas won't help put everything into the context necessary for you to pass the exam. I anticipate a reorganization of the guide very soon; that is, if this hasn't happened already by the time this book is published. **Context and having an understanding of the exam's content outline are key to passing the exam.**

#### Reference

The Project Management Institute also has the PMI®-ACP exam for Agile practitioners. If that is something you are interested in, please visit [www.pmi.org](http://www.pmi.org) and look for the information provided on the certification tab. *The Project Management Professional (PMP), PMBOK Guide, The Project Management Institute Agile Certified Practitioner (PMI-ACP), and The Agile Practice Guide* are registered trademarks of the Project Management Institute, Inc.

## Project and development life cycles

There are a variety of different life cycles that can be applied across many different types of projects. Of course, your EEFs and OPAs will drive much of the life cycle you choose. At a very high level, here is a breakdown of each type and whether they are predictive or adaptive:

- Predictive:

Scope, schedule, and cost are determined early in the project, and scope changes are managed carefully through formal change control.

- Iterative:

The scope is mostly determined early, but schedule and cost estimates are modified as the team gets a better understanding of the product.

Develop the product by using iterations and fulfilling a series of repeated cycles of adding increments to the functionality of the product.

- Incremental:

Deliverables are produced through a series of iterations that add functionality within a predetermined timeframe. The result will not be considered complete until the final iteration ends.

- Adaptive:

Agile, iterative, or incremental. The key word here is adaptive. The detailed scope is defined and approved before the actual execution of an iteration begins. It can be considered change-driven.

- Hybrid:

A combination of predictive and adaptive life cycles. If there are well-known aspects of the scope of work that are fixed, that part of the project can be run in a predictive way. Still, other areas of scope may be emerging and need a more adaptive approach.

It will be up to the project management team (read that as *the powers that be*) to determine what will work the best for the project that will be undertaken. There may be a need for life cycle flexibility in some instances, especially at the beginning of a project, where all the elements may not be as clear.

**Tip**

Here is where I remind you skimmers to read carefully. First, understand the difference between a product and project life cycle, then read carefully to select the best answer. Both look like the same thing if you don't read carefully. They are different.

Project life cycles are independent of the final product life cycle. The product life cycle is the series of phases the product travels through from concept to retirement.

## Project phases

Project phases are best described as logically related activities that produce one or multiple deliverables. Deliverables can be documentation or parts of the product, service, or result. There are a variety of labels we can use to measure, all of which are unique. These may be considered attributes, meaning anything you can *attribute* to the categories or labels. The following isn't an exhaustive list, and you may have your own names for the attributes of project phases:

- Name (Phase I, Phase II, and Phase III)
- The number of phases (this project is expected to have six phases)
- Duration (each phase may have a set duration or expected duration)
- Resource requirements (people, equipment, materials, and location)
- Entrance criteria (for entrance into the first or next phase)
- Exit criteria (completed deliverables, formal sign-off, and cohesive documents that have been completed)

Think about the phases you may have for your current projects. It's possible that you will label them based on the expected output of each phase, such as concept, feasibility study, design, prototype, test, milestones, and lessons learned review. These labels help you designate the type of work that will be done, the expected deliverables, and more.

The nice thing about phase-oriented projects, as well as the iterations in an Agile environment, is the ability to know what phase you are in at any given time, what you are attempting to produce, and the opportunity to not get too far into the scope of work without some go/no go decision or *phase gate review*, which is what we will be covering in the next section. Phase gate reviews allow us to carefully consider any corrective or preventative actions that need to be completed before exiting the current phase.

## Phase gates

Think about the last major road trip you took. You have a map, you know your destinations, and you have plotted out your route. Along the way, as you enter or leave a state or country, there is usually a checkpoint. This could be a security checkpoint where your passport is reviewed or for the authorities to determine whether you have any fruit or local vegetables in the car, as well as a garden variety of no-no's that can't be brought in or leave the state, province, or country. While traveling within the United States, there are a variety of toll booths that collect money to pay for the roads. You must stop, no matter what, in each example. These examples are equivalent to a phase gate review. What have you accomplished, and has it been completed to the point where you can move on to the next stage of the project?

Often, it will be the documents that track the completion of a phase, but also the performance to date, whether milestones have been met, and parts of the final deliverables are created and inspected. You may see different terms describing phase gates, and they may not align with your terminology. Either way, it should be reasonably easy to see the phase gate terms in a question and understand them, regardless of the terms being used in your current or future projects. These are as follows:

- Phase gate review
- Kill point
- Stage-gate
- Phase entrance/exit
- Go/no go decision

### Tip

Don't confuse process groups with life cycles. There may be multiple repeating process groups within a project, life cycle, or phase. For example, phase 1 would include initiating, planning, executing, monitoring, and controlling, and would close with a phase gate review. This would continue throughout the phases.

## Spot check exercise

Draw a line from the correct definition to the correct term. If you are on a Kindle, grab a notebook so you can play along too!

Scope, schedule, and costs are determined early in the project and scope changes are managed closely through formal change control		Adaptive
Deliverables are produced through a series of iterations that add functionality within a pre-determined timeframe. The result will not be considered totally complete until the final iteration ends.		Predictive
The detailed scope is defined and approved before the actual execution of an iteration begins. Can be considered change driven		Iterative
Develop the product by using iterations and a series of repeated cycles of adding increments to the functionality of the product		Hybrid
A combination of predictive and adaptive life cycles. If there are well-known aspects of the scope of work that are fixed, that part of the project can be run in a predictive way. Still, other areas of scope may be emergent and would need a more adaptive approach.		Incremental

## Spot check exercise answers

How did you do? Were you able to identify the correct project and development life cycles? I bet you did! Great job!

Scope, schedule, and costs are determined early in the project and scope changes are managed closely through formal change control.	<b>Predictive</b>	Adaptive
Deliverables are produced through a series of iterations that add functionality within a pre-determined timeframe. The result will not be considered totally complete until the final iteration ends.	<b>Incremental</b>	Predictive
The detailed scope is defined and approved before the actual execution of an iteration begins. Can be considered change driven.	<b>Adaptive</b>	Iterative
Develop the product by using iterations and a series of repeated cycles of adding increments to the functionality of the product.	<b>Iterative</b>	Hybrid
A combination of predictive and adaptive life cycles. If there are well-known aspects of the scope of work that are fixed, that part of the project can be run in a predictive way. Still, other areas of scope may be emergent and would need a more adaptive approach.	<b>Hybrid</b>	Incremental

All projects contain data and information that needs to be reviewed so that you can create a report on performance and make decisions based on that information.

# Project management data and information

I feel like I am being a bit precipitous in this section because the majority of what we'll cover here won't be considered until we begin to plan, execute, and monitor, and control. The fact of the matter is *The PMBOK® Guide - 6th Edition* wins every single time. In this case, *Chapter 1 of The PMBOK® Guide - 6th Edition, page 26*, goes through an overview of data and information that can be found throughout the project, regardless of the phases you use or don't use. These three items are *work performance data*, *work performance information*, and *work performance reports*. I believe I'm assuming this when I say that this chapter focuses on showing how the project data is collected and analyzed throughout the project, regardless of the phase or process group. I'll break them down here, and you'll see them again as inputs and outputs for several processes we'll cover.

## Work performance data

You know when you are chasing your team down and asking such questions as, "how long did that activity take you to do? Wait.... how long?? How much did you spend on it? How much?? Ugh..."? That is work performance data. It is the raw data you collect from your team when they are in the process of working the plans. Then, you go back to your desk and plug in the numbers. Typically, you do this using something called a **project management information system (PMIS)**. These are your software programs that keep things simple – a system for information management for the project. The goal of this is to have up-to-date data regularly so that you can compare it to your original plans.

## Work performance information

Once you have entered the data into your system, you will compare reality to the original plans or baselines. Typically, this is scope, schedule, and cost, but this could be other information across a variety of control processes. If there are any variances from the plan outside the normal, acceptable limits, then this is information that can be useful for the teams to determine what is necessary to adapt and adjust. This information also helps forecast future performance.

## Work performance reports

Work performance reports are where the information is communicated to those that need to know how the project is performing. Typically, this includes senior stakeholders, customers, and the like. We'll review stakeholder types in the next section, but ultimately, someone is going to want to know how the project is progressing and what your plans are to correct any actions or prevent future problems.

Typically, all three of these actions are done weekly, if not bi-weekly.

**Note**

For the exam, you can remember the order of the three types easily. They go in alphabetical order — data, information, reports.

## Key phrases that pay

For this section, these terms are as follows:

- Predictive
- Iterative
- Incremental
- Adaptive
- Hybrid
- Phase
- Phase gate review
- Work performance data
- Work performance information
- Work performance reports
- Project selection techniques
- Business case
- Benefits management plan

There are a variety of reasons why an organization would choose to sponsor or select a project. Different categories for project types will be covered next.

## Project selection techniques

There are many reasons why an organization would decide to run a project. As we've mentioned earlier in this chapter, businesses are in the business of making money, but they are also known to run projects for the greater good.

The categories of why projects may occur include the following:

- Market demand
- Business needs or opportunity
- Requests from customers
- Advances in technology
- Legal or regulatory compliance
- Environmental considerations
- Social need

Regardless of the reason why a project may occur, businesses need to validate their reasoning for taking on a project and determine whether it is feasible and fiscally healthy to do so. Usually, in the first few stages of determining what project to undertake and how it can help align the organization's strategic plan, there are numerous decisions to make about which project to select and how much to spend.

The business case is the main driver during pre-project initiation.

## Creating a case for business

It is not unusual for a business analyst to be involved in validating a project and project selection. After all, the organization needs to make sure that whatever they spend their money on aligns with the intended **return on investment (ROI)** or the outcome they were hoping for.

Because the global economy fluctuates so much, a business analyst will look at several different financial models and make an educated guess on expenditures and ROI. Although a business case isn't 100% money-oriented, the majority of project decisions rest on financial considerations. This can help executive management and key stakeholders understand the initiative from a financial perspective and weigh in the results from a scope perspective; this helps them decide whether it's actually worth it to charter the project.

The business' needs and justification can also come in the form of high-level estimates of an overall project budget, a predicted result for the scope of work, and possible timelines that work with the expected return on financial investments. This helps the prospective project manager understand project work from a business perspective.

Trust me when I say that even after all the financial analysis that goes into developing a business case, that analysis can have a larger margin for error, which means that when the true scope of work has been determined, the business case has some financial holes in it. This is why the project manager will gather scope requirements and build a schedule and a budget around what is actually going to occur at the fine-grained level – and even then, they could be wrong. There is a better chance of getting close to the right numbers once the project has been planned and understood. It's the project manager's job to determine whether the crunched numbers are feasible at the beginning of the project. That is why, in some cases, the project manager is a contributor to the process of project selection and may be part of the selection committee. Still, other times, all this analysis is done in spite of us as we happily go about our day, not knowing that a new project is being considered until we contribute to the project charter and are formally assigned to the project.

To narrow the gap of how wrong the analysis can be, there are several categories of techniques that can be used to analyze the costs versus the benefits:

- Decision models
- Economic models
- Constrained optimization
- Expert judgment

Let's start with the decision models.

## Decision models

Most organizations use decision models to determine projects to select for charter. The reasoning behind this is that there is a set, fixed criteria that is pre-approved or agreed upon by the selection committee. Decision models is more of an umbrella term that covers multiple methods. Most decision models are a combination of benefit measurement methods and constrained optimization methods.

The following are benefit measurement methods:

- Cost-benefit analysis
- Scoring models
- Payback period

The cost-benefit analysis is an important aspect of determining if the project is worth the money.

## Cost-benefit analysis

An easy way to think of a cost-benefit analysis is to look at both what the project will cost and whether it's worth it to undertake said project with limited information. Predicted costs versus the benefits to the organization will be analyzed. In this case, it is mostly money-oriented. A benefit-cost ratio takes into consideration the **Benefit/Cost** formula. Keep in mind that the numbers that are being analyzed are based on expert judgment, the historical information of similar projects, and projections in the current market.

### Tip

You probably won't be asked to calculate benefit-cost ratios in the exam, but you may be asked to determine which is the best project to select based on its benefit-cost ratio.

The result will be represented as a ratio. For example, if we assume that our organization will receive a return on investment of \$500,000 and we will have to spend \$300,000 to make that happen, our BCR = 1.67, which could be construed as an ROI of 167% return. Conversely, if we spend \$500,000 and get \$300,000 back, we would have a BCR =0.6 or a 60% ROI, which isn't a good result. That project may be considered too financially risky to take on.

### Tip

Always choose the highest BCR on exam questions. The higher the better.

Determining which projects to charter hinges on many different variables. In some cases, a scoring model may be utilized to make the best decisions.

## Scoring models

Scoring models are utilized by organizations when they are attempting to compare multiple variables when making project selection decisions. Typically, the model has a scoring structure and a weighting structure so that each potential project can be analyzed based on a variety of information. Because this type of decision method contains both financial and other considerations for project selection, it allows key stakeholders to determine which variables are the most important or carry the most weight. Stakeholders will then use their current knowledge of the project to score each consideration accordingly. Certainly, financial considerations are part of that process, but there may also be categories for industry growth, increased product value in the market, or a key opportunity that may or may not have been realized.

Because the scoring model is a standard organizational model, there may be some project potentials that don't even make the cut due to a low score or missing key aspects on the list. This allows everyone on the selection committee to view a variety of both objective and subjective categories, and then make the best decisions they can based on what they know for sure today. Similar scoring models are used in vendor selection for procurement decisions, which may be part of project selection as well.

How quickly an organization gets its money back and generates a profit is a consideration as well.

### Payback period

The payback period is exactly what it sounds like. How long will it take before we recoup the money that's been spent on a project before we realize value? Typically, this is in the format of money, but it doesn't have to be. Value can be different things to different people. Spending money to improve a process or product may cost money to complete and the value is a leaner process flow, better quality management, and so on, which can save or gain money in the future.

#### Tip

For exam purposes, the majority of the questions will be based on the premise of how much the project will cost, as well as how quickly the invested money will be paid back before the organization begins to make a profit. Some payback periods are faster than others, and that is the best-case scenario for organizations since today's money isn't going to be worth the same tomorrow. The faster the payback period, the greater the ROI is for the organization.

Think about the biggest blockbuster movie you have seen recently that made millions on its opening weekend. It may have taken 2 years and 25 million to get to opening night, but the studio made 95 million opening weekend and continues to make money in theaters. The payback period was fast and profitable. Conversely, studios that make a huge flop may never get their original investment back. This is typically why organizations gather as much information as they can in the business case: to attempt to make educated guesses based on historical information and provide expert judgment.

#### Tip

Always choose the fastest payback period if it is the only variable in the question. For example, project A has a payback period of 5 years and project B has a payback period of 3 years – which project do you select? Project B. When you review the economic models, you'll see why only using the payback period is the least influential selection method compared to other methods.

When an organization is making financial decisions about chartering a project, they will typically need more in-depth information. Economic models can provide that information.

## Economic models

Different economic models can provide more in-depth data about the overall financial potential of any given project under consideration. There are three core economic models that can be used to develop a business case:

- Discounted cash flow
- **Net present value (NPV)**
- **Internal rate of return (IRR)**

Return on investment is always a topic of conversation during project selection, and understanding potential future returns is a necessary analysis.

### Discounted cash flow analysis

Because businesses are in the business of making money, it makes sense that they would want to know what the future financial return will be worth. Determining discounted cash flow involves three very specific variables that help in determining the present value of today's money (in today's market), and you then apply that to a potential future return on investment:

- The first thing you must do determine the payback period or the time that it is projected to take to recover the initial investment.
- Then, the analysis will focus on determining what's going on in the market and figuring out the applicable discount rates, which are typically the current interest rates. Some consideration for inflation could be involved as well.
- The third consideration is the assumed amount of money the organization will recover in the future.

Even though discounted cash flow analysis could be considered subjective analysis, it is actually more objective because we are looking at the assumed payback period, as well as the present value of today's money and the potential return on investment in the future. Remember, some projects are chartered because of a customer request, so the analysis could be based on promised returns that have already been discussed, thus making the analysis more predictable.

Perhaps the most influential is an analysis of net present value. What is today's money worth tomorrow and how does it affect profit? That is a question that needs answering for project selection.

## Net present value

If more specific details are needed, then the **net present value (NPV)** can be used to see a potential net gain or net loss that your organization will incur in each period or timeframe, which is then discounted to today's values. This allows organizations to see the financial health of the potential project plotted out over time and determine which costs and/or revenues will be realized. The payback period strongly influences net present values when trying to determine what today's money will look like in the future. Net present value is an extension of discounted cash flow analysis and can provide some more specific information that can be used to make decisions. Basically, NPV analysis is the process of taking expenditures, net gains, and net losses for each potential year in an attempt to determine whether the project will return enough net revenue to keep up with the cost of capital over time.

**Tip**

Always choose the highest net present value as the correct answer in the exam. Even if the payback period is documented in the question, that information has already been processed in the formula and should not be considered when choosing the correct answer.

Even though organizations would prefer to make more money than they put into a project, on occasion, that won't be the case, either by accident or for a very specific reason. That specific reason could be regulatory compliance. An organization would have to spend money now to update a process to become compliant so they can become profitable later or improve the overall business. Some organizations need to make investments in new equipment, where the value is not necessarily profitable.

Business analysts and the organization would still most likely do a net present value analysis to determine whether the expenditures could be realistic, but since there isn't a payback period to consider, it might just be a forecasted return on investment. In general, organizations aren't in the habit of taking on financial losers and, more than likely, selected projects will have the highest net present value as possible.

## Internal rates of return (IRR)

**Internal rates of return (IRR)** allow the organization to determine profitability as well.

IRR is also considered during product selection because the process allows the rate of return on the project to be calculated, without any external factors to consider, such as inflation or the cost of capital. IRR also considers the time value of money and is designed to look at returns on investments, as well as what they are worth today versus what they might be worth in the future.

A return on investment that occurs tomorrow is worth more than the same return 2 years from now. The longer the return on investment takes, the lower the internal rate of return becomes. In general, organizations can use an internal rate of return as a litmus test for profitability. Then, by using net present value, the organization can attempt to prove the net value if an investment is made.

An easy way to think about the internal rate of return is to consider walking into a bank and asking about opening a savings account. The financial advisor at bank A states that if you put your money with them, you will get a 1.0 percent return on your investments. The financial advisor at bank B states they will give you a 3.5 percent return on your investment. Which one would you choose? I'm betting you would choose the latter. Organizations are no different.

**Tip**

Always choose the highest internal rate of return that's represented as a percentage.

It is the job of business analysts to crunch the numbers and look to the future to determine the best decisions to make financially. Those considerations can help organizations select the best projects. There are also big scary formulas involved with all of these, but the good news is you don't need to know them for the exam!

A good way to keep these all straight is to always choose the highest number, except in the payback period, where you would want to choose the lowest. If the question contains all three variables, then review each project and determine which would be most profitable for the organization. Typically, in an exam situation, the net present value is the key indicator of a profitable project.

Some organizations will also use mathematical models and computers to crunch the numbers for them.

## Constrained optimization

In the very simplest of terms, constrained optimization methods are mathematical models that can be used in very large projects. You should use constrained optimization methods if you need comprehensive calculations, though you can leave it to computers to figure this out. There are several techniques that can be utilized in constrained optimization, and they are as follows:

- Linear programming
- Nonlinear programming

- Integer programming
- Dynamic programming
- Multiple objective programming

The good news is that you don't need to know or even understand the constrained optimization methods for your exam, but what you may have to identify is **constrained optimization** when the question is asking about computer models and programming for project selection.

Perhaps the most important aspect is to consider experts in the field of project selection since their opinions and expertise can drive decisions as well.

## Expert judgment

If there's one tool that is utilized more than any other in project management, it would be expert judgment. Whether it's the beginning, the middle, or the end of the project, utilizing expertise from a variety of stakeholders, subject matter experts, consultants, and business analysts makes sense. In project selection, there will be numerous key stakeholders involved who can provide a variety of historical information, lessons learned, and even opinions as to which projects should be selected.

The downside to only using expert judgment to select projects is the potential for **groupthink**. Groupthink is when a group of people is trying to make decisions that they all agree on, and the stronger personalities believe they are correct and convince others to go along with their ideas. Unfortunately, some organizational politics are key influencing factors in project selection. This is why PMI® recommends knowing other project selection techniques, such as the ones you just covered (at a high level, at least) so that if you become the expert judge for developing the business case, you know what you're looking for and how to make the best decisions.

## Spot check exercise

Based on the project selection techniques we've gone over, determine whether you should choose the highest or lowest result based on the analysis. Place a checkmark or an "X" in the box you think it should be. Don't worry, you've got this!

Project selection techniques	Highest	Lowest
Payback period		
Internal rate of return		
Net present value		
Benefit cost ratio		

## Spot check exercise answers

How did you do? Keep these in mind for your exam. The simplest way to discern the best answers for the exam is by reviewing different projects for selection:

Project selection techniques	Highest	Lowest
Payback period		X
Internal rate of return	X	
Net present value	X	
Benefit cost ratio	X	

No matter what, all organizations need to determine whether the project they are considering is even feasible to accomplish.

## Feasibility analysis

All these specific project selection techniques are designed to help the organization determine whether the project can be kicked off and is financially healthy enough to meet the needs of the business. Much of the analysis of feasibility will depend on expert judgment and will be based on your organizational processes and your enterprise environment, not just the financial ROI.

Once all the analysis has been completed, a business case is developed as a way to promote a project and its benefits to the organization.

## The business case

To make a case for the business to take on a project, multiple variables must be considered outside of just the financial considerations. Because this is the very first document to be created on a potential project, it is an important piece for any go/no go decision. There are typical headers that are found in most business cases that describe a variety of items that should be considered by the selection committee.

The executive summary is first on the list but is usually the last to be written. It describes what the selection committee believes are the top key points for consideration.

Other headers may include the following:

- Issues that the project is addressing
- The anticipated outcomes
- Any recommendations from the selection committee
- The business case analysis team
- The problem definition and statement that describes why the project is under consideration
- The organizational impact of the project
- Technology implementations
- Project overview and description
- Goals and objectives
- Expected project performance
- Any assumptions or constraints
- Major milestones
- Strategic alignment
- Cost-benefit analysis
- Alternatives analysis
- Approval signatures

As you can see, a business case can be very comprehensive, even given the fact that not much is really known about the true breakdown of project scope, actual costs and schedules, and the need for resources at this point. Remember that in a predictive environment, it is easier to see the finishing line at the beginning of the race because everyone knows where the finishing line should be, which means benefits and project selection decisions are a bit easier to make.

## Key phrases that pay

The key phrases for this section are as follows:

- Market demand
- Business needs or opportunity
- Requests from customers
- Advances in technology
- Legal or regulatory compliance
- Environmental considerations
- Social need
- **Return on investment (ROI)**
- Decision models
- Economic models
- Constrained optimization
- Expert judgment
- Cost-benefit analysis
- Scoring Models
- Payback period
- Discounted cash flow
- **Net present value (NPV)**
- **Internal rate of return (IRR)**
- Constrained optimization
- Linear programming
- Nonlinear programming

- Integer programming
- Dynamic programming
- Multiple objective programming
- Feasibility analysis
- Business case

Don't let this long list of terms make you nervous. It is unlikely that you will get questions on all of them, and we still have to review the project charter and identifying stakeholders in the next chapter. That chapter will contain the bulk of the content for initiation questions. Understand what the results are telling you in project selection and the reasons or categories why a project would be chartered, or selected, in the first place, and you should be good to go.

## Key project stakeholders

What kind of stakeholders you may have on your projects depends on your project and your organizational dynamics. Some stakeholders come and go, and some stay with you through the entire project. In *Chapter 4, Charters and Stakeholders*, you will review the strategies that are used to identify your stakeholders. Remember that this is one process that is executed throughout the project. It is iterative on the exam. This may not occur in the real world (you're super lucky if so!) but for the exam, you can expect a revolving door of stakeholders throughout the situations that you'll need to analyze when choosing the best response to the questions.

The following is not an exhaustive list, and to be fair, they may not be the titles of the roles for your projects. If you don't have a sponsor, that's okay! These will be the players you need to know about. It is your sole responsibility to manage stakeholder engagements and expectations. There... the perfect world steps out to play. We can't always manage expectations, but we can try and manage our stakeholder's needs and expectations to the best of our abilities:

- **Project management office (PMO)**
- **Change control board (CCB)**
- Sponsor
- Functional manager
- Procurement administrator/vendors
- Customers/end users

Let's start with PMOs.

## Project management offices (PMOs)

If you have a PMO in your organization, then you already know that their primary role is to standardize the governance of projects across the organization. They are overseeing the resources, methodologies, tools, and techniques as a way to provide direct support and management to one or more projects.

There are three different and distinct categories of PMO that may exist in organizations. The differences could be based on the organizational processes and the amount of structure they want on their projects. It takes time, effort, and knowledge to get it up and running and adapting to stricter controls. The three types are supportive, controlling, and directive. Let's take a look at each of them individually.

### Supportive

A supportive PMO is like a project management consultant that you might go to for advice on best practices, what kind of templates you can or should use, and project management training for team members. They can also serve as a repository of project information and lessons learned. They may even have cookies! The control of a supportive PMO over aspects of project work is very low and is typically the first step in setting up a PMO organizationally.

### Controlling

It sounds a bit like what it is. A controlling PMO provides much more support and, in return, expects much more control and compliance. They may control what frameworks or methodologies are utilized for projects, what kinds of specific templates, tools, and forms are used, as well as ensuring conformance to governance frameworks (how the project is governed or run) is well known and well controlled.

### Directive

It may sound like the controlling PMO is holding the reins for the entire project, but it is the directive PMO that falls squarely under that category. Directive PMOs take control of the project and directly manage them. If you are a project manager working in a directive PMO, your work will be assigned to you by the PMO. The degree of control is high. In *The PMBOK® Guide – 6th edition*, on page 49, you will see a variation of the following list of functions of a PMO in an organization:

**Reference**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017, page 49.*

- Support the project manager.
- Manage shared resources across multiple projects administered by the PMO.
- Determining project management methodologies that are more effective, and the best practices and standards that support that initiative.
- Coaching and mentoring.
- Monitoring compliance of policies, procedures, and templates used by performing an audit.

**Note**

You will see several audits as we go forward. There are project audits, risk audits, quality audits, and procurement audits. Any time you see the word *audit*, I want you to think of the word *process*. All audits check the process by which we run projects, quality reviews, whether what we are doing to mitigate risks is working, and that the procurement process worked well. A PMO will audit whether you and your team are following the rules of the processes laid out by the PMO.

- Coordinating communications across projects.
- Make recommendations.
- Provide knowledge transfers.
- Terminate projects as needed.

Having a PMO in your organization provides the support system we might get otherwise, and helps us understand that a department understands what is happening in your projects and the information or support that is needed. Now, it may not always feel that way. You may ask for additional resources and receive a resounding no for your efforts. Don't take it personally – they are trying to do what is best for all projects organizationally, and your project may not be the priority at this time. Yes, yes, I know all our projects are always a priority...to us!

Another influential stakeholder is the change control board.

## Change control board (CCB)

The change control board is exactly what it sounds like as well: a board of people whose only job function is to deny change requests. Er...what I mean to say is a board of people who analyze change requests and determine if the change is necessary and if the solution you have presented is a sound one. I always go with two solutions: the one I want and the one I can live with. It doesn't mean I'll get a yes, but at least I tried. The CCB may even be part of the PMO, but typically, in your exam, it will be presented as its own entity. We will cover formal change control in *Chapter 14, Integration Management*. Just because there is a CCB doesn't mean the onus of all the changes rests in that department. We have a role to play, and so does our team. After all, we are the ones doing the work, tracking performance, and seeing if a change is even necessary. If it is, then we assess the impact of that change on the other competing constraints of scope, schedule, cost, quality, risk, and resources. Then, we determine the best solutions for the problems, and only then do we go to the CCB for approvals.

### Note

The exam assumes an integrated change control system and a CCB. There is the assumption in the exam that any changes would have to go through the CCB. This keeps things out of the gray areas in the exam. In the real world, you may only go to the CCB to approve significant changes to the scope of work, schedule or cost performance, or defect repair on the quality side, whereas smaller changes would be approved by the sponsor or even you as needed.

The project sponsor plays a major role in projects and is also there to help you manage your project effectively.

## Sponsor

A project sponsor is a person who has several responsibilities during project work but isn't necessarily the project manager's direct manager. Remember, you have a PMO who may delegate how all this works in the real world. Typically, when you think of the sponsor, you may think "*the person who pays or delegates the funding for the project and approves changes to the inevitable budget and baseline.*" They have other responsibilities too, which may include being a champion for the project to help get it chosen and chartered. They may also be the direct link between a project that has been selected and what project manager has been assigned to that project. It's entirely possible that the sponsor will be the one contributing to the business case with the initial scope of work, and then they will support the PM as they collect requirements and plot out the scope of work during the planning phase.

The sponsor is also the one who creates the project charter or is responsible for it. The project manager may be a contributor to the charter as well. Remember that, in the next chapter, we'll go through the charter and its elements. The sponsor will also be in the loop with project updates and part of the approval process for completed deliverables. Much like the PMO and CCB, the sponsor is a key and essential stakeholder.

## Spot check

See if you can identify the correct answers regarding who does what between the project manager and the project sponsor. Circle the right answer for each:

	Project Manager		Project Sponsor	
<b>Everyday management of work</b>	Yes	No	Yes	No
<b>Project funding</b>	Yes	No	Yes	No
<b>Accepts project deliverables</b>	Yes	No	Yes	No
<b>Creates the project charter</b>	Yes	No	Yes	No
<b>Identifies initial scope of work</b>	Yes	No	Yes	No

## Spot check answers

How did you do? Let's find out!

	Project Manager	Project Sponsor
<b>Everyday management of work</b>	Yes	No
<b>Project funding</b>	No	Yes
<b>Accepts project deliverables</b>	No	Yes
<b>Creates the project charter</b>	No (contributes but doesn't create)	Yes
<b>Identifies initial scope of work</b>	No (Not until assigned to the project and then they collect scope of work requirements and create a baseline)	Yes

In many cases, you will need to borrow resources from functional departments, or you'll find that those departments are the end users of your project's deliverables.

## Functional manager

Functional managers are the ones in charge of their departments and are typically involved in organizational operations – sales, marketing, HR, IT, and the like. They will have a team that is loyal to them and works in the functional department. So, why might they be a stakeholder? It is assumed that, unless otherwise stated in the questions, most scenarios presented in the PMP® exam function within a strong matrix. This means you may have a core team as a project manager, but you may also need to borrow experts from functional departments or via procurement. This is to make sure you have a high-performing team with the skills you need to help the project be the most successful it can be. Once you've borrowed their resources, both the resources and their functional manager are stakeholders of the project until you release those resources to their functional departments.

As your project progresses, you may see a need for external suppliers of materials, equipment, or even human resources.

## Procurement administrator/vendors

At some point in the project, it may be necessary to acquire people, equipment, and resources from outside of your organization. You will review procurement processes in depth in *Chapter 12, Procurement Management*. The procurement administrator is the person who oversees the negotiations and legal aspects of a contract or agreement. You are not expected to be an attorney, and it is assumed that you are not able to contractually bind your organization to that of another in the exam. You may be able to do so in the real world, but not the exam. It is also assumed that, unless otherwise stated in the questions, you are the buyer and not the seller. Therefore, you would need an internal procurement department to manage the contractual side of project management. This doesn't mean you wouldn't work closely with the department because you understand the scope of work and the needs of the project. You're involved, but just not in the legal matters, such as protecting your organization from future litigation or unnecessary future costs.

Vendors, on the other hand, are assumed to be the sellers, and you could see suppliers, sellers, vendors, and so on describe the external providers of resources. You will have a significant role to play in selecting the potential sellers you need on your projects, and you may be involved in the selection process by analyzing bids and the needs of the project.

Perhaps the biggest stakeholder to understand is the customer or end users.

## Customers/end users

The customer is a key stakeholder and is the person or group we are doing project work for and for whom we are producing deliverables. The customer can be internal or external. Remember that I'm using this term as a placeholder for any person who will receive the results of project work. End users are the same. They will be the person or group who will be using the product, service, or result. End users may be part of the scope definition if they are well known. If you are mass producing cell phones, then your end users may be a bit fuzzier. Instead, you would use a placeholder for them as well based on sales, surveys, focus groups, and the like to provide the information needed to understand end user requirements. It could just be Bob in IT who is using a specialized software program just for him. Bob, thank you for your efforts!

## Key phrases that pay

The key phrases for this section are as follows:

- **Project management office (PMO):**
  - a) Supportive
  - b) Controlling
  - c) Directive
- **Change control board (CCB)**
- Sponsor
- Functional manager
- Procurement administrator/vendors
- Customers/end users

How your organization functions is perhaps the biggest help or hurdle you will experience during project work. Understanding organizational structures goes a long way to managing your project work.

## Understanding organizational structures

Much of your day-to-day life running projects will be significantly impacted by your organizational processes and the culture of your organization. This could be based on your industry, what regulatory compliance is necessary, or simply because of how your organization chooses to run things.

The most significant impact on how these processes evolve is based mostly on how your organization is structured. Some structures are better than others for projects, and sometimes, trying to implement new best practices can be a bit painful due to your organizational influences.

In perfect-world project management, it may be necessary to restructure the organizational dynamics to accommodate projects. Some organizations began as a siloed functional organization and expanded and grew into something more effective in the project management space. This takes time and effort, though.

In my experience, when organizations attempt to massively change their structure to something more conducive to their current business needs, the entire organization goes from the status quo to chaos. Unfortunately, many times, organizations state that the new set of processes are not working instead of understanding that change causes chaos, and it takes time to reach the new normal.

I've seen organizations I've consulted with try too many new things at once and put their staff into a tailspin. I always recommend they try a few new things until they are proficient and then add new skills as needed and use the same approach. There is still chaos, but the chaos is minimized to only a few changes at one time. I stick to the rule of three, meaning no more than three new things are implemented at any given time, perfected, and then adapted as needed before the next three are chosen to be implemented. Continuous improvement is the name of the game.

You might be asking yourself where these magical organizations that try new things to improve best practices are. Trust me; I get it. Lots of organizations are like a squeaky wheel that never gets fixed but are so set in their organizational processes that change isn't an option. So, what is a project manager to do?

Without proof something works, the wheel will always squeak. That is why it is so awesome that you are learning this information and preparing for your exam. Once you begin trying new best practices to improve your projects and they are working, you will have the proof to back it up and the respect that comes from your position and your certification. My most significant rebuttal in project management after I was told to do things a certain way was, "yeah, but... there is a better way." A resounding "NO, we don't do things that way," followed that sentence!

Change is painful and chaotic, and we have enough going on every day, so I give you the same advice. Outside of exam prep (because you'll need to know all the information), try one to three of the new best practices you'll learn about in this guide when working on your next project. If it doesn't work out so well, try again in a different way that better matches your system in the real world. Before you know it, you'll have the proof you need to show your organization the value of doing things a bit differently, and trust me – if it saves them time or money or improves the quality of the result, they will listen, and change will come.

One more thing to consider is how your organization is structured. Different structures and dynamics can help you or make your life more challenging as a project manager. Once you know your structure, you can adapt to the implementation of best practices accordingly. Some structures are designed for project management and may be more open to better best practices, while some are more focused on departmental operations and may be less than enthused about changes.

Let's review the descriptions of each dynamic. As you go through them, try to identify the one you are currently working in.

**Tip**

You will get questions on your PMP® or CAPM® exam based on these descriptions. Be prepared to read a situational question and, based on the key phrases, identify which project organizational structure the question is describing.

## Organizational structures and their elements

There are numerous ways an organization can be structured. Many of these structures are conducive to projects being run on a regular basis, but some aren't. It is important to not only understand the structures for the exam, but also to be able to identify the structure you are currently working on and how it impacts your ability (or lack thereof) to manage your projects.

My boss, who is also a PMP®, mentioned to me one time that the biggest takeaway he had from *The PMBOK® Guide - 6th Edition*, was being able to identify and work within different corporate structures, and the understanding of such structures enabled him to adapt and adjust as needed. Pretty cool!

The following table can be found in *The PMBOK® Guide – 6th Edition, page 47.*

Note
<i>Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017.</i>

I like this table because it gives you a very succinct overview of the structures and their key components. This can also be used for study purposes. You will come across questions where you need to identify the structure based on key phrases and what is going on in the organization. I'll rework the same table shown here to help you keep everything in one place. The following table shows the variety of characteristics that make up organizational dynamics:

Organizational Structure Types	Project Characteristics					
	Work Groups	PM Authority	PM Role	Resource availability	Who Manages the budget?	Admin staff
Organic or simple	Flexible; people working side by side	Little or none	Part-time; may or may not be a coordinator	Little or none	Owner/operator	Little or none
Functional (centralized)	Departmental jobs being done (HR, engineering etc.)	Little or none	Part-time; may or may not be a coordinator	Little or none	Functional manager	Part-time
Multi-divisional	One of: Product; production; portfolio; program; customer type; geography	Little or none	Part-time; may or may not be a coordinator	Little or none	Functional Manager	Part-time
Matrix-strong	By job function, with PM as a function	Moderate to high	Full-time designated role	Moderate to high	Project manager	Full-time
Matrix-weak	Job function	Low	Part-time; may or may not be a coordinator	Low	Functional manager	Part-time
Matrix-balanced	Job function	Low to moderate	Part-time; embedded in the functions as a skill, may not be a designated role like a coordinator	Low to moderate	Mixed	Part-time
Project oriented (Composite, Hybrid)	Project	High to almost total	Full-time designated job role	High to almost total	Project manager	Full-time
Virtual	Network structures with nodes at points of contact	Low to moderate	Full-time or part-time	Low to moderate	Mixed	Could be full or part-time
Hybrid	Mix of other types	Mixed	Mixed	Mixed	Mixed	Mixed
**PMO**	Mix of other types	High to almost total	Full-time designated role	High to almost total	Project manager	Full time

\*\*PMO, in this case, refers to a portfolio, program, or project management office or organization\*\*

Figure 3.2 – Project Characteristics

It's probably fairly easy to spot the organizational dynamics you do and do not want to be working on as a project manager, and many people in my classes do a deep sigh because they are working in functional or weak matrix organizations. Over the years, though, there have been fewer and fewer people sighing because many organizations globally recognize the need to adapt their structure in order to accommodate the changes in technology, projects, products, and services. I'll cover the main configurations so that you know what to look out for on the exam. Having a cheat sheet is great at a high level, but remember: this exam is situational and there may be small, nuanced differences in the questions that alert you to the type the exam is referring to.

Let's start with functional organizations.

## Functional organizations

Functional organizations are a bit dysfunctional for project managers in that all the work is done in a siloed approach to business. The functional organizational dynamic has been around for hundreds of years and was very effective during the industrial revolution. Since functional organizations have been around for so long, many businesses are still structured that way. This makes it difficult for project management to truly be a part of our day-to-day lives. If a functional department completes a project, then the functional manager runs it, rather than a project manager.

Some of the key aspects of functional organizations include the following:

- The manager of each department is in charge, rather than a project manager.
- If a project is completed in the department, someone may be assigned to help with the project but may not be given the title of a project manager. Instead, they may function as an expeditor who helps move work along and supports the functional manager part time. In some cases, they may be a coordinator who has a bit more responsibility but still reports to the functional manager.
- If there is a project manager, they may be part-time and have very little authority over project work or project team members.

It may sound like this type of dynamic is impossible for project managers to work with and that the project is automatically set up for failure. That isn't the case at all. If you are working on a project in a functional department, you know you have your **real job** to do, but you are also helping your department get something new accomplished. This helps the department become more successful. This is also where a lot of newer project managers get their start either coordinating or, in part, managing a functional project.

There may also be a large project in a department that would best be executed with a full-time project manager who would then return to their day job once the project has ended. In short, functional departments may not be the best place to manage projects, but it is done successfully every day. Many times, jumping in to help run a project that involves a smaller base of similar stakeholders allows for better best practices to evolve organically. Team collaboration and communication are important aspects of success in any project environment but highly necessary in a functional dynamic.

Matrix organizations come in three different categories of matrix: weak, balanced, and strong.

## Matrix organizations

Matrix organizations are typically developed in one of three ways, depending on the organizational processes and how integral projects are to the organization. In fact, the three types almost show a progression that organizations would have to take to get to the point where project work is as important as functional or operational work:

- Weak matrix
- Balanced matrix
- Strong matrix

Let's take a look at the weak matrix first.

### Weak matrix

In a lot of ways, the weak matrix is similar to functional organizations because the organization itself is more focused on operational, functional work, versus project work.

Some of the key aspects of weak matrix organizations include the following:

- Operates in a functional, hierarchical design.
- The project manager has low to moderate authority and may work with some full-time and some part-time resources. Typically, resources are part-time on project work.
- The functional manager is in charge, and your role may be that of an expeditor or coordinator who works part-time on project work and has a position on the functional team.

## Balanced matrix

Balanced matrix organizations put an equal emphasis on functional work and project work. That means power is shared between functional and project managers. Even though it may appear that you have low to moderate authority, the chances are higher that you will have more power over project tasks and project work.

Some of the key aspects of balanced matrix organizations include the following:

- The balanced matrix emphasizes an equal focus on operational, functional work, and project work.
- The functional manager is still in control of the resources, so they may be the ones to assign resources to the project, but you may be assigning those resources to project tasks and managing those tasks accordingly.
- The resources could be loyal to the functional manager, which can cause some power struggles with the project.
- Improved communication inter-departmentally is an important aspect of a balanced matrix dynamic.

## Strong matrix

Now, project managers are getting somewhere! In a strong matrix, dynamic project work is emphasized over functional work. That doesn't mean you don't have functional departments working their operational work – you do. The difference is that project managers have full-time authority over their project team, project scheduling, and budgeting and are accountable for the requirements being met. There may actually be a **Project Management Office (PMO)** overseeing projects, programs, or portfolios, depending on the size of the organization and its products and services.

Some of the key aspects of strong matrix organizations include the following:

- The core project team helps the project manager plan and execute the work.
- The project manager is in full control but may borrow resources from functional departments or via procurement staffing as needed.
- Borrowed resources would be loyal to the functional manager but focused on project work and answer to the project manager during their role in the project. Then, they are released back to their functional departments when their work ends.
- The project manager and project team are full time.

**Note**

Many questions in the PMP® exam assume a strong matrix is an organizational dynamic, unless otherwise stated in the questions. Why? Because it is the first dynamic that gives the PM full power over the project, budget, schedule, and the team. But you may have to acquire resources from outside of your core team. It is also the first logical dynamic to be able to accommodate all or most of the processes, and project-based organizations are few and far between unless they are large global corporations.

Perhaps the best dynamic is project-based.

## Projectized or project-based organizations

Just as the names of these organizations suggest, it's projects all day, every day. This type of organizational dynamic is the best for project managers for many reasons, but it is difficult for organizations to attain unless it was set up that way from the beginning. Many large organizations such as Apple, Amazon, Walmart, Microsoft, and the like could be considered project-based organizations because there are so many products, services, and processes happening all the time. It would be impossible to produce all of that in a functional environment.

Some of the key aspects of project-based organizations include the following:

- Most – if not all – of the team is co-located.
- The project manager has full authority.
- Support staff reports to the project manager, including borrowed resources, as needed.
- The core project team doesn't report to anyone else, so their loyalty is to the project manager and the project.
- Often, the core team is released once the project finishes working on other projects. This means they may not totally belong to the project manager on every single project. The downside to this could be that the team members don't actually have a home department they return to after projects end.
- Most have a **Project Management Office (PMO)** and could also have a **Change Control Board (CCB)**, whose job is to approve or deny change requests.

Were you able to identify your type of organization from the descriptions provided? Sometimes, people see aspects of all of these in their current organization. This could be considered a **composite organization**, which is a combination of two or more organizational structures. This can be done for simplicity on a project, or because the organization itself runs different projects with different needs.

Because you will get questions on the different dynamics and be asked to recognize them in situational questions, the following table is a quick reference for the three major types you could see in your exam. This is a cheat sheet based on the most common dynamics in the exam:

Functional	Weak Matrix	Balanced Matrix	Strong Matrix	Projectized
No power	Limited power	Some power	In charge of the project	Complete control
Functional Manager in charge	Functional Manager in charge	Functional Manager	PM is in charge but borrows resources from Functional managers	The PM is in charge and has a dedicated team
Your role is an expeditor	Your role is a coordinator	Your role is a coordinator	Your role is a Project Manager	Your role is a Project Manager
Part-time project work	Part-time	Could be full time	Full time	Full time *Best dynamic

Figure 3.3 – Basic organization structures

Now that we are familiar with our organizational structures, let's test our knowledge in our spot check exercise.

## Spot check exercise

See if you can identify the potential pros and cons of project organizational dynamics.  
Good luck!

Org structures	Pros	Cons
<b>Organic or simple</b>		
<b>Functional (centralized)</b>		
<b>Multi-divisional</b>		
<b>Matrix-strong</b>		
<b>Matrix-weak</b>		
<b>Matrix-balanced</b>		
<b>Project oriented (Composite, Hybrid)</b>		
<b>Virtual</b>		
<b>Hybrid</b>		

## Spot check exercise (possible) answers

Your answers do not need to be exactly like mine. I want you to understand each enough to glean your own thoughts from the content. My answers are just examples:

Org structures	Pros	Cons
<b>Organic or simple</b>	Flexible; people working side by side	Little or no PM authority
<b>Functional (centralized)</b>	Departmental jobs being done (HR, engineering etc.)	Functional manager manages the budget and the project
<b>Multi-divisional</b>	One of: Product; production; portfolio; program; customer type; geography	Little or no PM authority
<b>Matrix-strong</b>	Full-time designated role for the PM	Lots of resource availability
<b>Matrix-weak</b>	Designed by job function	Low PM authority
<b>Matrix-balanced</b>	Designed by job function and balances functional and project work	Low PM authority
<b>Project oriented (Composite, Hybrid)</b>	The PM is in charge and has a dedicated team	The core team is released after the project ends to work on other projects
<b>Virtual</b>	Network structures with nodes at points of contact	Harder communication and team building
<b>Hybrid</b>	Mix of other types of structures	May not be the right mix of structures

Now that we have covered the other stakeholders, let's focus on a really important stakeholder: you!

## The role of the project manager

It's probably pretty easy to tell that there is a lot involved in being a project manager. I can tell you that, after many years as a project manager, there are days when I question the sanity of my stakeholders and, quite frankly, my own sanity. However, the beauty of being a project manager is we can work with multiple different kinds of people, produce results, and essentially keep the entire ship sailing straight. It doesn't always work out like that, of course, but in a perfect world, we have all the best practices, tools, techniques, and the right attitude to get to the finish line.

The roles of the project manager include the following:

- Managing the project team
- Solving problems
- Managing communication across multiple stakeholders
- The ability to collect the right requirements for scope
- The ability to create and manage a budget and a schedule
- The ability to identify, analyze, and remove threats and take advantage of opportunities
- Having an understanding of quality assurance and quality control as needed
- Effective planning skills across multiple knowledge areas
- Organizational skills

Some of the soft skills that are necessary include the following:

- Leadership
- Teambuilding
- Communication
- Active listening
- Consensus building
- Problem-solving
- Conflict resolution
- Negotiation skills

Most of the soft skills in this list could be considered aspirational skills, and it is not expected that every project manager be an expert in all of these. As I mentioned previously, there are always going to be areas where we may seek to improve our skill sets and utilize those improvements for our projects. Even though this list of soft skills seems pretty self-explanatory, it's important to look at the skills through the eyes of a project manager in order to answer the questions correctly in your exam, as well as to implement them in your day-to-day life. We will cover all these in more depth in *Chapter 6, Creating and Leading a Team*.

## Summary

In this chapter, you learned about how projects are defined based on different organizational structures, the areas that influence unique projects, and the role of the project manager and other stakeholders. This information is important as a stepping stone or baseline that can help you manage a project effectively based on the circumstances of the organization and your leadership skills as a project manager.

In the next chapter, you will put all this information to good use as you review *Chapter 4, Developing a Project Charter and Identifying Stakeholders*. Initiating a project effectively lays the groundwork for everything else.

## Assessment exam

Question 1:

What is the definition of a project?

1. A temporary endeavor that produces a unique product service or result
2. A temporary endeavor managed in a coordinated fashion
3. A temporary endeavor managed by a project manager
4. A unique endeavor managed by a project manager

Question 2:

What is the definition of a program?

1. A group of unrelated projects
2. Temporary and unique
3. A type of organizational structure
4. A group of projects managed in a coordinated fashion

**Question 3:**

Which of the following represents a portfolio?

1. A group of unrelated projects and programs
2. A group of related projects and portfolios
3. A program and multiple projects
4. A group of unrelated projects managed by the PMO

**Question 4:**

Chris has just accepted a position at the ABC manufacturing company. Her position requires that she support the functional manager in project work as a coordinator, as needed, and to keep the dashboards up to date daily. What type of organization dynamic are you working in?

1. Weak matrix
2. Project-based
3. Strong matrix
4. Hybrid

**Question 5:**

Connie has been promoted and now carries the title of project manager. She is excited to get started with project work and has been introduced to her team. She knows that, from time to time, she will have to supplement her team with outside resources via procurement, as well as internal experts from a variety of different functional departments. What organizational dynamic does Connie's organization best represent?

1. Weak matrix
2. Strong matrix
3. Functional
4. Balanced matrix

**Question 6:**

A strong matrix is a good organization dynamic for project managers for what reason?

1. The project manager reports to the functional manager.
2. The project manager is not in charge of the project and the team.

3. The project manager is in charge of the project and the team.
4. The project manager shares resources with functional departments but is still in charge of the project.

Question 7:

Ryan is working in a large organization and has been asked to create a supportive PMO to help manage the number of projects the growing organization has. His job role has been explained as offering help to project managers, providing templates, and helping projects with additional resources as needed. What type of PMO has Ryan been asked to create?

1. Controlling PMO
2. Directive PMO
3. Supportive PMO
4. Composite PMO

Question 8:

In a balanced matrix, which of the following statements could be considered true?

1. Project work is valued over operational work.
2. There is an equal amount of focus on project and functional/operational work.
3. There is more focus on functional work.
4. The project manager and the PMO have equal power.

Question 9:

All the following describe the soft skills that are important to project management except which one?

1. Leadership
2. Teambuilding
3. Scope management
4. Communication

**Question 10:**

All the following are generally true for project managers who exhibit leadership skills except for which one?

1. They can get people to do things for the good of the project because they are in charge of the project.
2. Leadership allows for the focus to be put on the efforts of a group of people trying to reach the goal of the project.
3. The project manager may garner respect and trust from the team through good leadership.
4. Leadership is very important throughout all project phases but is most important while planning for a project.

**Question 11:**

Kareem is a project manager who is working on a large IT implementation project. He knows he will need a lot of different resources and will need to carefully collect the correct requirements to end the project successfully. Which of the following is least likely to be part of Kareem's role as a project manager?

1. Ensuring that operations are functioning effectively in order to begin acquiring resources.
2. Participating in project selection analysis by offering expert judgment.
3. Analyzing project-related activities prior to the project being formally chartered.
4. Assisting in business case development and having discussions with the portfolio manager about their concerns regarding the initiative.

**Question 12:**

You are a new project manager who has just started discussing project selection and working with your PMO to help solidify the project's expectations and high-level scope of work. The head of the PMO, William, discusses the concept of governance and how important it is for correctly executing project work and the inevitable result. Which of the following best describes what is not part of project governance?

1. Policies
2. Stakeholders
3. Rules
4. Technique

Question 13:

Which of the following is probably not part of a project manager's day-to-day work?

1. Working with the project team
2. Discussing the project with the sponsor
3. Working to collect requirements from the customer
4. Discussing project governance and improvements that could be made

Question 14:

The selection committee has many potential projects to analyze. Which of the following would be a reason the selection committee might not approve a potential project based on the list of categories of project types provided in *The PMBOK® Guide - 6th Edition*?

1. Advances in technology
2. Operational improvements
3. Legal or regulatory compliance
4. Environmental considerations

Question 15:

Your organization has been working within the constructs of a functional dynamic for years and would like to put equal emphasis on project and functional work. The CEO has put together an initiative to get the organization up to speed within a year. They are asking for functional managers to work with a member of each team who can be promoted to a project management position, so they can act as a mixed authority of functional manager and project manager. They haven't determined that a full-time project manager is necessary, but they want to make sure they have trained resources in the field of project management. Which of the following structures are they trying to create?

1. Weak matrix
2. Balanced matrix
3. Strong matrix
4. Hybrid organization

**Question 16:**

The selection committee is trying to determine what project to charter and has several options to choose from. Which project is not the best for the committee to choose based on the information provided?

1. Project A has a payback period of 1 year.
2. Project B has a payback period of 2 years and a net present value of \$350,000.
3. Project C has a benefit-cost ratio of 0.6.
4. Project D has a payback period of 1 year and a net present value of \$350,000.

**Question 17:**

The project selection committee is working with a business analyst who is predicting that the projects the organization is considering have different financial implications. Project A has a net present value of \$250,000 and a payback period of 3 years. Project B has a net present value of \$550,000 and an internal rate of return of 1.3. Project C has a payback period of 1 year and a net present value of \$35,000. Finally, Project D has a net present value of \$-25,000. Based on this information, which of the following would not be a consideration for the selection committee?

1. Project A
2. Project B
3. Project C
4. Project D

**Question 18:**

Which of the following project selection methods is the most influential?

1. Payback period
2. Organizational process assets
3. Net present value
4. What the PMO chooses to analyze the projects

Question 19:

During project selection, the business analysts use integer programming. Which of the following categories of project selection techniques is this part of?

1. Expert judgment
2. Economic models
3. Scoring models
4. Constrained optimization

Question 20:

During project selection, the selection committee decides to take on a project with a negative **net present value (NPV)**. Which of the following is a reason why an organization would make this decision?

1. The organization needs to change a process or product for regulatory compliance.
2. The organization knows that the lower the NPV, the better.
3. The organization is only concerned with a payback period.
4. The organization needs to produce a new product or service.

# 4

# Charters and Stakeholders

This chapter will describe the importance of a project charter and why having formal authorization to begin project work is an integral part of correctly beginning a project. Once we have the formal authorization to begin the project, we will need to begin the process of identifying and documenting the stakeholder's needs and requirements. Stakeholder engagement is an iterative practice that happens first in project initiation and continues throughout the project's life cycle.

In this chapter, we will cover the following topics:

- The project manager and integration
- Goals and objectives of a project charter
- Documenting high-level requirements
- Criteria of a project charter
- Identifying stakeholders and creating a stakeholder register

Let's get started!

## Politics, power, and leadership

According to *The PMBOK® Guide – 6th Edition*, project managers have to dance between the realms of power, politics, and getting things done. We've all been affected by politics in our organization in some way, shape, or form throughout our careers. Politics are not necessarily good or bad, but as a project manager, it's important to understand how your organization works and how politics could impact you and your project. One of the little-known tasks that project managers are supposed to do is observe organizational landscapes in order to collect information about the project. Projects are unique and therefore the information that is being collected needs to be reviewed, keeping in mind the project, the organization, and all the stakeholders involved. That way, we can make the best determinations as to how to plan and implement to achieve the most appropriate result. I'm not surprised that project managers need to wear several different hats when it comes to determining the right kind of influence or power to work with others on the project. The bottom line is that we need to know our audience and have experience in multiple different kinds of communications, including negotiations, all while being sensitive to and respectful of other people. This represents the processes necessary for a project manager in relation to selecting the best way to move forward with a unique project.

This includes doing the following:

- Determining the appropriate project methodology/methods and practices
- Assessing project needs, complexity, and magnitude
- Recommending a project execution strategy (contracting, finance)
- Recommending a project methodology/approach (predictive, agile, or hybrid)
- Using iterative, incremental practices throughout the project life cycle (lessons learned, stakeholder engagement, and risk)

While this isn't an exhaustive list and even though all of these are nowhere near happening when a charter is created, it is important to know how you will progress. This includes identifying stakeholders and requirements and putting your best foot forward right from the start.

At this point, you may only know the project methodology and the potential complexity and magnitude of the project's needs.

This outline is far different from anything we have seen before because the role of a project manager is so much more diverse in the real world than it is in a perfect world. Therefore, this exam content outline represents the real-world necessity of talking the talk and walking the walk.

There are a variety of different forms of power that you may incorporate in the beginning and throughout the project and, much like leadership skills, there might be some types of power that you're either not comfortable with or have little experience with.

**Note**

Ensure you're able to identify the types of power in the exam.

The following are the powers of a project manager:

- Positional power, which is sometimes also called formal, authoritative, or legitimate power.
- Informational, which can include being in control of gathering or distributing information.
- Referent, which deals with respect or admiration that others hold for you, typically due to your credibility.
- Situational, which is based on unique situations that you handle or need to handle.
- Personal or charismatic – let's just assume we all have that one.
- Relational, which is a pretty common power because it deals with networking, connections, and alliances.
- Expert, which includes skills, experience, training, education, and, of course, your PMP® certification.
- Reward-oriented, which is the power to give praise, positive feedback, or other desired rewards.
- Punitive or coercive, which I personally don't like to use very often. This is because invoking discipline or providing negative consequences can lower the team's morale. But, unfortunately, it's sometimes necessary.
- Ingratiating, which is the act of using flattery to win favor or cooperation. I'm quite certain that if you're reading this right now, you are absolutely going to pass your exam because I believe in you!
- Pressure-based power often needs to be used if compliance is not occurring and we may need to limit choice, or movements, in order to gain that compliance.
- Guilt-based, and the imposition of obligation or sense of duty. Probably not the best power to be throwing around.

- Persuasive, which is essentially the ability to move people to a desired course of action and provide certain arguments so that they agree with us.
- Avoiding. While this is my favorite conflict resolution method, refusing to participate is not the best way to utilize your power. However, there are times when strategic avoidance may be necessary.

According to PMI®, project managers are considered to be *proactive and intentional* when it comes to their power. So, it's going to be our job to acquire power and authority, but within the bounds of organizational policies and procedures rather than waiting for it to be granted.

#### Reference

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017, pages 62-68.*

## Leadership versus management

Occasionally, management and leadership are used synonymously when, actually, they are quite different. Leadership focuses on relationships with people, inspiring trust, doing the right things, and guiding them by using relational power and innovation. Management is all about incorporating a focus on systems and structure, near-term goals, doing things right, and focusing on the bottom line. What you will cover in this guide, and in your exams, will be present in multiple questions that involve both doing things right and doing the right things.

## Leadership styles

Project managers lead their teams in multiple ways. This depends on who is on your team and whether they know you or you know them. The categories of leadership styles are influenced by several major factors, some of which are as follows:

- Leader characteristics, including ethics, values, moods, and "tudes," otherwise known as your attitude.
- The same thing goes for your team members and their characteristics.
- Organizational characteristics can significantly impact your leadership styles.
- Environmental characteristics, which could include the politics, the economic state, and the social situation of your project and organizations.

There are numerous different types of leadership styles that you can utilize as a project manager. As you read through this, think about your current leadership style or styles and where your comfort level is.

### **Laissez-faire**

The first on the list is laissez-faire. This is a French term that translates to *let do*. I think we can all agree that it sounds better in French! But in project management, this is about allowing your team to set their own goals, not micromanaging them, and ensuring you're as available as your team needs you to be.

### **Transactional**

The transactional approach has a major focus on the project's goals, providing feedback, and determining rewards based on milestones met. PMI® refers to this as *management by exception*.

### **Servant leadership**

Servant leader is a new term in *The PMBOK® Guide – 6th edition*, and directly relates to Agile frameworks. In *Chapter 5, Introduction to Agile Considerations*, you'll see that teams are self-directed and self-managed. So, a servant leader serves, puts other people first, and acts more as a coach to help the team and organization grow, learn, develop, and practice autonomy, all with a big concentration on relationship development.

### **Transformational**

Transformational is exactly what it sounds like – inspirational motivation, encouraging the team to practice innovation and creativity and to trust themselves.

### **Charismatic**

Who doesn't like a little charisma? I'm sure you or somebody that you know has the ability to inspire, is high-energy and extroverted, self-confident, and has strong convictions.

### **Interactional**

Interactional is a combination of transactional, transformational, and charismatic. It's the trifecta of mad skills to have and also sounds like a project manager I'd like to work for!

## Spot check

Review the different leadership styles and take a moment to identify your own style or styles. Obviously, those styles change as needed, but really consider how you interact and what your preferred method is. Remember that this is between you and you, so there aren't any wrong answers:

Style	Yes	No	Why?
Laissez-Faire			
Transactional			
Servant Leadership			
Transformational			
Charismatic			
Interactional			

## Personality traits

To be successful, project managers need to have a variety of different personality characteristics to be the most successful they can be. This also comes down to wearing different hats because each organization, project, and situation requires that you emphasize different aspects of your personality. The following is a list of personality traits that are helpful for project managers to embody:

- Authentic
- Courteous
- Creative

- Cultural
- Emotional
- Intellectual
- Managerial
- Political
- Service-oriented
- Social
- Systemic

This list describes pretty much every project manager I know. Catch them caffeinated and they are creative, intellectual, and managerial. Catch them at a bad time and they aren't very social and maybe a tad emotional. Welcome to the field of project management, where you are bound to experience one or all of these emotions daily.

The project manager is an important position, and part of that position is being able to integrate all the chosen processes together into a comprehensive plan.

## **The project manager and project integration**

As a project manager, it is important to make sure that all the pieces of the puzzle come together and are integrated into the final product, service, or result. We all know that, as project managers, being able to integrate multiple processes, people, plans, and results is a critical skill set.

Integration, as an entire knowledge area, encompasses creating a project charter, developing a project management plan, directing and managing project work, managing project knowledge, monitoring and controlling project work, performing integrated change control, and formally closing down the project or phase. Integration is the umbrella over the rest of the knowledge areas and processes. Because of that, it's important that the project manager understands the strategic objectives and makes sure that those objectives are aligned with the project objectives and results. Once we understand all the objectives, we are then responsible for getting our team to work together and focus on the most essential aspects at the project level. If we think of the word *integrate or bringing together* as it pertains to project management, it means that processes, knowledge, and people all work together toward a common goal.

There are three different levels of integration that a project manager needs to understand:

- The process level
- The cognitive level
- The context level

Let's go through them in more depth.

## The process level

Even though *The PMBOK® Guide – 6th edition*, lists the necessity of the integration of project processes, there isn't necessarily a strict definition of how that's done. In order to effectively integrate the processes that we will choose to use on our unique projects, we may experience overlap or do things that occur multiple times throughout the project. There are numerous processes that may be necessary in order to achieve the project's objectives. Some happen once, such as developing the project charter, but others overlap and occur several times.

## The cognitive level

If I were to walk into your organization today and oversee you working on a project, it may not be the way that I would work on the project, but if it's working for you, then that is integration at the cognitive level. We know that, depending on the project's size and how complicated it is, our organizational process assets, plus our enterprise environment, we can determine what processes we use. It's important to be proficient in all of the knowledge areas in case they are necessary for your current or future projects. But personal skills and your abilities can definitely impact the way that the project is managed, as well as how closely you conform to the processes and best practices.

## The context level

Technology is changing at the speed of light; virtual teams are becoming more common and maybe sometime soon we will be interacting with AI and robotics to help bring our projects to a successful conclusion. Some of you are probably already working in that environment. If we are not cognizant of the project context, it will be more difficult to plan for communications, guide the project team, and manage new elements in our environment. By the way, my grocery store has a googly-eyed robot that alerts employees to spills in the aisles. I'm not afraid to say it scared the daylights out of me! I love technology and hoard electronics, but that was quite disconcerting. It had a name tag and everything! They named him Marty the robot. I'm totally having a childhood Jetsons moment. Sorry... let's carry on!

**Reference**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017, pages 66–68.*

One of the more important things that should be done before the project is officially kicked off is a project charter. Let's take a look at this now.

## Goals and objectives of a project charter

Now that the project has been selected and a business case has been created, the organization and the project manager have the results of a needs assessment (which can happen before the business case is created – and usually does) and have a better understanding of the goals and objectives of the project, as well as the economic feasibility, hence all the project selection techniques. This isn't the only information that's collected prior to the project charter's creation.

*Business Analysis for Practitioners: A Practice Guide [7]* contains an overview of best practices when it comes to collecting information to create a business case. These recommendations are a result of the organization's needs assessment. This allows for the best decisions to be made in advance of chartering a project. The business case will be created due to the analysis and lead to the official project charter's creation.

A business case includes, but is not limited to, the following:

- Business needs for the identification of scope, what is causing the project to be fulfilled, documentation of the business problem or opportunity the project will undertake, and possibly identifying all key stakeholders.
- Analysis of the situation, including known risks, critical success factors, and organizational goals and objectives.
- Decision criteria to assess courses of action:
  - a) Required
  - b) Desired
  - c) Optional
- Business scenarios and options for alternative courses of action:
  - a) Do nothing.
  - b) Do the minimum work possible to address the opportunity or business problems.

- c) Do more than the minimum work possible to address the opportunity or business problems.
- Recommendations for success measures, constraints, risks, and dependencies of the potential options:
  - a) Milestones
  - b) Dependencies
  - c) Roles and responsibilities
- Evaluation:
  - a) The statement of the benefits the project will deliver and how to measure them.  
This may include the operations side as well.

Another document that is created as a way for the best decisions to be made is the *project benefits management plan*. This plan focuses on how and when the sponsoring organization will realize the benefits as early as possible in the project's life cycle.

Its creation is a way to target all the benefits in one location based on the analysis and assessments of the business case, and this is iterative throughout the project as benefits are realized.

Typically, the headers include the following:

- Target benefits to be realized through the project's implementation, including net present value.
- Strategic alignment and how well the business strategies align with the organization.
- Timeframe for benefits realization.
- Benefits owner who will be in charge of reporting those benefits and tracking them throughout the project.
- Metrics.
- Assumptions.
- Risks to the realization of those benefits.

**Reference**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017, pages 31-33.*

There are many different paths we can take to get to the same result in project management. In *Chapter 3, Pre-Project Initiation*, we reviewed a variety of project selection techniques that organizations use to develop a business case. While that still occurs internally, some projects begin differently – perhaps via a contract or a request from a customer.

If we go with the assumption that the decision has been made to charter a project, the actual charter will be developed once everyone making the decisions agrees on a few things. There is most likely a selection committee that **could** be comprised of the PMO, the project sponsor, business analysts, the customer, and additional key stakeholders. Included in the charter creation will be known problems, opportunities, risk events, time frames, and possibly the total amount of money an internal or external client wants to spend. This could be considered a **top-down estimate**. This means that until the true scope of work is defined and the project has been planned, it can be difficult to be as accurate as perhaps the organizations need the business case to be.

While money is important, and the business case can somewhat prove costs versus benefits, there are many reasons why a project may be undertaken, including projects for the good of society and the environment. Money isn't always the underlying factor for projects to be chartered. It's important, but it isn't everything.

There are many ways the selection committee may make final decisions about the scope of work, potential costs, and benefits, as well as schedule milestones or constraints. It isn't as simple as market projections.

It may be that you are already involved in the project and are part of the decision-making process. After all, as a project manager, you will be accountable for the work and may have to be the one to reel in the pie-in-the-sky approach to the project itself.

Expert judgment is imperative at this point to make sure everyone is making the best decisions, either on whether to actually charter the project internally or to respond to a customer request. Even if you aren't involved at this point, part of your job's responsibilities is to validate the project charter before project work begins and to do your own benefit analysis.

My benefit analysis usually ends with a conversation involving the selection committee and starts with the question, "where did you come up with those numbers?" They love it when you ask that question! All kidding aside, there are a variety of decisions and conclusions that need to be made before the project is chartered and the actual project work can begin.

You will notice that at the beginning of every chapter in *The PMBOK® Guide – 6th Edition*, beginning with *Chapter 4, Integration Management*, every chapter contains introductory information about the knowledge areas and an overview of several items. This includes the following:

- An overview of the knowledge area
- The processes found in the knowledge area
- The inputs, tools/techniques, and outputs of every process in the knowledge area
- Concepts for the knowledge areas to be aware of
- Trends and emergent best practices in the knowledge areas
- Tailoring considerations
- Considerations for agile/adaptive environments
- The processes in order of the process groups for the knowledge area

Why is this important? Because it gives you the overall feel or vibe of the knowledge areas you are reviewing and gives you a total understanding of the importance of these processes. As we go through the initiation and planning processes, you will get an overview as it pertains to the knowledge areas we are covering. It's important to read through this information because it can help you answer your exam questions. Remember that the PMP® exam is situationally-based. What should you do if that happens?

What don't you do? The introductions to each knowledge area can help you with your understanding as you go forward through the processes. With that in mind, we are at the very first process: developing a project charter in the knowledge area of integration. Here is a high-level overview of what you'll find when you review *Chapter 4, Integration Management*, in *The PMBOK® Guide – 6th Edition*:

**Reference**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017, pages 69-81.*

Overview of the knowledge area and processes found in Integration Management	<ul style="list-style-type: none"> <li>• Develop project charter</li> <li>• Develop project management plan</li> <li>• Direct and manage project work</li> <li>• Manage project knowledge</li> <li>• Monitor and control project work</li> <li>• Perform integrated change control</li> <li>• Close project or phase</li> </ul>
Key concepts for project integration management	<ul style="list-style-type: none"> <li>• Ensuring that the due dates, project life cycle; and the benefits management plan are aligned</li> <li>• Proving a project management plan to meet project objectives</li> <li>• Ensure the correct knowledge is documented</li> <li>• Managing the performance and changes</li> <li>• Make integrated decisions about project changes</li> <li>• Monitoring progress and taking actions to meet objectives</li> <li>• Collecting data for analysis and communications</li> <li>• Completing the work and formally closing the project or phase</li> <li>• Managing transitions of phases (if needed)</li> </ul>
Trends and emerging practices in project integration management	<ul style="list-style-type: none"> <li>• Automated tools</li> <li>• Visual management tool</li> <li>• Project knowledge management</li> <li>• Expansion of the PM role and responsibilities</li> <li>• Hybrid methodologies</li> </ul>
Tailoring considerations	<ul style="list-style-type: none"> <li>• Project life cycle adjustments</li> <li>• Appropriate development life cycle</li> <li>• Management approaches</li> <li>• Change</li> <li>• Lessons learned</li> <li>• Benefits</li> </ul>
Considerations for Agile/Adaptive environments	<ul style="list-style-type: none"> <li>• Control of the detailed product planning and delivery is delegated to the team</li> <li>• The project manager still needs to be in charge of integration and collaborative decisions making</li> </ul>

Some other things to consider are as follows:

- **Project management methodology**, which basically means what approach you will take, what life cycle is appropriate, and if a hybrid approach is necessary. The methodology or framework will influence the content of your charter as part of developing the project charter process.

- A **Project Management Information System (PMIS)** is basically somewhere you keep all the software you will use in your project or any computer-related help your project will have. How will you store your documents, create reports, and communicate? There are many software programs we all use to help us complete our daily work, and a PMIS is a system or piece of software we will use to do so.
- **Expert judgment** is a comparative approach that's used to select a project or a process. It is a group of experts who confer and give opinions on your project or how to manage it. Expert judgment is considered the *number one tool and technique* that's used in project management.

High-level requirements are an important starting point.

## Documenting high-level requirements

At the beginning of a project, not much is truly known about the ins and outs of the scope of work, what things will actually cost, and how long the project will actually be. Yes, it is predictive, but it's tough to predict everything at this point. That is why high-level requirements are made and agreed upon, and also why all projects are progressively elaborated on. **Progressive elaboration** is a fancy term for going with what you know today and expanding on that knowledge once you can. Elaborate progressively on scope, time, and cost, as well as risk, quality, and resources.

For example, we are planning to build a new data center in Scottsdale, Arizona. Predictive means we know we are building a data center, we know where it will be built, and we know how long the last data center took to build and what it cost (maybe). When we are finished, we will have a data center. So, the business case and benefits management plan is created, and the business analysts crunch the numbers and determine it will cost 1.5 million to build and should take about a year to complete, barring risk events such as technical issues or regulatory permits taking longer than humanly necessary, thus impacting the timeline. You will review that information, offer your opinions, and the project will be chartered.

Once we've completed the project, we may see that it ended up taking 2 years to complete and cost 2.5 million, but we won't know that until we are there. It's not unusual for the high-level requirements to be highly optimistic either – in fact, you can probably bet on the fact they will be. That is where your analysis, communication, and validation are important: because you are the one being held accountable for the result.

High-level requirements often include the following:

- **The predicted result for the scope of work:** A data center in Scottsdale, Arizona with some basic design specs.

- **The results of the business case analysis:** 1.5 million.
- **High-level schedule expectations:** 1 year.
- **Mandatory milestones:** Key date considerations to meet the high-level schedule.
- **Constraints:** Scope, time, cost, quality, risk, and resources.
- **Pre-approved sellers or vendors:** We're not even sure they are available or have the ability to work on this project yet.
- **The selection committee:** Those who make these decisions.

Once everyone has agreed on the project scope and the high-level requirements, a contract may be negotiated between the customer and your organization. Most organizations have procurement or legal departments that handle all of this, so we can leave those details to them. It may just be a **statement of work (SOW)** at this point until the scope of work is clearer and the project has been officially chartered.

## Spot check

Review the list of integration functions and put a checkmark next to the ones you currently do and the ones you don't do. Those will be good key indicators of items to study in the *Integration* chapter of *The PMBOK® Guide – 6th Edition*. Remember to study what you don't know, not what you do:

Ensuring that the due dates, project life cycle, and the benefits management plan are aligned	
Proving a project management plan to meet project objectives	
Ensure the correct knowledge is documented	
Managing the performance and changes	
Make integrated decisions about project changes	
Monitoring progress and taking actions to meet objectives	
Collecting data for analysis and communications	
Completing the work and formally closing the project or phase	
Managing transitions of phases (if needed)	

The key kickoff document will be the project charter.

## Criteria of a project charter

The first thing to note is that a project cannot begin without a charter. I know you are thinking: "we do it all the time!", and I'm not surprised at all. Not every organization uses a project charter to kick off their projects, but we have to return to the perfect world for a moment and assume you need a charter to begin project work.

### Note

You may see questions about the project manager being asked to start work without a project charter. In that situation, what do you do? You are expected to explain the risks of not having a charter and turn down the project until the charter is created. I'll pause for virtual laughter... but that is the correct answer. In my world, turning down a project without a charter is called an RPE – a resume producing event!

Typically, a project charter will be developed once everyone making the decisions agrees on all the items thus far – the scope of work, the business case, and the like. Included in the charter creation process will be known problems, opportunities, risk events, time frames, and possibly the total amount of money an internal or external customer wants to spend.

The **project charter** is the first piece of documentation for a project once the initial business case and benefits management plan has been created and approved. Typically, the charter is written and signed by the **project sponsor** (*the person in charge of the financial aspects and who supports the project manager and the project throughout*) and gives us **formal authorization** to begin a project. Your organization may call this something different, but the premise is the same. Usually, the project manager is named or chosen for the project and the sponsor will document what is currently known about the project's schedule, budget, risk events, and milestones.

Here's why it is so important to have a project charter prior to the project's kick-off:

- Describes the agreed-upon scope of work.
- Names the project manager and gives you formal authority to begin project work and use company resources.
- Identifies key stakeholders.
- It is a written agreement to charter the project.

There are many elements of a project charter to consider and even though there may only be high-level information right now, getting all that information in one place is important.

**Note**

The project charter shows a direct link between the project manager and the objectives of the organization. This gives us a formal record of the commitment to project objectives.

Chances are, the project charter will go through some revisions until the powers that be approve them, but once that occurs, it is rare for the charter to be updated or used as anything other than a reference point going forward. That being said, the project charter's creation may also occur at the beginning of each phase, if necessary.

Why, then, is it so important, and how can I tell the difference between a project charter and other documents I've seen already? Great questions!

The project charter is the culmination of the following:

- Business case development.
- The benefits management plan.
- An agreement between your organization and possibly that of another, as well as a decision by your organization to take on the predicted scope of work.

Once that work is better elaborated on, it will lead to the creation of other documents, such as a scope statement, a work breakdown structure, a schedule, and a budget. None of these can be created without the formal authorization to begin the project via the charter, and all will be reviewed once we get to them. Much like in project management, the charter has to come first.

Project charters, like projects, come in all shapes and sizes. There are some standardized headers that can be used as a template if your organization does not currently use project charters.

**Note**

In the exam, you will not be asked to define specific headers, except perhaps the area that gives the project manager formal authorization to begin project work and utilize organizational resources. You may also need to know how to identify the project charter based on the information found in it, so I'll go through the most common headers and show you which items to be aware of in situational questions.

## Typical headings in a project charter

The following is a project charter example:

- **Executive Summary:** Not all project charters have an executive summary and if they do, it is usually the last thing written, much like what you see in the business case. It is sometimes good to have an executive summary, in order to show support at the organizational level for the project and to help create buy-in with other stakeholders.
- **Project Name:** Usually, the project name is something generic, such as the "data center project." This is mostly just to identify it as unique and differentiate it from other projects that are being chartered.
- **Authorities:** The authorities are usually key stakeholders and may include the customer, the PMO, the business analysts that created the business case, and a variety of other decision-makers. This is a good section for the project manager to review because it can enable them to identify key stakeholders who may have very specific requirements for the project.
- **Initiating Authority:** The initiating authority is typically the project sponsor. Remember: the project sponsor is the one that writes checks for the project and is in a supportive role to help the project manager navigate the project. It's fairly typical that the project sponsor is internal to your organization, but in some cases, they could be an external customer.
- **Project Manager:** This is an important section for us because this gives we project managers formal authorization to begin project work and utilize organizational resources to produce the deliverable. Remember when I mentioned in a previous exam tip that project managers are supposed to turn down the project, and then explain the risks of not having a project charter? This is the reason why. Once the project manager's name has been added to the project charter, they are formally assigned to the project and are responsible for managing it. Without that documentation, it is risky for a project manager to begin project work.

It is also important to note that this section will identify the authority level of the project manager, meaning what they are responsible for.

### Example

\_\_\_\_\_ is authorized as the project manager for this project and will be the primary point of contact. \_\_\_\_\_ is responsible for meeting all key milestones within the time, cost, and performance constraints of this project. Furthermore, \_\_\_\_\_ has the authority to apply organizational resources to accomplish the goals of this project.

- **Business Need the Project Addresses:** In this section, it's important to describe why the project is being undertaken, as well as the business need that is being met by chartering this project. This may also include sections of or the entire business case. Even though ROI isn't always about money, chances are money will be addressed in the section.
- **Project Description:** At this point, there is really only a high-level scope description, high-level milestones, and a budget based on a business case. However, it is important for contributors to the project charter to describe the true scope of work to the best of their ability.
- **Product/Service Characteristics:** This may be key features and expected results and may be generated from high-level scope descriptions, the business case, or a contract.
- **Project Relationship to Business Need:** This section addresses why the business is chartering the project. Was it due to a change in the market? A customer request, perhaps? A regulatory compliance update? This will help with buy-in and to tie business needs to project results.
- **Assumptions:** These are aspects of the project we assume to be true without any specific proof. Assumptions are usually made based on past experiences from working on other projects or taken from historical information and lessons learned.

**Note**

If I walk by a bench that has a wet paint sign on it, I won't sit on the bench because I assume the paint is still wet. The sign could have been there a month, but I won't take any chances. This is an assumption that may or may not be true. Until it can be proven one way or the other, I will proceed as if the paint is wet.

Project assumptions will change and be proven or disproven as the project progresses.

Because of this, **ALL known** assumptions should be documented before the project kick-off and then questioned throughout the life of the project and updated. Projects that have never been executed before will have more assumptions than facts in the beginning, and those assumptions will need to be monitored, documented, and controlled. Assumptions analysis is also a large part of risk identification.

- **Constraints:** Anything that limits the project in any way. The competing constraints of time, cost, scope, quality, risk, and resources are definite constraints to document at this time. Other constraints may include having to use one specific seller because the organization has a single-source agreement with them. Constraints can hinder the project manager's ability to truly plan effectively because they may have to work around constraints that aren't flexible. The more constraints a project has, the higher the risk. If you change something in one constraint, everything else in the project could be affected. If you lengthen your schedule, that may affect your cost, the scope of the project/product, and potentially the quality. Not all changes are necessarily negative, but it's important to assess the impact on other constraints before making changes to the project.
- **Risk Events:** Typically, there are categories of risks that come with every project. Some are industry-specific categories such as cybersecurity or general categories such as technical risks, weather risks, and external risks. Even though risk identification has not formally occurred yet, knowing what categories might influence the project is important. Risk isn't always a bad thing, although that is what we are used to considering first. Risk can be a threat or an opportunity. It may be that the organization is trying to be first to market with a brand-new product and that the risk of being first is worth the money. It's an opportunity, but it still carries a probability of not occurring. It isn't guaranteed. This is referred to as a *known unknown*. We will review risk in more depth in *Chapter 11, Risk Management* and *Chapter 12, Procurement Management*. For now, knowing some of the threat and opportunity categories can go a long way to helping you and your team identify, analyze, and create responses to risks.
- **Approval:** Signatures are important because they make the project charter formal and mean that buy-in has occurred with a variety of key stakeholders. If the sponsor signs off on the charter, it means everyone agrees that the project is necessary.

The project charter is a necessary first step in any predictive project, and the same goes for a project run in an Agile fashion. While not as formal, the Agile project charter will still provide information that will help you kick off the project.

## Agile project charters

You will review Agile in a bit more depth in *Chapter 5, Introduction to Agile Considerations*, but it's important to note that even though Agile isn't considered predictive and is instead an adaptive life cycle, a charter is still created. The chosen life cycle doesn't change the best practices.

Traditional project charters are not as flexible as Agile charters because traditional charters document a lot of set information. High-level requirements are included, but it's clear that the organization knows what it is trying to achieve. Agile projects are more open to changes and need a bit more flexibility in the chartering process.

A large part of Agile project management is transparent communication, and then determining what kind of project to charter will be determined by engaging stakeholders in the process prior to chartering. Many topics will revolve around features and functions, rather than a set deliverable. Another difference is that the project charter can change and be updated prior to the project and possibly throughout, as this helps us keep on top of the changes to the scope of work. Thus, it is not a static document, such as a traditional charter.

It is important to have a charter on an Agile project, but it's also important to make sure that it allows for flexibility and responding to changing needs and technologies.

The structure of an Agile charter could depend on your organizational processes and if the project benefits from a hybrid approach between predictive and adaptive best practices. Due to this, you may find the charter is more like a predictive charter rather than an Agile charter.

## Typical heading on an Agile charter

The typical heading on an Agile charter could be as follows:

- **Who** are the key stakeholders involved in the project, including participants and team members?
- **What** is the high-level description of the project goals and vision today? This is documented but is also expected to change or adapt.
- **Where** are the worksites and client sites, and where is the majority of the work going to be done? Most Agile teams are colocated, but they may be off-site at a client site where the project will be run, or the client may be internal to the organization.

- **When** does the team anticipate the project will start and end? Scheduling is done in sprints or iterations in Agile environments, typically lasting a month or less. It would be very difficult to pinpoint the total duration or how many iterations will be required in the beginning, unless this is designated by the organization or the customer.
- **Why** is the project being done? What is the value to the organization and the customer?
- **How** will the project be run? Full Agile or a tailored approach to the framework?
- **Signatures** allow an initial buy-in to the charter and make the project formal and approved. It isn't uncommon for Agile projects to have a business case created in advance of the project charter, and that tends to be adaptable too.

At this point, you will be formally assigned as the project manager; you have the formal power we discussed earlier. You are in charge of the project and have hopefully done your due diligence. Now, it is time to remind you of the inputs, tools and techniques, and outputs. I know, I'm sorry! The good news is you have basically just covered them all at this point and if not, they are recognizable as things we use in our day-to-day work as tools and techniques and hopefully will be easier to identify.

#### References

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017, page 75.*

The inputs, tools/techniques, and outputs for developing the project charter are as follows:

Inputs:

- **Business documents:**
  - a) Business case (the reasons for undertaking the project)
  - b) Benefits management plan (proof of concept)
- **Agreements** (used to define initial intentions in the form of contracts, **memorandum of understanding (MOU)**, **service-level agreements (SLAs)**, letters of agreement or intent, emails, or other written agreements. Contracts are typical when the customer is external.)

- **Enterprise environmental factors** (government or industry standards, legal/regulatory, organizational culture/political climate, stakeholder's expectations, and risk thresholds.)
- **Organizational process assets** (processes and procedures, project governance, monitoring and reporting methods, templates, and historical information.)

Tools and techniques:

- **Expert judgment** (such an expert has training in organizational strategy, benefits management, technical knowledge, durations and budget estimations, and risk identification)
- **Data gathering:**
  - a) Brainstorming
  - b) Focus groups
  - c) Interviews
- **Interpersonal and team skills:**
  - a) Conflict management
  - b) Facilitation
  - c) Meeting management
- **Meetings**

Outputs:

- **Project charter**
- **Assumption log**

Once the project charter has been formally completed and you are authorized as the project manager, you will need to begin documenting and determining stakeholders and their requirements.

## Project stakeholder management

Stakeholder management is prevalent in projects of all shapes and sizes. Knowing who they are and what they want is almost a full-time job in and of itself. It is our responsibility, as project managers, to manage stakeholder expectations. The second process in the initiation process group is to identify stakeholders. Unlike the project charter, this process is iterative. We are just at the beginning, though, so we want to make sure we set up our process so that it supports the work of the project team so that they can analyze stakeholder expectations, assess the degree they impact or will impact the project, and create engagement strategies to support the project. Now, I'm sure you know these expectations could change as the project progresses.

### Reference

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017, pages 503-515.*

Since we are the beginning of a new knowledge area, we will review *Chapter 13, Project Stakeholder Management*, in *The PMBOK® Guide – 6th Edition*, at a high level and then drill down to the actual process of identifying stakeholders.

According to the exam content outline, it's our job to iteratively engage stakeholders throughout the project.

These tasks include doing the following:

- Engaging stakeholders
- Analyzing stakeholders (power interest grid, influence, impact)
- Categorizing stakeholders
- Engaging stakeholders by category
- Developing, executing, and validating a strategy for stakeholder engagement

The tasks will all begin in the *identify stakeholders* process and continue throughout the project.

Remember that, at the beginning of each chapter, there are items to be considered regarding your own projects that will set the stage for effective stakeholder management. The main goal of this knowledge area is to identify and manage stakeholder satisfaction levels and focus on effective and continuous communications with your stakeholders. This includes the project team as well. The following table describes the core concepts to be aware of:

<b>Overview of the knowledge area and processes found in Stakeholder Management</b>	<ul style="list-style-type: none"> <li>Identify stakeholders</li> <li>Plan stakeholder engagement</li> <li>Manage stakeholder engagement</li> <li>Monitor stakeholder engagement</li> </ul>
<b>Key concepts for project stakeholder management</b>	<ul style="list-style-type: none"> <li>Stakeholder identification and engagement should begin as soon as possible after the charter has been approved</li> <li>Identified and managed as a project objective</li> <li>Continuous communication with all stakeholders</li> <li>Updated routinely when the project moves through other phases or current stakeholders are not involved in the work anymore or new stakeholders join the project and when there are significant changes in the organization or stakeholder community</li> </ul>
<b>Trends and emerging practices in project stakeholder management</b>	<ul style="list-style-type: none"> <li>Identifying all stakeholders instead key or limited set of stakeholders</li> <li>Ensuring the team is involved in stakeholder engagement</li> <li>Reviewing the stakeholder community regularly</li> <li>Consulting with stakeholders most affected by the work or outcome through <i>co-creation</i>.</li> </ul> <p>Note: Co-Creation places greater emphasis on including affected stakeholders in the team as partners.</p> <ul style="list-style-type: none"> <li>Capturing the value of engagement, both positive and negative</li> </ul>
<b>Tailoring considerations</b>	<ul style="list-style-type: none"> <li>Stakeholder diversity</li> <li>Complexity of stakeholder relationships</li> <li>Communication technology</li> </ul>
<b>Considerations for Agile/Adaptive environments</b>	<ul style="list-style-type: none"> <li>Adaptive teams communicate and engage directly with stakeholder without a hierarchy of managers involved</li> <li>Client, user, developer work together in a dynamic co-creative process</li> <li>Aggressive transparent communications</li> </ul>

## Identifying the stakeholder's process

Much like it sounds, this process is designed to not only identify who is involved in the project and to what level – it is also about gathering information on their interests, involvement, interdependencies, and influences, and then analyzing and documenting all the relevant information. This includes any relevant information that can hinder or impact project success. Sounds exhausting, right? That is why, once you have your process flow down early on, it is easier to perform as needed throughout the project. In *Chapter 3, Pre-Project Initiation*, we reviewed several key stakeholders, including the PMO, CCB, and the sponsor, but there could be many more players in the game to identify. Since this is an iterative process, it's easy to see that, during planning, execution, and monitoring and controlling, you will be vigilant (yes, vigilant) with communications management and stakeholder engagement. This is why some of the inputs include items and plans we haven't covered yet. Have no fear, though – you'll get a high-level overview here and we will drill down further once we hit those knowledge areas and their outputs.

**Note**

It is true that the key stakeholders are often identified early on.

Some of the key stakeholders are as follows:

- **Project management office (PMO)**
- **Change control board (CCB)**
- Sponsor
- Functional manager
- Procurement administrator/vendors
- Customers/end users

This doesn't mean we know everything we need to know about their expectations and interests – it just means we don't have to go searching for them or trying to figure out who exactly is involved. There are other stakeholders we may need to consider.

## Project coordinator

Usually, project coordinators are found in organizations that are either strong matrix- or project-based. The reasoning is that smaller projects or functional organizations don't have the bandwidth for a project manager **and** a coordinator to help the project work. And typically, in those cases, the functional managers are in charge anyway. Even though a coordinator may be helping a functional manager facilitate project work in a functional, weak, or balanced matrix type of organization, this particular role is specific to helping a project manager with a variety of different tasks.

This would only be necessary for a longer-term project, or if the organization is designed to accommodate that particular role. There are really no set responsibilities that a coordinator would take on because they are there to support the project manager and project work. Coordinators who support large projects provide administrative support by answering emails, scheduling meetings, distributing agendas, and so on. They may also be helping the project manager with updating schedules, budgets, and change requests.

The coordinator may also be the go-between for different key stakeholders and resources.

The **Project Management Institute (PMI®)** has a certification designed for project coordinators called the **Certified Associate in Project Management (CAPM®)**. If you have some people on your team that want to get their feet wet in project management and improve their own skill sets, it's a good direction for them to go in, and they will learn the same best practices you are learning here. It's not unusual for people to gain that certification, work as a coordinator on projects, and then pursue their **Project Management Professional Certification (PMP®)** once they have the experience needed.

## Scheduler

The project scheduler, much like the project coordinator, is usually found in larger organizations and on long-term projects. But I can tell you that if I'm managing a project and a scheduler shows up, then they need to be prepared to see my happy dance! That is because the scheduler is doing exactly what it sounds like they're doing. They are developing and updating the project schedule, keeping track of schedule performance, and communicating schedule performance. In *Chapter 8, Schedule and Cost Management*, we will cover the process by which you define your tasks, sequence activities, estimate resources, and durations, and then how to get a schedule approved as a baseline.

For myself, personally, I find scheduling to be the most stressful aspect of project management. It's not that I can't do it, it's just that it stresses me out! Still, others love scheduling and are very good at it, so I prefer to leave it to them, hence the happy dance.

## Project team

The project team is anyone who will be executing project work. Note that in a strong matrix organization, some of the team may also be helping you plan. I know that the people who do the work know the work and are the best resources for me to turn to when developing my project management plan, its subsidiary plans, and baselines.

The project team can provide information such as the following:

- Duration estimates for tasks that they will be performing.
- The sequence or order that work needs to be performed. This, in turn, helps with scheduling.
- In some cases, your project team will be able to provide cost estimates or procurement needs for materials and equipment.
- The team will be also updating you on current project performance and working to implement corrective and preventative actions once they've been approved through formal change control.

In some cases, you will need to acquire additional team members to help execute project work, and they may come from functional departments or outside the organization itself. If you think you'll find yourself negotiating for resources with functional departments, then it is a good idea to understand the scope of work they will be performing, whether they're working full- or part-time on the project, and how they will be acquired and released on the project. If your project team is lacking the necessary number of humans to perform project work, that would be where the **sponsor** could be very helpful in assigning more resources.

## Project Management Office (PMO)

This is a governing body that oversees projects. They are considered a key stakeholder.

## Change Control Board (CCB)

Unsurprisingly, the **change control board (CCB)** controls project changes by approving or denying them. Typically, the change control board is made up of all project or program managers who oversee multiple projects and programs.

If a change needs to be made to a project, you and your team would follow four steps:

1. First, you would assess the impact of the change on other project variables and constraints.
2. You and your team would come up with solutions for the implementation of the change.

3. Only then would you bring it to the attention of the change control board, who would then need to analyze the change you are suggesting, review how it would impact other projects and programs going on, and then make the final decision.
4. The customer may also need to sign off and approve the changes – even if they are the one who asked for the changes to be made.

Don't worry – you will not be running to the change control board for every little change. Typically, these are big changes that involve scope, time, cost, additional resources, or the escalation of a risk event. A lot of times, either the sponsor can approve the change or you yourself can make the final decision. Typically, the CCB is internal to your organization, but if you have an external customer, they may also have their own change control board who may need to approve any changes that are made to the scope of work that impact the customer and the deliverables.

## Functional managers

Functional managers may be considered stakeholders at some point in the project, specifically if you will be borrowing resources from those departments. Functional managers are key stakeholders in functional or weak/balanced matrix organizations because they are in charge!

In a strong matrix or project-based organization, the functional managers may not have any input on day-to-day project work, but they will be the deciding factor as to whom you can acquire from their team, how long you can have them on your team, and whether or not they will be doing full- or part-time project work.

This is why it is important to create and maintain good relationships with functional managers – because you may be negotiating with them for additional resources. It's never a bad idea to know exactly what skill sets you are looking for before you negotiate for resources.

There have been times where I've acquired resources from functional departments and walked away thinking, "well that was easy," and later found out the resources I acquired were given away easily because the functional manager wanted to unload their worst resource on me. Since I learned the hard way, I'm passing this knowledge on to you. Go to the discussion prepared!

Some items to consider during the negotiation are as follows:

- Specific skills that are necessary to perform project work.
- Whether the team member can be co-located or virtual.

- What type of work authorization system you will be using to let the resource know it's go time.
- How long you believe you will need the resource, and whether you can utilize them part-time so that they can still perform their functional work.
- It's a good idea to make sure that the actual resources you're considering are interested in working on the project. The reason I mention that is we want motivated team members, not people who are resistant to project work.
- Whether or not you will be tracking and documenting their project performance and submitting the documentation to their functional manager for their performance reviews.
- Determine if training is necessary for the potential resource and, if so, how to go about setting it up and figuring out how much time you **think** is needed for the skill transfer.
- Make sure everyone understands how they will be acquired and how they will be released from the project work.

Remember that the sponsor is a key stakeholder and that they are there in a support role to help you navigate functional managers and the acquisition of functional resources. There is also the PMO, who might be actually assigning resources to your projects without any negotiation necessary with functional managers. It just depends on your organization and how projects are run.

## Sellers, vendors, and suppliers

Some may become part of your project team, while others may be looking over your shoulder to protect the organization from arbitration, mediation, or litigation.

Essentially, sellers, vendors, and suppliers can all be considered one and the same. Mostly, it's just semantics and what your organization uses as terms for anybody outside the organization that will contribute to project work. This could be human resources, materials, or equipment. In some cases, there will be a simple **service-level agreement (SLA)** or even a **master service-level agreement (MSLA)** that clearly defines the role of the seller and their role in the project.

Other times, you and your team may be performing a *make or buy analysis* to determine what the procurement needs of the project are.

In some cases, sellers may become part of your project team and therefore become key stakeholders. Your job will be to manage the relationship with your sellers but not necessarily do contract negotiations.

If procurement activities are necessary for your project, you may end up determining what the criteria will be for selecting your sellers, vendors, or suppliers. You may also be asked to create a **procurement statement of work (PSOW)** for each type of provider for the people, equipment, and materials that are necessary for your project.

Your level of involvement in procurement activities completely depends on your organizational dynamics, the level of influence from your PMO, and your experience with procurement processes. Either way, it is your responsibility to meet contractual obligations and protect your organization from future costs or litigation.

## Procurement managers

Depending on your procurement experience and how your organization works with sellers, you may also be working with a procurement department. In general, it is assumed that project managers cannot legally or contractually bind their organization to that of another. It's also assumed (unless otherwise stated in the exam) that we are the buyer. That may not be the case in the real world, and in some cases, on multiple projects, you may be performing the activities of both the buyer and seller – first, being the buyer to acquire the equipment that needs to be installed, and second, as the seller for the customer whose installation you are performing.

No matter what, there is probably a procurement department and a procurement manager overseeing contracts in your organization. Many times, the project managers do the pre-work for procurement needs.

Some of the items the procurement manager or administrator oversees are as follows:

- Performing the negotiations
- Determining which contract types are needed
- Procurement change control
- Officially closing out the contracts throughout the life cycle of the project as needed

Because of the high level of interaction in some projects between procured resources and the project manager, it is important to understand terms and conditions, incentives, and different contract types. But mostly, we can leave the depth of contractual knowledge to the procurement managers. We will cover what you need to know about your role in procurement in *Chapter 11, Risk Management* and *Chapter 12, Procurement Management*.

**Note**

Keep in mind that, during the exam, the assumption is that this is a brand-new project and you're creating something you have never created before. You will get a variety of questions representing different industries. That is why the best practices would all be used on a project.

The first step after identifying your stakeholders is to determine what their level of power/influence and interests are regarding the project. Be aware that things can change and sometimes change quickly. One stakeholder may be humming along, minding their own business, and be perfectly happy with weekly updates until something goes sideways with the project that affects them. Now, they are breathing down your neck and demanding daily updates. Trust me – it happens more often than you know.

Stakeholder analysis is crucial to determining the roles the stakeholders play in your project and any additional helpful information. This includes data analysis and representation.

## Data analysis

The tool or technique of data analysis is really just a label attempting to determine a variety of information, then analyzing it appropriately to gain the insight you and the team need. This is called *stakeholder analysis*. This process results in a list of stakeholders and any additional information that can help engage those stakeholders throughout the project.

Stakeholder analysis will result in gaining the following information:

- Their interest in the project and/or its outcome
- Legal or moral rights:
  - a) **Legal rights:** Occupational health and safety. This may be part of a country's legislation.
  - b) **Moral rights:** This could be the protection of historical sites or the sustainability of the environment.
- Ownership of an asset or property:
  - a) **Knowledge:** Any special knowledge that can benefit the project.
  - b) **Contribution:** Provisioning funding or other resources and being an advocate or a buffer between politics and the project.

Once you have determined your stakeholder's legal and moral rights, you can categorize them accordingly using data representations.

## Data representation

One of the main tools and techniques for categorizing stakeholders falls under the category of data representation. When you can categorize your stakeholders, you can help the team build good relationships with the project stakeholders that have been identified and then iteratively update them.

The five main ways you should do this are as follows:

- Power/interest grid, power/influence grid, or impact/influence grid
- Stakeholder cube
- Salience model
- Directions of influence
- Prioritization

Let's go over these one by one.

### Power/interest grid, power/influence grid, or impact/influence grid

This particular technique has a lot of names and there's a minute difference between them. The reason you may choose one or the other could be based on your comfort level. If someone walks by your desk and sees that you have listed their power as low, that could result in some uncomfortable conversations, purely based on perception. For some, this is less an actual exercise and more of a mental exercise. The premise is to group stakeholders based on their authority of power, level of concern about or interests in the project outcome, and their ability to influence the project's outcomes or cause changes.

The following diagram is a representation of the analysis:



Figure 4.1 – Power/interest grid

If you are wondering what the letters are for, they represent individual stakeholders and their placement on the grid. For example, stakeholder B has very high power and interest and would need to be managed closely as they can impact the project exponentially. This could represent the project sponsor or the customer. Stakeholder D has very low power or influence and at this point, little interest in day-to-day project work. This could represent a functional manager that you may borrow resources from down the line. After this, their placement on the grid would move to a more appropriate area. All of this allows us to create an effective communications management plan and stakeholder engagement plan, at least for today.

## Stakeholder cube

This technique takes the power/interest grid and expands on the model to provide a three-dimensional model that improves how the stakeholder community is depicted. This isn't something I have expertise in, but I'm assuming it's super cool-looking.

## Salience model

If the project has a complex network of stakeholders, then you need to identify their relative importance in the project. This model compares their power or level of authority, much like the power/interest grid. It also looks at the urgency for immediate attention based on the stakeholder's level of need and their legitimacy, meaning that their involvement is appropriate. This legitimacy can be swapped out for proximity in order to include the project team.

## Directions of influence

This is also known as the hierarchy of involvement or communication abilities. These directions of influence include the following:

- Upward to senior management.
- Downward to the team.
- Outward to suppliers, end users, regulators, and the like.
- Sideways or to the project manager's peer group. These are middle managers who are competing for your resources or who can collaborate in sharing resources or information.

## Prioritization

This may be necessary for your own sanity if there are a variety of stakeholders that need to be engaged. You have enough to do without trying to figure this out after the fact.

### Note

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017, pages 512-513.*

Now that you have reviewed the different categories of stakeholders and the roles they play, you must keep them all straight and find a way to keep track of who they are, how they want to be communicated with, what their expectations are, and so on. If only there were a specific document that you could use to do so. Good news – there is! It's called a *stakeholder register*, and while there isn't one way over another to create and use this document, it will go a long way to helping keep everyone straight – especially if this is a brand-new project and you have never worked with them before.

## Stakeholder register

The right way to engage your stakeholders is to do the best you can to determine their expectations (this week) and then work to meet those expectations. That is akin to having a bunch of preschoolers on a playground and trying to get them to come inside after recess. This isn't the easiest task in the world. The stakeholder register can help here. The register is the main output of the identify stakeholders process and is a very handy document to have, especially for large projects where you have people you have never worked with before or who have a different role in the current project. Mostly, you will be documenting the identification information, how you assessed their requirements thus far, and their influence and impact, as well as the classification based on the model you choose to use from the tools and techniques.

To put together an effective stakeholder register, it's best to actually talk to the individual and ask probing questions. Some such questions could include the following:

- How do you prefer to communicate? Email? Telephone? Meetings?
- How often would you like updates and status reports?
- Would you prefer to pick and choose which meetings to attend and if so, I won't put "required" on the invite?

- What are your needs and concerns about this project?
- What is the planned level of involvement you are expecting?
- What are your expectations of the deliverable, schedule, budget, and so on?

I realize that not everyone is going to be located in your office and that some may not even be on the same continent, so understanding their time zones so that you schedule these conversations is important as well. Nobody wants to have a meeting at 2:00 A.M. That makes for very cranky stakeholders, which is the opposite of what we are trying to do.

I find using checklists or interview questions is the best way to gather information from a variety of people. This keeps the conversation on track and to the point without jumping down any rabbit holes that can sabotage the information gathering process. There are a lot of ways to gather information about your stakeholders and no way is really the wrong way, as long you feel that you have enough information to make the best decisions going forward regarding stakeholder engagement and requirement collection. The only wrong way is to not do it at all. Therefore, having a comprehensive stakeholder register is an excellent tool for stakeholder management.

Typically (and I say typically because it may be different in your organization), my stakeholder register is a collection of information that I can update when stakeholder needs change. Trust me, they will change!

Best practice suggests the following headers should be used, but be as creative as needed to engage your own stakeholders:

- Name
- Department
- Contact information
- Time zone (as needed)
- Preferred method of communication
- Communication strategy
- Role or title on the project
- Needs, concerns, and interest regarding the project
- Level of involvement in the project
- Level of influence over the project

For some project managers, this is a mental exercise because they work with the same people all the time. The only new player may be the customer, and even then, it is good practice to document the information, if only as a tangible reminder to engage and communicate in the manner they are expecting. In *Chapter 10, Resources and Communication Management and Communication Management*, you will review the creation of a communication plan and different ways to effectively engage your stakeholders.

**Note**

There is a lot of overlap between stakeholder and communications management in the exam. Sometimes, it's difficult to tell which one the questions are referring to. A good rule of thumb is to view communication as planning to distribute information and control communications. Stakeholder management pertains to creating and maintaining good relationships and meeting stakeholder expectations. Do we do that with good communication? Yes, we certainly do. This is why I recommend that you read those types of questions carefully and refer to this exam tip to help you navigate to the correct answers.

The other major output, other than the stakeholder register, that we haven't really discussed yet is change requests. These may become necessary while planning and executing or monitoring and controlling the project. During the first go-around of the initiation process, you would be just starting the process and any updates wouldn't need formal change control, but as new stakeholders join or leave the project or new information is necessary for updates, a change request would need to be processed to keep everyone in the know.

## Spot check

Document one of your current key stakeholders using one of the tools or techniques for classification. Write down everything you may need to know for your projects and determine their role, power, interest, urgency, or legitimacy. You can use any software you want to do this if it is comprehensive, but it does get you in the habit of performing this process and understanding the importance of it:

Name : \_\_\_\_\_

Department: \_\_\_\_\_

Contact information: \_\_\_\_\_

Time zone (as needed): \_\_\_\_\_

Preferred method of communication: \_\_\_\_\_

Communication strategy: \_\_\_\_\_

---

---

---

Role or title on the project: \_\_\_\_\_

Needs, concerns, and interest regarding the project: \_\_\_\_\_

---

---

---

Level of involvement in the project: \_\_\_\_\_

Level of influence over the project: \_\_\_\_\_

---

---

## Wrapping up

To wrap up this chapter and this topic, we'll review the inputs, tools/techniques, and outputs of the identify stakeholder process regarding initiation.

### Reference

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017, pages 509-515.*

### Inputs:

- Project charter (lists key stakeholders)
- Business documents:
  - a) Business case
  - b) Benefits management plan

- Project management plan (This includes everything that has been planned to date. Stakeholder identification is iterative, so some of these documents won't be created in the initiation of a project but during the planning/execution phase.):
  - a) Communications management plan
  - b) Stakeholder engagement plan (strategy for stakeholder engagement, done during planning and iteratively updated)
- Project documents:
  - a) Changelog
  - b) Issue log
  - c) Requirements documentation
- Agreements (includes stakeholders who are part of procurement activities, such as sellers and contractors)
- Enterprise environmental factors (geographic distribution of facilities and resources, standards and organizational culture, and political climate)
- Organizational process assets (templates and lessons learned)

**Tools and techniques:**

- Expert judgment
- Data gathering:
  - a) Questionnaires and surveys
  - b) Brainstorming (brainwriting can also be used, which gives the participants time to analyze questions individually before the group creativity sessions)
- Data analysis:
  - a) Stakeholder analysis (power/interest, salience model, and so on)
  - b) Document analysis
- Data representation:
  - a) Stakeholder mapping/representation (prioritization, directions of influence)
- Meetings

**Outputs:**

- Stakeholder register (identification, assessment, and classification)
- Change requests (iterative updates to project management plan documents through formal change control)
- Project management plan updates (all covered in depth during each focused knowledge area in the chapter):
  - a) Requirements management plan
  - b) Communications requirements plan
  - c) Risk management plan
  - d) Stakeholder engagement plan
- Project documents updates
- Assumption log
- Issue log
- Risk register

Give yourself a big pat on the back! You have just completed the initiation process group! This information will pave the way for everything else we will cover going forward. We will move on to the planning process group next, so be prepared – there is a lot of content and processes in planning. I'm not worried, though – you are already crushing it! You've got this! Take a look at the practice questions for this chapter and see how you do. If you have to go back and review this chapter, totally do it! I highly recommend open book studying when going through this content for the first time. There is no shame in that, and nobody is watching.

## Summary

In this chapter, you reviewed the initiation process group, which includes developing the project charter and identifying stakeholders. You reviewed the inputs, tools/techniques, and outputs of each. Even though you won't need to memorize the ITTOs, you will need to understand the context of them as they pertain to the processes.

In *Chapter 5, Introduction to Agile Considerations*, you will dive into the wild and wonderful world of adaptive project management. You have already seen some Agile considerations for two knowledge areas, and we will review more as we move forward. Think of the next chapter as a crash course in Agile project management. If you want to skip ahead to *Chapter 7, Scope Management*, feel free to do so and go back to *Chapter 5, Introduction to Agile Considerations*, after.

## Assessment exam

### Question 1:

You have just started as a project manager in a new company and have been assigned a large project via a project charter. You will need to make the best determinations regarding what to plan and implement to achieve the most appropriate result. Since it is the beginning of the project, which of the following would be the best for you to determine?

1. Observe the organizational landscapes in order to collect information about the project.
2. Identify stakeholders.
3. Contribute to the selection of key requirements.
4. Discuss the charter with your sponsor.

### Question 2

Carmen has been officially assigned as the project manager for a large software development project. What kind of power does Carmen now hold?

1. Expert
2. Situational
3. Informational
4. Positional

### Question 3

You have been a project manager for 10 years and have worked with your current team for five of those years. You know your team performs at a high level and that your role is as a facilitator and coach when and if needed, rather than as a manager delegating goals to the team. Which leadership style is most appropriate for your team?

1. Transactional
2. Charismatic

3. Laissez-faire
4. Interactional

#### Question 4

At the beginning of your current project, you know that in order to fully integrate the project plan and determine what success looks like, you will need to understand integration at a variety of different levels. Which of the following is not a consideration for integration to understand strategic objectives for your project?

1. Process level
2. Context level
3. Project level
4. Cognitive level

#### Question 5

During your long career as a project manager, you have determined that there isn't a one-size-fits-all way to manage your projects. The current project charter is broken out with high-level information and not much is known about the true scope of work. You have determined that you will need to update the method you use to manage your project from predictive to adaptive. Which of the following best describes an adaptive project?

1. Predictive projects know the full scope of work in advance, while adaptive projects do not.
2. Adaptive projects typically correlate with descriptive charters, while a predictive charter provides a simple overview.
3. Predictive projects don't really know the scope of work in the beginning, and the expectation is that the scope of work will change throughout the project.
4. Adaptive projects are only for software development.

#### Question 6

What is the main goal or objective of the project charter from the project manager's perspective?

1. To explain the scope of work to stakeholders
2. To define the business case
3. To formally authorize the project manager to begin project work
4. To be signed by the sponsor

### Question 7

Which of the following represents a PMIS?

1. The project charter
2. The stakeholders involved in the project
3. The project management system or framework
4. The software and hardware used to manage communications, reporting, and performance

### Question 8

Which of the following would be considered an assumption in the project charter?

1. Who the project manager will be
2. Who the sponsor is
3. Who the customer is
4. The business case

### Question 9

An Agile charter differs from a project charter for which of the following reasons?

1. Offers less flexibility for the scope of work
2. Offers more flexibility for the scope of work
3. Offers more information about the software design
4. Doesn't document how the project will be run

### Question 10

You are a project manager who has been formally assigned, via the project charter, to a large international project. One of your key stakeholders is new to project management and asks you why a charter is even necessary before project work can begin. They were ready to start work on the project and are not happy about how long it's taking to get started. How do you best explain the value and necessity of a project charter and why you can't begin project work without it?

1. "The project charter shows a direct link between the project manager and the objectives of the organization. This gives us a formal record of the commitment to project objectives."

2. "There are many elements of a project charter to consider and even though there may only be high-level information right now, getting all of that information in one place is important."
3. "Project charters, like projects, come in all shapes and sizes. There are some standardized headers that can be used as templates."
4. "It's part of our organizational process assets to begin each project with a charter."

#### Question 11

All the following are tools and techniques of the identify stakeholders process except for which one?

1. Data gathering
2. Data analysis
3. Data representation
4. Data processing

#### Question 12

John is in the process of using a classification model to determine the categories that each identified stakeholder falls into. This will help John create an engagement strategy during the planning process group. John determines that he will classify those stakeholders using the categories of urgency, level of authority or power, and legitimacy or proximity to the team. Which of the following data representation models is John using?

1. Power/interest grid
2. Stakeholder cube
3. Salience model
4. Directions of influence

#### Question 13

Which of the following tools or techniques results in a list of stakeholders and any additional information that can help engage those stakeholders throughout the project?

1. Data analysis in the form of stakeholder analysis
2. Expert judgment in the form of stakeholder analysis
3. Data representation in the form of stakeholder analysis
4. Data gathering in the form of stakeholder analysis

Question 14

Which of the following are not outputs that are included in the initiation process group?

1. Project charter
2. Identify stakeholders
3. Stakeholder register
4. Change requests

Question 15

You must create the stakeholder register during the initiation of your current project.

You will need to include all the following information except for what?

1. Stakeholder classification
2. Project risk categories
3. Identification information
4. Assessment information



# 5

# Introduction to Agile Considerations

In this chapter, we will review another side of project management – one that is becoming more popular due to the need for unique ways to manage individual projects. There isn't a one-size-fits-all approach anymore and having the ability to tailor your life cycle strategies to a unique project or result is quickly becoming the skillset to have as a PMP® certified project manager.

In this chapter, we will cover the following topics:

- The history of Agile and the Agile Manifesto
- Empirical process control
- Agile versus waterfall project management
- Scrum framework overview

## The history of Agile and the Agile Manifesto

When most people think of Agile frameworks, they think of them as a recent development of something new or not often used. While that is far from the truth, I understand that Agile may seem like the flavor of the month, but it is here to stay.

The new 2021 PMP® exam content outline references Agile best practices. It may be tough to spot them at first because they blend so nicely with predictive best practices, but they are there. For example, in the domains of *people and process*, Agile best practices are right alongside the predictive best practices. The bolded items provided here are the tasks specific to Agile, but there is a lot of overlap, depending on whether you determine that a hybrid is better than a strict framework or life cycle. I may be getting ahead of myself, but it's good to know what you are referencing as you go along, and I wouldn't be surprised if many of you are hearing chit chat around the water cooler about the organization transitioning to Agile or expressing interest in it.

**Reference**

*2021 Project Management Institute, Inc. All rights reserved. PMI® PMP® Examination Content Outline – 2021.*

Think of the following tasks as a preemptive review of what is to come in this chapter. These tasks show which items are Agile-centric and could be tested for on your exam:

- **Empower team members and stakeholders.**
- **Organize around team strengths.**
- **Support team task accountability.**
- **Evaluate demonstration of task accountability.**
- **Determine and bestow level(s) of decision-making authority.**
- **Determine appropriate project framework/methods and practices.**
- Assess project needs, complexity, and magnitude.
- Recommend a project execution strategy (contracting, finance).
- **Recommend a project framework/approach (predictive, Agile, hybrid).**
- **Use iterative, incremental practices throughout the project life cycle (lessons learned, stakeholder engagement, risk).**
- Plan and manage project/phase closure or transitions.
- Determine criteria to close the project or phase successfully.
- Validate readiness for transition (to the operations team or next phase).
- Conclude activities to close out a project or phase (final lessons learned, retrospective, procurement, financials, resources).

The points mentioned in bold are also applicable to predictive project management, but you may have noticed a more significant push for team accountability or determining what life cycles are appropriate for a unique project. So, what exactly is this Agile thing, and how will you use it and see it in the exam? Great questions! Let's start at the beginning.

The history of Agile spans a decade longer than most are aware. As early as the 1990s, it became necessary for organizations to keep up with the rapid pace of enterprise software development. Technology went from answering machines to dial-up modems and "You've got mail" to the types of technology that we're using today. Due to the proliferation of software programs, apps, and other cutting-edge technologies, it became necessary for organizations to find a better way to manage and adapt their projects and deliverables. They needed a better way to practice flexibility when required. They weren't building bridges or apartment buildings; they were making the future of technology. Hence, Agile was born out of necessity.

You may even remember from early on in your career several of the newer software or operating systems of the time. DOS? Oh, the horror! Requirements, different kinds of computer systems, and new software programs were moving faster than most organizations could keep up with, and many were using outdated modalities and best practices. If you watch any true crime shows, you'll know that from the 1970s until the 1990s, there wasn't a way to track crimes or criminals across states or even county lines. There weren't any available databases police could search and gather information from. It wasn't CSI, that's for sure. It was PUTP – pick up the phone!

In many industries, it took much longer than needed to create the technology necessary to run the organization or to get specific projects off the ground. You might be surprised to find out that the primary industries that were affected weren't companies that produce software or computer technologies – it was the companies that were *using* or *needed to use* technology to get their projects off the ground.

Government programs, telecommunications, the production of automobiles, and other industries that were dependent on software and technology being totally up to date were finding that the technologies they were using from years prior were not sufficient for the projects they were executing. Think filing cabinets, phones with dials on them, paper everywhere – none of the options were good enough for keeping up with the pace of change in the brand-new technological age. They still aren't. Now, we have cybersecurity threats, hacking, viruses, firewalls, and everyone looking out for weird attachments in their emails. "You've got mail" has become "You've got a computer virus."

Organizations were also figuring out that predictive types of project management focused on more and more burdensome front-loaded planning based on the assumed result. These practices were not nearly as useful for the kinds of projects they were working on. The idea of creating a full-blown project plan was impossible because they were working on unique deliverables. They had no idea of how to execute the work, much less put together an integrated project management plan with baselines. They knew where they wanted to go, but they didn't know how to get there. Due to a profoundly changing environment and constant demands to stay updated on innovative technologies, it was relevant and timely to find newer and better ways of doing things.

The one great thing about being a project manager is the way we think. We know that there is a solution and that if we can point to it and work toward it, we will get to the finish line. In the late 1990s, several such project managers/software developers were increasingly frustrated with the lack of flexibility and the lack of upfront scope definition. How could they possibly plan for everything? They couldn't. Flexibility and malleability were needed, timely, and necessary.

Let me introduce you to *Agile Alliance*<sup>®</sup>. If you have a copy of *The PMBOK<sup>®</sup> Guide – 6th Edition*, scroll to page 2 – you will see that PMI<sup>®</sup> states very clearly that they entered into a partnership with the *Agile Alliance*<sup>®</sup> to collaborate on best practices that can be utilized or tailored with the best practices of *The PMBOK<sup>®</sup> Guide – 6th Edition*. This collaboration was necessary because there isn't a one-size-fits-all approach to managing projects, and teams were finding themselves in the messy middle ground without much direction. That's what is so cool about you jumping into your PMP<sup>®</sup> right now. You have the benefit of understanding both approaches, and you can be sure to see them both on the exam. While this chapter isn't an exhaustive overview of Agile frameworks, it is a good introduction to the wonderful world of adaptive project management best practices. I highly recommend that you get your copy of *The PMBOK<sup>®</sup> Guide – 6th Edition* and read through the *Agile Practice Guide*<sup>®</sup>. Pay special attention to the introductions that take Agile into consideration at the beginning of each chapter of *The PMBOK<sup>®</sup> Guide – 6th Edition* in each knowledge area as well. You will gain more and more information on Agile and its influences as you proceed through each knowledge area.

#### Reference

*The Project Management Professional (PMP), the PMBOK Guide and the Project Management Institute Agile Certified Practitioner (PMI-ACP), and the Agile Practice Guide* are registered trademarks of the Project Management Institute, Inc.

Remember that if you join PMI<sup>®</sup>, part of your yearly membership is a free PDF download of *The PMBOK<sup>®</sup> Guide – 6th Edition* with the *Agile Practice Guide* included, plus a discount on your exam.

Let's begin with Agile Alliance. Its contributions to project management and different frameworks were an integral part of how technology was shaped and the way that technology was created, and are now influencing the predictive projects we work on as well. So, gather round, and I'll tell you the story.

Once upon the early years of 2001, 17 software developers got together in Snowbird, Utah to discuss the projects they were working on and how they were progressing. They felt it was important for a common understanding of the principles that were working and those that were not, in multiple industries. They gathered there to discuss ways to simplify or create a lightweight type of practice or practices that could fluctuate, depending on the project needs. They discussed, in depth, the need for the ability to quickly build working software by understanding what the customer needs with very little frontend planning and documentation. The result of that meeting was the *Agile Manifesto*. This meeting in Utah wasn't the first meeting or the last of the now formed alliance, but it was the most influential.

The *Agile Manifesto* was designed to be lightweight and provide guiding principles rather than to set rules and formal processes. The definition of a manifesto is "a written statement declaring publicly the intentions, motives, or views of its issuer." That doesn't mean long-winded and spanning pages and pages. Much like Agile frameworks in general, the manifesto is short, easy to understand, and straight to the point, without any additional noise.

#### **Agile Alliance determined new methods should be as follows:**

- *Based on iterative and incremental development* of the result by building on the scope of work as it becomes known.
- *Higher-quality software in shorter time frames* involves providing value to the organization and customers faster.

##### **Note**

The Agile Manifesto forms the basis of most methods currently in use today.

## **The Agile Manifesto**

The Agile Manifesto is essential to your projects because it provides a focus on the values and what is vital in any Agile framework or method. Agile Alliance clearly states the following values:

- Individuals and Interactions Over Processes and Tools
- Working Software Over Comprehensive Documentation

- Customer Collaboration Over Contract Negotiation
- Responding to Change Over Following a Plan

**Note**

Memorize the Agile Manifesto for your exams, including the CAPM® exam. The updated exam content outlines any important updates that were made in January 2021 and the CAPM® updated exam in August 2019. Both include Agile questions. Memorizing the manifesto is a great way to navigate the correct answers to notoriously vague situational questions.

What did you notice about the manifesto? Did it appear that the premise is to collaborate and not negotiate contracts? Or that there isn't a plan at all? I wouldn't be surprised if that were your first thought. I thought the same thing when I first dipped my toe into the unknown world where planning without a result attached was a waste of time. Well, after I did my happy dance, that is. A lot of people look at the Agile Manifesto and think that individuals and interactions are *more* important than processes and tools, or that customer collaboration takes *the place* of contract negotiation, but that is not the case at all. The feeling was that more cumbersome processes and overuse of tools and documentation were not working in software development projects and that it was unbalanced on items that limited the project work and distracted from the areas that could enhance the overall results, faster.

Once the need for computers and software became very apparent, there had to be a shift. I mean, think about it this way: let's say you are planning a project to build a cabin in the woods near your favorite stream. You would spend a lot of time thinking about your dream cabin, how you could build it, what materials cost, when to do it based on weather forecasts, which friend or relative you'll be recruiting to help you do it, and how much beer to bring with you. That last piece is an integral part of the plan. You would need to integrate many of the best practices we cover in a predictive manner. You would need to initiate after determining a high-level budget, schedule, scope of work, and obvious risks. Then, you would need a plan that you could execute and keep an eye on until you are finally building a fire in your cabin and cleaning your fishing gear. That is my husband's idea of a project.

Now, let's say you have some experience in technology. Maybe you are an IT manager of a large or small corporation. All of a sudden, a representative from NASA comes in and assigns you with the task of managing a team of experts and running a brand-new, super-secret project. They have asked you to develop a brand-new spaceship that can identify new solar systems and beam Scotty up.

**Reference**

That is a Star Trek reference, in case you were wondering. I'm guessing you knew that, but we always question our assumptions, right?

Now what? You have no idea where to begin, you don't know who this Scotty person is, but you have a team of people that have mad programming skills, engineering skills, and experience with rockets. You are also convinced the actual way it was supposed to be is that Scotty was in the spaceship beaming other people up. What gives? This type of project is all new. Who could start to put it all together? The team. The initial requirements would be collected and sorted by priority. The execution of those requirements would be by trial and error, iterative testing, and reviews, and managing more requirements that could lead to a shift in the final result. Either the deliverables don't work correctly or the key stakeholders... uh, NASA... may want to add a beam for Captain Kirk also (another reference to Star... oh, you get it.) There is no way you could plan everything upfront. You wouldn't be able to look more than a couple of weeks into the future. Sure, you could build out a plan and assume the requirements were substantial and the budget and the schedule are as well. Then, 4 weeks later, the tests fail, the scope changes based on those tests, and the stakeholders want to include Netflix beaming into the spaceship too. See where I'm going with this?

Don't get me wrong – you plan. You just don't plan comprehensively too far in advance. You take on significant requirements and attempt to focus on 2 weeks' to 1 month's worth of work at a time. That way, you are never too far ahead of yourself. We call that getting in front of your skis in my house, which never turns out well. Iterative and incremental planning allows you to work with a design that emerges organically, based on needs and requirements over time. That is valuable to organizations. Your now-defunct project plan is not.

Too many projects were spending an excessive amount of time doing comprehensive documentation, which was taking away from interacting with individuals on the team and creating working software. Add to that limited collaboration with the customer and other stakeholders and not being able to respond to changes quickly.

The fine folks who wrote the Agile Manifesto are not suggesting that we do one over the other. They are suggesting that individuals and interactions, working software, customer collaboration, and responding to change are valued *more*. Freeing, isn't it?

Agile, as a label, is just that – a label. It's a term that describes multiple frameworks and best practices that many of the folks of Agile Alliance® created based on their needs and industries. Any methods that fall under the Agile umbrella are iterative and incremental development and as you'll see, requirements and solutions can evolve with a team that can freely collaborate, self-organize, and be cross-functional.

For the PMP® exam, be very aware of the Agile Manifesto and its values because that will enable you to answer more questions correctly. If you are unsure of the correct answer or are deciding between two answers, always revert to the values of the Agile Manifesto and ask yourself if the solution that you are choosing is more valuable or less valuable. If three of the answers focus on processes and tools, comprehensive documentation, contract negotiation, and following a plan, then the best answer is probably the fourth one in the case of Agile questions. It's the opposite for predictive questions.

That is what is going to adjust the difficulty of the PMP® exam a bit more in this iteration. This is because you'll be shifting between different scenarios and trying to determine the best answer while the frameworks and best practices change between life cycle types instead of just being predictive or adaptive. They're now both.

**Note**

The CAPM® exam will maintain the same exam content outline (at the time of writing) and not be 50/50 predictive and Agile like the new exam in 2021. You'll get some questions, but it won't have as many Agile questions as the PMP® exam. The updates to the CAPM® are more about requirements, the ease with which you can work toward your PMP®, virtual exams with a proctor, and a shift in the types of questions and their formats.

Now, let's go over some key phrases that will help you on the exam and help get you into the mindset of Agile principles.

## Key phrases that pay

The following are the key phrases:

- People
- Communication and collaboration
- Working software faster
- More flexibility in procurement
- More flexibility for changes

**Note**

The 12 essential principles that were developed and placed in the Agile Manifesto are also items to bear in mind as you are reading questions on the exam. Don't worry too much and don't memorize anything. Just review them and try to get in the mindset of an Agile project.

This section does go further than an exam situation, though, as it also addresses organizations that are trying to implement Agile and may be used to a more substantial set of processes. Organizations may have to adapt their current organizational culture and processes to embrace those differences.

Although Agile is considered more lightweight than predictive life cycles and the manifesto is short in length, trying to implement new methods and best practices is much easier said than done. The Agile Manifesto and its values and principles are easy to talk about but very hard to do in the actual real world. I realize I'm writing about philosophy and that perfect worlds don't exist in the real world. I hope that you'll be psyched about some of the things you learn here or in your training class and take them back to work with you and try them on for size.

## The 12 principles of the Agile Manifesto

Now, let's take a look at the principles we were talking about:

- **Customer Satisfaction:** I think all of us, no matter what, are concerned about our customers and end users. We want to meet the requirements and be successful. They don't care what project management road we travel; they want what they want, the way they want it. All projects are looking for ways to bring value to the customer regularly by communicating and adapting to changing customer needs.
- **Welcome Changes:** This keeps the team on top of new requirements and allows for some flexibility in the design rather than pre-planning and going through a formal change control system every time an update is made to the scope of work.
- **Frequent Delivery:** Agile projects typically deal with short iterations of 2 weeks to 4 weeks; the goal is to produce something usable early and often. Regular delivery is about building a usable increment in a short period that the customer finds valuable. Today is Tuesday – patch Tuesday, if you will – and I had to update all my software, and my cell phone went through an update too. We are used to this. These are the ways we get value first and fixes second. My phone works. It may crash and be buggy, but I can use it. It's a dumb phone. Then, the mighty update hits, and suddenly my life is in technicolor smartphone mode. Frequent value faster.

- **Colocated Teams:** Many best practices in Agile project management have colocated teams. If team members are remote or virtual, the best practice is to colocate them for at least one iteration if possible. Okay, this is a tough one because not every single team is colocated. (By the way, this is how PMI® spells it. My spell check hates it and collocate, or co-locate, inevitably will be found by someone, somewhere in this book. Apologies in advance.) I'm a virtual team member who runs projects for my organization. Granted, I do more teaching and writing now, but I've consulted in 15 countries and worked with even more representatives from other areas around the world who joined me in those countries, and I know that colocation works. I also know virtual teams work as well. My team is fantastic and self-directed. I'm a coach, facilitator, and sometimes have expert judgment, but otherwise, my virtual team is stunningly amazing.
- **Motivated Individuals:** Teams are self-managed and self-organizing, and they are there because they want to be there. Demotivation doesn't produce an excellent working increment or keep the team focused on providing value. What if I said to you "I have 50 things I need you to do in the next month; some are larger than others, but you decide what to work on, what you can and can't do, and if your capacity is only 20 of those things a month, then that's fine. Work on the most valuable things first." How motivated would you be? Highly. Our teams are self-directed and self-managed. Our job is that of a coach, a leader, a facilitator, a motivator. It doesn't mean there isn't a plan, but your team decides what is needed for them to produce customer value successfully.
- **Face-Face Contact:** Communication is a large part of any project, but in Agile project management, face to face is the best way to communicate. It ties into colocational as well as open and honest communication across the team dynamic. 55% of all face-to-face communication is body language. It stands to reason that being in front of people improves communication because you can *see* them. However, you virtual folks out there know that we deal mostly with email and chat, and that works too. Maybe a visit to the site or flextime to get face-to-face with your people can be planned as well. Or a video chat to gain a face-to-face dynamic. It may not always be possible, but it's essential to consider if you are running a virtual team. My team typically plans those video meetings on a shockingly bad hair day.
- **Working Software:** A usable increment that works. Simple sounding, right? The goal is not to spend a lot of time creating software that doesn't work. Meeting that goal is done by getting frequent feedback from a variety of stakeholders, utilizing regular testing to determine what is working and what isn't. Hopefully, this is done before the result is too far gone for you to know what isn't working. Lots of reviews with the customer and looking back to see what changes for the better are necessary while moving forward.

- **Constant/Sustainable Pace:** A 40-hour workweek and no overtime if possible. Now you are starting to like Agile, right? It stands to reason that if you work 40 hours a week and have evenings and weekends off, you'll be a happier person and be able to sustain that pace indefinitely. Maybe the next update will say 30 hours a week? Here's to hoping!
- **Continuous Attention:** The entire team looks for ways to improve quality, the design, and the overall process regularly. We will cover reviews and retrospectives further in this chapter, but keeping your eye on the prize and improving the outputs is a very Agile concept. Not to say that in predictive project management, we don't inspect and attempt to improve quality, but remember that those specifications and requirements were determined early, planned, and executed. Monitoring and controlling processes inspect the results. Often, that can be too late, and defects are present. Hey, it happens to all of us at some point. Even Six Sigma has 3.4 defects per million opportunities. Nobody is perfect. But if we find out later that there is a defect or problem, we document lessons learned and attempt to fix the defects. It's targeted but not continuous.
- **Simplicity:** Keep it simple. Don't add unnecessary extra features. Scope creep isn't a *thing* in Agile. You LOLED, right? Scope creep is a thing on every project, but the goal is to have the essential features in the result and nothing extra. Only the most valuable features. Nothing more and nothing less.
- **Self-Organization:** The team decides for itself what it can and can't do and they work together on solutions. There isn't a project manager delegating what they work on, when they work on it, and in what order.
- **Regular Reflection:** A constant focus on looking back to move forward more successfully. This is much like lessons learned, except those lessons are reviewed daily.

*"It is typical to adopt the defined (theoretical) modeling approach when the underlying mechanisms by which a process operates are reasonably well understood. When the process is too complicated for the defined approach, the empirical approach is the appropriate choice."*

– *Process Dynamics, Modeling, and Control* by  
Babtunde Ogunnaike and W. Harmon Ray

## Scrum and empirical process control

Ken Schwaber and Jeff Sutherland are the creators of the Scrum framework and were contributors to the Agile Manifesto. They adapted and used empirical process control to develop and update the best practices of Scrum, using the Agile Manifesto as the motivating force. The three critical aspects of empirical process control are also the three pillars of Scrum. Empirical process control focuses on **transparency, inspection, and adaptation**. This includes the **transparency** of not just the process but all communications, including frequent **inspection** and the utilization of regular reviews of the product service or results. None of this will fully work without **adaptation**, which is the ability to embrace uncertainty, change, and manage risks accordingly.

Many of the Agile questions on the PMP® exam were designed to determine your ability to place yourself into the mindset of the Agile team and how to function in an Agile environment. Empirical process control embraces the Agile Manifesto. When you think of the definition of empirical ("based on, concerned with, or verifiable by observation or experience rather than theory or pure logic"), it's easy to see that when we find better ways of doing things, we embrace them rather than being stuck in a process or processes that simply do not work. Many times, in my career, I would be asked to do something a "certain way," and my response was "Yeah but... there is a better way." In my experience, that wasn't OK because the way we did things was part of the enterprise environment and the organizational processes. That is the beauty of Agile; there is a clear focus on observation and conversation. Don't confuse that with a free-for-all, though. Many of the frameworks and Agile methods have specific rules and best practices. However, if someone says, "yeah, but there is a better way," then everyone listens, discusses it, and they may decide to move forward with it. If they fail, they dust themselves off and try again. Tailoring is one of the essential skills to have as a project manager in today's technological world. We will review the Scrum framework in more depth later in this chapter.

## Spot check

Now that you have had an overview of Agile, it is vital to keep the manifesto front and center in your mind to help you answer the questions you'll come across in the exam. Fill in the more important values given in the following table:

	Over Processes and Tools
	Over Comprehensive Documentation
	Over Contract Negotiation
	Over Following a Plan

## Spot check solution

The following is the solution to this spot check:

Individuals and Interactions	Over Processes and Tools
Working Software	Over Comprehensive Documentation
Customer Collaboration	Over Contract Negotiation
Responding to Change	Over Following a Plan

How did you do? If you had to peek, that is okay! I highly recommend taking practice exams and working with the spot checks open book. There isn't any expectation that you should know everything after reading about it once. For those who learn by doing, writing the answers down after looking them up is an excellent way to solidify the information.

Now, let's do a comparative approach of predictive or waterfall project management and an Agile approach.

## Agile versus predictive project management

Regardless of the frameworks that you choose in both Agile and predictive types of project management, the goal is to produce a result that meets specifications and customer requirements while working effectively. But what exactly is the difference between Agile and predictive or waterfall project management?

We know based on the Agile Manifesto that software development got a bit of a facelift once the decision was made to embrace frequent changes, frequent reviews, adaptation, and putting certain aspects first, such as people over formal processes. That wasn't always the way that software development projects (or other projects) were managed. The 1970s were when the predictive or waterfall method was created and utilized in many large projects, including the United States Department of Defense projects. Many standards and books of knowledge were created from these best practices, including *The Project Management Body Of Knowledge or (PMBOK®) Guide* that was produced by the Project Management Institute.

#### Reference

*The Project Management Professional (PMP), PMBOK Guide and the Project Management Institute Agile Certified Practitioner (PMI-ACP), and the Agile Practice Guide are registered trademarks of the Project Management Institute, Inc.*

Waterfall and its model are attributed to an article written by Winston W. Royce, and even he looked at the model as flawed. Royce is often the one credited with the waterfall model. He also discussed adaptive methods and the differences between them in the same article. He seemed to be leaning more toward adaptive best practices, but at the time, they weren't at the forefront of most organizations.

Specifically, in Royce's original model for predictive project management, he posited that work would flow from top to bottom like a waterfall. In software development, the project begins with a collection of requirements and the documentation of those requirements. Once those requirements have been collected, then the project moves into the design phase of software architecture. Only after the architecture has been designed can we then go to implementation. Once the product is complete, validation and verification can take place. The approval of the final deliverable is necessary before moving into the maintenance phase and operations and support.

While there are many opinions on the waterfall model being ineffective for software development, the fact of the matter is that all projects can benefit from the best practices. Many of the best practices for waterfall project management can be found in *The PMBOK® Guide – 6th Edition*, as well as options for tailoring your approaches to meet the unique demands of your current project. There are certainly best practices and documents I use on every single project. It's my own Frankenstein version of project management, but it works for me. Hence, I tailor my projects as needed for my way of doing things. That's not a one-size-fits-all approach – just the things that always work for me get used every single time.

The Project Management Institute recognizes the need to tailor our projects and potentially having a combined approach between waterfall and Agile project management (when needed) for the effective delivery of a result or results that meet requirements.

It is important to note that if an organization is building a skyscraper, housing development, or creating a new mass-production system, Agile frameworks or methods may not be the best way to manage those projects. It is much better to have pre-approved requirements, a plan in place, formal change control, verification, and validation that the project requirements for scope, schedule, cost, and quality are met and are monitored and controlled to make sure they do meet those requirements. In some cases, there is room for both.

*The PMBOK® Guide – 6th Edition* embraces the best practices of both. The majority of those best practices are a formal project life cycle, much like a waterfall or phase-oriented approach where the scope of work is pre-planned and approved before execution. Plus, those practices (typically) follow a very formal change control system not found in many Agile frameworks. Because technology, IT, and software development are a large part of the project management industry globally, it is relevant to compare different best practices and have a flexible approach. It is also pertinent to mention that projects are unique, and therefore one project might need a formal waterfall type of procedure, and yet another might benefit strictly from Agile approaches, and again another may need a more tailored approach that uses a combination of best practices from different life cycles.

## The benefits of using Agile approaches in any industry

The benefits of using Agile outside of software development are numerous. Tailored strategies to meet the rapid pace of technology today are essential for organizations. They need to be able to respond to the rapid changes in technology, competition for products, services, results, and changing requirements. That, however, is easier said than done. The challenge is that many organizations are used to their current process flow, and even though it may not be working sufficiently, organizational changes are always painful. Perfecting these approaches takes time. The time may not be available in your current process or workflow, so making those changes can be difficult. I know that many of my students have organizational processes that are predictive and don't use change control and contractors who run things in an Agile fashion. Needless to say, there is some confusion and some irritation on both sides.

Agile is a label and represents different types of frameworks that can be used. To pass an exam like this, you have got to get into the frame of mind of both predictive and adaptive life cycle approaches.

## The Agile mindset

Half the battle of incorporating Agile frameworks into your organization is getting into the mindset of an Agile team, and it takes practice and focus not just on the project objectives, but the culture of the team and how they work together. Aggressive, transparent communication may not be acceptable in your organization because the hierarchy doesn't support communication that flows everywhere. They may have a more strict approach to communication and with whom you communicate. Aggressive, transparent communication doesn't mean people are pointing and snarling at each other – more to the point, nothing is left unsaid. Everyone on the team and their stakeholders know how the project is progressing, what the status is of schedules and budgets, and what the most valuable feature or function to work on next is.

The Agile mindset isn't expressly covered here. Sometimes, it takes years of practice to go with the flow. The same is said for a predictive environment. The mindset is based on the team's ability to explore, embrace, and apply Agile principles while incorporating that mindset across the team and the organization. A big focus is on value-driven delivery, and the team focuses on creating high-value increments (a fancy term for pieces/parts of deliverables) and making sure that they are completed early and often. Meeting and reviewing stakeholder priorities is a given in all project management best practices. For Agile teams, the interactions are more frequent and open to discussion. Those discussions will include gaining feedback on the increments produced and then prioritizing the next features and improving performance, estimating and delivering value going forward.

Regardless of the framework you subscribe to, we have to be able to participate and collaborate. Those are skills that are crucial to a successful project outcome and successful team interaction.

That can't happen without high team performance, and that is dependent on trust, learning, collaboration, and conflict resolution.

**Note**

You'll see a few questions on the PMP® exam about self-organizing teams, utilizing emotional intelligence to enhance relationships, and the culture of high performance.

Scope change is just our day-to-day. We try and get over that or get through it, but we know the change is going to occur, so we prepare ourselves for it. That means continuous improvement is necessary. With Agile (think agility), we must be malleable to improve our best practices and our products or services. The team is self-driven, self-motivated, and self-managed. That doesn't mean they don't have support – they do. An Agile project manager may have the responsibility of coaching and also being coached in the best practices of the frameworks that are chosen or even determining a hybrid approach of several.

These days, more waterfall types of projects are incorporating some of that Agile framework, and even the PMP® exam is adapting to accommodate more Agile kinds of approaches. *The PMBOK® Guide – 6th Edition* and the updated exam content outlines include Agile and tailoring approaches. The exam is going to be agile and predictive and with the acquisition of **Disciplined Agile (DA)** by PMI®, you can be sure Agile is here to stay!

What's probably the most recognizable framework, or the one most often used by organizations transitioning to Agile approaches, is known as Scrum. This is what we will be covering in the next section.

## Scrum overview

Ken Schwaber and Jeff Sutherland first co-presented Scrum at the **Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA)** conference in 1995 and were contributors to the Agile Manifesto 6 years later:

*"A framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value."*

– Ken Schwaber and Jeff Sutherland

The framework is lightweight and very simple to understand. That is why many organizations embrace some or all the best practices. It sounds easy, but it's easier to talk about than it is to actually do it.

Scrum theory was founded or based upon *empirical process control theory*, or empiricism. The three pillars of the Scrum framework are *transparency, inspection, and adaptation*.

## Transparency

Agile project management has a common theme of openness, as well as transparent communication regarding what is considered necessary and valuable as a result or feature, the processes, and techniques that will be used. All of these can also be adapted should they not work, and you can make tweaks to how to manage risks and issues. The main focus of transparency is understanding that everyone knows what everyone else is doing and how they are doing it. If someone makes a mistake, they own it and work as a team to fix it. Transparent and clear communication and a team atmosphere of unity help the framework be successful. Aggressive, transparent communication isn't always easy to transition to if your world is more formal.

## Inspection

In the Scrum framework, frequent inspection allows informed progress to be known about the results and allows for the identification of variances that would keep the result from being accepted. Just like inspection is a necessary technique for reviewing the scope results and the quality of the deliverables in a predictive environment, it makes sense to check your work regularly. Frequent inspection is a crucial aspect of Scrum, but performing inspections too frequently will do the opposite and can hinder progress and disrupt the work rather than promoting effective execution of it. If you have a skilled inspector to review the results and work with the team to improve them, then, by all means, use them. Not all organizations have inspectors on hand to do so. Therefore, continuous improvements in both the result and the process would need to be the focus of the team.

## Adaptation

If the inspection process shows a variance that is not acceptable or that an undesirable result has been identified, that points to a problem in the process and the execution of the process. That doesn't mean the problem is immediately evident. If the process is deemed not to be working and is negatively affecting the result or increment, the process will need to be adjusted.

That does not mean that you switch from Scrum to another Agile framework or method such as **eXtreme Programming (XP)**. It just means that the process is not being effectively executed and it's necessary for the team to adapt or revisit the best practices of Scrum and continuously check to make sure the process is working. Adaptation also points to the way the process is executed and whether the customer is getting the value they expected. The further you go without adapting, the worse it can get. You open yourself to risks and issues and deviate further from the value that you were supposed to create. The bottom line, however, is that if the process isn't working, it's time to adapt. Much like the definition of insanity is doing things the same way and expecting a different result, the adaptation pillar is there to make sure that you can adjust your direction and provide a better process to produce the result.

The team roles on an Agile project are important to know as they are not like a waterfall team. There are distinct roles that will be necessary to know for both your organizational approaches to Agile and for the exam.

## Agile team roles

There are particular roles on an Agile team, and each of these roles has its own focus, responsibilities, and abilities. All Agile teams are considered self-organizing and cross-functional. Sounds vastly different from a functional hierarchical organization, right? Self-organization doesn't mean team members are doing whatever they want, whenever they want. The self-organization model was designed to help optimize the flexibility of decision-making and the courage to be creative. If self-direction and organization by the team are done correctly, productivity increases. It takes a while to get there, though, primarily if your team is used to a predictive dynamic. It feels strange and different and may need some getting used to at the team level.

If you are familiar with the sport of rugby, then the word "scrum" may be recognizable. A "scrum" is a banding together of individual players on the team who work together toward a common goal. They are much stronger together than they are apart. In all team sports, there are specific positions that are necessary to win the game. A Scrum/Agile team has three significant positions:

- The product owner provides information on **what** will be accomplished and the features and functions necessary.
- The development team decides **how** the work will be done and how much they can handle.
- The Scrum master is a **servant-leader who** helps guide the product owner and the team.

**Note**

I'm using Scrum as the basis for the team roles because PMI® tends to lean toward that framework the most but uses more generic labels to describe it. Many Agile frameworks incorporate the same responsibilities but use different names for them. For example, the Agile project manager may be the same as the Scrum master, but because you may be tailoring, the role may be that of a project manager. Semantics I know, but hopefully less confusing as you go forward.

## The product owner

I often think that the product owner is more aligned with a project manager due to their day-to-day responsibilities. Their job is to maximize the value of the product and the value of the work of the development team by collecting the requirements and organizing them by what is the most valuable or the most critical requirement/feature to work on first. They do this by creating and owning a product backlog. It is the product owner's responsibility to manage the product backlog and nobody else's.

What exactly is a backlog, though, and how does it differ from a documented scope of work on a predictive project? Excellent question!

The product backlog is a container for all the possible items that could go into a result or increment requested by the internal/external customer. The product owner is the sole party responsible for managing the product backlog and prioritizing the features and functions, and it is their job to explain what items are in the backlog to the team.

Because Agile frameworks embrace rapid changes and updates to features and functions, the product owner will need to continually reorganize and reorder work items in the best way possible to achieve the project/product goals. At the same time, they will be balancing the requirements set by the customer and potentially saying "no" to features and functions. I know, right? Whatever happened to the customer is always right? Here's the deal: let's say you have a 5-year-old in your house. You open a cabinet in the kitchen and give them a piece of candy from the candy jar – just one. Then, you close the cabinet. The child has seen that there is more than one piece of candy in that jar, and as soon as they finish one piece, they ask for another, and another, and you say "no, you'll ruin your dinner." Yep, that's what happens when the customer sees the features and functions that have been built and want more.

The last thing the product owner wants is a backlogged backlog and, sometimes, they must stop the customer from overeating sugar. For the most part, though, the goal is to provide something of value to the organization or customer as quickly as possible. That can only happen if the essential features are worked on first. The reason for this is to optimize value so that whatever the development team is working on will produce a valuable, usable increment or result.

The backlog is transparent and visible so that it is clear to all involved what work is next on the list. Because the product owner is accountable for the product backlog, they are also responsible for making sure that the development team understands the items in the backlog to whatever level is necessary to accomplish the work. That responsibility means that the product owner is continuously in contact with the customer, other stakeholders, the development team, and the Scrum master.

The following is a sample backlog so you can get an idea of what a *very* simple backlog looks like. This is very different from a breakdown of the scope of work in a predictive environment:

Must Do	Should Do	Could Do	Won't Do (for now)
Get all shots	Train to sit	Doggy training school	Let run loose in the backyard
Potty train	Train to stay	Go to dog parks	Stop him from barking at strangers at the door
Exercise	Train to come when called	Take camping	Train them to roll over

Figure 5.1 – Raising a puppy backlog

I realize this is a far cry from an actual backlog for those that use them, but I just got a new puppy, so it's front and center in my mind. It's everything you or the customer consider deliverables, prioritized. That could change daily. Not barking at strangers could quickly become a must-do and until he has all his shots, we won't go to a dog park. In *Chapter 7, Scope Management*, we'll review *user stories*, which are a way to plot out the requirements outside of a list of requirements, a Gannt chart, or **Work Breakdown Structure (WBS)**.

**Note**

*The Project Management Professional (PMP), PMBOK Guide and the Project Management Institute Agile Certified Practitioner (PMI-ACP), and the Agile Practice Guide are registered trademarks of the Project Management Institute, Inc.*

This type of defined scope of work is far different from what you will see in the scope management sections of predictive project management. There is a rank and file structure in predictive project management. This is a distinct order of activities that are approved as a baseline, causing the scope of work and schedule management to function differently from an Agile environment because it's not as flexible for dealing with a rapidly changing scope of work.

The following are all part of the product owner's role:

- They're in charge of collecting the requirements for the features and functions and scope of work.
- They own the product backlog.
- They explain the items in the backlog to the team.
- They regularly prioritize to make sure the essential features are in the final result, no matter what.
- They work closely with stakeholders to make sure they have the most up-to-date information.

The following are the critical aspects of a product backlog:

- Dynamic
- Constantly changes
- Exists if a product exists
- Lists all features, functions, requirements, enhancements, and fixes

**Note**

Here is a link to an awesome video about product ownership by Henrik Kniberg. I hand it out to every single one of my students. Check it out!

<https://www.youtube.com/watch?v=502ILHjX9EE>

Alternatively, you can search for *Product Ownership in a Nutshell* on YouTube to get there faster.

## The development team

Because the product owner decides which items in the backlog are the most valuable, the development team will need to figure out how they think they will do the work of producing a potentially releasable increment. They are the "*how*" of the operation. The development team is typically recommended to be small enough to adapt quickly to changes and risks, but also large enough to complete the work. In a perfect world, the Scrum team would be greater than three people and fewer than nine. The team is also empowered to organize and manage their work. Now, you might be thinking; I have 15 people or 125 people on my team, so how do I practice agility? Variations of the Scrum framework were embraced by others who were asking the same question. How do we adopt the framework of Scrum but scale it to accommodate more team members? It can be done, I promise. Plus, you'll probably be tailoring or using a hybrid, so don't worry too much about the rules presented. The team is **self-organizing and cross-functional**. Once they know what the most valuable items are to work on first, they determine how to accomplish them.

## Scrum master/coach/Agile project manager

Generically, the Scrum master is a role designed to be the glue that holds the rest of the team together and provides necessary training and information to both the team and the organization.

Organizations tend to try and implement Scrum or other Agile practices without seeing the value of a Scrum master and tend to frown upon someone just being a coach. Many hats are expected to be worn by project team members daily, but especially the coach. Because of this, often, Scrum or other frameworks are blamed for not working. The Scrum master is described as a servant first and a leader second, not a manager, not a business analyst, and not a senior stakeholder.

The goal of the Scrum master is to maximize value in all interactions with the product owner, development team, and the entire organization. Their role in the organization is to make sure that Scrum is effectively implemented from the top down and the bottom up. That can be a big job, and that is why the *Agile Practice Guide*® works with the need for knowledge of teams that are attempting to utilize the best practices in a hybrid or tailored way.

Now that you have covered the team roles, let's take a look at the Agile life cycle.

## The Agile life cycle

This section is probably the most tested because some specific events and artifacts occur during an Agile project. The life cycle is so much more different from a predictive environment, so it should be easier to identify in the exam.

There are five main Scrum events:

- Sprint planning
- The Sprint
- The Daily Scrum/stand-up
- Sprint review
- Sprint retrospective

When I think of the word Sprint and how it applies to the framework, I think of running very quickly but not getting very far. It's the same concept in Scrum and most Agile frameworks. The Sprint is typically 1 month or 2 weeks in duration. That allows for a consistent duration to be in place for all development efforts.

That does not mean that the project is over and done with. In fact, a new Sprint starts immediately after the previous Sprint is over until such a time when the customer or organization determines that the project is complete.

## Sprint planning

Agile gets a bad rap for lack of planning because the assumption is that if you don't know the specific scope of work, how could you possibly plan? Think of the term progressive elaboration. Essentially, we elaborate on the scope of work progressively. We plan at the *last responsible moment* so that we don't have to change plans whenever the customer or organization suggests a new idea or deliverable. Go with what you know today and plan the rest once you have more information. Agile teams do plan, and most of our planning meetings are 8 hours for a 1-month sprint or iteration. It sounds like a lot, right? Imagine how much conversation and planning could happen at that meeting.

Sprint planning involves answering the following questions:

- What can be created and delivered in the current increment?
- How will the work results be achieved?

The team would select the work they are going to do during the Sprint and determine the way to achieve it.

## The Sprint

An uncomplicated way to think of a Sprint is to think about it as its own small distinct project with no more than 1 month's worth of work being accomplished. This is much like a phase-oriented, predictive project where something of value is delivered and approved before the next phase begins. Something usable by the customer will be created at the end of each sprint or iteration. That doesn't mean that it has all the features and functions the customer wants; it just means that the customer will have something they can test, review, and use to make future decisions. Another reason why sprints (or iterations) are limited to one calendar month is to think about how much risk could be prevented by not pre-planning the unknowns. The scope of work is a bit more buffered from impacts of risk, and it also protects the budget because only a certain amount of work has been completed and paid for in any 1-month time frame. Now, the customer can change their mind about specific features, the product owner can shift the value in the backlog, and the team can go into another Sprint, producing something valuable and usable at the end.

## Daily Scrum or stand-up meetings

The daily stand-up meeting is quite possibly the main takeaway for predictive project managers, meaning something they want to use on their projects. This meeting is what it sounds like it is. Daily. Stand-up. Meeting. The team will gather together at the same place, at the same time, for the same duration (15 minutes) every day to communicate about the project work. I try to do this in the morning when the team is both caffeinated and avoiding their inboxes in favor of Facebook. We stand in a circle, and each team member answers three all-important questions:

- What did I work on yesterday to help meet the project goal?
- What will I work on today to help meet the project goal?
- What impediments are in the way that could keep me from meeting today's goal?

Keep in mind that this isn't about solutions – it's only about information. If there are impediments or problems, the team works on those together outside of the meeting. It's information only. The other great thing about these meetings is the ability to identify potential risk events and any schedule or scope issues.

## Sprint reviews

Put simply, the reviews are an informal way to get the customers, the team, and other stakeholders in a room to demo, test, and discuss the result. The review gives the team insight into the customer's needs, what they feel is valuable, and what they would like to see next that will be part of the emergent design process. If I were building an app to edit photographs on the go, I wouldn't be able to build it all out right from the get-go. I would have to create the architecture, have it tested and reviewed, then produce the next iteration plan so that I have the first page designed and tested and so on until someone says "voila, the perfect app for me!" The review could be aligned with the validate scope process, which we'll review in *Chapter 7, Scope Management*. Basically, the validate scope process is the act of getting formal approval on the work or deliverables that have been completed.

## The retrospective

Once the review is completed, just the team will hold a retrospective meeting, which is designed to review the past Sprint or iteration, discuss what worked, what didn't work, as well as the customer's review results. It's like a lesson learned meeting except the retrospective happens every time an iteration ends, rather than when the project is over. This is designed that way because, at the end of a project, there isn't any way to fix what happened, only to find out what to do better the next time. The retrospective is a key *inspect and adapt* meeting for the team so that they know what to focus on the next time. You may also discuss continuous improvements in the way the team communicates, works toward solutions, makes decisions, and so on. After the retrospective ends, the team goes right into the Sprint planning meeting, and the cycle begins again.

Pretty cool, right? There are many more nuances that go into a Sprint or Agile life cycle than we can address here. The PMP® exam will test your ability to adopt best practices and to identify the correct life cycles, work as a team with communications and conflict resolution, as well as some basics on the value of the stand-up meetings, retrospectives, and the like. In *Chapter 7, Scope Management*, we'll review how requirements are documented for both predictive and Agile projects and how they fit into the life cycle we just reviewed.

## Summary

This chapter started with a discussion on the roots of Agile's history: the Agile Manifesto. Next, we went through the 12 principles of Agile that influence every aspect of Agile project management, regardless of the type. The manifesto and principles are great things to keep in mind, regardless of whether you are implementing some process on your projects or answering questions in your exams.

Then, we reviewed the Scrum framework at a high level. It's best when studying to be aware of the roles and responsibilities and the life cycle of a basic Agile project. Scrum was used as an example due to its popularity and simple structure.

While Agile differs from a waterfall type of project management, it is relevant to mention again that it is possible to have best practices come from each life cycle type, as needed for your unique projects. All of what we'll discuss are best practices and can be adapted as required for your organizations.

In the next chapter, we will go through scope management planning. The scope of work will include collecting requirements, defining the scope of work, and creating your **Work Breakdown Structure (WBS)**, as well as additional information on Agile requirements and how user stories influence a different way of presenting what requirements are needed.

## Assessment exam

### Question 1

You and your team are meeting to discuss the customer's feedback on the deliverable you created in this iteration. What part of the Agile life cycle are you experiencing?

1. Review
2. Retrospective
3. Sprint planning
4. Daily stand-up meeting

### Question 2

One of the team members is describing the work they did yesterday and their plans for today. What is the best time to discuss those areas of project work?

1. Review
2. Sprint planning
3. Daily stand-up meeting
4. Retrospective

### Question 3

Kamilla is your project sponsor and is introducing you to Bob, the customer whose software you will be developing. Bob wants to know what to expect from the life cycle. You mention that you and your team practice Agile and use the Scrum framework. Bob looks confused and says, "Agile? Does that mean you aren't doing any planning at all?" How do you respond to your customer?

1. "Right, we don't do a lot of planning in Agile because you know things will change."
2. "We plan, but not the first iteration."
3. "We plan at the last responsible moment, so we don't have to change plans whenever a suggestion occurs for a new idea or deliverable."
4. "Correct, Agile teams don't plan at all; they go with the flow."

### Question 4

Which of the following best describes Scrum?

1. A process
2. An Agile method
3. A waterfall method
4. A framework

### Question 5

During your 15-minute stand-up meeting, two of your team members start discussing a solution to one of the issues that they ran into the day before. As the Scrum master or Agile project manager, what should you do?

1. Extend the meeting and encourage your team to find a solution before going back to work.
2. Make sure you help them resolve the issues after the meeting but not during the meeting.
3. Invite other experts to the meeting to help create a solution.
4. Do nothing – a Scrum master only listens during the stand-up meeting.

### Question 6

You are the product owner in your organization, and you have just started working with a new Agile team. One of the team members wants to know what your job entails. What do you tell them?

1. "My entire job is to make sure the team has daily stand-up meetings and continues to embrace Agile."
2. "My job is to coach all of the managers on the different aspects of Agile project management."
3. "My job is to own the product backlog and make sure that customer value is realized, no matter what."
4. "My job is to debate requirements only with key stakeholders to make sure we are building the product correctly."

### Question 7

As an Agile project manager, you want your team to be which of the following?

1. Self-organizing and self-managed
2. Dependent on your project plans
3. Dependent on the product backlog
4. Self-organizing and servant-leaders

### Question 8

You are an Agile project manager, and you are explaining to your new team why retrospectives are so valuable to the team and the organization. What will the team begin to understand about retrospectives once you have explained it to them?

1. Retrospectives are a specific, planned review and reflection point.
2. Retrospectives are a primary function of all Agile methodologies.
3. Retrospectives are when the customer comes to our location and tests the increment.
4. Retrospectives are for helping the product owner to create the backlog.

### Question 9

As an Agile project manager, you explain to your team that, as their coach, you are there to provide for the team's needs and remove any roadblocks to their progress. This leadership approach is also described as which of the following?

1. Project management
2. Agile leadership
3. Management and leadership
4. Servant leadership

### Question 10

Your customer is asking you to describe what you mean by self-organizing and self-managing teams. How would you describe them?

1. Your team is colocated, which helps with self-organization and self-management.
2. Your team is a group of experts who really don't need a manager.
3. Your team can make all project-related decisions.
4. Your team can make decisions about how to produce the result of each iteration based on a shared knowledge of the work.

### Question 11

The basics of a stand-up meeting are to achieve which of the following?

1. Describe accomplishments for motivation.
2. Coordinate discussions on problems and work on solutions.
3. Identify opportunities for improvement.
4. Identify issues and describe what has been completed since the last meeting.

### Question 12

Who is responsible for the product backlog?

1. The Scrum master
2. The product owner
3. Everyone
4. The sponsor

### Question 13

Your team is looking forward to practicing the framework of Scrum and Agile. When asked how long the stand-up meetings will be, what will you say?

1. Stand-up meetings are weekly for 1 hour.
2. Stand-up meetings are for waterfall projects.
3. Stand-up meetings will require 15 minutes every day.
4. Stand-up meetings will require 15 minutes every week.

### Question 14

Colin has just joined your organization and is going to be part of your team. He has some familiarity with Scrum but is confused about the backlog and what it is. How do you explain to Colin what a backlog is?

1. "It's an itemized list of things that the development team wants to accomplish on the Sprint."
2. "It's all the requirements for features and functions prioritized by what it's most valuable to do next."
3. "It's the list of value to be created, as well as the risk information for the project."
4. "It's the development team's "punch list," and it includes the theme of the Sprint."

### Question 15

Daily stand-up meetings or daily Scrums are designed to work through three questions. What did we work on yesterday? What will we work on today? Which of the following is the third question?

1. What impediments are in our way?
2. What solutions have we created?
3. What risk events have occurred?
4. What backlog items need to be accomplished?



# 6

# Creating and Leading a Team

In this chapter, we will review tasks relevant to people. The first task is probably the last thing you want to think about, but it's an essential skill to have as a project manager. This is something known as conflict resolution. Conflict can create multiple problems for a project team and with stakeholders, and as uncomfortable as it may be to work through, it is imperative for you and your team to have the skills necessary to identify and manage conflict accordingly. The second task focuses on the importance of leading a team of individuals that have a clear mission and vision while supporting diversity and inclusion.

In this chapter, we will cover the following topics:

- Interpreting the source and stage of the conflict
- Analyzing the context of the conflict
- Evaluating, recommending, and reconciling the appropriate conflict resolution solution
- Setting a clear vision and mission
- Supporting diversity and inclusion
- Valuing servant leadership (relating the tenets of servant leadership to the team)

- Inspiring, motivating, and influencing team members/stakeholders (team contract, social contract, reward system)
- Analyzing team members' and stakeholders' influence
- Distinguishing between various options to lead various team members and stakeholders

## Interpreting the source and stage of the conflict

This is where we focus on the human aspects of project management. As we move forward, you will hopefully generate some ideas that will help you manage, motivate, team build, and understand your team. Even though this all sounds awesome, we know that nothing messes up a project faster than people, and not just people, but conflict as well.

Conflict isn't about "if," it's about "when." Even though most conflicts will be considered functional conflicts, there could be some dysfunctional conflict going on as well. Much like I can't tell you how to motivate your team of individuals individually, neither can I give you exact resolutions for conflict in your unique team. The only way to address conflict resolution is by presenting categories of strategies, and which strategies work better than the others.

It is also essential to determine what is causing the conflict and how long it has been going on. Is it a personality issue? Does the team disagree on the direction in which they should go? Is the team newer to Agile frameworks and are they finding it challenging to practice transparent communication about pain points? What is the root cause? Most of the time, it could be due to issues or risks that have been realized, and the team doesn't know how to solve them, or possibly don't have the skill sets to do so. Nothing can wreck a person's day like failing to do something correctly at work.

Indeed, we would love it if every conflict could be resolved in a solution-oriented manner where everyone walks away happy, but that is rarely the case.

What would you say is the number one cause of conflict on your team?

- Lack of communication?
- Personality issues?
- Unclear expectations?
- Work styles and habits?

- Being behind schedule or over budget?
- Lack of resources?
- Scope creep?
- Unexpected risk events?
- All of the above?

There are a variety of reasons why a team could have a conflict situation. Sometimes, it's just a couple of people; sometimes, the whole team is trying to work through a situation. You are in charge of guiding your team through conflict resolution, with the hope being that the team will eventually figure out how to play nicely together so you can stop parenting. Other times, the team stays in conflict or the project itself is a bit of a nightmare and everyone is pretty cranky about it.

You will get questions in the PMP® exam that describe a conflict situation and how the conflict was handled, and you will need to select the best resolution that matches the situation that's presented. You may also be asked whether a resolution is a win/win, win/lose, or lose/lose situation.

After we have interpreted the source, we need to understand the context of the conflict.

## Analyzing the context of the conflict

Many of the skills and qualities of an effective leader include managing relationships and conflicts by building trust, satisfying concerns, seeking consensus, and by nurturing personal and professional relationships. The thought is that building and maintaining long-term relationships is equally as important as having a successful project result. As one of the many interpersonal and team skills reflects, conflict management can be used to bring stakeholders into alignment and to allow for functional discussions and resolutions of differences in project opinions. That is why you see conflict management being used as one of many tools and techniques for a variety of processes, and that is due to the necessity of managing conflicts in a constructive manner. Constructive conflict resolution can be difficult due to the global nature of project management, the potential for virtual team members, and disagreements about the way the project should be managed.

While identifying context, it's essential to understand who the individuals are and what their interactions with each other have been like to determine conflicts. Is this a first-time occurrence or have the stakeholders had different opinions before? What narratives have occurred in meetings or in the office? Is the team newly formed or have they been together for a while and are possibly considered a performing team? There are times to get involved and times to step away. The importance and intensity of the conflict are factors for consideration, as well as how quickly the conflict needs to be solved. For example, is there a schedule constraint that might not be met if the conflicting opinions can't reach an agreement? What is the status of the people involved and their position of power, if any? Is there motivation to solve the problem and maintain a long-term solution? Or is it a situation where a "like it or lump it" (as my grandmother used to say) decision has to be made?

Effectively managing conflict can lead to lots of excellent project management benefits, such as a highly productive team. According to *Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition*, the success of project managers and their ability to manage and motivate their teams often depends on their ability to resolve conflict. You know, conflict isn't always about us looking from the outside in; often, there is conflict with stakeholders in charge of the project or a change control board member who seriously doesn't want to approve your change request – a conflict between yourself and functional managers who have a tight grip on the people you need. Conflict is inevitable. I despise conflict. It makes me sick to my stomach. I have to decide whether to negotiate, run away, or cry, and there is no crying in project management! Yes, yes there is – having emotional intelligence goes a long way toward helping with conflict resolution.

The people side of project management is dedicated to building and maintaining not just a high-performing team but a high-performing team that can manage conflict effectively while still going about the business of business. Typically, this is due to functional conflict or disagreements about project direction, resources, or changes. Then, there is dysfunctional conflict. How you manage conflict is based on your working knowledge of the actors, and the interactions between them. Keep a close eye on any disputes regarding cultural differences. It is imperative that you stanch any ethnocentrism (the belief that someone's culture is superior to that of another), practice fairness, remove conflicts of interest, and practice active listening. This is easier said than done, I know.

## Conflict resolution strategies

There are six categories of resolution for conflict. As you review them, ask yourself which resolution strategy is your go-to or your preferred way of handling things:

- Collaborate and problem-solve
- Compromise/reconcile

- Smooth/accommodate
- Force/direct
- Withdraw/avoid
- Negotiate

We'll start with the best resolution strategy for collaboration, albeit the most difficult to attain. However, if it works, then it's the longest-lasting strategy.

## **Collaborate and problem-solve**

This is considered a win/win strategy and the best, longest-lasting way to manage a conflict situation because it is solution-oriented. The team or individuals will discuss ways to resolve the conflict and agree on the solution. This is a bit of perfect-world conflict resolution and is easier said than done. In fact, this is the most time-consuming of all solutions, because it may take some time and effort to get everyone on the same page and reach an agreement. This strategy is best used when there is a disagreement in the way a functional conflict should be managed. For example, let's say we are behind schedule, and one team member thinks that if they just had more help they would move faster, while another thinks fast-tracking is the way to go to protect the budget and not involve more people. In that case, both parties will be heard, and a decision can be made. If the disagreement is based on something personal and each party feels strongly about it, then a solution may not be attained. Imagine someone trying to convince you that your favorite sports team was the wrong choice.

## **Compromise/reconcile**

Believe it or not, compromise is considered a lose/lose strategy because both sides have to give up something to conclude. It is, however, useful especially when a decision or resolution needs to be made fairly quickly and if each party feels they gave up the same amount to move forward. If one party feels like they gave up more than the other party, there may be some residual conflict that shows up later in the project. Until then, compromise is a typical strategy. This is lose/lose but useful, especially if confronting and solving the conflict isn't possible.

## **Smooth/accommodate**

Smoothing is considered a win/win strategy but one that's a short-term fix to a conflict situation. This is because the focus is on commonalities between the parties and not the differences. I look at this like smoothing ruffled feathers. The parties may feel good about things in the short term and then go home and think about it, or perhaps talk to other people, and realize they are still not happy about it and that nothing was resolved. The next day, they may come back with the same issues. That is why smoothing is best used in combination with collaboration and/or compromise. It just may be necessary to calm the situation down to do so.

## **Force/direct**

Forcing as a conflict resolution strategy should be used sparingly because it's the equivalent of telling your children to knock it off and stop fighting with each other. Forcing is a win/lose strategy and can breed more hostility and conflict if used too often. It may be necessary upon occasion (on your team, as with your children) to lay down the law – especially if there is a compliance or regulatory requirement a team member disagrees with but it is necessary to execute it. That's a "too bad, do it anyway" conversation. Forcing and directing may also be needed if a swift decision needs to be made and you have to make it. We are fast-tracking instead of crashing; end of story, let's move on and get it done.

## **Withdraw/avoid**

I don't know many people who enjoy conflict, although some enjoy drama and wreaking havoc. You know who they are, and you avoid them at all costs. When it comes to conflict, though, avoiding is considered a lose/lose situation. Trying to get away from the conflict doesn't make it go away – it only makes things worse and prolongs the issue. However, there are situations where something called strategic avoidance is necessary and this could be because of a very heated or dangerous escalation of conflict. Another way to utilize this strategy is if you are sitting around a conference room table and nothing is getting accomplished, and everyone is cranky and tired – you could let them all go and shelve the conversation for another time when everyone has had some rest and downtime to consider the alternatives. I'm self-aware enough to know I am very avoidant of conflict in general and try very hard not to stir the pot or create drama or conflict, but it does occur in teams, and it does need to be handled. Therefore, I need to pull my head out of the sand, be solution-oriented, and face the music. Avoiding is unavoidable sometimes in our chosen profession.

Often, a conflict situation can be quelled before it even begins by having a clear team vision and mission. If the team has a clear vision, conflict can end after a gentle reminder that we are all in this together.

## Negotiate

Negotiation is a key aspirational skill for project managers to have and continually work on. Compromise is a bit of negotiation as far as conflict is concerned, but the skill is utilized in many ways, from the acquisition of resources, garnering more support from stakeholders, to overcoming a dispute in procurement. You may need to bring in a third party to facilitate negotiation discussions where conflict is concerned if you are not the right resource to engage in the discussion. An impartial party may help to quash the conflict and facilitate an effective discussion because they don't have any emotion behind the conversation.

The role of a project manager is vast, as we know, and best practices go a long way in helping to manage project work. The people side of project management is a bit vague and dependent on your understanding of human and organizational behaviors. The first step is to set a clear vision and mission for the team.

## Setting a clear vision and mission

It's probably pretty easy to tell that there is a lot involved in being a project manager. I can tell you that after many years as a project manager, there are days when I question the sanity of my stakeholders and, quite frankly, my sanity. However, the beauty of being a project manager is that we can work with multiple different kinds of people, produce results, and mostly keep the entire ship sailing straight. It doesn't always work out like that, of course, but in a perfect world, we have all the best practices, tools, techniques, and the right attitude to get to the finishing line.

The role of the project manager includes doing the following:

- Managing the project team
- Solving problems
- Managing communication across multiple stakeholders
- The ability to collect the right requirements for the scope
- The ability to create and maintain a budget and a schedule
- The ability to identify, analyze, and remove threats, as well as to take advantage of opportunities
- Having an understanding of quality assurance and quality control as needed
- Effective planning skills across multiple knowledge areas
- Organizational skills

Some of the soft skills that are necessary include the following:

- Leadership
- Team-building
- Communication
- Active listening
- Consensus building
- Problem-solving
- Conflict resolution
- Negotiation skills

Most of the soft skills given in this list are considered aspirational skills, and nobody expects every project manager to be an expert in all of these. There are always going to be areas where we can seek to improve our skill sets and utilize those improvements when working on projects. Even though this list of soft skills seems pretty self-explanatory, it's crucial to look at the skills through the eyes of a project manager to be able to answer questions correctly in your exam and to be able to implement them in your day-to-day life. Let's start with leadership.

## Leadership

Leadership involves goal setting in a strategic manner and having the ability to lead, direct, inspire, and motivate your team of individuals. Project management exists in a global environment, and it's essential to be culturally aware and able to work with a variety of different types of people. The leadership category is an important one because project managers need to lead by example. Just like parenting children or helping a younger brother or sister, leading by example helps everyone understand the rules and the processes that are acceptable for your project. Leading by example is also the ability to have a passion for your work, which will allow you to become trusted by others and to interact with people from all walks of life.

## Team-building

Team-building is an integral part of project management. If you're lucky enough to have worked with the same people for an extended period, chances are your team is well-built and performing. There may be an occasional conflict or flareup, but for the most part, they work well together already. At this point, your job is to maintain the momentum. But what if you have a brand-new team that you just acquired? At this point, they may be more concerned with what the expectations are of project work and be dependent upon the project manager to present that information. Over time, there may be some conflict before the team settles into a routine. Team-building is vital during those points to help align everyone with the goals of the project and also to develop trust in their teammates and their project manager.

## Communication

Communication is another skill that is necessary to be effective in project management. This doesn't mean you have to be a chatty extrovert; it merely means that you know and understand what you want to communicate, how often you deliver information, who will receive the information, and how they will receive it. According to a study done by *Albert Mehrabian and Susan Ferris (1967)*, when a communicator is expressing feelings and attitudes, body language makes up 55 percent of face-to-face communication, 38 percent represents your tone of voice, and only 7 percent is the words you are speaking.

*"Please note that this and other equations regarding the relative importance of verbal and nonverbal messages were derived from experiments dealing with communications of feelings and attitudes (such as like-dislike). Unless a communicator is talking about their feelings or attitudes, these equations are not applicable."*

- *Albert Mehrabian*

When you remove face-to-face communication (as in emails or text messages), the tone becomes the prominent factor, and then the words you write. How many of you read and reread your emails or texts before sending them out? Especially if you're feeling a bit salty that day or under the weather, you probably know it can inadvertently affect your tone. You are checking for tone. *How people perceive you is how they will receive you.* Even though you can't control others' thoughts and perceptions, you can present the message in a way that the tone is considered and reviewed before pushing send.

**Fun fact**

This is why emoticons were and are created. They step in for the lack of body language and to make sure that the tone of the message isn't misunderstood. Not all organizations find emoticons business-appropriate :( so be sure to check your tone more often if that is the case. :)

## Active listening

What? Active listening is truly a skill we can all work on daily. Trying not to think of what you are going to say next, thinking about other things, or being distracted by your cell phone is difficult in this day and age. Authentic active listening is focusing on the message that the other person is communicating, asking questions for understanding as needed, and then responding appropriately to the message.

Reaching a consensus, solving problems, reducing conflict, and being an effective negotiator are also skills you should either acquire or improve upon throughout your career. I don't know a lot of people who enjoy conflicts, although some enjoy drama. I bet somebody's name just popped into your head. For the most part, though, we are talking about functional conflict; for example, a disagreement about the direction to correctly schedule performance or about a feature or function that someone wants to be included or removed from the plans. Most of the time, this is conflict at work. There is also dysfunctional conflict or drama. That person's name popped back into your head, didn't it?

The other soft skills include building consensus through good communication, the ability to solve problems, and the aforementioned conflict resolution and negotiation skills that all make for a well-rounded project manager. The one item that is missing is the ability to support diversity and inclusion. The world is getting smaller and business is getting larger. Without conscious consideration being given to diversity and inclusion, the other skills pale in comparison.

## Supporting diversity and inclusion

Since you are in the process of gaining your PMP® or CAPM® certification, you will need to be aware of *The Code of Ethics and Professional Conduct*. Since this section is about supporting diversity and inclusion, it seems relevant to discuss the code here due to the mandatory and aspirational skills that are applicable. Plus, you will see questions on the exam related to ethics. We will review the *Code of Ethics and Professional Conduct* at a high level here. You can find the document on PMI's website (<https://www.pmi.org/about/ethics/code/>). It will be essential to read and understand it, both for the exam and for your future as a certification holder.

The code applies to the following:

- All PMI® members
- Individuals who are not members of PMI® but meet one or more of the following criteria:
  - a) Non-members who hold a PMI® certification
  - b) Non-members who apply to commence a PMI® certification process
  - c) Non-members who serve PMI® in a volunteer capacity

Therefore, you are held accountable if you fit into any of the criteria mentioned. The *Code of Ethics and Professional Conduct* is broken into four distinct categories that include both *aspirational standards* and *mandatory standards*.

These categories are as follows:

- Responsibility
- Respect
- Fairness
- Honesty

According to PMI®:

*"Aspirational standards describe the conduct that we strive to uphold as practitioners. Although adherence to the aspirational standards is not easily measured, conducting ourselves in accordance with these is an expectation that we have of ourselves as professionals – it is not optional. The mandatory standards establish firm requirements, and in some cases, limit or prohibit practitioner behavior. Practitioners who do not conduct themselves in accordance with these standards will be subject to disciplinary procedures before PMI's Ethics Review Committee."*

**Note**

*Project Management Professional (PMP) PMBOK Guide, The Project Management Institute Agile Certified Practitioner (PMI-ACP), Code of Ethics and Professional Conduct, and The Agile Practice Guide are registered trademarks of the Project Management Institute, Inc.*

## Responsibility – aspirational standards

Responsibility is the first on the list and describes the aspirational and mandatory standards. These are as follows:

- We make decisions and take actions based on the best interests of society, public safety, and the environment.
- We accept only those assignments that are consistent with our background, experience, skills, and qualifications.
- We ensure that critical stakeholders receive timely and complete information regarding the gaps in our qualifications so that they may make informed decisions regarding our suitability for a particular assignment.
- We fulfill the commitments that we undertake – we do what we say we will do.
- When we make errors or omissions, we take ownership and make corrections promptly.
- When we discover errors or omissions caused by others, we communicate them to the appropriate body as soon as they are discovered.
- We accept accountability for any issues resulting from our errors or omissions and any resulting consequences.
- We protect proprietary or confidential information that has been entrusted to us.
- We uphold this code and hold each other accountable to it.

## Responsibility – mandatory standards

The mandatory standards for responsibility are as follows:

- We inform ourselves and uphold the policies, rules, regulations, and laws that govern our work, professional, and volunteer activities.
- We report unethical or illegal conduct to the appropriate management and, if necessary, to those affected by the conduct. This includes but is not limited to theft, fraud, corruption, embezzlement, or bribery.
- We do not take or abuse the property of others, including intellectual property, nor do we engage in slander or libel.
- We do not condone or assist others in engaging in illegal behavior. We report any illegal or unethical conduct.

- Ethics complaints – we bring violations of this code to the attention of the appropriate body for resolution.
- We only file ethics complaints when they are substantiated by facts.
- We pursue disciplinary action against any individual who retaliates against a person raising ethics concerns.

## Respect – aspirational standards

The aspirational standards for respect are as follows:

- We inform ourselves about the norms and customs of others and avoid engaging in behaviors they might consider disrespectful.
- We listen to others' points of view, seeking to understand them.
- We approach the people we have a conflict or disagreement with directly.
- We conduct ourselves in a professional manner, even when it is not reciprocated.

## Respect – mandatory standards

The mandatory standards for respect are as follows:

- We negotiate in good faith.
- We do not exercise the power of our expertise or position to influence the decisions or actions of others to benefit personally at their expense.
- We do not act in an abusive manner toward others.
- We respect the property rights of others.

## Fairness – aspirational standards

The aspirational standards for fairness are as follows:

- We continuously reexamine our impartiality and objectivity, taking corrective action as appropriate.
- We provide equal access to information to those who are authorized to have that information.
- We make opportunities equally available to qualified candidates.

## Fairness – mandatory standards

The mandatory standards for fairness are as follows:

- We proactively and fully disclose any real or potential conflicts of interest to the appropriate stakeholders.
- When we realize that we have a real or potential conflict of interest, we refrain from engaging in the decision-making process or otherwise attempting to influence outcomes, unless or until we have made full disclosure to the affected stakeholders; we have an approved mitigation plan; we have obtained the consent of the stakeholders to proceed.
- We do not hire or fire, reward or punish, or award or deny contracts based on personal considerations, including, but not limited to, favoritism, nepotism, or bribery.
- We do not discriminate against others based on, but not limited to, gender, race, age, religion, disability, nationality, or sexual orientation.
- We apply the rules of the organization (employer, Project Management Institute, or other groups) without favoritism or prejudice.

## Honesty – aspirational standards

The aspirational standards for honesty are as follows:

- We are truthful in our communications and our conduct.
- We provide accurate information promptly.
- We make commitments and promises, implied or explicit, in good faith.
- We strive to create an environment in which others feel safe so they can tell the truth.

## Honesty – mandatory standards

The mandatory standards for honesty are as follows:

- We do not engage in or condone behavior that is designed to deceive others, including, but not limited to, making misleading or false statements, stating half-truths, providing information out of context, or withholding information that, if known, would render our statements misleading or incomplete.
- We do not engage in dishonest behavior with the intention of personal gain or at the expense of another.

As you can probably tell, understanding and abiding by the *Code of Ethics and Professional Conduct* is comprehensive but is designed to point out the necessity of being fair and honest and striving to be a better version of ourselves every day. The one thing to note is that PMI® is a global organization, and inclusion and diversity come part and parcel. Ethnocentrism (meaning you believe your culture is better than that of another) is a big no-no in project management. The other consideration here is culture shock, which doesn't always happen when you get off an airplane in another country. Culture shock is experienced when someone joins a new team or experiences something that is outside their routine existence. Good or bad, it can feel a bit "off." All of these considerations are important, and if your team is experiencing some cultural issues, then *diversity training is imperative*, as well as team-building exercises that promote an *understanding of different cultures*. As a project manager, you will need to identify any potential conflicts or issues and get in front of them before they turn into a real problem. Regardless of the type of life cycle you work with or choose to apply, practicing servant leadership is an excellent way to build a high-performing team.

Servant leadership in the Agile and hybrid project management space is becoming more influential as a valuable skill for project managers to have and continue to improve upon.

## Value servant leadership

In *Chapter 5, Introduction to Agile Considerations*, you were provided with multiple examples of servant leadership in the context of a coach or a Scrum master. These days, there are lots of opportunities to practice servant leadership, whether you are working on a hybrid project or a full Agile or predictive life cycle. Determining the appropriate style and practicing servant leadership is always a work in progress but conceptually, it regards the desire to lead rather than manage and the options to build a high-performing team and work as a communicator, facilitator, and coach. That's not to say we aren't tied to our desks, occasionally updating dashboards and Gantt charts. That's management, and we need that too. The value of servant leadership and building high-performing teams is that no matter what type of project you are working on, you will work in a support role and allow the team to self-organize around the work.

The benefits of using Agile or servant leadership in other industries beyond software development are many. Tailoring our approaches to better meet the rapid pace of projects today is a necessary skill, as well as for organizations to be able to respond to the swift changes in technology, competition for products, services, results, and changing requirements. That, however, is easier said than done.

For an organization to practice agility at the right organizational level, there must be an understanding and internalization of Agile principles. It's only recently that collective knowledge of Agile frameworks has been gathered. It's been something of a well-guarded secret for only software development projects or Scrum aficionados. Some organizations attempt to implement Agile best practices but don't use them effectively. It is vital to practice the steps until you're proficient in them and to encourage others not only to internalize Agile best practices but to practice them regularly. The hard part is that a lot of organizations are used to their current process flow, and even though it may not be working sufficiently, change is always a bit painful.

**Note**

*The Agile Practice Guide*<sup>®</sup> was designed for teams in the messy middle ground between predictive and Agile, as well as *The Project Management Body of Knowledge (PMBOK<sup>®</sup> Guide) - Sixth Edition*, which contains considerations for implementing Agile and creating an Agile environment. *The Agile Practice Guide*<sup>®, page 33.</sup>

Servant leadership is used to empower the team. This role allows for facilitation and to approach work in the order of the purpose and goals of the project, providing collaboration and understanding of the mission at a project level, rather than at an individual level.

Once the purpose is well understood, the focus turns to people and creating an environment of self-direction and promoting team success. Only after that can we can focus on the process of creating value early and often. This can be done in the form of a hybrid approach or a full Agile framework.

According to the *Agile Practice Guide*<sup>®</sup>, the characteristics that make an effective servant leader include the following:

- Promoting self-awareness
- Listening
- Transparent communication
- Serving those on the team
- Helping people grow
- Coaching versus controlling
- Promoting safety, respect, and trust

- Promoting the energy and intelligence of others
- Facilitation
- Removing organizational impediments
- Educating stakeholders in the chosen approach
- Supporting the team through mentoring, encouragement, and support
- Helping the team with technical project management skills
- Celebrating success

The beauty of servant leadership is that it complements and encourages collaboration, consensus, team-building, communication, and facilitation, all while building a high-performing self-directed team. Cool, right? I highly suggest you read through the *Agile Practice Guide*® as it's designed for those who may not have a lot of experience with Agile best practices but have always been a developer of people. Plus, it's in the exam, so there is that. There are other leadership styles that may complement a predictive environment more than an Agile environment, but the ability to move between the styles where appropriate is the real sign of an adaptive leader and a servant leader.

As a project manager, it is essential to make sure that all the pieces of the puzzle come together and are integrated into the final product, service, or result. We all know that, as project managers, being able to incorporate multiple processes, people, plans, and results is a critical skill set.

Integration, as an entire knowledge area, encompasses the creation of a project charter, the development of a project management plan, directing and managing project work, managing project knowledge, monitoring and controlling project work, performing integrated change control, and formally closing down the project or phase. Integration is the umbrella term over the rest of the knowledge areas and processes. Because of that, it's crucial that the project manager understands the strategic objectives and makes sure that those objectives align with the project objectives and results. Once we know all of the goals, we are then responsible for getting our team to work together and focus on the essential aspects at the project level. If we think of the word *integrate* or *bringing together* as it pertains to project management, then it means processes, knowledge, and people all work together toward a common goal.

## Inspiring, motivating, and influencing

The ability to inspire, motivate, and influence is an entire topic all on its own and usually a work in progress. One of the best practices would state that a team charter is how you set the project vision and how the project benefits the team, the organization, and the customer. The team charter may also describe the project's release criteria within the understanding that the team's vision needs to align with the results they are producing. Finally, but maybe most importantly, it describes how the team will work together. Those topics are more likely to include team values and working agreements, including the completion criteria for increments they create. Completion criteria in the Agile space are called the *definition of done*. Ground rules and group norms are also discussed, agreed upon, and written in the team charter. The social contract process of creating a team charter is an excellent way to create an environment of collaboration and effective decision-making and paves the way for developing or maintaining a high-performing team of individuals.

As a project manager or servant leader, our skills need to be honed to effectively influence our team and other stakeholders for the good of the project and the good of the people. The *Code of Ethics and Professional Conduct* explains many of the best practices and rules for, if you will, effective management.

I'm sure it's obvious that having your team that you work with all the time is a perfect situation for project managers. You know your team, you know their skills, and you know their work styles and personalities, which makes it easier to schedule work correctly and interact with your team daily.

### Note

The PMP® exam assumes a strong matrix organization (unless otherwise stated in the question). This assumption provides core resources for the project and the potential for acquisitions outside of the team for functional resource needs or through staffing and procurement and is why it would be necessary to acquire your team. This means you should acquire the **rest** of your team when it's time to execute the work.

Since projects are temporary and unique, it would make sense that some of your resources are as well. The disadvantage of this type of team is that they may be part-time on your project since they have a **real job** in their functional departments, and they may be more focused on their day job than what is going on with your project. Those team members may also be more focused on their performance reviews from their manager than their performance on your project.

I'm not sure why that is, though, as most managers in my distant past only remembered the last 2 weeks of my work life and the one stupid thing I did all year, and that was my yearly review! I always keep that in mind, and after I shudder a bit in remembrance, I make it a habit to save a file regarding my acquired team members to keep track of the wins and challenges that they have overcome. I turn that over to their managers when the work is completed so that they are aware of any additional weeks of their team members' work-lives when it's time for reviews.

On longer-term projects, it's very typical for your resources to be over-allocated because your team members are working on multiple projects at once. However, there are specific techniques to reduce over-allocation. The methods that are not mentioned are begging, pleading, negotiating, and possibly crying to gain the resources you need to avoid over-allocating the resources you currently have scheduled. Since there is no crying in project management (yes, there is), you may need to brush up on your negotiating skills to acquire the right resources for your project team.

How good are you at negotiating? I thought I was great at it until I raised my daughter. I tried the standard phrases parents use when their children are about to do something idiotic. I chose, "if all of your friends jumped off a bridge, would you do it too?" Her response at 9 years old was, "Where is this fictional bridge? I'd like to see it before I answer that question." Now, I'm paying for graduate school. Negotiation is a critical aspirational skill that project managers need to hone, especially when trying to acquire resources from functional managers. I've learned the hard way that negotiating with functional managers for their best resources often ends with acquiring the only resource they want to unload from their team. Their problem is now yours, and that is why honing your negotiation skills is essential.

It's also important to know several things about your project before entering into said negotiation. Preparation is critical in any negotiation, but in this case, it's for a cohesive team or additional resources to round out your current team, so it's imperative to know what you are looking for and prepare to do some haggling.

You should have the following information at the ready:

- Dates of acquisition and release to the best of your ability
- The skills needed from the resource
- Whether that resource will be full- or part-time on your project
- How you will track their performance and report on it
- Whether that person is working on other projects at the program level
- Virtual or colocated

I also like to ask the potential resource (if possible) if they want to work on the project. I find this to be important because if the potential resources don't want to work on the project, you may deal with a poor attitude during their tenure. I would much rather acquire a person with a great attitude with fewer skills than a rock star with a poor attitude.

Just like projects, borrowed resources are temporary, so you will need to develop your team so that they perform well and thrive. It is essential to plan for your human resources as much as you would prepare for the scope of work or your schedules, budgets, and the like.

Teams go through stages of development, especially when you have team members who have never worked together before. As a project manager, identifying where your team is and in what stage of development can help you appropriately manage and develop your team and also know when you should step in or back away slowly and with purpose.

Psychologist Dr. Bruce Tuckman created the team development model unsurprisingly called Tuckman's ladder. Tuckman theorized that all teams go through certain levels of development and that at each level, there is a variety of input necessary from the manager.

Tuckman believed that to reach the level of real performance, the team had to adapt, adjust, and grow, and part of that was resolving conflict. Of course, there are people you may work with that love the drama! Someone's name just popped into your head again, didn't it? Most conflict, in this case, is functional conflict, meaning how teams deal with being behind schedule, reaching consensus, and making collective decisions.

There is also a varying level of significant influence from you, the project manager. In the forming stage, the team is very much looking to you to set expectations and explain the vision of the project. In this stage, the team is pretty much on its best behavior. You may have a mix of people who have worked together and some that have not, but at this stage, everyone is saying things such as "great to work with you," "excited for this project to begin," and other such niceties. Eventually, the storm clouds will roll in, and people will start to show their true colors and begin to disagree on a variety of things. They will figure out peoples' work styles and whether or not it works for them and so on. We hope for functional conflict, but sometimes, personality clashes occur as well, and it may be necessary for you to have a private meeting to help them work through it.

The team is still very much dependent on the project manager to "parent" them until they can begin to normalize and agree to disagree as needed. In norming, you can start to step away a bit and focus on other things. Even though they will still look to you, you may be doing less squirrel organization and more of your work. When the team reaches the performing level, they can work on their own and will be executing effectively. You will have the roles of updater, coach, facilitator, and communicator.

Adjourning was added to Tuckman's ladder later on after testing his theory for a while. Due to this, the development model is sometimes referred to as the Tuckman-Jensen model. Tuckman had initially been calling adjourning, mourning. Dr. Jensen may have gently suggested to Tuckman that not everyone mourns the loss of a team member when they leave the team or organization. Many may feel relief and say "woohoo!" It was determined that mourning would be called adjourning, and when someone leaves the team for whatever reason, the team will have to adjust to the new normal again. If a new person joins the team, then they start forming, storming, norming, and then performing again – much faster this time, of course, but still, the adjustment is necessary.

The following table is of Tuckman's ladder and provides an overview of the team development process:

Stage	Description: Tuckman's Ladder
Forming	Allowing team members to get to know each other and trust one another.
Storming	Resolving conflict and achieving consensus.
Norming	Less structured and more informal focused on maintaining momentum.
Performing	More structured and formal focused on sustaining momentum.
Adjourning	When a team loses a member or when the team is finished on a project.

Project Management Institute, *A Guide to the Project Management Body of Knowledge, (PMBOK® Guide)* - Sixth Edition, Project Management Institute, Inc., 2017, Page 388.

Figure 6.1 – Tuckman's ladder

Don't worry – we are going to dive deep into the project team psyche and review some cool human motivational theories from the experts, and hopefully generate some ideas to help you manage, motivate, team build, and understand your team.

One significant caveat before we begin this journey is that there isn't any way that I could, or PMI® could, ever tell you the exact way to do all of these things. The reason for this is that we don't know your team as you do. We don't know the personalities or the career goals or the challenges of your team. Therefore, we are going to pass it over to the experts and the theorists of motivation and team-building with the hopes that you will answer questions correctly in your exam and glean some new information to help you with the human side.

## Motivational theories

Your ability to manage your team effectively may very well come down to how you reward, recognize, and motivate. Remember the caveat, though; we can't "tell" you how to do any of this. All we can do is provide information that you'll see in the exam. My hope is that this will spark some interest in you and help you uncover some ways to motivate your team.

What motivates you? Is it money? Is it the work itself? Is it taking care of your family? What would you say is your greatest motivation?

Permit me a sidebar here with a personal theory that isn't the most well-received in the motivational guru world. My theory is that people can be inspired, but they can't be motivated by someone else. My thought behind this is that people go to see motivational speakers for whatever they need to help themselves in life. When they are there, they engage in a lot of adrenaline and high fives and tools to start adapting to their behaviors. Three days later, the euphoria wears off and many are left back to their own devices, having changed nothing. Instead, they must be inspired to change and then be self-motivated to make the changes stick. With that in mind, it is essential to recognize human behavior in such a way that you are not responsible for the challenges of your team members, especially if you have done everything you can to help them, guide them, coach them, and the like. It merely comes down to the fact that they may not be inspired and if so, they are not self-motivated. This could be for a variety of reasons, but you can only do what you can do. I ran large teams, and every day I would ask myself, "how can I help my team be successful today?" That was my inspiration to get to know everyone – their kids' names, their birthdays, their personalities, and their workstyles/habits. Then and only then could I help the individual reach for success. But they had to want it. Our job is to inspire and guide and help where we can. The motivational theorists we are about to cover understood human behaviors and collated theories that help explain the behaviors of humans and humans at work.

There are five theorists you will review, and all five could be in questions in your exam:

- Abraham Maslow's hierarchy of needs
- Douglas McGregor's Theory X and Theory Y
- Dr. William Ouchi's Theory Z
- Frederick Herzberg's theory of hygiene
- David McClelland's theory of needs

## Maslow's hierarchy of needs

In 1943, Abraham Maslow posited his theory of needs after studying hundreds of individuals and found that all humans have basic needs that must be met before they can strive for or attain other things. The following is a basic overview of the hierarchy of needs. Many of you may already be familiar with this theory as it typically shows up in psychology classes or in management training (both feel like the same thing, occasionally):

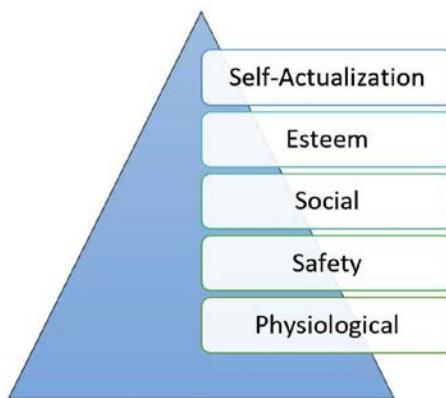


Figure 6.2 – Maslow's hierarchy of needs

The theory starts at the bottom of the hierarchy with physiological needs and goes up as a visual way of representing growth or moving up to the top of the hierarchy, which ends with self-actualization.

### Physiological needs

All humans need air, food, water, shelter, and sleep. Without those very basic needs, a human won't survive, and if they are in the process of lacking any of those variables, that will be all they will be able to think about until they have what they need. If you are starving, you will always think about food. If you are thirsty or can't breathe, those things are critical to survival, so they too would be all you would be thinking about attaining. It would make sense that those needs would come first. Lack of sleep can affect every aspect of your life, so thank goodness for caffeine! I'm just kidding (sort of) – actually, the best way to meet the sleep need is to get as much rest as you can.

## Safety needs

Humans need to feel safe in their surroundings and their lives. Once the basic human needs of air, food, and water have been met, safety needs become the dominant concern or need. Safety falls under numerous categories, including personal safety, psychological or emotional safety, financial security, and health and wellbeing. Safety is another core need, and if you live in a war-torn or poverty-stricken country or are suffering personally or psychologically, those impacts will be at the center of your life – at your core. Safety needs are exponentially necessary for all humans. Sadly, that is not the case in many situations.

## Social needs

Humans need to feel a sense of belonging and have friendships and relationships. Sometimes, social needs can far outweigh the other core needs of physiological and safety needs, especially in young children. The need to be loved and have relationships at the individual and group levels is very strong in humans, and if someone feels like they are being shunned or avoided in groups of people, it will lead to depression. This makes me think about all of the keyboard warriors on social media who shun, bully, and ostracize people who do not agree with their thought processes or opinions. Bullying and other types of removal of social acceptance are devastating to all ages.

Once the physiological, safety, and social core needs have been met, the person can start seeking esteem.

## Esteem needs

Esteem involves our ego and the need for respect. Maslow believed that there are two core levels of esteem. The first level is seeking respect from others. Many will seek that more than seeking self-respect. Those who have respect from others can focus more on self-respect. One doesn't lead to the other, though, and it may be a constant struggle for some throughout their lives. You may have seen reports on the news about famous people who have taken their own lives due to low self-esteem or depression, even though the world loved and revered them. That is a sad example, but it's strikingly similar to Maslow's thoughts on the matter. With that, let's focus on the top of the hierarchy: self-actualization.

## Self-actualization

What is your full potential? Have you realized it? Then you have reached self-actualization. No? Don't feel bad about that; many people don't reach self-actualization, which is essentially saying all of the other needs have been totally and fully met and you have a strong desire to achieve a difficult goal or something that you aspire to achieve. A great musician, a great football player, a great public speaker, or a great project manager. Once someone has achieved this, they have reached self-actualization; they now have the motivation to accomplish something and be the most they can be.

Later in life, Maslow also added self-transcendence, which is a more spiritual way of being and doing for the good of the universe and an understanding of it. I met five Buddhist monks in Thailand, and they had reached self-transcendence. For the rest of us earthly folks, it may be a bit of a struggle to achieve this since we have bills to pay, children to raise, friends, family, and day-to-day responsibilities in 2021 and beyond. This probably is why you won't see self-transcendence in most models of Maslow's theory.

### Note

You may get a question on Maslow's hierarchy of needs in one of two ways. The first may be a simple question regarding what the highest level of Maslow's hierarchy of needs is. The correct answer would be self-actualization. You may also see a situational scenario that describes a team member and where they are in the hierarchy, and you would need to match up the scenario to the correct level. Most of the questions are not too demanding on this subject; it's more challenging to work through them for real.

## Douglas McGregor's Theory X and Theory Y

Maslow set the stage for an influx of human behavior specialists who were trying to determine how people were managed and motivated in organizations. Douglas McGregor created Theory X and Theory Y in the 1950s and later adapted it in the 1960s. Not much has changed since then. McGregor studied workforce motivation by management and postulated that management styles fall into two categories: the X manager and the Y manager.

### X managers

Managers that conform to the X style of management go through their lives with the assumption that they have to micromanage their employees because their team doesn't want to work. They assume that each person is there for a paycheck only and must be forced to do their jobs with the threat of punishment. They are **authoritarian managers**.

Authoritarian managers could be that way based on their personality, or it could be because of how they perceive their roles and the motivation and performance of their teams. I worked for a Theory X manager once (notice the usage of past tense verbiage) and never again. They were the type of person to wear T-shirts that said things such as "morale will improve, or the beatings will continue." But let's face it, there are some jobs and some employees who are at work for their self-interests; they want a paycheck because they need it, but they don't want to work. You often find them in the break room for the 95th time in an hour. It's tough to be a manager when you have staff like that, and some may have to resort to threats and punishments to get everyone back on track.

## Y managers

Y managers are much more my style, as they are **participative** and rarely find themselves needing to micromanage their team. Usually, when you have a performing team, it is unnecessary to do so. If you don't, then this style would act as more of a coach and facilitator to guide performance and help the team members. There is a downside to being a participative manager, though. I found this out with my first large team: you get run over by your team if you are too kind. There is a fragile line between being a manager and being a coach. Finding that balance is essential, and, if the time comes when you must micromanage one or several team members, then that is what you need to do. For the most part, I'm more geared toward being a Y manager because it suits my personality and I enjoy developing people so that they're successful in their careers. That is the reason I teach and write. I want you to be successful in your exams and your position, and I want to help where I can. Some may see that as a weakness, so be sure to have an X-factor in your back pocket as needed. The main focus will hopefully be on building your relationships with your team and getting them to that performing stage if they aren't there already.

## Dr. William Ouchi's Theory Z

Dr. William Ouchi's Theory Z encompasses the Japanese management style movement of the 1980s. Theory Z focuses on working at increasing employee loyalty to the company by providing a job for life. The main focus was on the wellbeing of the employee, both on and off the job.

## Frederick Herzberg's theory of hygiene

Frederick Herzberg began his research in the 1950s and developed what has been called the two-factor theory, or the theory of hygiene. It's not what you think, although showered employees are always appreciated. Instead, hygiene, in this case, means health. How healthy is your organization? Herzberg separated satisfiers and motivators from each other to show that satisfiers must be in place so that the employee can be motivated. If they weren't in place, then demotivation would occur, and people would leave the organization. You can see the differences between hygiene needs or satisfiers and real motivators.

The following are classed as hygiene needs:

- Policy
- Relationship with supervisor
- Work conditions
- Salary
- Company car
- Status
- Security
- Relationship with subordinates
- Personal life

The following are classed as true motivators:

- Achievement
- Recognition
- Work itself
- Responsibility
- Advancement
- Personal growth

Even though this isn't an exhaustive list, Herzberg wanted companies to know that they had to have several perks in place and good working conditions, health care, time off, and so on to recruit and retain good employees. Without those things, they would leave the company or be demotivated. Did you notice that salary is a satisfier? If I had asked you if you were money motivated at the beginning of this, I'm sure the answer would have been a resounding YES! Let me ask the same question from Herzberg's perspective. Have you ever worked at a job that you loved, but they didn't pay you enough money to survive, and you eventually left? That is because that satisfier was missing. Everything else was great, but that one thing led you to another position and maybe even one you don't like as much, but hey, you've got bills to pay. Make sense? The real motivators are when people have the satisfiers they need to stay at the position and then experience reward, recognition, achievement, and personal growth on top of that. Now, your team is happy and feels safe. Much like Maslow's safety level, many things must be in place organizationally to truly motivate your team.

## David McClelland's theory of needs

In a survey published in 2002, McClelland was listed and ranked as the 15th most cited psychologist of the 20th century, and there is a good reason for that. His theory of needs is applicable in many situations, and he firmly believed that all humans could be taught to change their behaviors once they understood what the driving factors or requirements were. The theory states that all humans, regardless of where they grew up and their cultural heritage, are driven by three core needs, which are as follows:

- The need for achievement
- The need for power
- The need for affiliation

McClelland felt that all humans have a mix of all three needs, but one stands out more than the rest in individuals. Once you've determined what that core need is, you can drive their behavior to change or use it to motivate the employee because you understand what is driving them internally.

## The need for achievement

People whose driving need is achievement tend to be risk-averse when it comes to taking on things they don't think they will be successful at; they also tend to want to work alone in a commission-based environment or work on their part of a project without a whole lot of collaboration. If you recognize this need in yourself or a team member, it's essential to realize that training, guidance, checklists, cheat sheets, and giving feedback regularly is necessary for achievement. To motivate these folks as their manager, it's important to let them know the path to success specifically, guide them when needed or asked, and let them know when they have achieved success and why they got there. Provide specific feedback and specific praise for their actions.

## The need for power

The theory of power states that there are two distinct driving power factors: *personal power* and *institutional power*.

Personal power-seekers were looked upon as an adverse condition by McClelland as he felt that people who sought out power for their own needs were probably not the kind of people you would want to invite to dinner. They are those who strive for power no matter who they hurt to get there, with little to no empathy in the wake of bad behaviors they leave behind. This is the *I win, you lose* mentality. That's fine when you are having a friendly competition in a sporting event, or you kick someone's behind in a game. "HAHA, I win AGAIN!" Then, it's okay. This type of person would be chronically competitive and seek to replace their manager to see if they can do the same job. I wouldn't be surprised if you know someone like that or recognize that trait in some of the leaders of the world out there. There wasn't much advice from the theory on how to deal with this type of person, other than avoidance, if possible. That's tough to do if they are on your team – trust me, I speak from experience.

People who need **institutional power** are those that seek higher positions in an organization for the good of the organization. They want to be leaders, managers, presidents, and CEOs and they seek promotion. To help motivate this type of power-seeker, you can provide them with more responsibilities, a lateral title change, or help them get promoted. I always felt that I couldn't move up or move out until I had someone competent to replace me. Not every manager feels that way, but I always tried to help my people get promotions or better positions. One thing to keep in mind is that people who need institutional power have a very low need for affiliation power. Institutional power people could lay off employees during the holidays because it was good for the corporate bottom line and then sleep just fine that night. Affiliation power-seekers would never sleep again.

## The need for affiliation

People who have the need for affiliation want to be around people; they seek acceptance from groups and they want people to like them. They are those bubbly types at work that notice your new haircut before your significant other does, who ask you about your weekend, and want to know where you shop for your clothes. They are happy, chatty, and people-oriented people. The fastest way to demotivate affiliation-oriented people is to put them by themselves, in a dark bottom-floor room with only a red stapler to keep them company. If you have seen the movie, then you know what I'm referring to, but if you haven't, that's okay too. It's important to remember that to motivate affiliation-oriented people, they need to be told that people like them, that their team appreciates all they do, and that they are doing a great job. They need a pat on the back – a lot! They will also be very gracious once they receive kudos for exceptional performance, and most likely say they couldn't have done it without their team.

Have you recognized yourself in any of these examples? How about your team members? Could you list out their primary motivating need or factor? If so, you are well on your way to having a tailored approach to motivate your team members individually. Reward and recognition is one of the most overlooked aspects of project management, but it's vital when it comes to excellent team performance.

## Reward and recognition

The ability to reward and recognize is an essential skill in management. How you go about doing that depends on your team and your organizational culture. If your organization doesn't already have reward and recognition built into its culture or budgets, it may be time to get creative. There have been many times in my career where I've reached into my pocket and bought my team lunch or brought coffee or candy bars, and even let my team go early on a Friday if they had worked hard that week meeting a deadline. It's not that you are creating an expectation that every time they work hard they will get something. You don't want a team to become demotivated because they are not rewarded the way they think they should be every single time, but setting reasonable expectations and goals and then sticking to your side of the bargain is an excellent place to begin. It's tough to motivate until you truly know your team on an individual level, but it is a good thing to keep in mind that certain personality types do not like public displays of recognition. How would you feel if you were pulled up on a stage in front of everyone and given a reward for good work? Would that make you uncomfortable? Would you think twice before doing that exact thing again? Sure, you would! Still, others on your team may crave that recognition and wonder where the heck the party for them is. Cake? No? What?

Sometimes, the best way to go about things is to give your team a simple thank you for their hard work on XYZ and to tell them to keep doing what they are doing. The best practice for the exam states that a formal system of reward and recognition is a large part of human resource planning and that if you have the bandwidth to create a system and have the support of the organization, then this is easier to do. The other best-suggested practice is to allocate money to the project budget for reward and recognition. I'll pause here for virtual laughter...

As you can see, there are multiple areas you could come across in your exam, but there is still more to cover! Let's take a look at the powers of the project manager and how to use them effectively.

Other considerations for team management will include the following:

- **Team Skill Appraisals:** Appraisals enable the team to holistically identify its strengths and weaknesses; assess opportunities for improvement; build trust, and establish communication mechanisms.

**Appraisals might identify the following:**

- a) Team preferences
- b) Aspirations
- c) Information processing and organization
- d) Decision-making processes
- e) Interactions with other team members

In some cases, pre-assignment may influence who ends up on your team. If that is the case, you will still want to make sure you create an environment that takes advantage of the diversity and builds a climate of mutual trust.

**Team development objectives might include the following:**

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

- **Resource Management Plan:** The resource management plan is a formal plan integrated into the overall project management plan. There could very well be two facets of this plan, one section for the people side, and another for materials and equipment.

**Standard headers of a resource management plan may include the following:**

- a) How you identify your resources
- b) Acquisition guidance
- c) Roles and responsibilities including authority and confidence
- d) Project organizational charts
- e) Management of the project team including staffing and release
- f) Training and strategies for team members as needed
- g) How you will reward, recognize, and develop your project team
- h) How you will ensure that you have enough physical resources and information on how you will manage your inventory, equipment, and supplies throughout the life cycle

The team charter is also an output of the resource management plan process and is also a new output in *the PMBOK® Guide - 6th edition*.

**Reference**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Pages 319-358.*

I like to think of the team charter as a mission statement for the team. If the team creates it, they are more likely to stick to it. Not to say that, as project managers, you won't have rules and responsibilities that are necessary for a high-performing team, but having clear expectations and commitment allow for precise guidelines. As things change, the team charter may need to be updated, especially with the coming and going of different human resources. Just like in sports and understanding what the rules of the game are, rules of engagement and a focused commitment to your team members allow a more successful outcome.

**Potential headers for a team charter include the following:**

- Team values
- Guidelines for communications
- How the team makes decisions
- Conflict resolution
- Rules for meetings
- Personal agreements by team members on the rules of engagement

The majority of the questions focus on the tools and techniques and the outputs rather than the inputs. Although the inputs are important, the exam wants you to be more conscious of the different ways to plan your resources.

As an overview, the resource management plan specifically covers 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, and so on
- 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
- Project team resource management – guidance on the lifecycle of the team resources and 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

We'll now move on to understand the influence or power the different stakeholders hold in the team and its importance in creating and leading the team.

## Analyzing team members' and stakeholders' influence

There are numerous types of power a project manager or other stakeholders may possess. Some are based on the position they hold, while others are based on their experiences. Many of these types of power could be considered aspirational skills as well. Power can be complicated and having the emotional intelligence to know when and what to throw around is critical for project managers, regardless of whether you are practicing Agile or predictive project management.

There are a variety of different forms of power that you may incorporate at the beginning and throughout the project and much like leadership skills, there might be some types of power that you're either not comfortable with or have little experience in and are working toward them.

According to PMI®, project managers are considered to be *proactive and intentional* when it comes to their power. So, it's going to be our job to acquire the power and authority within the bounds of organizational policies and procedures rather than waiting for them to be granted.

### Reference

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017, pages 62-68.*

Power applies to all stakeholders and project managers, as well as your team. Knowing which power to yield and when is the sign of a great project manager! It is also an important step to classify your stakeholders (including your team) to determine their level of influence over the project, and that allows you to craft a strategy for engagement and effective communications.

Just as a reminder of what we covered in *Chapter 4, Charters and Stakeholders*, one of the main tools and techniques used to categorize stakeholders is data representation. When you can categorize your stakeholders, you can help the team build good relationships with the project stakeholders that have been identified and then update them iteratively.

The five main ways to do this are as follows:

- A power/interest grid, power/influence grid, or impact/influence grid
- A stakeholder cube

- The salience model
- Directions of influence
- Prioritization

You will need to know those for the exam, so if you need to go back and review this before you continue, there is no shame in that. You're learning, and there is a *ton* of information to learn! Since the exam mainly focuses on people and processes, the people side is more prevalent than ever before.

## Key phrases that pay

The key phrases for this section are as follows:

- Leadership
- Team-building
- Communication
- Active listening
- Consensus building
- Problem-solving
- Conflict resolution
- Negotiation skills

## Summary

In this chapter, you learned about the role of the project manager outside scheduling and budgeting, with the main focus being on people. This information is a vital stepping stone that can lead to you managing a project effectively based on the circumstances of the organization and your leadership skills as a project manager.

In the next chapter, you will put all this information to good use as you review *Chapter 11, Risk Management*. Nothing causes demotivation and conflict faster than threat events. When you have a well-motivated team and a project manager who is ethical, a servant leader, and knows how to work with the team for the best results, then tracking team performance becomes relatively easy – once you know what you are looking for in terms of performance, that is.

## Assessment exam

### Question 1

Bill and Vanessa have a difference of opinion about how the schedule should be managed, and their squabble is making the team uncomfortable. You call a meeting with the entire team and begin to discuss the scheduling issues before asking the team to discuss a variety of solutions, analyze them, and decide on a course of action. What conflict resolution style was used here?

1. Negotiate
2. Compromise
3. Smooth
4. Collaborate

### Question 2

Karen is a senior team member and has always completed her work on time. This week, her coworker, Frank, has managed to put Karen behind schedule because he missed a crucial step in the project and now needs to rework it. Karen comes to you and is frustrated because she is never behind schedule. As the project manager, you tell her that you understand but that it isn't that big of a deal in the grand scheme of things and that you appreciate her diligence and hard work. What conflict management style did you use?

1. Compromise
2. Smooth
3. Force
4. Collaborate

### Question 3

You are having a bad day. The situation with your customer has become tenuous due to the many scope changes and reworks your team has had to do. You know the customer is always right, but you just don't have it in you to deal with them today, so you do not return their calls or emails and plan to deal with it tomorrow. What conflict resolution style are you using?

1. Avoid
2. Compromise
3. Smooth
4. Negotiate

#### Question 4

Your organization has just landed a large client in Asia and is assigning you and your team to manage the project. Your team has never worked on an international project before, so you call a meeting to discuss the culture, how communication can be most effective, and to answer any questions the team has about the country they will be working with. Which of the following standards in the *Code of Ethics and Professional Conduct* does this represent?

1. Honesty, mandatory
2. Respect, aspirational
3. Responsibility, mandatory
4. Fairness, aspirational

#### Question 5

You have been put in charge of hiring contractors to supplement your team. During one interview, you are very impressed by the qualifications of the potential hire, especially when they say they are PMP® certified. After the interview, you look them up on the PMI® website to make sure their PMP® number is on record, but you can't find them anywhere. You suspect that they may have lied during the interview. What do you do?

1. Report them to management.
2. Don't hire them.
3. Report them to PMI®.
4. Overlook it for now.

#### Question 6

You have just joined a new company as a junior project manager and due to the lack of project managers, your PMO has asked that you manage a large megaproject. This project will span years and millions of dollars. You have only ever managed small IT projects and know that you are not qualified to take on this project. What do you do?

1. You explain to the PMO that you do not have the experience to manage such a large project and may not be the best resource.
2. You explain to the PMO that you know you can do it but will need some guidance.
3. You explain to the PMO that it's a conflict of interest since you lack experience.
4. You explain to the PMO that you will need a team of experts to help you manage the project.

### Question 7

Your company has recently hired an older gentleman to work as a contractor on your project. Many of the team members are in their early 30s and the new resource is 63. Your team has expressed concerns that their work habits don't match up with the way they do things and want you to replace them. What should you do in this situation?

1. Replace them.
2. Explain to the team that would be age discrimination and you will not do that.
3. Explain to the team that different work styles can benefit the project.
4. Explain to the team that you don't have any choice in the matter.

### Question 8

You have been assigned to a large project and will need multiple contractors from external staffing agencies to supplement your team. One of your best friends recently lost their job and has asked that you bring them on, even though they don't have the skills necessary for the project work. What do you do?

1. Hire them and train them.
2. Explain that you can hire them but not to tell anyone they lack experience.
3. Explain to them that even though you are friends, it would be a conflict of interest to bring them on, especially since they don't have the experience you need.
4. Explain to them that hiring them would go against the organizational culture of using outside contractors from staffing agencies.

### Question 9

Which of the following does not represent an aspect of servant leadership?

1. Listening
2. Transparent communication
3. Facilitation
4. Management

### Question 10

Which of the following is the top of Maslow's hierarchy of needs?

1. Safety
2. Esteem

3. Physiological
4. Self-actualization

#### Question 11

You are overseeing a junior project manager and helping to mentor and train them to be promoted. They are very hardworking and diligent and are constantly asking for feedback and the next steps. What kind of need is most prevalent in this employee?

1. Institutional
2. Personal
3. Affiliation
4. Achievement

#### Question 12

Which of the following motivational theories is most focused on working at increasing employee loyalty to the company by providing a job for life?

1. Theory X
2. Theory Y
3. Theory Z
4. Theory of hygiene

#### Question 13

You are analyzing your stakeholders in order to determine their level of need for communication and engagement at this point in the project. You are categorizing them based on their power or level of authority on the project, the urgency for immediate attention and their legitimacy, and whether their involvement is appropriate. Which of the following stakeholder assessment methods is being used?

1. Power/interest grid
2. Stakeholder cube
3. Salience model
4. Directions of influence



# Section 2: Project Management Processes

Understanding the best practices and processes used in the project management industry is very important. For you, best practices may vary from one day to the next, and there is a wealth of information to prepare you for your exams and your projects. In this part, we begin with scope, which drives all projects to produce the deliverables. We can then begin to create a schedule and a budget for our predictive projects. Quality management is highly integrated with the scope of work and needs to be managed accordingly. People, equipment, and materials align with resource management. Effective communication with our team and stakeholders is crucial for project success. Risks can be hidden anywhere, so we will review all the best practices to identify, analyze, and respond to threats and opportunities. Contracts and agreements have rules, and understanding procurement is essential when it comes to protecting the organization. Stakeholder engagement is the project manager's job, and keeping on top of changing needs is a full-time job. Finally, we will put everything together and craft an integrated project management plan.

This section comprises the following chapters:

- *Chapter 7, Scope Management*
- *Chapter 8, Schedule and Cost Management*
- *Chapter 9, Quality Management*
- *Chapter 10, Resources and Communication Management*
- *Chapter 11, Risk Management*
- *Chapter 12, Procurement Management*
- *Chapter 13, Stakeholder Engagement*
- *Chapter 14, Integration Management*

# 7

# Scope Management

In this chapter, you will review the knowledge area of project scope management in both the planning process group and the monitoring and controlling process group. You will begin with the scope management plan, which describes how the scope of work will be planned, executed, monitored, and controlled. Then you will cover the requirements management plan, which will outline the processes of gathering requirements and executing them. Then you will review why a comprehensive scope statement is the most critical scope document. Once the requirements have been collected and approved, the most important planning document, the **Work Breakdown Structure (WBS)** is created. After this, the scope of work will need to be formally approved through the Validate Scope process and scope creep controlled via the Control Scope process. Both are important aspects of gaining approval on the deliverables and being able to control scope creep.

The topics covered in this chapter are as follows:

- Key concepts and scope management trends
- Agile considerations
- Developing a scope and requirements management plan
- Requirements documentation
- Creating a scope statement

- The Work Breakdown Structure
- The WBS dictionary
- The Validate Scope process
- The Control Scope process

## Key concepts and scope management trends

Throughout the last several chapters, you have dug into the main concepts of kicking off a project with a project charter, how to identify your stakeholders, and the necessary considerations for Agile environments. Now we are going to speed things up and concentrate on the main items in project scope management to know for the exam. Are you ready?

**The key concepts at the beginning of each knowledge area are essential for the exam.** There have been some changes that are major, including the new core competencies of **people, process, and business environment**. The scope of work affects them all in one way or another. *Product scope* is the features and functions of the deliverables that are necessary to gain approval from the customer. You will need to determine and prioritize those requirements, break down the scope of work to plan effectively, monitor, and validate the scope of work. You will be tested on the *project scope*. That encompasses the entire exam content outline because it's how we choose to manage the project and what we want to use as far as best practices and processes are concerned.

Project life cycles can be predictive, adaptive, or a combination of both. Determining that life cycle early in planning can help with the scope planning process.

The scope of work in a predictive environment results in a scope baseline once project deliverables are collected and documented during the planning of the project. The scope of work is managed progressively through formal change control. Agile environments focus on responding to high levels of scope changes and require the prioritization of the scope of work in every single iteration. Three of the scope processes we will cover in depth in this chapter include collecting requirements, defining scope, and creating the WBS (or backlog). All three processes happen in each iteration.

The completion of the product scope is measured against the product requirements, while the project scope is measured against the integrated project management plan. Did we do what we were supposed to do across the board or not? The product scope is measured again, irrespective of whether all agreed-upon scope requirements were met.

One of the trends and emerging best practices is that the project manager collaborates with business analysts even after the initial project charter and planning occur. The interactions with business analysts are far more complex than ever before. We know the world is getting smaller and more complicated, and these interactions are necessary for business value to be realized and iteratively reviewed for updates if and when needed.

Some of those interactions at a high level include determining what the business needs are and what problems could be forthcoming. We play a game in Agile projects called *remember the future*. It is a way of discussing early on what issues we could run into, how the project could fail, and so on. It keeps things real and allows us to address problems before they arise. This questioning is similar to the collaboration with business analysis professionals throughout the project, regardless of the chosen life cycle. The solutions that are selected to meet the needs also need to be discussed and adopted as required. Then there is the all-important documentation of the requirements collected to maintain consistency until a change occurs, leading to an update. Finally, the product scope has to work, be approved, and implemented. Whether it is a product, a service, or a simple incremental result at the end of an Agile iteration, the steps are the same.

Tailoring considerations is essential as well, and this is why you see them at the beginning of each knowledge area. It is crucial as you read through this chapter to think of your current projects and whether they would benefit from a tailored approach.

## Tailoring considerations

The beginning of a project is ripe with potential risks that are unique in their results. You may need to tailor the way you plan or manage your project to match up with the guidelines for knowledge and requirements management. Also consider how the organization will validate and control the scope of work, and what the development approach should be. There are also requirements and the question of how stable they are. Building a bridge has firm requirements that can be pre-planned. Developing the next grocery store robot may not.

Finally, the governance of the project – does your organization have formal or informal approaches to the governing of audits, policies, procedures, and guidelines? If so, then the project work may need to accommodate that regardless of choices made in the life cycle.

Governance may also drive the inclusion of Agile best practices, thus Agile needs to be considered before you move forward through the scope processes.

## Agile considerations

The current and new exam content outline for the PMP® exam addresses the processes that are necessary for a successful project or iteration completion. The ability to assess the opportunities that provide the most business value to the organization is a crucial skill for project managers to have. Sometimes that involves an Agile approach to determine where value can be delivered incrementally, instead of one formal approval at the end of the project. Often, it is too late by the end of the project to determine whether the value has been met, and could result in rework and additional costs, plus awkward lessons-learned meetings. The other task in this area is our ability to support our team's capability to subdivide project tasks if and when necessary, to find the minimum viable product.

### Reference

*2019 Project Management Institute, Inc. All rights reserved. PMI® PMP® Examination Content Outline, June 2019*

What exactly does that mean you ask? Great question! Creating a minimally viable or minimally marketable product means creating the simplest thing that works and can be approved. There may be multiple, minimally marketable, products. Try saying that three times out loud! Here is the simplest example I can give you. Let's say your customer has asked you to create a word processing software program for them. The critical scope of work is that the program types, has a spell checker, and prints. Your team will plan the scope of work for just the typing feature. Then they will execute that work and present it to the internal department or external customer, who tests it and validates that you can, in fact, type. At that point, typing is a minimally marketable product. Does that mean you have completed the entire project? Not at all. You still need to add spellchecking and printing. If your organization wanted to, they could promote the new software, sell it, and add the other features later. Typing is minimally marketable. The scope of work is broken down into unique features that are approved, and then it's on to the next feature.

There are project charters in Agile projects that help with the scope of work to determine a minimally marketable or minimally viable product; however, they tend to be much more flexible and are presented as an overview, rather than a formal document, because the scope of work will change. It's not unusual to have a project charter and a new scope statement for every single iteration. In a predictive project, this is much more formal and includes management plans to help keep the scope of work front and center during the project.

Now that you have a good overview of considerations for a variety of scope best practices, let's now focus on the predictive management plans that can help drive the project in the direction you want it to go.

# Developing a scope and requirements management plan

In *Chapter 2, Introduction to Project Management*, you reviewed the beginnings of what an integrated, project management plan does and why it is so important. You also learned that other than baselines for tracking performance, there are subsidiary management plans that are the **how-to** guides for the knowledge areas they represent. The **scope management plan** and the **requirements management plan** are the subsidiary plans for the scope of work. The scope of work in a predictive project is the major constraint. The collection of requirements will set the stage for planning your budget, schedule, quality, resources, and risk assessments. In a predictive project, the scope of work is typically fixed or well known in advance, meaning the outcome is already known. What is not known at this point in the project is how long the project will take, how much it will cost in the end, and what risk events could derail the efforts. Those items are variable. It is the opposite of an Agile project. The scope of work is variable, and the schedule and budget are fixed. Collecting the right requirements based on your chosen life cycle will lead to a successful outcome. The business case and project charter have a lot of that information; however, there may be a wider margin of error than we were hoping for at the end of the project or iteration. It won't be until we have the requirements collected and scope defined that we can begin to plan for the other knowledge areas.

The first step is to determine how the scope and requirements are going to be managed throughout the project. The *scope management plan* and the *requirements management plan* are designed to lay the groundwork for this all-important knowledge area. Get the processes correct, and the rest of the scope management will cover execution, upkeep, change control, and formal acceptance of the deliverables.

Remember that the subsidiary plans found in the integrated project management plan are our playbooks. They designate the processes we follow. Much like in American football, if the play is going sideways, the quarterback shouts an *audible* to change his team's planned play at the last minute. The football team realizes the play they were going to execute won't work with the other team's current lineup. It will be our job to follow the plans until they are no longer working. If they are not working as expected, call an audible! We would then update through change control and try to get back on track without a 15-yard penalty. The two subsidiary plans for the scope of work may contain several helpful best practices, not only to plan the scope of work, but to execute on requirements. You would also document whether and how the customer gives formal acceptance of the result.

These are essential **how-to** guides because, without them, your stakeholders may not be aware of your strategy to meet all of their requirements.

Remember, a lot of how you run your projects is contingent on you being at the mercy of your organizational processes and enterprise environment. I've mentioned this a couple of times, and how those influencing factors may make it unnecessary to create specific management plans. The plan could contain well-known or innate best practices you use all of the time, rendering these specific management plans as excessive documentation. This is due to spending time unnecessarily documenting best practices driven by your organization and your expert judgment. That is true, in a sense. But what if your customer isn't aware of how you manage the scope of work? What if they aren't privy to your change control processes or that they need to approve the result formally? Now that documentation may become necessary.

The reason why you may want to consider a scope management plan is because it describes how the scope of work will be managed, including the following:

- How the scope of work will be clearly defined, and the baseline maintained
- How the scope of work will be broken down to a level that can most effectively estimate the required time, money, and resources
- Documentation on how the customer will accept the deliverable(s) or results
- How changes will be managed and controlled
- How you will communicate scope updates, completions, and changes throughout the project

Much of the essential how-to information that needs to be included in these plans is covered in detail throughout this chapter.

Remember I'm using the word *customer* loosely, meaning whoever the key stakeholders are that will need to approve the results. Also, however, the influencing party will accept the finished product, service, or result. It is vital for you and your other stakeholders to know and agree upon many things. Specifically, how the scope of work and requirements will be managed, executed, monitored, and controlled on your project.

The requirements management plan will document how your requirements are going to be planned, reported, and tracked, as well as covering configuration management activity determination. This plan will include how changes will be initiated, analyzed for impact, traced, tracked, prioritized, and reported. Requirements will have metrics of performance as well. Why those metrics were chosen is documented, and the structure of traceability from the origin of the requirement to its completion is as well, along with documentation on the requirement's relationship to other project requirements.

Once you have scope management and requirements management plans in place, you'll want to make sure everyone agrees on them. Then you can move forward with collecting requirements and defining the scope of work.

The inputs, tools/techniques, and outputs of plan scope management are explained in this chapter. Check out some of the items in the input list, many of which we haven't covered yet. Why are they there then? Because the process of project scope management is iterative and along the way, you may be referring to numerous other plans to update your scope management strategies. The other reason is that project management isn't linear. There are many overlapping concepts and knowledge areas. For example, scope and quality will be very tightly integrated, as are schedule and cost management. You will be working on many things at one time. The only distinct order is the one you decide you need for your unique projects. Some or all of the inputs will be created in whatever order you need them to be in to execute project work effectively.

As you can see, there doesn't appear to be much bulk to this section, but remember we are reviewing relevant documentation conceptually. In the real world, it may be a much more significant impact on how you plan, execute, monitor, and control the scope of work. In my real-world experience, both documents are combined to make one scope-specific plan. That's just me. It's up to you how you use these documents to support the management of the scope of work in your projects.

The plans also are the how-to guides. Next, we move into the *what* stage of planning the scope of work, which is the collection of requirements.

## Collecting requirements

Collecting requirements is far easier said than done. It's imperative to make sure that you speak to the right stakeholders for the collection of requirements. You will need to ask for clarification and document the requirements so that you can trace and manage them throughout the project. It's also an iterative process that could involve project scope or product scope requirements, which are two very different things. **Project scope** is what you are learning in this guide. It's the best practices, tools and techniques, documentation, and different ways of managing your projects effectively, all of which are dependent on the **product scope** requirements.

This spot is as good a place as any to stop and remind you again that reading carefully is the most critical exam tip I can give you. Project management exams are notoriously vague in the situational questions they present. The questions you answer in this guide may not be close to what you get in your exams. I say this because practice exams are designed to make sure you understand the information. You will also need to put yourselves in the shoes of a project manager in multiple situations and decide the best answer to handle that situation. If you don't read carefully, you may miss the nuance of the question and answer incorrectly! That is the last thing I want, so while you are answering practice questions, remind yourselves that this is about understanding the content and solidifying information rather than mirroring the exam. Reading the situational questions carefully on your actual exams can help navigate to the correct answers.

Collecting accurate requirements is the key to project success. It is essential to collect requirements from the right stakeholders. Being able to understand those requirements well enough to analyze, document, and execute the work to specification is the key to project success. There are multiple ways to collect requirements, and no one way is better than any other. You may be brainstorming with your team and other key stakeholders to determine requirements. You may even have prebuilt questionnaires and surveys so that you ask the right questions of the right people comprehensively. You may also be looking at the documentation that is currently available to you. That documentation could include any procurement agreements, the business case, the project charter, and stakeholder documentation. Remember, you will be collecting requirements iteratively throughout the project. At the beginning of planning, there isn't much documentation to refer to, but you will have multiple documents to refer to once you begin executing project work. You will have the integrated project management plan, the change log, lessons learned, your assumptions log, and any project documents updated while executing, monitoring, and controlling project work.

I find compartmentalizing requirements into categories makes it easier to determine how to execute them and how they all fit together in the project. It also allows you and the team to specifically focus on individual categories to determine whether anything is missing or needs to be adjusted. There are several different techniques to document requirements. You may be used to opening up your **Project Management Information System (PMIS)** and arranging requirements in a specific fashion. How you do that could be by using an outline format, or using visual structures that will inevitably become your schedule. There's nothing wrong with that; because believe me, I'm guilty of it as well! However, it is essential as a best practice to focus first on requirements, then decompose those requirements into the form of the WBS, and then, and only then, begin your scheduling.

I realize that project management is not a linear thing, and much of this is all going on at the same time. For your exam, it's crucial to compartmentalize processes as separate entities. This best practice will help you to understand the role that each process plays in the project. Let's start first with requirements documentation and some categories that might be useful. Then we will move on to the scope statement and the WBS a bit later in this chapter. You will see how each element plays its own important role in defining the scope of work.

Some typical categories of requirements are given in the following list, but remember that many of these categories will be based on your industry, your organizational process assets, and your enterprise environments.

**Typical categories to describe how requirements meet business needs include the following:**

- Overall project requirements, including set or necessary constraints
- Requirements to meet the business need as seen in the business case and project charter
- Individual stakeholder requirements for both the project and product scopes
- Requirements based on the solution that you're trying to provide to the organization
- Phase or quality gate review requirements or transitional elements between phases
- Requirements involving quality to make sure that the results are fit for use
- Documentation on how requirements will process through change control, and be updated and communicated

I often find it helpful to present requirements visually. The visual aid helps communication with stakeholders, but also shows the traceability from the requirement's origin to the deliverables it represents. The *requirements traceability matrix* ensures all of the requirements are in one place, and visually displays the structure of influence on other requirements to help with the tracking of changes. If a change request impacts another requirement or even several requirements, you will be able to see the domino effect of that change on those other requirements. It's also useful as a checklist of sorts to make sure the requirements are being executed, traced, and tracked through the life cycle.

In *Figure 7.1*, you can see a very generic way to trace requirements through the life cycle. It is a significant output and best practice to utilize when you are collecting requirements from a variety of stakeholders:

Requirements						
Project Name:	Anti-Phishing campaign for employees					
Description of the result:	Resigned process including software and corporate training					
Requirement number	Requirement description	Business value	Objectives	Requester	Deliverables impacted	Changes control
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Figure 7.1 – Traceability matrix

The importance of understanding all of the requirements throughout the life cycle and making sure the changes don't impact other requirements negatively is exponential. Understanding what your requirements are will allow you to create a document called the scope statement comprehensively. The scope statement will build on your collected requirements and allow buy-in to occur from stakeholders on your projects.

The inputs, tools/techniques, and outputs of collecting requirements may seem overwhelming. Remember, there are many documents to review to make sure the requirements align with the overall strategy for the deliverables. There are numerous ways to collect requirements, and the tools and techniques available reflect that. The outputs include the traceability matrix, which you have just covered. As you go through the list, spot-test yourself, and put a checkmark or make a mental note of the tools and techniques you use to collect requirements. I wouldn't be surprised if there are several tools or techniques on that list that you have used on one project or another. That will make it much easier to answer questions about these techniques in your exams.

# Defining the scope and creating the scope statement

Before we get into what makes up the scope statement in the *define scope process*, this is an excellent point at which to circle back and see how far we've come. This documentation or process is easier said than done. We have covered a lot of information you will need to create a detailed scope statement, so this is a great spot to circle back and look at what has already been created and documented thus far on the project. To review everything we have done to get to this point, it is important to understand what you, the project manager, have done already:

- Project managers are considered contributors to the business case development and do assessments of project viability.
- We are expert judges on the creation of the project charter.
- We have identified stakeholders, what their levels of interest are, and what the likely impacts are on our project.
- Finally, we have collected and will continue to collect requirements throughout the project. Now we are ready to define the scope of work as we know it today.

The project scope statement is considered the *most important scope document*. That is because you will very specifically detail major deliverables and confirm scope understanding with stakeholders regularly. Categories can help get scope organized and are necessary for a clear understanding of the scope of work.

**Those categories may include the following:**

- Functional specifications
- Systems analysis
- Systems engineering
- Value analysis
- Value engineering

Keep in mind that the collection of requirements is an iterative process. The goal of creating a comprehensive scope statement at this point in the project is to define specific project requirements for the scope of work and what the acceptance criteria may be. Indeed, the scope statement will be progressively elaborated on and will be riddled with assumptions and constraints, as well as the specific scope of work already collected. There may be several versions of the scope statement because of the progressive elaboration or substantial changes to the scope of work as it becomes more evident throughout the project life cycle. Keep in mind though that the scope statement is considered a formal document, and once approved by key stakeholders, will become part of the scope baseline. That baseline is integrated into your project management plan, which, as we already know, you have to go through formal change control to update. Because we are working with a predictive deliverable, it is sometimes easier to see the forest through the trees at this point in the project. That does not mean the scope of work won't change. In an Agile environment, a scope statement may be created at the beginning of each iteration as the scope of work emerges.

You might be thinking to yourself, the scope statement sounds an awful lot like the project charter, and in a lot of ways, you would be correct. But remember, the project charter is the formal authorization to begin project work and will document at a high level what success should look like in the realm of the scope.

Here's a little tip for identifying the scope statement from other documents, specifically the project charter. The key to the project scope statement is that it not only defines the scope of work that will be done, it also describes the scope of work that *will not* be done in the project.

Now you might be thinking to yourselves, what isn't going to be done is just everything else and a bag of chips, plus that sounds like excessive documentation. The scope statement is the number-one most important scope document because it confirms the work to be done, reduces assumptions and risks, and provides an understanding of the scope of work. The scope statement describes what we *will do* and what we *won't do*.

Let's say you are working with a customer who wants a dark green, 10-speed bicycle. They set the scope of work and define some of the key characteristics of what they want on the bicycle. Perhaps they are looking for a specific kind of street tire, shifting mechanism, seat type, and so on. You would document that in your project scope statement as part of what you will do to accomplish the customer's needs. You would also document that you will not include a bell on the bicycle. This documentation is an important step. What if the customer assumes that every single bicycle has a bell on it? They may believe they don't need to tell you they want a bell because everybody knows there's a bell on every bicycle! Except for the fact that there *isn't* a bell on every single bicycle.

Being very specific is a crucial aspect of making sure that all requirements are well documented, and everybody understands what a successful result is. Documenting what will not be part of the scope of work keeps any assumptions to a minimum and prevents risks to the scope of work, all of which create excess costs, waste time, and cause aggravation. The customer still has time to decide that they do want a bell on the bicycle. That decision would lead to an update in requirements and an update to the project scope statement. It's best to find out the actual scope requirements as soon as possible in the project. That does not mean that your customer won't decide they want a bell later in the life cycle. *"Yeah, because THAT never happens,"* I think sarcastically to myself. You're nodding right now, right? If that is the case, it would involve formal change control at that point. The scope statement will also include the acceptance criteria by which the customer will formally accept the scope of work throughout the project and the final acceptance at the end of the project. Scope acceptance is very typically a formal process with which we collect signatures from the customer to validate that we have met the scope of work. That allows us to not only get paid, but hopefully to formally close out the project successfully.

In *Figure 7.2*, you can see a comparative approach between the project charter and the project scope statement. I look at the scope statement as a way to go to stakeholders and say, *"Is this what you meant by your scope requirements in the project charter? If so, then we will move forward with all of this until further notice."*

Project Charter	Project Scope Statement
Project purpose or justification	Project scope description (progressively elaborated)
Measurable project objectives and related success criteria	Acceptance criteria
High-level requirements	Project deliverables
High-level project description	Project exclusions
High level risks	Project constraints
Summary milestone schedule	Project assumptions
Summary budget	
Stakeholder list	
Project approval requirements (what constitutes success, who decides it, who signs off)	
Assigned project manager, responsibility and authority level	
Name and authority of the sponsor or other person(s) authorizing the project charter	

Figure 7.2 – Comparative approach

**Note**

*Figure 7.2 is based on the PMBOK® Guide Table 5-1. Elements of the project charter and project scope statement. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Page 155.*

*The Project Management Professional (PMP), PMBOK® Guide and the Project Management Institute Agile Certified Practitioner (PMI-ACP), and the Agile Practice Guide are registered marks of the Project Management Institute, Inc.*

The scope statement is also essential because it sets the stage for you and your team to begin to see the trees through the forest. The scope statement allows for the next process of creating the WBS. Once you have the scope statement approved and the WBS created, you can begin to address scheduling, budgeting, resources, and everything else you will be planning.

In the next section, you will review the WBS, which is the output that breaks everything down to a level at which you can most appropriately plan and execute the scope of work.

## The Work Breakdown Structure

The WBS is the number-one most important planning document. But why? Because the WBS is utilized to organize 100% of the scope of work as represented in the currently approved project scope statement. If the scope statement changes, then the WBS will be updated. Understanding how they both work together can help you understand why they are the most important scope and planning documents.

Imagine if somebody came to you and said, "*I want you to set up helpdesks in all 87 of our corporate locations in 15 countries, train everyone, and do it in a timely fashion.*" That is a massive scope of work! It would be impossible for you even to comprehend that much information, let alone create a schedule and budget to meet the requirements right away.

It is a good assumption that much of the scope of work can be duplicated in each location, or at least the processes that you use can be similar across locations. But you will have multiple stakeholders, speaking multiple languages, needing multiple specifications, and perhaps even different techniques of training in different languages and cultures. It would be virtually impossible at this point to define what *a timely manner* means. Even more challenging is working out what an actual schedule might look like, how many resources you would need, and how much everything would cost at this point in the project.

That is also an excellent example of a program — a group of related projects managed in a coordinated fashion.

That's why the project scope statement alone isn't good enough to effectively plan the scope of work.

The scope statement describes the scope of work specifically, and what success looks like, but it is not broken down enough yet to be used to efficiently plan. We will have to take things a step further and organize and define the scope in a *deliverable-oriented, hierarchical way*. That is why the WBS is so important; it forces us to plan out all of the scope of work in a systematic manner based on deliverables. Those deliverables can then be broken down into smaller packages of work to most effectively estimate the time, money, and resources required, as well as determining risk and procurement needs.

One thing to keep in mind is that the WBS is not a schedule. In the real world, we may be defining the scope of work and creating a WBS. But, at the same time, we are trying to determine what tasks would need to be done to accomplish the work. In the real world, they overlap, but for exam purposes, the WBS represents the scope of work **only**. However, the WBS is a fundamental planning tool and therefore, will be the basis for breaking down the scope of work to the activity level, and eventually sequencing those activities and producing a schedule. For now, we want to make sure that we don't miss anything as far as the scope of work is concerned. We do this by collecting good requirements, confirming scope understanding via the scope statement, and utilizing the WBS to get a better idea as to what we will be executing. Therefore, we are going to hold off on putting things in a logical order or trying to create a schedule at this point.

Have you ever gotten halfway through your project and realize you missed an aspect of the scope that is critical for success? It's possible you jumped right from scope management planning into schedule management planning. It's more probable that a crucial requirement was assumed or that it didn't get collected from the stakeholders. Hey, it happens...all...the...time! To avoid that happening, we will break down the scope of work in an orderly manner. There isn't a wrong way to do this, except not to do it at all, especially with all the software we have available to help us these days.

Old-school WBSs, using no real software so to speak, look like an organizational chart, and in some ways that's an excellent way to think about it. Org charts take top-level positions (CEO, CFO, President, and so on) and break the organization down to the team or functional level. For the scope of work, we will take significant deliverables or features and break them down into a group of tasks to be done that can then accurately be estimated.

These days, we're utilizing software programs to help us create our schedules, our Gant charts, our budgets, and resource scheduling. The construction of the WBS happens in software programs. In your real-world experiences, your WBS may look more like an outline than an org chart.

I think of the WBS and the project scope statement working together to produce something to specification. An analogy that I use in my classes to describe both of these crucial scope documents is that of a jigsaw puzzle.

When you go to the store to buy a jigsaw puzzle, the chances are that you choose the one you choose because you like the picture on the puzzle box. Maybe it's puppies or a field of sunflowers. Whichever one you want, the image on the puzzle box shows you what success looks like. There is nothing extra; it tells you how many pieces are in the puzzle, how much the puzzle costs, and what age groups it's appropriate for. So, you go home all excited to build your jigsaw puzzle, and you open up the box. There is no way that that jumble of pieces is easily sequenced, or even managed in its current state. What is the first thing that you do?

You start taking the pieces out of the puzzle box and organizing them — corners with corners, yellows with yellows, greens with greens, and so on. Once you have your piles organized, you then refer back to the picture on the puzzle box to help you execute the task of putting the puzzle together. In this case, the project scope statement is the picture on the puzzle box. It is what success looks like at any given moment. The WBS is the piles of puzzle pieces that are organized, like with like. The scope breakdown is a necessary step to be truly ready to begin putting a puzzle together and finishing it without any missing pieces.

The one thing to be aware of with the WBS is that it utilizes a tool or technique called *decomposition*. Decomposition isn't the friendliest of terms, I agree, but it is an apt description of what we are doing. We are taking significant deliverables and the scope of work and decomposing or breaking it down to a level that is easier to manage.

With the puzzle analogy in place, let's take a look at that massive help desk project again. You can see what a very basic WBS might look like.

In *Figure 7.3*, the WBS is represented as an old-school org chart-looking thing:

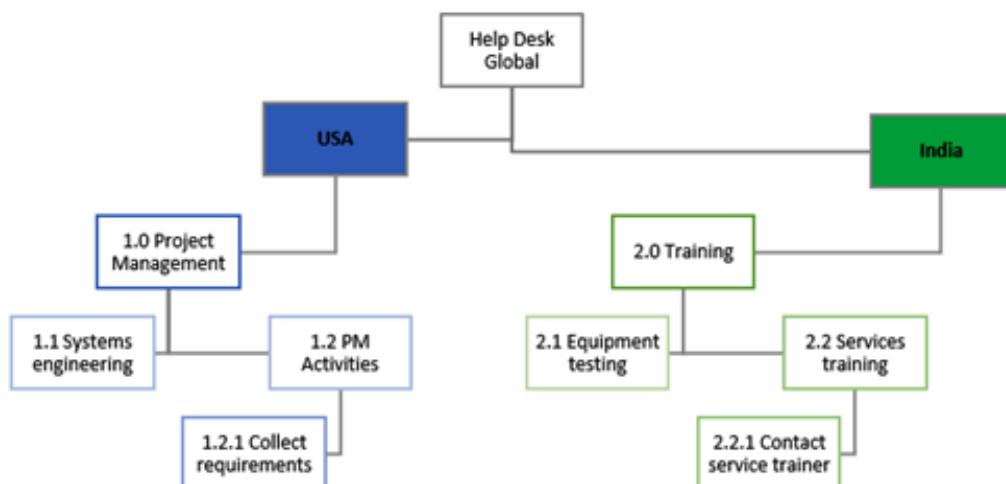


Figure 7.3 – WBS

Then, as we can see in *Figure 7.4*, the same information will be represented as an outline, which is a more realistic representation of your day-to-day:



Figure 7.4 – Outline

You can see from both figures that there's no wrong way to create your WBS. I often think of it as an outline or a visual flowchart. Visual documentation allows you and your team to determine the best way to accomplish the scope of work. By organizing it in such a way that you and your team can focus on one deliverable at a time, there is less chance that anything can get missed. The people that do the work know the work, and will be the best resources to help you create your WBS. You are not in this alone! Just because we're explicitly documenting the scope of work does not mean that we are not thinking about other knowledge areas and things such as schedules and budgets. We might be discussing the order in which the work needs to be done, how long it's going to take, how much it is going to cost, and which resources are being used for what.

Now is probably a good time to give you some of the terminology that you can see regarding the WBS. You might've noticed the outlining system or numbering codes on the WBS examples. These are called the **code of accounts**. Using the code of accounts will help you keep track of the scope of work placement in the WBS. This is due to the ability to organize your scope of work and keep track of the hierarchy. The code of accounts will be utilized in budgeting, in change control, or if you need to export your WBS into a spreadsheet program, it can help keep track of the hierarchy.

Don't confuse the code of accounts in the exam for the chart of accounts. The chart of accounts is an accounting term and could be used as a distractor in an exam question, but it will never be the correct answer in WBS questions.

The lowest level in the WBS is called a **work package**. It's important to understand that we are not breaking the WBS down to the activity level, because that would be jumping headfirst into scheduling and we're not there yet. What we want to try **not** to do is to decompose the scope of work at this point excessively. The WBS is not a schedule; it is not a schedule; it is not a schedule! Just in case you missed it the first three times, I want to make sure that you don't answer a question incorrectly because I forgot to mention that it's not a schedule. We will get there in the scheduling chapter, and you'll see the pieces fit together, but for now, we are utilizing a function of scope best practices. Yes, it will help us create a schedule at some point, but not yet. Say it with me now, "*the WBS is not a schedule!*"

A simple rule of thumb to keep in mind is that work packages should not be any smaller than eight hours' worth of work or any larger than 80 hours' worth of work. The hour breakdown isn't a hard-and-fast rule, but just another way to roughly indicate the sizes of the piles of puzzle pieces. Some piles will be bigger than others. How you do this also depends on the types of projects you're working on. If it's a three-week project, then chances are that you'll jump directly to scheduling after defining the scope of work. But remember, the assumption in the exam is we are working on longer-term projects where it might be necessary to work through the WBS first.

Another best practice for the WBS is to follow the 100% rule, meaning 100% of the scope of work as it is known today will be represented in the WBS. If we create the WBS correctly and roll up the work packages from the bottom up to the first-level deliverables, the complete scope of work will be accommodated. That is tough to do if we don't have all of the information at the beginning of a project.

We may have to engage in something called *rolling-wave planning*, which is mostly waiting for the next wave of information to come crashing into your project. Rolling-wave planning is the act of updating your scope statement and your WBS as new scopes of work are added to the project. That leads to waves crashing into schedules and budgets throughout the project as well. As we move into the execution and the monitoring and controlling processes later in this guide, you will see a lot of updates to both the project management plan through change control and updates to project documents. Rolling-wave planning is a type of *progressive elaboration*. Trust me when I say you're going to feel like the waves are crashing down on you when your customer changes the scope of work! Which...never...happens...uh...ever? More like a rolling tsunami in that case.

*"Hi, change control board, the customer wants something else added.... again!"* The goal here is to avoid another scope term, called **scope creep**.

Scope creep is defined as unauthorized or uncontrollable changes to the scope of work without any regard to scheduling or budgeting. It's the project management equivalent of having too many cooks in the kitchen trying to make soup. Everybody decides to walk by the pot and add salt to the soup. It isn't going to take very long before the soup is ruined.

Even though scope creep happens in every single project, the goal is to have some formal change control mechanisms in place to prevent scope creep. Think back to that bicycle project. Let's assume somebody on your team added a bell without any regard to the true scope of work documented in the scope statement. They just decided one day that this bicycle needed a bell.

One of two things is going to happen. Either the customer is going to say, "*Wow! I didn't want to have to pay for a bell, but I really wanted one, and now I've gotten it for free, I'm going to call my friends to order bicycles from you!*" Pretty soon, your organization is losing massive amounts of money, providing free bells to the customer population.

Conversely, the customer may look at that bell and say, "*I never asked you for that; everybody knows not every bicycle has a bell on it! Remove it right now!*" Now you and your team have to spend time and organizational money and resources removing the bell from the bicycle. Whether it's too much salt in the soup, too many bells on the bicycle, or a very slight scope edition done without regard to formal change control processes or the true scope of work, scope creep should be avoided at all costs, or it will cost you and the company you work for.

I'm hoping that it is straightforward to see why the WBS is the number-one most crucial planning tool. The WBS hierarchically defines scope and project success by representing 100% of the scope of work. The inevitable scope baseline includes the scope statement and the WBS. The aspects of the documents in that baseline will then be an input to just about everything else. It will be what you use to perform scheduling processes, budgeting, resource management, procurements, and other aspects of the project that will support the successful completion of the scope of work.

Now we have two critical documents completed: the project scope statement (the picture on the puzzle box) and the WBS (the pile of organized puzzle pieces). There is just one more document that we need to create to be as successful as possible with the scope of work, and that is called the WBS dictionary.

## The WBS dictionary

When I was younger, and I didn't know the meaning of a word, my parents would tell me to look up the definition in the dictionary. Once I finished rolling my eyes at my parents in the way that only teenagers have perfected, and found the word in the dictionary, there would be a precise definition of the word. There would also be some additional information on the word, as well as whether the word was a noun, a verb, or an adjective, or even some combination thereof. The same can be said for the WBS dictionary. There is no way that you and your team can break down 100% of the scope of work, compartmentalize it, and get it organized, without throwing a ton of additional information into the mix. You may be asking your team what the work package is for a certain scope of work, and instead of just giving you what you asked for, they start giving you information about how many resources they're going to need, how long it took them to do something similar in the past, how they need to confer with the procurement department about parts and equipment, and so on.

You won't say, "*No, no, this isn't a schedule, and we can't discuss this now because my study guide said so.*" Quite the contrary! All that information is essential for successful scope completion. Nobody is suggesting the information isn't being discussed or thought about during the process of creating your WBS. It is also safe to say that your customers and other key stakeholders may not thoroughly understand some work packages. You can then refer them to the WBS dictionary and explain that they will find the definition of the individual work packages and the deliverables they belong to. They will also find a multitude of other planning information that can be useful for understanding. They may roll their eyes at you, but at least they can get the information they need. I find that well-informed stakeholders are a necessity, always.

For many of us, the WBS dictionary can be a text column next to our outline where we jot down the information that we were gathering as we plan. For others still, the WBS dictionary can be a formal document that is in addition to the WBS itself. No matter what, it's never a good idea to make assumptions about what your customers and other key stakeholders know. We very much want them to understand the scope of work because inevitably, they will be the ones that sign off on the baselines of scope, schedule, and cost. We know we need approval for a scope baseline, and we also need everyone to be on the same page about the result. So this is as good a time as any to tell your stakeholders to "*look it up in the dictionary.*"

## WBS dictionary information

Here is some information that may be found in the WBS dictionary. Not every single work package and deliverable will have all this information, but it is useful information to document if needed:

- Code of account identifiers
- Description of work
- Assumptions/constraints
- Responsible organization
- Milestones and schedule activities
- Resource requirements
- Cost estimates
- Quality requirements
- Acceptance criteria
- Tech references and agreement information

It makes perfect sense that having something all stakeholders can refer to is an important step to building good relationships, communicating effectively, and getting everyone on the same page. Even more important is getting the scope statement, WBS, and WBS dictionary approved as the current scope baseline. At this point, you have created all three documents that could be considered everything needed to execute on the scope of work. The scope baseline is ready to be approved and signed.

### What is the scope baseline? It is the following:

1. The currently approved version of the project scope statement.
2. The WBS of 100% of the scope of work to date.
3. Work packages are the lowest level of the WBS and each part of a control account. The control account is a control point for management where scope, the schedule, and the budget are integrated for performance measurements using my friend, the *earned value technique*.

Okay, it's not totally my friend, so we'll put that off until later in the guide. The earned value technique is a way of tracking performance using math. Yep, math. Don't worry if you are mathematically challenged and are now freaking out about math on the exam. Put your fears to rest. You'll have a calculator (whew), and there are fewer formulas on the exam than ever before. Many of the mathematical concepts are presented based on the results of the formulas. Instead of running the formulas, you will be asked to identify whether your project is in trouble, ahead of schedule, or right where it needs to be. That's not to say you won't get formula questions; you will. But everyone knows we have software for those tedious kinds of things these days, so I'm happy to put all of that math off until *Chapter 8, Schedule and Cost Management!*

4. The WBS dictionary, which defines the work packages and deliverables in such a way that all stakeholders can understand and put their signatures right on the bottom line.

Let's discuss baselines at this point and consider their importance to the project. Baselines are your game plan. Once kick-off happens, it may be necessary to call an audible because things aren't exactly going the way you expected. It happens. But when the coach is in the locker room pre-game, they are confident in their plays and their team players. It's not until you get on the field that you realize that you may have to make some adjustments as soon as possible. Baselines work the same way. They are the plan we put in place with every confidence that things will work out, but with a healthy sense of skepticism and confidence that if it doesn't, then we can adapt and adjust on the fly. You are the coach; your team believes in the plays, and until the plays are executed, it all looks good on paper, the X's and O's. If your scope baseline says *no bell on the bicycle*, then that is the expectation, and without change control or scope creep, that is how it should work out. Well, I hate to say this, but scope creep probably (definitely) will happen.

*Change control is good; scope creep is bad.*

The best we can do is define the scope of work clearly. If changes are necessary, we assess the impact of those changes, create solutions for implementation, get approvals, update our baselines as needed, and implement the change. Don't forget to validate the solution worked as well. The scope of work is the driving force of every other baseline you will review. Any changes to the scope of work inevitably drive changes to your schedules and budgetary baselines, as well as other plans to support the scope of work.

It's a good idea to memorize what makes up the scope baseline. I promised to tell you when memorization can help you with specific questions. This is one of those times. The scope statement, the WBS, and the WBS dictionary make up the scope baseline. Memorize that, and you'll be sure to answer the questions correctly.

You've reached an essential step in the planning process. Even though you know that you will continue to plan in an iterative rolling-wave fashion throughout the project, for now, you have locked down the scope of work and gotten your strategy approved by your key stakeholders. Now that planning for the scope of work is completed, we will go with the assumption that project work is being executed and deliverables are being produced. At this point, it is imperative to monitor and control scope creep and to gain acceptance of the deliverables formally by the powers that be. That brings us to the Validate Scope and Control Scope processes.

## Monitoring and controlling scope

To officially close your project, it is usually necessary to get the final, formal signatures. Having a structured process does a couple of things; it provides formal acceptance of the scope of work, and it provides the necessary documentation needed to begin project closure or phase procedures. Not every organization has a formal sign-off policy on the scope of work, but I find it is an important step. After all, you did all of the planning, execution, monitoring, and controlling, and you would like to feel validated for all that hard work, darn it.

There is a cadence to project management and this is the reason for everything else we do to plan, execute, monitor, and control effectively.

### That process includes the following:

1. Producing the deliverable during execution (see the *Direct and manage project work* section in *Chapter 14, Integration Management*).
2. Verified quality via inspection (see the *Control quality* section in *Chapter 9, Quality Management*).
3. Validate scope via inspection (the *Validate Scope* section: you are here now).
4. Formal closure of the project or phase (see the *Close project or phase* section in *Chapter 14, Integration Management*).

That's it! The entire reason for every best practice we cover outside of those processes is to support that trajectory from deliverable creation to a closed project with full acceptance and without any adaptations. Does it always work that way? I think you know the answer to that question. Nope, nada, no – or as they say in Germany, *nein*. There are a variety of reasons why projects may not reach the finish line. It's the goal, of course, but even the best-laid plans don't always go the way they should. It may be that scope validation doesn't occur because the scope of work is not correct. The bicycle seat isn't right, the color is off, and who the heck added that bell? The dreaded scope creep strikes again!

**Scope creep** means unauthorized, uncontrollable changes to the scope of work without regard to constraints or formal change control. It happens. Often. A lot. In every project. You get my point. The thought is that, if you have a formal process in place for change control, then scope creep won't happen. I'm officially rolling on the floor, laughing out loud! For the millennials in the house, that is ROTFOL! Why is it so funny? Because it doesn't matter how good your change control procedure is or how well the team understands it, there will always be tweaks and adjustments made without regard to requirements. Your team may think they are helping but adding scope outside of the requirements is a big no-no. Nein.

Keep in mind the process of deliverable creation, verified quality, validate scope and project/phase closure – not because they will test you on the process, but because it helps you see the big picture as to why these formal processes are necessary and could help you answer questions on your exam.

The inevitable goal of any project is to produce the result to meet the specified requirements, make sure it is fit for use, gain the appropriate approvals, and then transfer the result to the customer or end users. Without formal acceptance and validation of the scope, that won't happen, so the scope needs to be controlled and scope creep needs to be kept in check. Therefore, we will cover both the validate scope process and the control scope process. Both are monitoring and controlling functions that may be repeated throughout the project, especially in phase-oriented, Agile, or adaptive environments.

## The Validate Scope process

In the simplest of explanations, the validate scope process involves gaining the formal acceptance of the deliverables periodically and as required throughout the project, and is very tightly integrated with controlling quality as well. Because validate scope is a formal process, it would be necessary even if the project were to be canceled in the middle. You must have formal acceptance and validation before the project or phase closure occurs. That's not to say that you won't be gaining acceptance on day 30 of a year-long project. You might if the deliverable is completed and requires approval. Think back to the Agile considerations where there is a review at the end of each iteration. The increment is tested and discussed, and is either considered done or not done. We apply the same concept here. There is a physical inspection of the deliverable and it's either accepted or not. If not, a change request would need to be made formally to fix the defect or change something that wasn't needed or wanted, or quite frankly, if the result isn't working. How would you know whether it did or didn't meet the expectations or requirements? You would physically inspect it. There aren't a lot of inputs, tools or techniques, or outputs for this process, so it's seemingly less bulky than the scope statement or WBS processes. Don't let that fool you though – it is an integral aspect of monitoring and controlling, and is necessary so you can close out the project or phase and, you know...get paid!

If you remember that, you'll do just fine on those questions in the exam. Next, we move on to the control scope process. You most likely will not get validation if you don't control scope creep with formal change control.

**Note**

Formal integrated change control is assumed on the PMP® exam.

You will cover the ins and outs of integrated change control in *Chapter 14, Integration Management*.

## The Control Scope process

Part of being a great project manager is the ability to document and review documentation for trends in the wrong or right direction. How do you know if you are meeting scope requirements? Compare the scope baseline and requirements traceability matrix to the actual performance. If it doesn't match up, then something has gone wrong, and you'll need to find the root cause. Did someone add something they were not supposed to without approvals through change control? Was there a defect that went unnoticed during inspections and has slipped through the cracks? Did we misunderstand the requirements or make false assumptions about the results? All signs point to scope creep, and part of controlling the scope of work is to identify variances from the plans and look for things that are trending in the wrong direction. Keep in mind that if the scope of work has changed, with or without formal change control, then the schedule, the budget, and the quality could be affected, and now you have a real mess on your hands. Change is a fact of life and everyone I talk to experiences scope creep regularly. If there is a formal change control procedure that assesses the impact of a scope change on the other constraints, allows the team to brainstorm the correct solution at the time, and finally get approvals, then we are well on our way to managing the competing constraints while keeping the scope of work in check. This is why you will notice multiple change-oriented documents for consideration as inputs, and change requests and updates to the project management plan as outputs.

As you can see, the scope of work is the main constraint that drives the rest of the project in a predictive environment. In an Agile environment, it's the opposite. Think of it this way; you have competing constraints of scope, schedule, cost, quality, risk, and resources. Let's take the big three, **scope**, **schedule**, and **cost**, and compare them against the life cycles:

- **Predictive:** The scope of work is fixed and planned, and the schedule and costs have to conform to the scope of work to complete it based on requirements.

- **Agile:** The scope of work is flexible, and changes are expected every iteration. You are working with emergent designs. The schedule is a fixed iteration length and typically the costs are fixed as well, either by iteration budgets or total project budgets.

You might have heard the old saying, "*you can have it fast, good, or cheap, but you can't have all three.*" That may be true in the real world, but in a perfect world, if you plan effectively and manage changes formally, you can avoid many opportunities for scope creep and poor quality while staying within the schedule and the budget. Where exactly is this perfect world and how do I get there? Sigh...we can only do the best we can and make sure to understand the best practices that can help us get there, slowly and painfully, but moving in the right direction.

## Key phrases that pay

A list of some key phrases is as follows:

- Requirements traceability matrix
- Scope management and requirements management plans
- Prototyping
- Facilitation
- User stories
- Project scope statement
- WBS
- WBS dictionary
- Decomposition
- Scope baseline
- Validate scope
- Scope creep

## Summary

In this chapter, you reviewed how the scope and requirements management plans are essential to outline how the scope of work and collection of requirements will occur, how changes and updates are managed, and how the scope will get accepted. Next, you reviewed the most important scope document, called the scope statement. This document defines what will and what will not be included in the scope of work, and may go through several updates before it is approved as part of the scope baseline.

We then reviewed the most important planning document, called the WBS, and its companion document, the WBS dictionary. The WBS is a hierarchical decomposition of 100% of the scope of work, and that is the definition to remember for the exam regarding the WBS. Then you reviewed the scope baseline and its importance for the rest of the project planning process. Finally, we reviewed the validate and control scope processes to ensure the deliverables that we spent so long planning for will work out the way they should. If not, change control is necessary, as well as updates to other documentation affected by the changes.

In the next chapter, we will create the project schedule and the resulting baseline, and review our cost estimates, budgeting, and what is included in the cost baseline, as well as how to control your schedule and budget.

## Assessment exam

### Question 1

You are the project manager for a large installation project. Your key stakeholders are discussing what is needed to be accomplished to set up their new data center and have some specific ideas about what they want. What is the best document to keep all of their requirements organized and to identify deliverables that affect other deliverables in order to effectively manage changes during execution?

1. The requirements list
2. The WBS
3. The requirements traceability matrix
4. The scope statement

### Question 2

Which of the following is the best description of a WBS?

1. A hierarchical decomposition of 100% of the scope of work
2. An org chart for the scope of work
3. What will and will not be included in the scope of work
4. An outline

### Question 3

Joaquin is your sponsor, and he has come to you and asked for an overview of the deliverables you and your team have decomposed. He wants to make sure the customer fully understands the scope of work, but they are not well versed in how a WBS works. What is the best document the customer can review to gain a better understanding of the requirements?

1. The scope statement
2. The WBS dictionary
3. The WBS
4. The requirements traceability matrix

### Question 4

Which of the following is not part of the scope baseline?

1. The scope statement
2. The WBS
3. The project charter
4. The WBS dictionary

### Question 5

You and your team are doing some brainstorming and breaking down large deliverables into more manageable planning packages. What technique are you using to do that?

1. Scope planning
2. Requirement planning
3. Decomposition
4. WBS creation

### Question 6

You are working with your team to decompose the scope of work and your coordinator, Jim, suggests that you organize the WBS using a numbering system. What is the numbering system called?

1. The chart of accounts
2. Outline numbers
3. The WBS dictionary
4. The code of accounts

### Question 7

You have taken over in the middle of a large IT project after the previous project manager was pulled to work on something else. You are reviewing what they have accomplished so far and have determined that requirements have been collected. What do you do next?

1. Double-check that everything is properly documented.
2. Discuss with your team your plans to document the scope of work.
3. Create the scope statement.
4. Explain to the team that you need to review the charter first before you can do anything.

### Question 8

You are working on the documentation for a project that involves installing data centers at multiple client sites on a very tight timeline. You have described the scope of work in a formal way, but have also mentioned that your team will not be involved in the testing of the equipment. That will be left to operations. Which document would be best for this information?

1. The WBS
2. The charter
3. The WBS dictionary
4. The scope statement

### Question 9

All of the following are the major differences between the scope statement and the WBS, except which one of the following?:

1. The scope statement describes what will and will not be done, and the WBS allows for a hierarchical version of the scope of work.
2. The scope statement describes what will and will not be done, and the WBS decomposes to a level you can estimate effectively.
3. The scope statement is very descriptive, and the WBS is more of an outline.
4. The scope statement is very high level, and the WBS is very descriptive.

### Question 10

What is the main goal or objective of the WBS from the project manager's perspective?

1. It helps create a schedule.
2. It decomposes work to the activity level.
3. It formally authorizes the project manager to begin project work.
4. It decomposes the scope of work to the work package level.

### Question 11

Jamal is a key stakeholder on your current project and is also new to project management best practices. He has asked you to explain the difference between the project charter he signed and the scope statement he is about to sign because they look similar to him. How would you answer Jamal's question?

1. The scope statement is just an updated project charter.
2. The project charter gives formal authorization to begin project work, and the scope statement breaks down the scope of work for scheduling.
3. The project charter gives formal authorization to begin project work, and the scope statement clearly describes what features will and will not be produced during the project.
4. The project charter is just an overview to begin project work, and the scope statement is hierarchical.

### Question 12

You are working with your team to determine the structure of the WBS, and you have collected all requirements and have a good understanding of the scope of work. Even though you know the scope could change, what is important to include in the WBS at this point?

1. A high-level scope
2. Major deliverables and work packages
3. 100% of the scope of work as it is known today
4. The business case

### Question 13

An Agile charter differs from a project charter for which of the following reasons?

1. It offers less flexibility for the scope of work.
2. It doesn't document how the project will be run.
3. It offers more flexibility for the scope of work.
4. It offers more information about the software design.

### Question 14

Which of the following could be considered a minimally marketable or viable increment on an Agile project?

1. A payroll system that is going to be used by the HR department
2. A corporate website with scrolling pages of content
3. A cup holder on a beach chair
4. A tracking website for your dogs

### Questions 15

Which of the following best describes what a WBS dictionary is?

1. A document that describes technical terms used for scope management
2. A document that describes the details for each component in the WBS
3. A document that translates essential WBS terms for global project teams
4. A document that helps translate functional into technical requirements

### Question 16

A project you have been working on has been canceled in the middle due to the customer going out of business. What must you do before you close out your project?

1. Validate the scope
2. Control the scope
3. Review the project using quality assurance
4. Go through change control to reflect the project closure

### Question 17

Jimmy is one of your best team members and you trust him to make the right decisions as he is working on the deliverables he was assigned to. You are collecting performance information in the form of work performance data, and after running a variance analysis, you realize that Jimmy added something a bit extra to the cabling outside of the requirements. Which of the following answers is correct in this situation?

1. This is scope creep, but it isn't really affecting the results, so you leave it.
2. You ask Jimmy why he thought it was necessary and he explains in a way you understand, so you agree to leave it the way it is.
3. This is scope creep, and a formal change needs to be made either to keep the change or remove the change.
4. This is scope creep, but you don't have a formal change control system, so you ignore it. Jimmy knows what he is doing.

# 8

# Schedule and Cost Management

In this chapter, we will review the knowledge areas of schedule management in the planning process group and planning cost. We will begin with the schedule management plan, which describes how to manage your schedule from creation to monitoring and controlling. Then, we will review how to define and sequence activities in a logical order to best estimate durations, as well as how to establish the project schedule and schedule baseline. On the cost side, we will review planning for cost management, estimating costs, and determining a budget and cost baseline. We will wrap up this chapter by looking at controlling schedules and costs, where we will compare the baseline to the project's performance and determine whether corrective action is needed. These are all important aspects of keeping to a schedule and budget during project execution.

In this chapter, we will cover the following topics:

- Developing a schedule management plan
- Define activities
- Sequencing activities
- Estimating activity durations
- Creating the project schedule
- Plan cost management
- Estimate costs
- Determine budget
- Controlling the schedule and budget

Let's get started!

## Key concepts for schedule management

To ensure your schedule is both flexible and accurate, the team needs to determine both the life cycle and the practices to maintain the schedule after its creation. Will the team choose a critical path and run the project in a predictive fashion, or will a more Agile approach be a better choice? Either way, there will be a model the team can follow to plot out the schedule activities, as well as maintain the schedule or update it as needed throughout the project.

## Trends and emerging best practices in scheduling

Because a long-term scope is challenging to determine in the earlier stages of planning, the team might benefit from a more flexible approach, such as iterative scheduling using a backlog. User stories are created, and the team may choose to use a Kanban or pull system approach. Essentially, the next piece of work in the queue is in the backlog and when the team is ready to work on the user story or stories, they will pull that work into progress and incrementally work through the scope and activities necessary to produce something minimally marketable or a usable increment.

## Tailoring considerations for scheduling

Since tailoring is one of the best skillsets a project team can have, they may decide to view the project through the lens of flexibility in their approaches via life cycle choice, the availability of the resources (or lack thereof), how complex the project work will be, and how the schedule will be tracked. It could be earned value or a red, yellow, green stoplight approach to monitoring what is completed and what is not.

## Considerations for Agile and adaptive environments

For me, it seems that scope and schedule are the two most significant knowledge areas that are impacted by a change from a predictive environment to an Agile or adaptive one. They appear to be opposites in the way the work is managed. The one thing that doesn't change is the project manager's role in the project. An exact Agile approach doesn't necessarily have a project manager. It's typically the role of the product owner to collect requirements, and the team determines the work. Because you may be working in an adaptive or hybrid project, where appropriate, your project manager role remains intact. How you manage the team and the schedule can adapt based on your project's complexity, but for the exam, you are and will remain a project manager.

As you read this chapter, ask yourself what may work for your organization and your current projects.

### Reference

*The Project Management Professional (PMP), PMBOK Guide and the Project Management Institute Agile Certified Practitioner (PMI-ACP), and the Agile Practice Guide are a registered mark of the Project Management Institute, Inc.*

We will begin by looking at a predictive type of project schedule management planning, as predictive project management is the majority of the content you will find in *the PMBOK® Guide - 6th edition*. However, there is always room for an adaptive approach in all or any of the processes we will cover for schedule management and your exam.

## Developing a schedule management plan

Like any other management plan, the schedule management plan is a *how-to guide*. While this plan helps you get your schedule priorities in order, it may be a plan that you wouldn't use in the real world because those who do schedule, schedule and don't need a plan to tell them how to do it. They already understand how to put together a schedule baseline and the rules of the organization. But what if you are new to scheduling? What if your customer needs more clarity on how the schedules will be created and updated? Now, it may be realistic to at least get everyone on the same page about the rules and how changes will be managed.

The high-level overview of what may be included in the schedule management plan allows for several schedule management best practices to be addressed in one place.

### Schedule management plan considerations

Take a look at the following questions. If you can answer them clearly and with purpose, you probably don't need to create a schedule management plan for your current project. But ask yourself these questions from the perspective of your team and other key stakeholders as well. Just because you know the answers doesn't mean they know the answers. Remember, schedule changes can impact everything else, so knowing how to manage changes is a significant consideration:

- How will you monitor and control the overall schedule?
- What are the approved schedule development tools and techniques?
- How will changes to the schedule baseline be managed?
- Who is responsible for developing and maintaining the project schedules? (Please say a schedule coordinator!)
- How and when will schedule performance be reported?

You will see as you move through this guide that we spend less and less time on management plans. There are a few exceptions, though, and they are the communication management plan, the quality management plan, and the risk management plan. We will look at these in more depth in *Chapter 9, Quality Management*, *Chapter 10, Resource and Communication Management*, and *Chapter 11, Risk Management*, but until then, it's time to move on to the **what** of schedule management.

The completed schedule will be a significant constraint, so it's essential to have a management plan that can address some of the challenges of scheduling. All constraints, not just the schedule, are **competing constraints**. Competing constraints not only affect each other, but some constraints are more important than others to your customers and stakeholders. Does your organization care more about the schedule, the scope of work, or the budget? You may have heard the saying you can have it fast, good, or cheap, but you can't have all three because they are competing with each other. How long will this take and how much will it cost? Did we build the right thing, and did we build the thing right? These are questions that will be asked and need to be answered as you progress through the project. By planning effectively, you will be able to answer those questions.

Once you have determined your life cycle approach, as well as the way you will create, track, and control your schedule, you can begin to review the scope of work and break it down to the logical activities that will be performed on your project.

## Define activities

Remember when we discussed the **work breakdown structure (WBS)** and we reviewed how to decompose significant deliverables down to the work package level? Now, we will take those work packages and decompose them to the activity level. **Define activities** is the process where the WBS begins to influence the schedule but is still **not** a schedule. We will use the WBS to get to the activity level, and once that occurs, we will have an **activity list** and some **milestones** that will guide the creation of the actual schedule and the baseline. I realize that for the most part, I'm writing philosophy here. We are involved in the realm of easier said than done right now. This piece can be very time-consuming, especially if you have never created a schedule before or you are working on something new. For the sake of the exam, defining the activities process is pretty self-explanatory, meaning you don't need to know a whole lot about the process to answer questions because it just is what it is. This is generally because PMI® could never say explicitly, "this is how you define activities on your projects." Every project is unique, and every project will have differing levels of activity decomposition.

Even though the scope of work may not be 100% clear right now, we will progressively elaborate throughout the project, and this is why the process of define activities is considered *iterative*. That is why the WBS and the currently approved scope statement are the most significant influencing factors right now. Couple that with the process of breaking deliverables to the activity level, and it's probably best to call in reinforcements. Remember, even though project management is a big job, you are not working by yourself on large projects. You are in a strong matrix organization unless otherwise stated in the exam, and you have a core team of people to help you plan. The people who do the work know the work, and their expert judgment can help streamline this iterative process.

**Note**

Expert judgment is the number one tool or technique in project management.

The best practice is to break work packages down to the level where everyone understands the work to be done, and assumptions are documented and discussed. It's always a bit of a guessing game to determine how far the work packages should be broken down. Some project managers like to stick to the rule of thumb that each work package is no larger than 80 hours' worth of work and is at least 8 hours' worth of work. This rule of thumb can vary from project to project, but it is easier to plan 1 day or 2 weeks' worth of activities than a month or more. The difference could very well be a concise activity list versus an 8,000-line item project plan. I realize you don't want to miss anything, and I get that, but try to balance both sides as much as possible. It will help you in the end. Plus, if you have resources who understand the work they are going to do, it becomes unnecessary to break it down any further than their current understanding. This process is, as we mentioned previously, iterative because it is dependent on the currently approved scope baseline. If the scope changes, so will the activities that must be fulfilled to complete the work. **Progressive elaboration** and **rolling wave planning** are very typical when defining the activities and putting together a schedule you can probably meet. Once you have completed this process, you will have an activity list.

The other main output of the defining activities process will be **milestones**.

Typically, there are two types of milestones: **mandatory and discretionary**. Mandatory milestones are the ones we are used to using the most – those dictated by the project charter, the customer, the sponsor, and other stakeholders. Discretionary milestones are typically used by project managers to set goals for their team. Discretionary milestones allow for checkpoints of successes without all the pressure.

Once you have your activity list and any additional information or **attributes**, you can use them to help you plan. You can also use the milestones you documented or were dictated for this.

Remember, the WBS isn't a schedule because you will need to break it down from the workpackage level to the activity level in a progressive way as the new scope is determined. Then, you must sequence those activities and estimate durations before you can even think about what your schedule will be. Assuming the define activities process has been completed, at least at the beginning of planning, the next step is to sequence activities.

## Sequencing activities

I find sequencing activities to be the most stressful piece of project management because if you get the order wrong, the entire project could go sideways. It isn't unusual to see (me) project managers gesticulating wildly at their computer screens and asking why the finish date just jumped out ten thousand days into the future. This tantrum is due to the order in which things occur, which affects the dates; then the resources you assign to the activities, which affect the level of effort; and finally the duration of the activities, which will affect everything else. This is the process of schedule creation, but it starts with sequencing activities and some crying.

The goal of sequencing is to determine the **relationships** between the activities and the dependencies that drive the sequence. There are many reasons why certain activities are performed in specific orders. Dependency determination is typically the first step when sequencing and may encourage the order or relationship between activities.

## Dependencies

There are four dependencies that may drive the order in which you perform work:

- Mandatory
- Discretionary
- Internal
- External

Let's discuss **mandatory** first. This dependency may be the most influential because it is based on hard logic. You have to open the door before you can walk through it. You can try it the other way, but it will be painful. Trust me, I know of what I speak. The good news with this dependency is you are probably already aware of the sequences many of the activities in your project follows. It won't be something you can debate or that is flexible – it just is what it is. This is known as **hard logic**.

**Discretionary** dependencies are the opposite. It is up to our discretion regarding the order in which we perform activities. This could be because a resource isn't available now but will be shortly, or we have received parts and equipment for one activity but not the other. You can perform these activities in any order – Activity A first then Activity B, or Activity B first and then Activity A. Either way, the activities will still be performed, and the order doesn't affect the outcomes. This is what is known as **soft logic**.

**Internal** dependencies are typical for any project. These are based on organizational process assets or driven by your PMO. Your organization states that you will do this first and then that. This is usually followed up by a project manager saying, "yeah, but... there is a better way." This statement is quickly followed by "yeah but... no." Make sure you understand organizational processes and best practices well enough to accommodate internal dependencies.

**External** dependencies are very typical of any project. These are the outside forces that push us to do things in a certain way. This could include the customer requesting something be done a certain way, or you have regulatory requirements that must be met. Could you break ground for your new data center without a permit? Logically, sure you could. Would you want to? Nope. Anything that forces your sequence to conform and comes from outside your organization is considered an external dependency.

I would imagine both mandatory and external dependencies drive many of your projects. Sprinkle in some internal and a couple of discretionary influences, and you can see why sequencing can potentially lead to sobbing and wanting to fling your computer out a window. No? Just me? Okay; we will carry on to determining relationships.

## Relationships

Relationships can be difficult. Relationships and their dependencies will provide you with a road map of your project and inevitably affect the duration of it and its resources. Just like any road map, there are multiple directions you can go in to reach your final destination. If you have ever taken a long road trip, you may decide to find the most direct route that will get you there the fastest. The same can be true for sequencing your activities together: finding the shortest distance between multiple points. Many highways diverge and converge with each other, as will project activities. Some will abruptly end, while some will carry on to the final destination.

The goal is to create the main output of a precedence network diagram or **activity on node (AON)**. The precedence network diagram is a visual map (Gantt chart for those using software) of all your activities connected by dependency and relationship. The precedence diagram isn't actually a Gantt chart, so don't tell PMI® I said that, but it is the best way to describe what it is we are trying to accomplish without software. The precedence network diagram will show us visually how the activities are connected and their logical flow from the beginning of the project to the end. Divergence and convergence. Predecessors and successors. That network will also drive how the project is resourced, budgeted, and its duration is estimated.

There are four relationships that can be used in any precedence network diagram:

- Finish to start
- Start to start
- Finish to finish
- Start to finish

Because the finish to start is the most common approach to sequencing, we'll start with that relationship first.

## Finish to Start relationships

We'll start with perhaps the easiest and most popular relationship, which is **finish to start**. The reason it is the easiest is that, like many things, you have to finish one thing completely before you can start another. This relationship could be due to hard logic or a lack of resources, or because it makes a pretty Gantt chart. Activity A first, then Activity B. This relationship will also give you the longest total duration a project could take if you use it on every single linked activity. Activity A's duration + Activity B's duration + Activity C's duration = total duration of those activities. Even though we haven't covered duration estimating yet, it would make sense that you are thinking about how long activities may take. The relationships you choose will also drive the total duration of the project, along with the resources you assign to it. More on that later in this chapter. For now, it's important to both recognize the relationship visually and be able to identify the relationship in a situational question. I'll give you examples of both.

In the following diagram, you can see a finish to start relationship. Be sure to look at where the arrow is because that will help you identify relationships visually:



Figure 8.1 – Finish to start

Notice the circles on the left and right of each activity. The left-hand side of the activity is the start, while the right-hand side of the activity is the finish. Where the arrow connects shows you the relationship. In this case, the arrow is at the **finish** of Activity A and the **start** of Activity B. If I were looking at durations as well, I could easily see that if I took A's duration and added it to B's, I would have the total duration for both activities. I must **finish** setting up my brand-new computer before I can **start** loading software.

## Start to start relationships

In the following diagram , you can see a **start to start** relationship. Again, notice the arrows. Keep in mind that these are examples. You may have a more significant gap between activities due to lag time or a different configuration due to resources being able to start sooner or later and so on:



Figure 8.2 – Start to start

The **start to start** relationship is also a common relationship, especially when you are trying to condense the total duration of two or more activities. This is referred to as **fast-tracking** or making the boss happy. The boss is smiling because the activities are running in parallel and shortening the total duration.

A good example of this is writing this study guide. I need to start writing the first chapter so that my very patient editor can start editing. We carry on this way throughout the writing process until we have completed everything. If my editor had to wait until I'd finished writing this guide and then started editing, then this study guide wouldn't be in your hands or on your computer screens right now. It would have taken twice as long to complete the entire project.

This relationship is useful in a lot of ways, but especially if you have the resource availability to run things this way and only if it is logical to do so. In this case, if you think of duration estimates, it makes more sense. It takes me about 6 months to author a book. It takes about 4 months to edit it and get it ready for publication (I'm guessing here). In this case, 4 months is fewer than 6, so the entire process should take about 6 months. Conversely, if this were run in a finish to start manner, it would take 10 months. Therein lies the value of this relationship.

## Finish to finish relationships

In the following diagram, you can see a **finish to finish** relationship. Look at the arrows; they are both connected to the right-hand side of the activities, or the finish of both. We are also running in a parallel format, except this time, activity A needs to finish so that activity B can finish. The relationship driving these activities doesn't necessarily mean they will both finish at the same time. Activity A may finish before Activity B, but Activity B is dependent on Activity A so that it can be completed:



Figure 8.3 – Finish to finish

The **finish to finish** relationship may be necessary but isn't usually as common as the finish to start and start to start relationships. It stands to reason though that, somewhere in your projects, you will have a dependency that forces this relationship. I need to finish installing the software so that I can finish testing it. Now, you might be thinking, "hold on a second, I can also finish installing the software and start testing it," and you would be correct. Remember that I said this sequencing thing could be a bit trying. It's up to you to determine what works best for your project and then sequence accordingly. Each relationship will affect the total duration of the activities and, like a row of dominos, once the first is knocked over, the rest will follow.

Like I said, finish to start is the most common relationship, and if you are newer to scheduling, you may feel more comfortable keeping everything finish to start. Trust me when I say you would not be the only one who does this. Yes, it makes for a pretty Gantt chart when everything waterfalls to the end of the project, but the **finish-to-start** relationship also allows project managers to build in contingency time. It is just this philosophy that keeps most project managers from venturing out to other relationships too much, and they keep themselves in the range of finish to start.

I recommend that you try different configurations in a demo schedule. Add resources, add durations and dates, and then change the relationships that seem logical and see what this does to your finish date and your resource allocation. Then, you can start to see the power of logic and how it affects time.

## Start to finish relationships

In the following diagram, you can see the **start to finish** relationship. You can tell it's a bit different from the ones we have just reviewed. There is a reason this is the least used relationship, although I see this being used more on IT projects than anywhere else. There was a time when I saw these relationships in large projects and thought that they were showing off by using it. "Look, we can use the least used relationship. Top that regular project manager!" Now, with the technological age in full swing, this relationship may be useful for your project schedules:

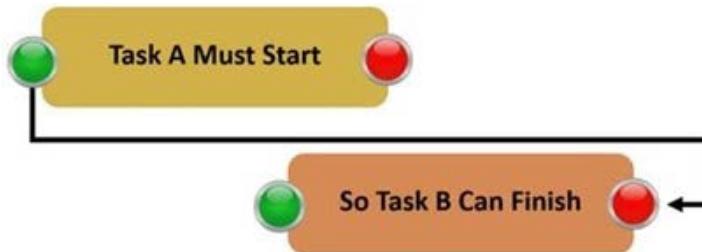


Figure 8.4 – Start to finish

A **start to finish** relationship sounds the most logical, doesn't it? You start the race and then you finish the race; what is so weird about that? In the case of a start to finish relationship, you have to **start** something to **finish** something else. Let that sink in a bit.

Here is the best example in an IT environment I can give you. Your customer has asked that you install a brand-new server system in their office building, and they want you to do it during business hours. They have expressly stated that you are not to halt organizational productivity during the installation. So, you wheel in the new server, get it turned on and set up before you unplug the other server system, and then wheel that out of the building. You must start the new server before you can finish the old server.

Other than that, you probably won't see this relationship much in the exam or use it much in the real world. It is a good one to know, though, in case you find yourself in a situation like the one I just mentioned. If that's the case, it is the most realistic for that type of project.

You will also need to consider lead and lag time when you wish to create a realistic schedule.

## Lead and lag time

When sequencing activities and determining relationships, you may identify a need for either lead or lag time to be added to the relationship. Lead time condenses the overall duration, while lag time adds to it. There are some particular nuances to that statement, though. Lead and lag time do not add to costs, nor to resource schedules. If I am updating our data center and then installing the servers, I have a finish to start relationship. However, the servers will need to be delivered, and we may have to wait between the update and the install for that delivery. I will need to add some lag time between the update and the install. I'm not sure how your organization works, but I don't take kindly to paying people to stand around and wait for delivery people when they could be doing other things. Logically, though, that time needs to be there. Update data center = 4 hours, delivery time 4 days (lag), while installing servers = 3 hours. I only need resources for the first and the last activity. I will use a finish to start relationship with 4 days of lag. In this case, the entire duration will be approximately 5 business days, but I'd only be resourcing and paying for 7 hours of work.

In the following diagram, you can see what lag time looks like in a network:



Figure 8.5 – Lag time

As we move through this chapter and most especially when we go through duration estimations, you will see that dates, duration, and effort are all different types of schedule drivers. If I look at budgeting, I'm paying for Activity A and then Activity B, but I'm not paying resources for the lag time. Plus, there is the other side of the duration estimates in which lag time is accommodated in the duration total. Thus, the team feels they can use the lag time to push out the activity until the last possible moment. This logic is flawed though, because not only am I paying them to push out the activity, but we STILL need the lag to accommodate logic. This probably wouldn't happen on your team, but it has for sure happened on mine in a galaxy far, far away.

In the case of **lead time**, the total duration of both activities will shorten because the lead is subtracted from the total. Much like running activities in parallel, the total duration on a calendar is reduced.

In the following diagram, you can see an example of lead time. Also, notice that both lead and lag sit on the arrow between activities. This is a visual cue to show that it isn't the actual duration of activities but a necessary addition or subtraction of time:



Figure 8.6 – Lead time

In this example, we still need to finish a certain amount of work before activity B can start, but we do not need to wait for them to finish the first activity. We have to wait for 2 weeks' worth of work to be completed. Even though a finish to start relationship is being used, the total duration will compress and run a bit in parallel, thus shortening the overall duration. Otherwise, had it been a real finish to start without lead, it would have taken the total duration of both activities added together. With that, we have compressed the duration and shortened the total. Remember that these are just quick examples and reference points for exam purposes, but I also believe understanding these relationships and sequencing can help you put together a more comprehensive and realistic schedule.

When you have sequenced your activities appropriately and plotted out everything you know today, you will have a precedence network diagram or AON **since the activities sit inside the node or box**. In the following diagram, you can see a straightforward version of this:

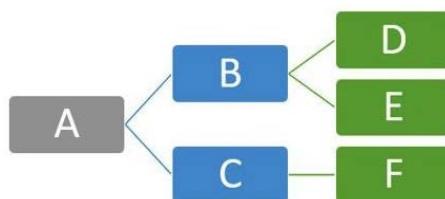


Figure 8.7 – Precedence network diagram

What do you notice about the diagram and its activities? Hopefully, you can see that they are all finish to start relationships – that and the fact that it is the smallest project ever!

Here is the good news: there would be no way you could analyze a network diagram that is too involved for a massive project on the exam, so they will tend to be small examples like this one. It's a bit more in-depth, but not by much, and the majority of the relationships will be finish to start relationships. This makes it easier to analyze.

When we move on to schedule creation and discuss the critical path further in this chapter, I'll show you what you may come across in the exam and how to navigate it. Until then, let's move on to the next step in schedule creation: estimating durations.

## Estimating durations

Estimating durations is more of an art form than a science. Some people are good at it and others, well, not so much. Most estimates are either too much or not enough, and that is because time is a concept. You will have the over (achiever) estimates and the under (always late) estimates. Perfect timing is tough to attain, so we have to use a multitude of different techniques to get a duration estimate that is realistic for each activity. Permit me a sidebar here though because **dates, duration, and effort** are three different things that affect your project schedule equally. These concepts and sequencing activities can drive a project manager to hurling their computer out a window. Let's start with dates.

## Dates

We all use calendars – they are how we maintain our day-to-day lives. A calendar shows the dates and the days and anything that is scheduled for us to do. Most organizations run on a Monday through Friday schedule. I say most because that isn't always the case. I'll use this to make a point in a moment. Let's assume your workweek is Monday through Friday and that you work 40 hours a week (I'll pause for virtual laughter). This is also what your scheduling software is betting on unless you tell it differently. The very first thing I teach when I teach scheduling software is how important calendars are. Typically, there are three main calendars, all of which are scheduling software accommodates: a project calendar, a resource calendar, and an activity calendar.

## Project calendars

Project calendars run on your organization's working and non-working days. This means you'll want to update the generic calendars so that they include holidays and other times where the organization may be closed so that your schedule is based around those working and non-working days. This calendar will drive your schedule unless it's told differently with resource or activity calendars.

## Resource calendars

Since the project calendar is driving the project based on the corporate calendar, it is also essential to address when your resources are on vacation, working different hours and dates on your project, or have a different holiday calendar altogether. Global calendars are SO important. If you are working in the United States as the project manager and have team members in another country, they will for sure have different dates that their holidays fall on. When we get further into the people side of project management, we'll touch on how important it is to be globally conscious.

There is another reason why resource calendars are essential, and that is when a resource doesn't work full-time on your project. They may be working on a variety of projects and can only focus on your project on Monday and Thursday from 12 P.M. to 5 P.M. If that isn't correct in their calendar, you will have a schedule that looks good on paper but it is impossible to meet.

## Activity or task calendars

This type of calendar would be necessary only if the task is running differently from the 8-hour workday with the weekend and holidays off. If you were running automated tests on software and you needed to run them for 24 hours straight, you would use an activity or task calendar. That way, it's tracked for a full 24 hours instead of running in 8-hour increments, making the schedule appear to need 3 full working days to run the tests.

## Effort

The effort of your resources is assumed to be at 100% in most scheduling software unless you adjust it. This means that every human resource you assign to an activity is expected to be working full time on that activity. That is seldom the case. Even if your resources are working full time, it's probably safe to say they aren't at 100% all of the time. Let's say you have a part-time resource who works on multiple projects, that would make their level of effort 50% maximum, and it may even be 25%. It will take them twice as long to get the work done across a calendar at 50% and four times as long at 25%. It's essential to affect effort appropriately when creating your schedule because otherwise, you will find yourself with over-allocated resources and inevitably behind schedule. This doesn't include holidays and vacations either, all of which can affect your finish date. That brings us to duration.

## Duration

Durations are typically hours, days, and weeks in regular schedules. Anything larger than that on the activity level probably needs to be decomposed further down to adequately resource it – either now or in the future when the scope of work becomes more evident.

Another consideration with resources and durations is how many resources will be working on the activities. There are specific activities where, if you add another person, the duration is cut in half. For example, you have one person painting four walls of a room. The duration is 4 days. If you add another person to help them, the duration is cut in half. That's awesome if you have the right number of resources and they are skilled in painting rooms. That is why I mentioned the estimate resources process as a consideration. They are a significant factor in duration estimations, but they live in the knowledge area of resource management now.

There are, however, certain activities where it doesn't matter how many resources are assigned; it will take the same amount of time as if one person were doing the work. An example of this would be two people in a delivery truck; this doesn't cut the total duration in half. The duration is fixed.

As you can see, there is a lot more involved in estimating time and creating schedules. Here's the good news for you: the exam will only use durations and estimating durations in questions (yay!). In the real world, well, you know, it's different. I'll give you some techniques you can use to help estimate as effectively as possible and still consider risks to your schedule that can cause a less than hectic pace while work is being executed.

**The techniques you could see in your exams and could use in the real world are the following:**

1. Analogous estimates
2. Parametric estimates
3. Three-point estimates
4. Reserve analysis

Analogous estimates are more typical at the beginning of a project or when you have excellent historical information.

## Analogous estimates

I like to think of the **analogous** estimating technique as an analogy for your duration estimates. You will be looking at the recent past to predict how long an activity or activities will take in the future. If you know that your team upgraded everyone's software in the sales department 6 months ago, and that you will be doing the same in another comparable department in terms of size and scope, it's a safe bet you will probably take the same amount of time to do this. This could be the one time that it takes twice as long due to a risk event, but it's a safe bet estimate – an educated guess. A lot of times, the business cases are developed using analogous information, which is why I like to ask business analysts where they came up with "that number." They love it when I ask that. It's also probably the way you will estimate many activities that are repetitive on multiple projects. It isn't the most accurate way of estimating because it is based on history and assumptions, but it is a good jumping-off point.

## Parametric estimates

Parametric, metric, math. These estimates will be based on the resource's level of effort and their estimate of how long the activity will take, based on the activity duration and the number of activities that need to be done. If my painters can paint one wall in 3 hours and they have four walls total to accomplish, then I can use that to forecast the entire duration being 12 hours total. This type of estimate is more accurate and is typically what your software is doing in the background when you determine the activity, the duration, the resources, and the effort. Boom, it's got a number for you because the software used math and your inputs to calculate it. Parametric is a much more accurate estimate because it's based on the actual work that's been done on the current project and the actual resources that have been assigned, as well as their assumed levels of effort.

You probably won't need to calculate using a parametric estimate in the exam, but you may be asked about its level of accuracy. By the way, all these techniques can be used for **cost estimating** as well. Time and money are very tightly integrated.

## Three-point estimates

I'm not kidding when I say I use this particular technique with my customers. It all stems from the psychological factor of calculators and math. For some reason, when you explain something with a calculator or jot down the equation on paper, people are like... woah... it must be right, it's math! It's true, try it sometime. This particular estimating technique is my favorite because I am risk-averse, and any time I can take potential risks into consideration, I will, because it is never too early in a project to think about risk. The first place we see risk is in the Project Charter, while the last place we see risk is during the administrative closure of a project or phase. In simpler terms, risk is everywhere.

Three-point estimates help us plan for schedule risk and cost risk. The three-point estimate is also fondly known as PERT. No, not the shampoo. **The Program Evaluation and Review Technique.** PERT was created in 1957 by the US Navy Special Projects Office. It was designed and used to support the US Navy's Polaris nuclear submarine project. PERT has also popped up in numerous projects in aerospace throughout the years and even showed up in the planning of parts of the 1968 winter Olympics in Grenoble, France. It will also make an appearance in your exam. The concept is to take into consideration the optimistic, pessimistic, and most likely estimates of activities and provide a duration estimate that is more accurate. These durations can then be used to determine the total duration or cost used in correlation with overall project duration or cost estimates with risk included.

Since PERT was created by scientists and engineers, I typically imagine three rocket scientists sitting around arguing about how long things will take to accomplish. I would imagine it isn't just rocket scientists having that conversation, but it makes me laugh, so I use it:

- The first rocket scientist is risk-averse (me too), so they see threats to the project everywhere and inflate the duration estimate to protect it. Just. In. Case.
- The eternal optimist also has an opinion and sees progress everywhere, thereby estimating that things will move much faster.
- The most likely or expert says, "listen, I've done this a million times, and it always takes this long." Who's right? They all are!

There are two formulas you may see in the PERT family. Either formula can be the one that will make you a big hit at parties when people ask you what you do for a living. ...Not really, their eyes glaze over. Nobody truly knows what we do, right? When people ask what I do, and I say I'm a writer and instructor of project management... wait for it... ah, here comes the blank stare and the polite uh-huh. We are in a tribe nobody truly understands.

I digress. The first formula is also considered a **beta distribution or weighted average** formula and is used for duration and cost estimates.

#### Time estimate or TE = (O+4ML+P)/6

You might be wondering why we divide by six. That is because we have six variables: four most likely, one pessimistic, and one optimistic – hence the **weighted average** distinction.

You trust your expert four times more than your catastrophic thinker or your eternal optimist. This is because they have the experience, and we can believe it. This is what is known as a **weighted average duration estimate**. The most likely estimate carries more weight. We trust it four times more than the other two estimates. Let's assume we have three estimates from our rocket scientists:

- **Optimistic Scientist:** It will take 5 days to complete because we are all awesome.
- **Pessimistic Scientist:** No, no, it will take 15 days to complete, and a variety of risk events will occur.
- **Most Likely Scientist:** No, no, no, no, no! I've done this a ton of times before, and it usually takes about 9 days.

If you are like me and a bit mathematically challenged, make sure you follow the standard order of operations in math. If you run it in the same way the formula is presented, you will get the wrong answer, and the other three incorrect answers in the exam will be any way you can run the formula incorrectly. Please, Excuse, My, Dear, Aunt, Sally, or Parentheses, Exponents, Multiplication/Division, Addition/Subtraction unless, of course you have been taught common core. If that is the case, forget you ever learned it!

You will have a calculator and something to write with and on during the exam so that you don't have to do math in your head. Whew.

Here is how to run the math for the PERT expected duration formula using our rocket scientists:

$$[O + (4 \cdot ML) + P] / 6 \text{ or } [5 + (4 \cdot 9) + 15] / 6 = 9.33$$

The answer works out to be about 9.33. You might be thinking, "that seems like a big waste of time seeing as the answer is pretty darn close to the original estimate; what gives?" I typically use the example of being late for a flight. If I'm even 25 seconds late after they shut the door, they don't open it for me. What if we were calculating in weeks? Now, our schedule is a bit behind because of poor estimates. It also gives the expert time to say "I told you so" to the others involved. This formula is typically used for activities that have been done before. We trust our expert four times more. That is why there is another formula for those things we have never done before. This formula is called **triangular distribution**. Instead of a weighted average distribution, we need to consider all points equally. There isn't any true historical knowledge to guide us; therefore, we have to take risk into consideration equally with our estimate. Much like a triangle has three sides, this formula is a true average, and we divide by three. In this case, our scientist's estimates would look more like this:

$$TE = (O + ML + P) / 3 \text{ or } (5 + 9 + 15) / 3 = 9.66 \text{ or rounded up to 10}$$

Many times, this exercise helps explain why we have added some buffer time to our schedules to accommodate risk because, frankly, if something goes sideways, it could take 15 days to accomplish, or certainly more than the 9 we have scheduled. We also need to consider another aspect of risk in our estimates in the form of reserve estimates or standard deviation.

Here's a quick lesson in statistics, but don't worry too much if the following gives you a bit of a headache – you will *not* have to calculate this more than once, if at all. I permit you to forget this entire section on standard deviation. Proceed with caution.

**Standard deviation** is a statistical concept that measures the range of the values of a random variable around the mean of a distribution. It shows how much variation there is from the average or the mean value. The more variation, the more the uncertainty or risk in the process. If you have a normal distribution and you try to calculate those values that are plus or minus one sigma or standard deviation from the average (or the mean), you will learn that 68% of the values fall within that range. The standard deviation formula takes the most likely out of the equation and instead focuses on the pessimistic and optimistic variables. The formula for this is as follows:

$$\text{SD} = (\text{P-O}) / 6$$

Our job is to determine how many days, hours, and so on  $\pm$  the original duration estimate. All will be factored based on our confidence level in the original estimate. If you are familiar with the sigma variable for quality management, then this may look familiar:

- Confidence level in estimated value  $\pm 1 \times \text{SD}$  is approximately 68%
- Confidence level in estimated value  $\pm 2 \times \text{SD}$  is approximately 95%
- Confidence level in estimated value  $\pm 3 \times \text{SD}$  is approximately 99.7%

What if your customer asked you what the duration variables are above and beyond the 9.33 estimated duration for a particular activity? You would need to be able to answer this.

Let's go back to our rocket scientists:

- **Optimist: 5**
- **Most Likely: 9**
- **Pessimist: 15**

If we take the expert judgment out of the picture and run the math, the standard deviation would equal  $(15-5) / 6 = 1.7$  rounded up.

Now, we must determine how confident we are in the original weighted duration estimate of 9.33. We will use "N" to represent the sigma level.

If **N = 1 Sigma**, then we would consider that the original estimate of +/- 1 x SD is approximately 68% of the sigma level we estimate is correct.

**For example, let's say we have the following:**

$$9.33 \pm 1 \text{ sigma} * 1.7 =$$

$$9.33 + 1.7 = 11.03$$

$$9.33 - 1.7 = 7.63$$

If **N = 2 sigma**, then our confidence level, as an estimated value of  $\pm 2 \times \text{SD}$ , is approximately 95%.

$$9.33 \pm 2 \text{ sigma} * 1.7 \text{ (or two times } 1.7 \pm 9.33)$$

$$9.33 + 3.4 = 12.73 \text{ or 13 rounded}$$

$$9.33 - 3.4 = 5.93 \text{ or 6 rounded}$$

All this information provides us with a range of estimates so that we can build in contingency or adjust our estimates. In this case, it's more than likely we will go with one standard deviation or sigma if we are doing something we have never done before. This builds out more accurate estimates. Now, you can tell the customer and your team that activity A "should" take about 9 and half days but could be finished early at 7.63 days or late at 11 days, depending on the risk impact to the work.

Typically, this is why finish to start relationships are so common: because they present the longest total duration an activity or string of activities can take, thus building in contingency. The other consideration is that contingency reserves are typically money and will be ours to distribute as needed throughout the project. This is considered part of our cost baseline.

The goal of duration estimating is to put together a schedule you can probably meet and get your schedule approved as a baseline. You will also be able to initially answer the question of "how long will this project take?" That question can be explained by determining the critical path.

## Developing the project schedule

Let's take a look at the project schedule management road you have traveled thus far:

- First, you created an activity list and milestones by decomposing the workpackages in your WBS.
- Then, you sequenced activities based on their dependencies and relationships.

- After that, you estimated your resources and durations, taking into consideration dates and effort, lead and lag time, and the estimates for the duration of your activities.
- You will also be keeping a close eye on your schedule for risk, and also attempt to put some time and/or money in reserves for those risks that can be overcome with time or money.
- Now, we have a schedule. What we don't have is a finish date, a total duration, and the answer to the question of how long the project will take. That brings us to schedule creation. There are several techniques we will go through, and I'm sure you have noticed that time management takes a lot of time to review!

### The techniques we will cover are as follows:

- Critical path
- Critical chain
- Monte Carlo technique
- Schedule compression
- Resource optimization

Before we dive into the critical path method, let me make a few comments regarding this for your exam. First, it takes me longer to explain the concept; then, you will never get questions on your exam. Most people fall on one side or the other with this technique. Either they have used it, and it makes sense, or they haven't, and it looks and sounds confusing. If the latter is the case, do not fear! You may get about three to five questions on critical path that ask you to navigate a network diagram or determine float or slack time (these are interchangeable terms; PMI® uses float). Unfortunately, people spend too much time studying these confusing concepts instead of taking a well-rounded approach to the content, and they find they don't have the number of questions on the exam to have warranted late nights studying critical path and the inevitable caffeine jitters that come with it. I am going to make this as easy as humanly possible to understand these concepts, as well as how to read a network diagram for exam purposes. In the real world, we have software that does all the heavy lifting for us.

## Critical path

In the simplest of terms, the **critical path sets your finish date** – it is your baseline and is the date you are being held accountable for once you begin to execute it. Remember, we have a map of sequences in our project, as well as different relationships, durations, and resources. The web of our project must end somewhere, and the critical path tells us where that finish is. It is critical that we finish by that date; otherwise, we will be behind schedule.

Here's a straightforward way to understand the critical path: we will use the example of making dinner. Even if you don't cook, you'll get the reference. My husband doesn't cook, but he does want to know what is for dinner and the all-important answer to the question of "how long until dinner?" Here is what is on the menu tonight:

- Steak
- Baked potato
- Salad

Now, let's put some things into order and in the context of duration:

1. The baked potato takes 1 hour and 20 mins to cook in the oven, or 80 minutes.
2. The steak has to rest for 30 minutes and will grill for 12 minutes total before resting again for 6 minutes. The entire duration is 48 minutes.
3. Regarding the salad, I'll open the bag, put the dressing on it, and voila! Salad! (I know, I know... judging is fine, I'm busy.) Let's say that, for my lazy salad, making it takes 5 minutes total. Trust me, it doesn't even take that long, but for learning purposes, we'll call it a solid 5 minutes.

Which of the dinner items will take the longest? The baked potato. What is the answer to the question of how long until dinner? 1 hour and 20 minutes. That is my critical path. Everything else can happen in the time it takes to cook the potato. Now, if I want everything to come to the table where the hot food is hot and the cold food is cold, I have some decisions to make regarding the steak and the salad. If my steak takes 48 minutes and the baked potato takes 80 minutes, I could wait to start the steak until minute 32 of the entire potato process and do the salad (as easy as it is) – however, I don't want it to be soggy and brown by starting the bag shaking process too early. Instead, I'll wait until the baked potato has 5 minutes left to cook before I start shaking the bag and putting dressing on the salad. This means that for the steak, I have 32 minutes of float time. I could start it when I start the potato, but that wouldn't work for the hotness factor, and I have 75 minutes of float for the salad because, you know, the soggy factor. When my senior "steakholder" asks how long until dinner, the critical path is 80 minutes or 1 hour and 20 minutes. Here, the same scenario is being presented in a simple network diagram. The critical path is the longest total duration the project can take, and the absolute fastest the project can go:

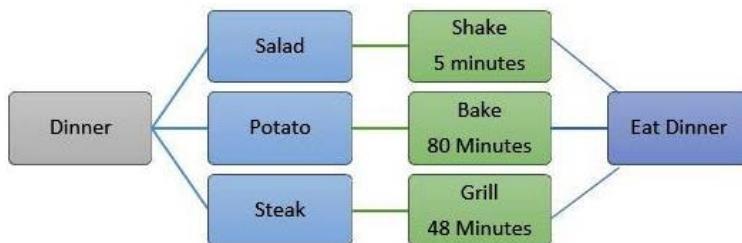


Figure 8.8 – Critical path

Here's where things start to get interesting. A network diagram that you will have to analyze for exam purposes could be looking for several different variables. For example, you may get questions that ask, "What is the **early start (ES)** and **early finish (EF)** of each activity and the **late start (LS)** and **late finish (LF)** of each activity?" The problem with this is that it sounds like you are starting something super early or super late, which would put you ahead or behind schedule. That isn't the case at all. The ES is asking what the earliest possible time is that the activity can begin based on its relationship with other activities and its duration. Then, based on that duration, when it will be finished is based on the EF. This is called a forward pass and allows us to determine the duration of all paths and find the longest or the critical path.

The LS is asking if there is any conceivable way that an activity can be pushed out a bit and if so, when can it start and, based on its duration, what the LF will be. This process is called a backward pass, and it will provide the information on float/slack time for non-critical activities. The critical path doesn't have any float/slack time.

The good news is that you have already figured this out with the dinner example, but I want to show you how this works using a network diagram. In the following diagram, **Dinner**, you can see the same network diagram except now the finish to start relationships and the durations are represented in the activity box:

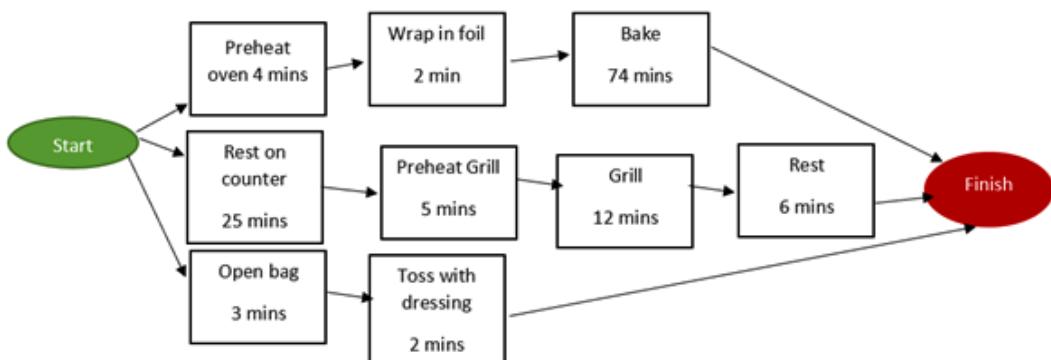


Figure 8.9 – Dinner

All projects start on day or minute one and finish once the longest path is completed. The easiest way to calculate the critical path is to jot down each path and add up the durations. The most significant number is the critical path. Then, take the critical path and subtract each additional path from it, and that will tell you the float/slack. The following is a precedence network diagram outlining a simple project's early start/finish days.

**Note**

For the exam, you will most likely be using finish to start relationships and calculating durations only. You won't have to worry about dates.

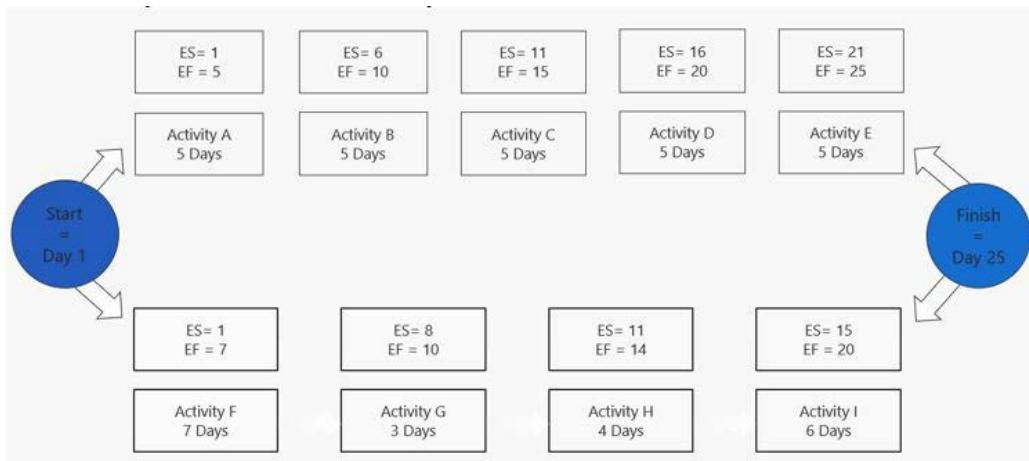


Figure 8.10 – Critical path example

In this case, 25 days is longer than 20 days, so path A-B-C-D-E is the critical path.

The critical path can also be calculated beginning with day 0 instead of day 1. This was the way it used to be done in the earlier iterations of the exam. While it will still provide you with the critical path total, it will not provide you with the correct answers regarding the ES and LS for the exam. Besides, who the heck starts their project on day 0 anyway?

Float time is the longest we can possibly push out non-critical activities without slipping up with our schedule. This allows us to have some breathing room to move resources around as needed to critical activities without actually falling behind schedule. If you are late on your critical path, you are behind schedule. Float is calculated by subtracting durations from the critical path to determine the difference. This is done by using a backward pass or working from the finish of the critical path and working back to the start.

In the following diagram, you can see the late starts and finish for the non-critical path. The critical path has zero float/slack:

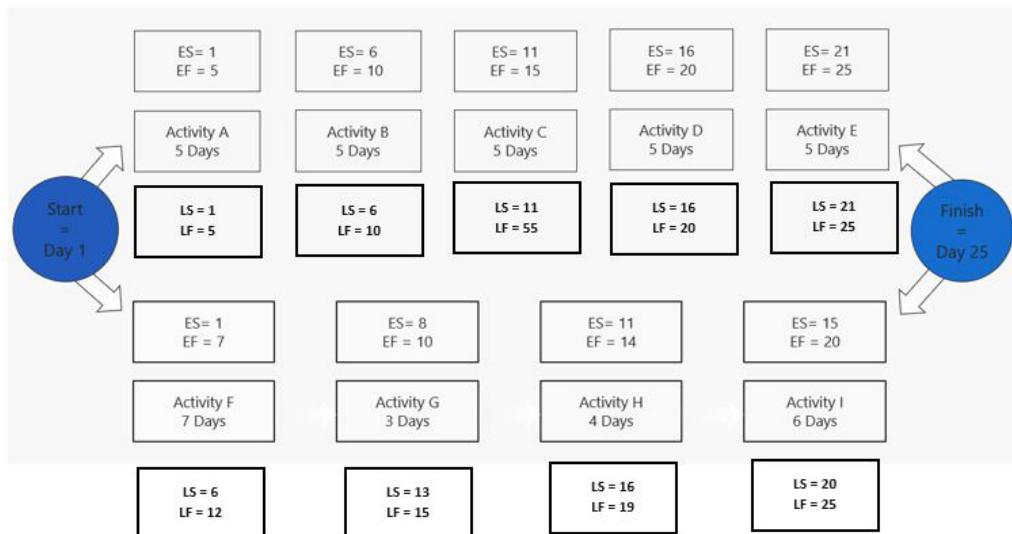


Figure 8.11 – Float

Another way to calculate float/slack is to use the relevant formulas, as follows:

#### **LS-ES = Float or LF-EF = Float**

Both will give you the same answer. Take a look at the activity to the bottom-right of the preceding diagram. If I were to subtract LS 20 - ES 15 or LF 25 - LS 20, I would get five. If I took the total of the first path of 25 and subtracted the total of the second path 20, I would get five. This means there are 5 days of float.

There are different types of float, depending on what you need for your projects, but for the exam, you should be working with the total float the most. Often, in exam questions and precedence relationships, you will see activity relationships represented as the **predecessor and successor**. This is just a fancy way of saying the activity that comes first and the one that comes after it, respectively:

- **Total float:** This is the amount of time an activity will be delayed from its early start without delaying the project finish date.
- **Free float:** This is the amount of time an activity can be delayed without delaying the early start date of any following activity. You are free to use your float however you like! It's typically best to use it at the end of a non-critical path because Murphy's law is a certain thing in project management. Having buffer time at the end of a non-critical path, if possible, is the best course of action. Otherwise, you can use it as needed. 2 days here, 3 days there.

- **Negative float:** This is when you have float/slack on your critical path. You can read negative float as being behind schedule. Typically, this comes from a date constraint that defies reason. You already know you are going into the project sideways. The customer says get it done in 3 months and you know it will take 6. That is negative float.
- **Positive float:** This is the opposite of negative float and is the unicorn of project management. The date constraint is further out than your assumed baseline. Woohoo!

If you found all of that confusing, remember that the critical path is the longest string of connected activities in terms of duration. To determine float, you take the critical path's total duration and subtract each non-critical path from it. The difference is the float time.

**Note**

You may also see the term near-critical path, which is the second-longest path of activities in duration, and this would need to be watched closely as well. If a risk event lengthens the near-critical path, it could create a new critical path total, and you would be behind schedule. It isn't unusual on complex projects to have multiple critical and near-critical paths.

## Critical chain

The critical chain, in its simplest of forms, adds buffer time to the critical path to accommodate limited resources. This may be the only way you see it on the exam – if it even comes up at all. The critical chain method takes away float from individual activities and places it at the end of the path. This is the junction where non-critical paths meet the critical path. This is what we are doing by using all finish to start relationships when sequencing, instead of other relationships that streamline our critical path. FS relationships give us the most extended total duration the project could take, and then provides some buffer time on the critical and non-critical paths to allow us to limit scheduled resources.

## Monte Carlo technique

The Monte Carlo technique uses probability and impact, along with specialized software, to determine the *odds* of meeting your schedule in its current form. I'm not sure who has time to sit around running different computer-generated schedule models on regular projects, but clearly some people do. **Random number generation, computer-generated, and iterative** is how this technique is described. Let me give you a more straightforward explanation and use a casino to do so. After all, Monte Carlo was the first and oldest casino as it was built in 1856 after permission from Charles III of Monaco to help with some pesky financial problems he was having. The house had to win for those problems to disappear. Let's say you are a new casino owner and you are setting up a blackjack table on the floor. Charlie knew, and we all know the house always wins – not because you are psychic, but because you are going to run the odds first and choose the best configuration for your house to win. Let's say you set up your table, to begin with, and use five decks of cards, five players, and five US dollars a hand. You would enter that into the software system. Then, you would take away a deck of cards. Now, there would be four decks of cards, five players, and five US dollars a hand. Then, you would put the deck back and take away a chair. Now, there would be five decks of cards, four chairs, and five US dollars a hand. This continues until you find the best configuration based on the odds. It could be six decks of cards, 10 players, and 15 US dollars a hand. Winner, winner, chicken dinner!

### Note

For your exam, Monte Carlo analysis won't be heavily tested on, but if you do get a question on it, it may relate to a "what if" analysis and a random number that's computer-generated and iterative, which means over and over again.

## Schedule compression

There will be multiple times when your schedule will need to be shortened or compressed throughout your project management career. Typically, the first time will be when you have worked so hard to put all of it together and turn it in to be approved as a baseline, and are then told to remove at least a month from the total... meh. The other times could be during the execution of the project and finding your project behind schedule... facepalm. To get back on track, you will need to take some corrective action and compress what is left to do to finish on time. There are only two ways to compress your schedules before execution or during, and those are **fast tracking** and **crashing**.

## Fast tracking

Understanding different relationships and lead time comes in handy here. Fast tracking is all about running activities on the critical path in parallel rather than sequentially. That isn't going to work for every activity because we have dependencies that may not allow for compression due to logic. We will have to look for areas where we can adjust activities. Fast tracking is typically the best way to compress because it doesn't cost additional money or need other resources. You may have to move some resources around, but you don't need more resources. Fast tracking is considered the **best, first choice** because of that very reason. There is always a downside though, and in this case, the downside is that doing things faster than you are supposed to can create risk events. I know this to be the case because when I was 12 years old, I had a steep driveway and a skateboard and the two together were shortly followed by a broken ankle.

We will have to keep a pirate eye on the scope and quality if you are fast tracking because you are rushing it, but again, what does your organization value most? Good, fast, or cheap? It's far easier to plan to fast track before execution than it is to use it as corrective action. The current project trajectory may not handle it as well amid project work.

## Crashing

Crashing sounds like it would fit my skateboard story more appropriately, but crashing is throwing money or additional resources at critical activities. We would have to look for areas where if we added more people, the activities would move faster. This doesn't work with road work, just for your information. There could be 80 people standing around drinking coffee and one person doing the work. If another truck full of people roll up and drink coffee, your project isn't moving faster. If anything, it's bogging the progress down. Suddenly, the traffic cone becomes the state flower. Extra people cost extra money. The trick to crashing is to look for activities that will move the fastest for the least amount of money or the **least incremental costs**. We need to move it along, but we don't want to break the bank either!

### Note

Watch out for exam questions asking about the least incremental costs. Some equate that to fast tracking because it is (air quotes) free, but in reality, crashing is spending money to move faster.

Many times, as a preemptive strike during planning, we can get support and approval for more people or equipment if we can prove our case. This is great because we are in the process of getting baselines approved and haven't done any of the work yet.

## Resource optimization

Often, when we are scheduling, we are also assigning our resources while updating their calendars and effort. Everything looks good until you realize that you overallocated Bruce and now have him working 16 hours on multiple activities. Trust me when I say Bruce isn't happy, so it's up to you to fix this. When resources are overallocated, it not only impacts their state of happiness, but it also affects the budget due to overtime costs. There are only two ways to fix overallocation, and those techniques are **leveling** and **smoothing**.

### Leveling

Leveling happens on the critical path and will extend your total project duration because Bruce needs to have two 8-hour days instead of one 16-hour day. This situation could lead to rescheduling work and pushing out the dates. Much like dominos, if one falls, the rest do as well. As soon as you push out his schedule, it impacts the other activities and resources that come after it.

### Smoothing

Smoothing is the easier of the two if you are lucky because smoothing is done on non-critical paths and will *not* extend your finish date. You can use your float time because you are free to use your total float however you like. In this case, if Bruce is overallocated, then you apologize profusely and move the rest of the work to the next day if possible, or the next available day that is realistic. That will utilize the float, but that is what float is there for: to be used when needed. Sometimes, you'll use your float time to crash your critical path – if you are lucky enough to have additional resources you can pull away from non-critical activities at the moment you need them.

Everything you have reviewed in this section is designed to put together a schedule you can probably meet and get approvals for regarding your schedule baseline.

## Schedule baseline

After all this effort and work to put together a comprehensive schedule, it is now time to get a formal version of your schedule approved as a baseline.

### Note

There will be three significant baselines: the schedule baseline, the cost baseline, and the scope baseline. All these baselines are used to track performance and will have to be updated through formal change control.

You will need to present your schedule to your sponsor, customer, and other key stakeholders in order to gain approval and acceptance on the dates/duration of the project. Once you get that approval (after multiple revisions and some tears), you will have your schedule baseline. The schedule baseline is a formal, approved version of your schedule and will be used to manage schedule performance during execution and to determine if you need to make corrections.

The baseline will reside in the formal integrated project management plan and be used to compare planned schedule performance versus actual performance. The schedule will be updated as you progress through the project.

During execution, you will ask your team how long the activities **actually** took to update your schedule (work performance data). You will then compare your actual and planned versions – baseline to schedule (work performance information). If there is a variance or difference between planned and actual, you will determine if it is bad enough that you need to take some corrective action such as fast tracking, crashing, or both.

Most of the time, schedules are presented as Gantt charts, bar charts, or milestone charts to senior management. The best is a milestone chart for senior management because it gives them an easy-to-follow, easy-to-read chart without a tutorial on Gantt charts being necessary.

Scheduling is a lot of information to take in, and it takes practice to become proficient in your day-to-day. So, don't worry too much. You won't need everything I've explained here for the exam, but because there is a lot of information here, there are many areas that PMI® can pull questions out of for your exam. If you do well on the practice exam, then you are half-way there. If you don't do well the first time, do not despair – answer the questions open book and look up what you don't know, not what you do. You'll get there! Schedule management is one knowledge area out of 10, and perfect practice makes perfect. Ready to move on to something else? Oh, yeah... me too! Next, we will address another significant constraint: project cost management. Time and money are very tightly integrated with both the real world and the exam.

## Key concepts for project cost management

Money is money, but how stakeholders view costs could be different. You may be answering to a variety of stakeholders at various points in the project. You may also be both predicting what project items could cost or documenting the actual costs once they are incurred.

## Trends and emerging best practices of cost management

The expansion of **earned value management (EVM)** to include both earned schedule theory and cost performance shows the relationship between time and money. I'll leave this here since we will cover earned value later in this chapter. Plus, it's all math and... you know... so much fun to write about and read.

## Tailoring considerations for cost management

Every organization is different when it comes to their practices for cost management. Many project managers don't have the option of setting budgets, so instead, the organization tracks the accounting aspects. The assumption for your exam is that you are putting together a budget and getting it approved as a baseline that you will then track throughout the project. Either way, tailoring may be necessary based on your organizational protocols.

Tailoring could be applied to knowledge management of financial databases, how the estimating and budgeting should be executed, and within a certain margin of error. It could also include whether you use earned value or an Agile approach to the budget, as well as the governance of your project. Here, budgeting could be formal or informal, where financial audits or policies are rigorous or not.

## Considerations for Agile and adaptive environments

Good, fast, or cheap? It depends. If your Agile project is very uncertain regarding the scope of work, then the financial side may be a bit cloudy right now. It would be necessary for lightweight estimates to be created to reflect the lightweight scope aspect. However, I've found that most of my Agile projects have very set schedules and costs. They are fixed, and the scope is variable. This is not to say that these don't change as the design emerges. Like all things in project management, the answer to most questions is, it depends. As you move forward through this section on cost planning, keep in mind that it may differ from your organization's way of doing things, but since you will get questions in the exam on this the excellent news is that money is money and budgets are budgets. Estimating costs is iterative, as well as durations or sequence updates. The scope drives the schedule and the costs as we know them today, and this is why it may be essential to have a cost management plan: in case the process is different this time around.

## Plan cost management

The cost management plan is similar to the schedule management plan in terms of its headers, and it sets the stage for agreement about the almighty budget early in project planning. You'll see from the following headers that they make sense as needed:

- Units of measure (How the currency is used, lump sum or otherwise. This may also include different types of currency.)
- Level of precision (Are we rounding up or down... um... up?)
- Degree of accuracy (Usually, the standard is a tolerance of +/- 10%. This can help with risk contingency, and also provides the levels we can bounce between. If we bounce out, it's time for corrective actions.)
- Organizational procedures link (The WBS is the framework for the cost management plan, so estimates, budgets, and control of costs are consistent. The WBS aspect that is used for cost accounting is called the control account, which has a unique code or number that ties it directly to the accounting system of the organization.)
- Control thresholds (How far over/under budget before corrective action is necessary.)
- Rules of performance measurement (How you will monitor and control your baseline.)
- Reporting formats and any additional details required

Now that you have a cost management plan, you can begin the iterative process of estimating costs. You will notice that a lot of the tools and techniques are the same as they were for the estimating durations process. Keep that in mind for your exam as well.

## Estimating costs

The good news about this section is that everyone is aware of money and how budgeting works for their day-to-day lives. It's entirely possible that you will not be managing a budget for your current projects, and if you are, it may only be for the acquisition of materials and equipment.

The PMP® exam assumes you will be doing some budgeting for project work, and that you will be tracking budgetary performance throughout the project.

Estimating costs is not just about what things cost but whether there are alternatives that can be discovered for the good of the project. This means that if one thing costs more than the project would like to spend, is there an alternative we can use to help protect the budget? Replacements can be a dangerous game if you have ever cut corners on costs and gotten exactly what you have paid for. That dance is consistent in cost management and is also present in procurement management as well.

What does your organization value most? Time, scope, cost, or quality? Many organizations answer that question with cost. Because of that, it will be imperative to do your research, trust in your experts, and come up with a budget your project can probably meet. It's also realistic to assume that many project managers are given a set budget and will then have to allocate that budget appropriately across project work. This could very well lead to fluctuations in the quality of work and cuts in scope or schedule. It's important to understand that cost estimating, like duration estimating, isn't always as accurate as you might like it to be. A variety of techniques will need to be used to narrow the gap a bit.

The nice thing for you is that the same tools and techniques we discussed when we looked at estimating durations are the same for estimating costs:

- Analogous: Lessons learned
- Parametric: Mathematical
- Three-point estimates: PERT

**Bottom-up estimates** will be the focus here because using the work breakdown structure to estimate durations and costs is the most *definitive way* to estimate. This is because it deals with the specific scope of work. The scope of work plus materials, equipment, and human resources will determine your budget.

Costs are attached to your resources, which are attached to the schedule activities. These are connected to durations, dates, relationships, and constraints and use materials and equipment to get the job done. That is why it is vital to use the WBS to help you plan. Bottom-up estimates works from (you guessed it!) the bottom of the WBS at the work package level up to the main level deliverables. Bottom up is used instead of a top-down or analogous estimate, which is essentially what the business case provided you with, in the project charter. It's much easier to estimate effectively when you are working with smaller packages of work and aggregating all costs together into one significant number. This process is essentially what your software is doing, as long as you attach price tags to resources.

Estimating costs isn't an exact science, though, and there is always room for error and improvements. A lot of your success depends on how well you plan for scope and estimate your resources. At the beginning of the project, there is only the predicted result, the assumed ROI, and what is happening in the market at the time a business decides to invest in a project. Because of those influencing factors plus the top-down estimate, it stands to reason that the margin for error could be huge and would be considered a **rough order of magnitude or ROM estimate**. The fluctuations in how wrong a ROM estimate could be waver between -25% and 75%. I'm not sure how your organization budgets, but if that were how I presented my budget to my sponsor and expected them to accept it, that could result in a **resume producing event (RPE)**!

Now, if there is a clear business case with stable requirements, some historical information, and good expert judgment, then that gap could narrow a bit to -10% to 25%. We are getting closer, but this is still not great. That range of accuracy is also very typical in the chartering phase. It's crucial for us to do our own cost/benefit analysis if possible, to make sure the numbers are matching up with what we know today.

Bottom-up estimates are the best because we have moved from the initiation and the business case part of the project to the real scope of work. With practical resources and schedule estimates and so on, this allows the estimates to get as close as possible to reality at -5% to 10%. Many budgets fluctuate and bounce between those numbers during the execution of project work. 10% is usually my tolerance level for being over/under budget. Anything over that tolerance lets me know it's time to take corrective action to fix the issues that are causing my budget to fluctuate wildly.

There is also the fact that many long-term projects must be planned using rolling wave planning. This means we can budget in the short term and be definitive, but the future is fuzzy. Even though we are, again, working in the easier said than done department, estimating costs is difficult due to indirect costs that may need to be considered. **Direct costs** are easier. We can budget for direct costs, but **indirect costs** fluctuate, which is always why we have a range of estimates rather than one hard number.

We also need to make sure that we are meeting quality requirements. It costs a lot less to budget well and to make sure we do it right the first time than it does to fix defects once the project has been executed. The **cost of quality** is part of the estimation process. As you'll see in *Chapter 9, Quality Management*, paying for quality requirements upfront is way less expensive than fixing defects and errors after the fact.

Estimating project costs and determining the budget may be considered the same process, especially for smaller projects. Each has its own systems and techniques, but much like creating a schedule, there will be many hats to wear to get the budget approved as a baseline.

## Determining budget

Because we all use software of some kind, it makes sense that as we add costs to project work, the software is adding them all up together and giving us an aggregated total project budget. That doesn't mean, however, that everyone will be happy to sign off on that significant number and accept it outright. In many cases, the business case or a contract is driving the budget from the beginning. If you are given budgetary constraints to work with upfront, then you will spend your time splitting that significant number into price tags rather than doing the opposite of estimating first and then budgeting. Either way, the budget and its inevitable baseline are time phased. More money is spent during the execution of project work than it is during planning. Changes are more comfortable to adapt to during planning and less expensive to make than during project execution. The cost baseline, when represented visually in a chart, is low expenditures at the beginning, rising in the middle and tapering off again at the end.

The goal of any baseline is to allow for performance to be tracked throughout the project, but we also need a living breathing budget so that we can update our actual expenditures and then compare them to the baseline. The cost baseline is a formal, approved version of your budget, much like your schedule and your schedule baseline. Even though you may think you have the most fabulous budget ever created and happily skip to your sponsor's office to prove it, you'll likely be walking out of the office dragging your feet after being told to cut the budget in half but still get all of the scope of work done – sigh, the joys of project management.

Keep in mind that the business case is an analogous top-down estimate, and you have the definitive budget in your hands. Sometimes, that is where the disconnect occurs. If you were told that your vacation to your favorite place was one cost and then the next minute it was double, you may not take too kindly to that. Your sponsor may be feeling the same way.

Now is an excellent time to bring up risk management again at a high level. Risk comes in two categories: **threats and opportunities**. Threats cost money, while opportunities save or gain money for the project. If you have identified a risk event that could cost the project money, but there isn't any way to handle it without throwing money at it, then it may be that you need contingency money as part of your baseline. Usually, contingency is +/- 10% of the estimated total project budget. If your organization considers that, then you may be able to push your budget through approvals without a lot of grumbling.

The assumption is that you get your budget approved, add in the 10% contingency, and that equals your project baseline. It's yours to manage. On top of that, there is a magical bucket of money called management reserves for risks you couldn't have possibly accounted for, and that management can afford to use this money to help manage an unknown/unknown threat event. This is a unicorn, folks. It rarely happens. If you do happen to live in this magical project management land, then your budget, plus your contingency reserves, plus your management reserves would be the entire project budget — the BIG number. You would only be responsible for allocating money out from the baseline itself. The project budget and your contingency will be yours to manage accordingly.

Much of that responsibility ties to expenditure tracking and reporting in real time as the project work begins. Typically, weekly is how often you will be reporting on the cost performance of projects, but like everything we review, it depends on the size of the project and how often your stakeholders want updates. Using mostly software, you will put together how the cost performance is going, what your **burn rate** is, and then create project cost performance reports to communicate to your stakeholders.

**Note**

The burn rate is how quickly you are "burning" through your project budget. Too fast and too much at once and you may find the project is over budget. The formula is  $1/\text{CPI}$  or cost performance index. Scroll down to control costs for more information on the formulas.

Typically, the burn rate is tracked to make sure that venture capital isn't spent above and beyond the income capabilities of the organization. This can apply to projects as well because they have determined project payback periods and net present values. Too much out and not enough in is the wrong position for projects to find themselves. The formula for burn rate is  $\text{BR} = 1/\text{CPI}$  or the cost performance index. This is calculated by using the value of the work completed (Earned Value) / Actual costs spent to date (AC). We will review all earned value formulas toward the end of this chapter.

Your organization may also have what is called a **funding limit reconciliation**. I remember this as "I must reconcile myself that I have a limit to my funding." Organizations don't want too much out and not enough in, and they are paying for other projects, salaries, building rentals, power bills, and the like. A project budget may be approved, but they aren't writing you a check day 1 of the project for the entire amount. Instead, the disbursement will occur over time and may have limits attached that don't meet your budgetary expenditures as they are currently scheduled.

Typically, this is either common practice, and you are aware of the limits, or you will know it through the business case upfront. Other times, it's a surprise or a shift in project priority. It's never a good time to find this out, but it's better for this to happen at the beginning of the project than once you have suffered through task sequencing! The bottom line is that once you get your cost baseline approved, it will become a static document that can only be changed through **formal change control** processes. This is typical and done by adding or subtracting the scope of work at some point during project execution.

The good news is there isn't too much that can cause exam stress in this section because creating budgets is based on your organization, your role in budgeting, and how money works across projects.

Now that we have looked at planning for schedules and budgets, we have to control the actual performance of each during execution. This is no easy feat for sure, but there are some techniques from the control cost and schedule sections you can use and some you'll want to promptly forget the second you pass your exam.

## Controlling schedule and budget

Both schedule and cost are tightly integrated, so your costs become a time-phased baseline that is working with your schedule to pay for executed work. While it would be nice to think all things went the way of the baselines, it's probably better to assume they won't. Since you are responsible for reporting on the performance, it's important to know ways to do that effectively. This means that we will cover both schedule and cost performance together using a handy technique called the earned value technique. A word of warning: if you are mathematically challenged (I just pointed to myself), then this section may seem a bit overwhelming to you. If you like, you can blame the United States **Department of Defense (DoD)**, who created this technique, for losing the next hour of your life, because I certainly will! I'm just kidding (no, I'm not). Let's get to it and through it together.

## Tracking and reporting cost/schedule performance

What is the time value of money? That is essentially the question we are trying to answer, as well as what is the money value of time? Delays on your schedule can affect your critical path and cost the project money to fix. Spending more than what has been allocated will affect your project's budget negatively. This is a moving target all the time. Just because you are behind schedule doesn't mean you are also over budget. In fact, often, being behind schedule makes it look like you are under budget because you haven't paid for the work that needs to be done yet. Your variables will fluctuate. The goal is to keep a pirate eye on your baselines versus actual performance because trust me – your sponsor and customers certainly will.

I always expect some level of fluctuations and am typically very aware of what my tolerance levels are. This means how far over/under budget and ahead/behind schedule I am. There is a visible line that, once crossed, means it is time to figure out how to fix things. Just like the cost and duration estimates have a range, so do the results. Bounce outside of that range and it's time to take corrective action.

## Earned value management (EVM)

EVM looks at the completed scope and compares it against what should have been done at this point in the schedule. It also looks at what was actually paid out of the budget for the work. The hard part is thinking about time in the context of money. This was difficult for me at first, so I'm both empathetic and sympathetic to those of you that could be confused as well. I think it's best to give you each concept and then jump into the formulas you could see in the exam.

Remember, you will have a calculator and something to write with and write on. As soon as it was *go time* for my exam, I wrote down all of the formulas. I knew I would blank on them when I got to a formula question. My brain and math don't mesh very well. If you are the same way, then take a minute and **no more** to jot down what you need to remember. It's worth using up a very short amount of time if it saves you math angst during the exam. This exam is also not totally math oriented. It will take you longer to read this information than the number of questions you will get. I think I had about 15 formula questions but your mileage may vary, some lucky folks don't get any math on their exams. Many of the earned value questions will be based on your understanding of what the result of the math is telling you about your projects, rather than the rote memorization of formulas.

All EVM formulas are algebraic and contain acronyms. It's easier to remember the formulas using those acronyms, but it's necessary to understand the terms and what the acronyms relate to first before we cover the formulas themselves. The first variable we will cover is **Budget at Completion (BAC)**.

### Budget at Completion (BAC)

Unfortunately, this acronym is the opposite of what you might think it is. It sounds like the amount of money spent when the project is over. It's actually the amount of money you got approved as a baseline during planning. It's the **assumed** amount of money you will spend on the project. Remember that the goal of this is to compare planned versus actual. So, we need the total planned budget to begin this process. Think of it as your **budget and cash**. The following is a spreadsheet that portrays our BAC:

Project Tasks	% Complete	Labor hours	Labor costs	Material Cost	Total Per Task	
Develop project charter		5	\$2,500	\$450	\$2,950	
Design acceptance test		7	\$35,000	\$250	\$35,250	
Develop design specification		4	\$15,000	\$0	\$15,000	
Develop system architecture		3	\$25,000	\$4,500	\$29,500	
Develop Functional specifications		9	\$5,500	\$95	\$5,595	
<b>Total</b>			<b>\$83,000</b>	<b>\$5,295</b>	<b>\$88,295</b>	



Figure 8.12 – Budget at Completion (BAC)

Here, we can see all the project tasks and labor hours, plus the costs of the labor and materials. If you aggregate all those numbers together, you get your budget or your BAC. This is an important place to begin because we now need to look at actual performance on the project work and see how much of that work has been accomplished, as well as what that work is worth in terms of money. Once your budget and baseline have been approved, it is set in stone unless a formal change is needed to adapt that number. Otherwise, it is static and used to track planned versus actual budgetary performance. Notice that each task has its own price tag attached, plus the hours that it should take to complete at that price point. This is key for calculating earned value.

## Earned value (EV)

Earned value is basically the amount of work that has been completed and what that work is worth based on the price tag assigned to it. If task number two is worth \$35,250 at its completion, then when it's halfway complete or 50% completed, it's worth \$17,625. The goal of earned value is to see how much work is completed and its current value. The formula to use to calculate earned value is as follows:

$$\text{EV} = \text{BAC} \times \% \text{ complete}$$

Here, you can see the earned value represented on our spreadsheet:

Project Tasks	% Complete	Labor hours	Labor costs	Material Cost	Total Per Task	Earned Value
Develop project charter	20%	5	\$2,500	\$450	\$2,950	\$590
Design acceptance test	15%	7	\$35,000	\$250	\$35,250	\$5,288
Develop design specification	10%	4	\$15,000	\$0	\$15,000	\$1,500
Develop system architecture	25%	3	\$25,000	\$4,500	\$30,500	\$7,625
Develop Functional specifications	0	9	\$5,500	\$95	\$5,595	\$0
<b>Total</b>			<b>\$83,000</b>	<b>\$5,295</b>	<b>\$88,295</b>	<b>\$15,003</b>



Figure 8.13: Earned value (EV)

Let's say you have hired someone to paint your living room. You have four walls in that room and the painters have told you the cost for the entire room is \$2,000 equally distributed across all four walls, **meaning each wall's worth is \$500**. Halfway through the project schedule, you check on their progress and are expecting them to ask for some money based on the work completed. You look around the room and two walls are done. What have the painters earned? \$1,000. That is the earned value. Does that mean they are on schedule? Nope. Does that mean they are sticking to the budget? Not at all. What it means is they have completed \$1,000 worth of work. The earned value can be calculated for each task or on the project level. If the project is 50% complete or if a task is 50% complete, they each retain the original value that was planned. That would be the only way to tell if things were not working out as planned. However, in order to do that, we need to review a couple more variables. The next variable will allow us to determine schedule performance using planned values.

### Planned values (PV)

Remember that your entire baseline comprises individual price tags for the work. These, when rolled together, equal your BAC, plus your contingency reserves for risk. BAC is a timed-phased budgetary baseline that we will use to pay for work that will be done on the project. It makes sense that each task has a value. That value could include resources or procurement or the simple costs of working the plan. The **planned values (PV)** are the distribution of your BAC across time and could be considered the budgetary costs of work scheduled. Going back to our wall example, we determined that if all the money is distributed equally across work (which it never is), then each wall's worth is \$500. Now, let's say the schedule the painters gave us was 4 days. This means it will take them 4 days to complete all four walls and that all four walls are worth \$500 each. If I look at my schedule, I would say that each day 1 wall should be done or \$500 a day's worth of work should be completed.

Okay, let's check out their progress at the end of day 3. The following image shows their progress at the end of day 3:

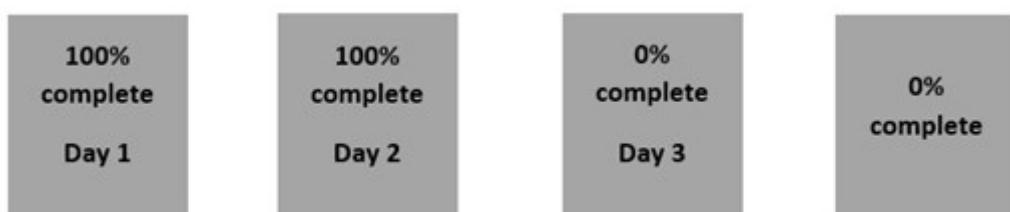


Figure 8.14 – PV

If I were going to pay them for the work they had actually accomplished or their EV, then I would write them a check for \$1,000. But it's the end of day 3! I should be writing them a check for \$1,500. Am I happy with my painters? Yeah... no. Why? Because the planned value of work I expected to be completed was \$1,500 and they did \$1,000 worth of work. Hmm, so they are \$500 behind schedule. Planned values are determined by the original budget spread out over time and assigned to each task. If you don't use earned value, you may instead say that the painters are 1 day behind schedule. That day is worth \$500. Does that mean they won't get all four walls done on time? Not necessarily; they may get it all done on time and on budget, but right now, it looks like they are not working up to the full schedule potential and I have to report on that.

There are three ways to report on schedule performance, and they all provide a different kind of performance review. The first is schedule variances.

The following is a spreadsheet containing the PV:

% Complete	Labor hours	Labor costs	Material Cost	Total Per Task	Earned Value	Planned Value
20%	5	\$2,500	\$450	\$2,950	\$590	\$600
15%	7	\$35,000	\$250	\$35,250	\$5,288	\$6,500
10%	4	\$15,000	\$0	\$15,000	\$1,500	\$1,500
25%	3	\$25,000	\$4,500	\$30,500	\$7,625	\$7,700
0	9	\$5,500	\$95	\$5,595	\$0	\$0
		\$83,000	\$5,295	\$89,295	\$15,003	\$16,300
					Completed work	Should have completed

Figure 8.15 – PV

It's obvious we didn't get everything done as planned at this point in the schedule. Now, let's look at the math behind the spreadsheet results.

## Schedule variance (SV)

Variances allow us to see if there is a difference between the planned and actual values for both schedule and cost. If there is a big variance on one side or the other, corrective action may need to be taken. Here, you can run the numbers on the entire project or look at individual work packages or activities. Sometimes, you can tell exactly where the schedule problems are and target a correction to the right areas of the project.

For your exam, you will most likely be asked to calculate the schedule variances or other formulas for schedule and cost based on the entire project. Also, watch for positive and negative results for variance formulas. Negative bad, positive good. The formula for schedule variance is as follows:

$$\text{EV-PV=SV}$$

Basically, my painter's performance shows their EV as \$1,000 – their PV is \$1,500, so their schedule variance = - \$500. This tells me that they are behind schedule. Any time the amount of work completed is less than planned, it will result in a negative variance. What we really want to see is zero variance. This means we are right on track. A positive variance means we are ahead of schedule, which isn't so bad, within reason.

### Schedule performance index (SPI)

The schedule performance index is a formula that can provide you and your team with a rating of your schedule efficiency. You'll notice that we are using the same data for the formula; that is, EV and PV. However, we are changing the mathematical operator. This time, we will divide. The formula for schedule performance index is as follows:

$$\text{EV} \div \text{PV} = \text{SPI}$$

In this case, I'm trying to figure out the percentage of efficiency for my painter's performance. If I take the earned value (what they have done) / planned value (what I thought they would do), I can see they are not performing up to snuff at all.

**\$1,000/\$1,500 = 0.67** is the result if I were to follow normal rounding procedures. Basically, this tells me that my painters are working at 67% efficiency when I expected 100%. Anything **below 1.0 is behind schedule** and anything **above 1.0 is ahead of schedule**. If the result is 1.0, then my painters are exactly where they should be.

**Note**

Follow normal rounding procedures in your exam but if you don't see your answer and you know you did the math correctly, then round up. Most results will include two decimal points.

The schedule variance index and the schedule performance index give you the money side of time, as well as a percentage of efficiency based on the scope of work completed versus what you expected to be completed. If there is a variance or a difference, it may be time to apply some corrective action to get back on track. This would be done during formal change control procedures since you can't just change your baselines or take corrective actions, as these may impact other constraints whenever you want to and without approval from the powers that be. The last formula steps away from time as money and looks at the earned schedule versus the planned schedule.

### Earned schedule (ES)

The **earned schedule theory** is an enhancement to the other earned value formulas that have been around since the dawn of time. In fact, this is a new formula. It's so new that you will most likely see it in your exams and may even want to use it in the real world since it is closer to a calendar result we may use. The formulas are as follows:

- **Earned Schedule (ES) – Actual Time (AT) = Schedule Variance**
- **Earned Schedule (ES) ÷ Actual Time (AT) = Schedule efficiency metrics**

This way, you can calculate using time and your schedule, especially if you don't do budgeting for your projects. This is yet another way to put together performance reports on your schedule and your project's progress. If the schedule was 4 days' worth of work and the team finished all 4 days of work in 5 days, then they are a day behind schedule since  $ES = 4 - AT = 5$  or  $4-5 = -1$ . Now that we have compiled the schedule information, we can turn our attention to the cost performance.

### Cost variance (CV)

When we look at costs for the project, we are looking to see exactly what was spent when the work was being executed. Remember that we have a baseline, so now we are going to be collecting information about **actual costs (AC)**. AC includes all expenditures for work that is being executed. *It is the actual amount being spent.* When we compare the work that has been done (EV) again the amount of money spent on it (AC), we can start getting a clearer picture of whether our budget is working out the way we planned. The formula for cost variance is as follows:

**Earned value (EV) – actual costs (AC)= CV**

Essentially, we are comparing the amount of work completed against the amount of money spent on it. If the earned value is **less than the actual costs**, this means the team got less work done and you spent more on it; that is, you are over budget. If your earned value is **greater than your actual costs**, then the team got more done and you spent less on it. If the variance is zero, then they are right on target. Remember that being behind schedule doesn't automatically mean you are over budget. Even though we are viewing time as money, this isn't reflected on your budget. Only actual costs compared to earned value can give us true budgetary information. If I asked my painters how much they spent on supplies and they said \$5,000, I'd probably first flip out because I have realized they are way over budget. But how much? Let's look at the numbers again:

- **The painters at the end of day 3: \$1,000 of work completed**
- **What the painters spent on 3 days' worth of work: \$5,000 spent on that work**

Right now, my painters appear to be \$4,000 over budget and even if they were on schedule, which they are not, it stands to reason that the actual cost number could go up. Even if the \$5,000 number remains and the total amount spent stays the same AND they complete \$2,000 worth of work on time or otherwise, they will still be very over budget. Right now, during my assessment, this is the result I'm getting: two walls completed, with \$5,000 actually spent:

$$\$1,000 \text{ EV} - \$5,000 \text{ AC} = -\$4,000$$

There's no real way to compress your budget like fast-tracking a schedule. When your project is over budget, it's almost impossible to regain that money without cutting scope or begging management for their reserves. We start getting into the sunk cost zone, meaning we have sunk money into the project that we didn't expect to spend and don't expect to get back. Whoops! The next formula is considered the most important metric since it tracks cost efficiencies.

### Cost performance index (CPI)

The reason the **cost performance index (CPI)** is considered the most critical metric on a project is that it looks at the earned value and the amount spent to give a percentage for budgetary efficiency. This can give us information on the past to present performance, and can also be used to forecast future performance if the way the project is going now remains the same in the future. The question of how much this project will cost is always asked at every meeting with your sponsor or customer. You must show that future performance is just as good (hopefully) as today's and, conversely, if performance is not good today, how you plan to fix it.

The formula for the CPI is as follows:

$$\text{Earned Value (EV)} \div \text{Actual costs (AC)} = \text{CPI}$$

If I look at my painter's efficiency rating for cost as of now, then the CPI is as follows:

$$\$1,000 \text{ EV} / \$5,000 \text{ AC} = 0.2$$

0.2? 20% efficient? RPE! Resume. Producing. Event. That is unrecoverable money and a very long walk to your sponsor's office. I have given you the extremes because anything lower than 0.5 CPI is typically unrecoverable and if we used the information to forecast forward, it's not looking good. Now, imagine a megaproject that spans years and billions and billions of invested money. You can imagine how that wouldn't go down well. Granted, my painting project isn't being funded by sponsors, but it's still irksome to be drastically over budget.

Here, you can see our spreadsheet after running all the data. See if you can tell how the project is doing based on the results of the analysis:

EARNED VALUE	PLANNED VALUE	ACTUAL COSTS	SCHEDULE VARIANCE	COST VARIANCE	SCHEDULE PERFORMANCE INDEX	COST PERFORMANCE INDEX
\$590.00	\$600.00	\$300.00	-\$10.00	\$290.00	0.98	1.97
\$5,287.50	\$6,500.00	\$350.00	-\$1,212.50	\$4,937.50	0.8	15.11
\$1,500.00	\$1,500.00	\$3,600.00	\$0.00	-\$2,100.00	1.00	0.42
\$7,625.00	\$7,700.00	\$7,700.00	-\$75.00	-\$75.00	0.99	0.99
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	0
<b>\$15,002.50</b>	<b>\$16,300.00</b>	<b>\$11,950.00</b>	<b>-\$1,297.50</b>	<b>\$3,052.50</b>	<b>0.92</b>	<b>1.26</b>

Figure 8.16 – Results of earned value analysis

Hopefully, it was easy to tell that this project is a bit behind schedule and under budget. Even though the schedule performance is a bit low, it's still pretty darn good. Considering our tolerance levels are usually +/- 10% before we start adjusting, this project is doing just fine. Also, when we catch up on the schedule's performance, our budget will adjust also, but we still won't be over budget. Remember that this is all a moving target. We are updating this information weekly and trying to accommodate risks and issues, as well as keeping everyone on the team's eyes on the prize. It's a balancing act, and the earned value technique can help you see your areas for improvements and what to leave well enough alone.

**Just a few tips and tricks to remember to help you with these formulas for the exam:**

1. EV is first in all formulas.
2. PV is for schedule questions.
3. AC is for budgetary questions.
4. For variances, negative results are bad. Over budget, behind schedule.
5. For indexes below 1.0, the results are bad. Over budget, behind schedule.
6. Variances are subtraction.
7. Indexes are division.

I promised I would help the mathematically challenged with an easy way to remember these formulas. Here it is. I memorized all the formulas straight down instead of across like this. First, on my scratch paper, I would write down the earned value since it came first in all the formulas:

- EV
- EV
- EV
- EV

Then, I knew that variances were subtraction and that indexes were division, so I wrote those next to the earned value, like so:

- EV –
- EV –
- EV /
- EV /

Then, I knew that planned values were for time and that actual costs were for costs, so I added that into the mix:

- EV – PV
- EV – AC
- EV / PV
- EV / AC

There you go! If you say it in the same way, there is a bit of a little rap song spin you can put on it: EV, EV, EV, EV, MINUS, MINUS, DIVIDE, DIVIDE, PV, AC, PV, AC. You can dance too, nobody is looking. Interpretive dance for sure. Hopefully, that helped with those formulas!

## Forecasting

There are forecasting formulas that can help you calculate what would happen if your performance remained the same and then give you results that will answer various questions, such as, how much more will we need to spend to get this project completed (**estimate to complete (ETC)**) and how much do we think this entire project is going to cost (**estimate at completion (EAC)**)?

Many times, the ETC is based on expert judgment and an idea of how work is performing today. EAC is merely taking that estimate and adding it to what has been spent to date. I'll give you the formulas but honestly, you probably won't see them on your exams (insert happy dance here)! The formulas are a bit like which comes first, the chicken or the egg, but it depends on who is asking for what information and what information you have to provide. My best advice is to read through the control costs chapter in *the PMBOK® Guide – 6th edition Chapter 7, Cost Management*, for the forecasting overviews.

$$\text{EAC} = \text{ETC} + \text{AC}$$

$$\text{ETC} = \text{EAC} - \text{AC}$$

The following table provides all the formulas in one section, so feel free to use them with your practice questions at the end of this chapter or for any other practice exams you take. There is no shame in taking questions open book, and nobody expects you to absorb everything all at once:

Meaning	Formula
CV	EV-AC
SV	EV-PV
CPI	EV/AC
SPI	EV/PV
EAC	AC+ ETC
ETC	EAC-AC

There are other ways to calculate the estimate at completion, depending on the situation and risk events that may happen one time and affect the budget or continue to impact it.

- We had a risk event but don't expect it to continue to impact our budget going forward:

$$\text{AC+ (BAC - EV)}$$

AC = Money actually spent

(BAC - EV) = How much work is left to complete at its budgeted rate

- We had a risk event, and we expect it will continue to impact our budget going forward:

$$\text{EAC} = \text{BAC} \div \text{Cumulative CPI}$$

BAC = Total planned project budget

Cumulative CPI = All individual cost indexes are rolled up into one project CPI

- Our schedule is impacting our future budget and must be considered for accurate forecasting:

$$\text{AC} + [(\text{BAC}-\text{EV}) \div (\text{CPI} \times \text{SPI})]$$

- **To-Complete Performance Index (TCPI):**

The calculated projection of cost performance that must be achieved for the remaining work to meet a specified management goal such as BAC or EAC.

Formula based on BAC:  $(\text{BAC} - \text{EV}) \div (\text{BAC} - \text{AC})$

Formula based on EAC:  $(\text{BAC} - \text{EV}) \div (\text{EAC} - \text{AC})$

How much work is left/How much money is left?

Below 1.0 = More money than work

Above 1.0 = More work than money

You may also see a question about the burn rate, which is how fast the project is burning through funds. This formula is the opposite of the CPI formula; that is,  $\text{AC} \div \text{EV}$ , though you can calculate  $1/\text{CPI}$  to gain that information.

The odds of having more questions than formulas are slim and for the most part, you will be testing on the main formulas listed rather than in-depth forecasting formulas, but you never know!

## To-Complete Performance Index (TCPI)

The last formula we are going to review (I promise... in this chapter, anyway!) is the **To-Complete Performance Index (TCPI)**. TCPI is a measure of the cost performance required with the resources you have in order to meet management's goal. In the simplest of terms, TCPI compares how much work you have left to do versus how much money you have left to pay for the work. If there is more work than money, you'll have to do more with less (always) or the sponsor will need to approve the forecasted **estimate at completion (EAC)**. Let me tell you that conversation isn't fun and that it is a long walk to the sponsor's office when the meeting needs to happen. But, hey, what can you do? You don't have enough bandwidth to work harder when your capacity and baselines change. Let's assume you do have more money than work. This can show the team's necessary level of performance to maintain their current performance. That formula for this is as follows:

$$(BAC-EV) \div (BAC-AC) = \text{We think we can work within the current baseline}$$

Here, (BAC-EV), which tells you how much work is left to do and (BAC-AC) tells you how much money you have left.

The other formula assumes we cannot work within the baseline and that the sponsor has approved the current EAC and the baseline has been updated. The formula for this is as follows:

$$(BAC-EV) \div (EAC-AC)$$

If the TCPI is below 1.0, this means your team has more money than work left and can cruise along at less than 100% effort.

If the TCPI is above 1.0, this means more work than money is left and that you will have to work above 100% capacity to meet the goal. Often, the BAC becomes unattainable and will need to be changed to the EAC. I mean, who can really work at 160% (1.6 TCPI) effort? Not me, that's for sure! It's a judgment call either way for all involved. That is TCPI.

Wait! I almost forgot the Agile side of things. Good news – there's no math. We are going to take a look at an iteration burndown chart. The burndown chart is a visual way to track current performance against ideal performance. In Agile projects, story points or durations can be used to plot out the amount of work we thought we would do versus the work we actually do. The same thing occurs in predictive project management, except we use Gantt charts and the earned value technique. You'll find that most Agile charts and graphs are fairly simple and low tech. This is because your brain can process images 60,000 times faster (four zeros!) than text. By using simple visuals, anyone at any time can see the status of the work. A burndown chart shows the work completed and how we are burning through the work versus the planned work. The following burndown chart shows that we aren't moving exactly as quickly as planned. We are getting less work done than planned in the timeframe that was set for our iteration based on the ideal. The arrows show that instead of doing 25 points, we did 20, which pushed us off course a bit. The one thing that burndown charts DON'T do is explain why performance is off. It's left to the team to explain to the product owner, the coach, and the other stakeholders what speedbumps were hit, along with risks or changes that were met, and adapt accordingly:

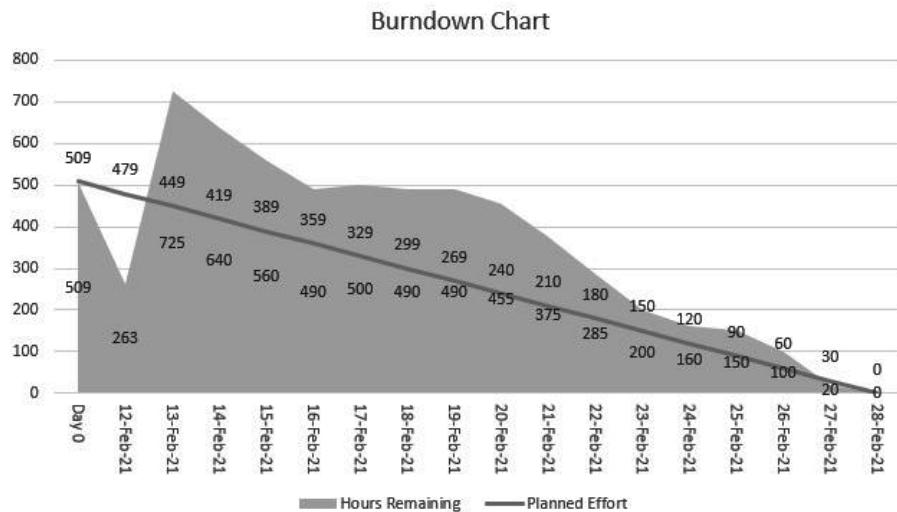


Figure 8.17 – Burndown chart

Now, we can wrap this all up with some assessment questions.

How did you do while going through this chapter? I'm sure you did a great job! Don't worry if everything wasn't immediately evident; there were a ton of terms and concepts in this chapter. You have covered a lot of information in this chapter, without going through any spot checks or being provided with any key phrases that pay. Let's wrap this chapter up with key phrases that pay; the assessment questions that follow should give you an idea of how you are doing with the schedule and cost knowledge areas.

Take a look at the key phrases that pay and see if anything on the list needs to be reviewed that can help tailor your studies. Study what you don't know, not what you do.

## Key phrases that pay

The following is a list of some key phrases:

- Activity list
- Precedence relationships
- Resource optimization
- Fast tracking
- Crashing
- Critical path
- PERT: Both formulas
- Near critical path
- Critical chain
- Precedence diagramming method
- Dependencies
- Bottom up estimating
- Total float
- **Earned value (EV)**
- Earned schedule
- **Budget at completion (BAC)**
- **Schedule variance (SV)**
- **Cost variance (CV)**
- **Schedule performance index (SPI)**
- **Cost performance index (CPI)**

See how you do on the assessment questions, and if there are still some concepts that are cloudy to you, don't worry – you can always go back and review those concepts to make them more transparent.

## Summary

In this chapter, you reviewed schedule and cost planning, including the definition of activities to create an activity list. Then, you sequenced those activities based on logic and dependencies, as well as precedence relationships. After this, you determined the duration and the critical path and float for your project schedule. Then, you moved on to cost estimating and determining your budget, which was inclusive of contingency reserves for risk. Finally, you reviewed the control of your schedule and your budget by using the earned value technique and an iteration burndown chart. In the next chapter, you will review quality management to understand how quality requirements are a necessary aspect of deliverable approvals, and why we also need to consider the cost of quality during our cost estimates so that we have enough money to produce a quality result the first time around. Having a good process in place that is well-documented is half the battle.

## Assessment questions

### Question 1

Which of the following is the most common precedence relationship?

1. Finish to start
2. Start to start
3. Finish to finish
4. Start to finish

### Question 2

You are working with your team and analyzing the current version of your precedence network diagram, as well as the durations that have been added to it. You are trying to figure out the critical path. Which of the following would be considered the near critical path?

1. 20 days
2. 19 days
3. 10 days
4. 5 days

### Question 3

While planning a large installation project, your key resource lets you know that the first rollout will include tests for the system before the rest of the installations happen. He estimates that the automated tests will take about 5 hours to complete, and that it isn't necessary for him to be there when the testing occurs. Which of the following testing times could be considered?

1. Lead time.
2. Total duration.
3. Lag time.
4. This isn't considered schedule time.

### Question 4

Lisa is one of your primary go-to resources when estimating time because she tends to be right on schedule. You have asked her to estimate the time it will take for phase one of the project. Lisa lets you know that, based on other projects she has done that are similar, phase one should take about 2 months. What kind of estimate did Lisa give you?

1. Analogous
2. Parametric
3. Three-point
4. Reserve analysis

### Question 5

Your customer tends to have an optimistic view of your schedule and doesn't consider risk if they don't see it happen. You are trying to convince your customer that you have some concerns about the total time an activity will take due to identified threat events. You also state that your expert on the project has experienced the same on other projects. You have presented your customer with three different durations. What is the expected duration of the task using a three-point estimate?

Optimistic: 10 days

Pessimistic: 32 days

Most likely: 17 days

1. 17 days
2. 16.6 days

- 3. 18.3 days
- 4. 32 days

Question 6

Which of the following schedule compression techniques involves performing tasks in parallel to speed up critical tasks?

- 1. Fast tracking
- 2. Crashing
- 3. Resource optimization
- 4. Monte Carlo technique

Question 7

Both Bill and Juan have come to you and pointed out that, on the schedule, they have been over-allocated for several tasks and will not be able to meet their requests. They have asked if you could adjust the schedule. After reviewing the schedule, you have determined that Bill is working on critical tasks and that Juan is not. What adjustment would you have to make for Bill?

- 1. You would need to fast track.
- 2. You would need to crash.
- 3. You would need to level.
- 4. You would need to smooth.

Question 8

You are reviewing your precedence network diagram and are attempting to determine float time for one activity after your assigned resource asked for a vacation day. You have determined that the early start of the activity is 30 and the late start is 38. How much float time does the activity have?

- 1. 8
- 2. 10
- 3. 5
- 4. There is not enough information to answer this question

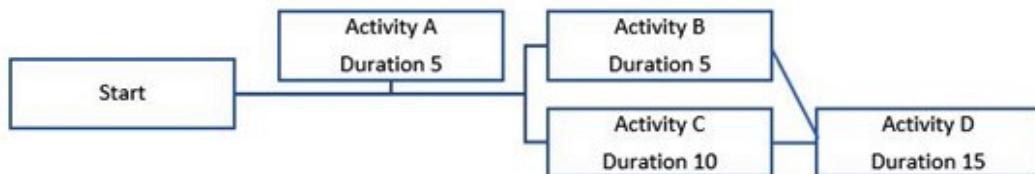
**Question 9**

Your customer is working with you on your schedule creation, and they have made it very clear that they want this project completed by January 5th. By your calculations, it appears you will wrap up the project on January 15th. This is an example of which of the following?

1. Float
2. Negative float
3. Positive float
4. Total float

**Question 10:**

Based on the following network diagram, what is the critical path?



1. ABD
2. ACD
3. ABCD
4. BD

**Question 11**

You are the project manager for a large development project and are discussing budgeting with your sponsor. The sponsor is asking for a definitive estimate from you to properly allocate funds for the project. Which of the following estimating techniques will give you a definitive estimate?

1. Analogous
2. Parametric
3. Bottom-Up
4. Three-point

Question 12

As a project manager, your responsibility is to put together a comprehensive budget that will be approved as a cost baseline. Therefore, you need to incorporate several considerations into the total number. All the following are included in your cost baselines except which one?

1. Sunk costs
2. Contingency reserves
3. Cost of quality
4. Scope of work

Question 13

You are a project manager for a large international project and are beginning to set up your schedule by determining sequence and durations. You know you will need to accommodate some of your overseas resources in the schedule. What is the best document to update and review to create the best possible schedule?

1. Project calendar
2. Resource calendar
3. Task calendar
4. Schedule calendar

Question 14

The near critical path can best be described as which of the following?

1. The longest path in duration.
2. The second-longest path in duration.
3. The third-largest path in duration.
4. There isn't a near critical path.

Question 15

Which of the following makes up the cost baseline?

1. The budget and management reserves
2. The budget and risk reserves
3. The cost baseline and the contingency reserves
4. The budget and the contingency reserves

**Question 16**

You are the project manager for a large development project and are discussing budgeting with your sponsor. The sponsor is asking for an estimate based on past projects from you to properly allocate funds for the project. Which of the following estimating techniques will give you the best estimate?

1. Analogous
2. Parametric
3. Bottom-up
4. Three-point

**Question 17**

As a project manager, your responsibility is to put together a comprehensive budget that will be approved as a cost baseline. Therefore, you need to incorporate several considerations into the total number. All the following are included in your cost baselines except for which one?

1. Funding limit reconciliation
2. Contingency reserves
3. Cost of quality
4. Scope of work

**Question 18**

It's week 4 of a 30-week \$40,000 project and you are collecting work performance data from your team to determine your cost and schedule performance. Your team reports that they are about 10% complete and have spent \$15,000 of the total budget. What can you tell about the cost performance of this project?

1. The project is currently over budget.
2. The project is currently under budget.
3. The project is right on budget.
4. There is not enough information to determine the budgetary performance.

### Question 19

You have compiled your performance reports and are about to have a meeting with your sponsor. Your current performance information shows the following:

EV = 30,000

PV = 32,000

AC = 28,000

What will you be reporting to your sponsor regarding the project schedule and budget?

1. Behind schedule and over budget
2. Ahead of schedule and under budget
3. Behind schedule and right on target for the budget
4. Behind schedule and under budget

### Question 20

One of your team members comes to you and states that their current CPI is 0.8 and that their SV is -\$12,000. How is part of the project performing?

1. Over budget and behind schedule
2. Under budget and ahead of schedule
3. Over budget and ahead of schedule
4. Under budget and behind schedule

### Question 21

Which of the following is the correct formula for earned value (EV)?

1. EV-SV
2. BAC \* SPI
3. BAC \* % complete
4. EV/BAC

### Question 22

You have received approvals for your \$4,000 cost baseline and have scheduled the project work across 4 weeks. Which of the following could be considered the planned values of each week?

1. \$2,000
2. \$4,000
3. \$1,000
4. There is not enough information to answer this question.

### Question 23

As a project manager, you are collecting work performance data from your team and need to process the data through variance analysis.

Your data is as follows:

$$\text{EV} = 42,000$$

$$\text{PV} = 41,200$$

$$\text{AC} = 42,200$$

What are your SPI and your CPI on this project, respectively?

1. 1.02 and 0.99
2. 0.99 and 1.02
3. 800 and -200
4. -200 and 800



# 9

# Quality Management

In this chapter, you will review the knowledge area of quality management. You will begin with an overview of the entire quality management knowledge area and the quality management plan, which describes how to manage and control your quality. Then we will review the best practices to audit your quality process and inspect your results for defects.

The following topics are covered in this chapter:

- Key concepts for quality management
- Trends and emerging best practices
- Tailoring considerations
- Considerations for Agile/adaptive environments
- Planning for quality management
- The Manage Quality process
- The Control Quality process

## Key concepts for quality management

The goal of any project is to complete the deliverables as stated by the requirements and to make sure that they function the way they are supposed to. If your result is a bicycle, it could meet all the scope requirements and be the best-looking bicycle on the road. However, if the chain falls off and the brakes don't work, then it's just a large sculpture; isn't it? Failure to meet quality requirements can have serious negative consequences for any or all of the project stakeholders. According to the **International Organization for Standardization (ISO 9000 series)**, the definition of quality is "*the degree to which a set of inherent characteristics fulfill requirements.*" The project manager and team's job is to determine which requirements for both quality and grade are necessary.

### Quality versus grade

**Grade** is a category assigned to products or services having the same functional use but different technical characteristics. Let's look at this in two different ways. A prime example is when you go to the gas station to fill up your car. You have choices in grades of gasoline: low grade, middle grade, and high grade. The higher-grade gasoline is not only more expensive, but it has other agents in it that make it a higher grade. Perhaps it helps to clean a high-performance engine or is a better choice for long road trips. In a pinch, though, you could use the low-grade gasoline and pay less but still get where you need to go due to quality regulations on gasoline. Low quality is always a problem; low grade may not be. Another example would be software-oriented. If a customer comes to us and asks for a software program that only types, spellchecks, and prints, the grade may be lower, but as long as it works and it's what the customer wants, then they are getting what they asked for and what they paid for.

Conversely, if the customer asks for additional features such as photo editing, different fonts, and grammar checking (thank goodness for that particular feature, I must say), then they are looking for a higher grade of software, and if it works, great! If it doesn't, then you have high grade and low quality. Not good at all. *Quality means correctness, and that the result is fit for use.*

### Precision versus accuracy

Precision means consistency in the values of repeated measurements that are clustered and have little scatter; this is exactly the opposite result of my darts game, by the way. In simpler terms, precision means doing things the same way every single time with very little deviance from the process. I know that when we have a specific set of steps to meet quality requirements, it is crucial to make sure I do all of the steps the same way every single time to get the results I expect.

Accuracy is the correctness that the measured value is very close to the actual value. It's what it is supposed to be. How do we know our result is accurate? We have to inspect it to be sure that our precise process is working to produce an accurate result. Let's use something super simple. You are dialing a phone number. You know, those things we don't memorize anymore. If you are calling a friend or loved one and dialed their number precisely, they will pick up the phone. That shows correctness. If you fat-finger a number while dialing your aunt in Texas and someone named Francoise picks up in Paris, well, you did it wrong. It wasn't precise or accurate.

The goal of any quality plan is to create a process that works, can be executed precisely by the team, and provides accurate results. Let's face it, though; nothing is ever perfect. Even a six-sigma project's goal is to have fewer than 3.4 defects per million opportunities. That's about as close to perfect as we can get – 99.9997% correct, to be exact. We know there will be times when we butt-dial Francoise by accident because it was the last number you called, but, in general, we are trying to avoid that by changing our process. Delete the last number called and program in your aunt in Texas, thereby removing the possibility of it happening again. Unless, of course, you and Francoise hit it off on the call. Then, by all means, add him to your list of friends.

## Other considerations for quality management planning

The importance of executing your quality process and creating a result that meets specifications can't be overstated and depends on the precision of your process execution and the accuracy of the result you are planning for. How quality is managed will also depend on your industry. Not all quality management is designed for manufacturing, even though that is where a lot of the predictive project management concepts and best practices began: in manufacturing and construction. Your team may need a distinct understanding of statistical process control to get results that have a precise process and an accurate result. If you cried through statistics in college as I did, fear not, you mathematically challenged! Unless you plan to get your green or a black belt in Six Sigma, you won't need to wade through mean, median, and mode differences for your PMP® exam! All the statistical control processes or terms that are covered in your exam are simple concepts used to evaluate data or results. Those results are identified during the control quality inspection. The results we need to be compliant will have to be clearly outlined in our quality management plan so we can tell the difference between the results we want and the results we get.

**The three terms to be aware of are the following:**

- Prevention over inspection
- Attribute sampling
- Tolerance levels

## Prevention over inspection

*Prevention over inspection* is the preferred way to get a quality result. The **cost of quality (COQ)** is considered as part of your cost estimates and is designed to prevent defects finding their way into your customer's bicycle brakes. Inspection is used to review the deliverables and make sure they are fit for use before your customer takes a 400-mile bike trip of a lifetime. If inspection shows defects that are not acceptable, then the team will need to look at the process and determine whether that process was executed precisely. If not, then a process update or fix would be necessary. Sometimes, it is down to human error, because nothing messes up a result faster than people. If it is the process then it would need to be updated, and the results inspected again for correctness. If it were human error then money would need to be spent for training. The two types of COQ are **conformance** and **non-conformance**. Failure costs can also be referred to as the **cost of poor quality (CoPQ)** and can be internal or external failure costs. There are also the costs of conformance and the costs of non-conformance. Conformance costs are far better because we are spending money to execute correctly through the training of your team, proper equipment, the time to do the work, and internal inspections. Conformance costs are also used internally to perform defect repairs before the defects are discovered by the customer. If the customer finds the defects then those are the external costs of non-conformance and those can be exponential.

It is much less expensive to pay upfront to do it right the first time than to have external failure costs. External failure costs can be exponential and hard to estimate in advance. If you have watched the news and seen recalls of products, you know how the stock drops, lawsuits are filed, and the company has to eat the costs of both the recall and the defect repair under the watchful eye of the world – not an excellent spot to be in. I'm always surprised when recalls happen; it tells me that profits are more important than quality and in that respect, the external COQ is penance for putting their customers in danger. We PMPers aren't going to allow that to happen on our projects because we will incorporate a stable process and keep an eye on the results using attribute sampling if it is the approach we use to inspect our results.

**Reference**

*The Project Management Professional (PMP), PMBOK Guide and the Project Management Institute Agile Certified Practitioner (PMI-ACP), and the Agile Practice Guide are a registered mark of the Project Management Institute, Inc.*

## Attribute sampling

Attribute sampling is a way to determine whether the results conform or not. Do the brakes work or not? Not? That's a no-go. Work? Go! However, some items are not so cut and dry as a go/no-go decision. For example, let's say we are setting up our process for mass-producing chocolate-chip cookies. We know there isn't any way we could inspect every single cookie, although I'd like to try that, so we set up a sampling procedure that allows us to use one sample to represent a population. Let's say one out of every 100 cookies will be eaten...uh...inspected for quality. We also have requirements that there must be between five and ten chocolate chips per cookie. Those requirements must be met to call our cookies quality cookies. In that case, we will inspect for both attributes and variables. The attributes we inspect are to make sure there are chocolate chips in the samples. Go! The variables will be the quality measure of between five and ten chocolate chips in each sample. Go! If there are four chocolate chips in our sample, no-go!

## Tolerance levels

Where do those requirements come from? They are determined by tolerance levels, which are a documented range of acceptable results usually set by the customer. They apparently won't tolerate anything less than five and no more than ten chocolate chips per cookie. We expect fluctuations in a lot of processes, so having tolerance levels implies we are meeting requirements, and the acceptable variations are explicit and well documented as part of our quality process.

Remember, we are currently identifying the very best way to meet quality requirements; therefore, it would be necessary for the team to know and understand these concepts so a process can be adequately planned for, executed, and monitored, and controlled. Otherwise, if we choose not to pay for it now, we will have to pay more for it later. Prevention costs are less expensive than fixing defects after inspections from the team who find defects internally. In the worst case, the customer sees them after the fact. Once the customer discovers the defects it will lead to a rework by the team or an epic fail for not meeting requirements and could result in the loss of the customer. Even general non-conformance to requirements represents the costs of poor quality.

The COQ over the product's life cycle is typically the concern of the program, portfolio management, the PMO, or operations, but the project manager will include estimates in their budgetary baselines to meet quality requirements during the project life-cycle.

The organization will have to adapt and work toward a better quality management culture. That can be difficult to do if there are any defects or signs of continuous poor quality. In *Figure 9.1*, you can see the **five levels of increasingly effective quality management, as documented in the PMBOK® Guide – Sixth Edition:**



Figure 9.1 – Quality management

#### Reference

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, page 275.*

Quality management is essential no matter what kind of result your projects produce and there are several possible trends or best practices that can be used to create a culture of proper quality management.

## Trends and emerging practices in quality management

There are many trends in quality management, depending on your industry, outputs, and the frameworks that you choose to use to manage your projects.

The following is an overview of these trends:

- Customer satisfaction
- Continual improvement:
  - a) Plan-Do-Check-Act
  - b) **Total Quality Management (TQM)**
  - c) Six Sigma
  - d) Lean Six Sigma (Lean keeps the process flow moving without any additional steps. The process is, um, lean.)
- Management responsibility
- Mutually beneficial partnerships with suppliers

The environment in which you work and your chosen life cycles may drive your ability to tailor your practices. It's essential to know the direction you want to go in with quality management and then tailor your execution accordingly.

## Tailoring considerations

Because not everyone is mass-producing a product or developing software, it's essential to determine how to tailor your projects based on the necessity of quality and how your organization conforms to quality requirements. Remember, not everyone has a quality assurance or quality control department, or a bunch of Six Sigma black belts running around shouting things like *"How many chocolate chips did you count? Wait... how many?!!!"* Therefore, it is our job to understand how our organizational policies impact our ability to tailor our project quality management. The following certainly isn't an exhaustive list, but more to the point, it covers some areas for consideration when embarking on a new deliverable with quality requirements:

- Policy compliance and auditing
- Standards and regulatory compliance
- Continuous improvement
- Stakeholder engagement

Many of the items are innate to you if you already are immersed in quality management, and you probably understand the full cycle of continuous improvement. That is especially true if you practice Agile or adaptive project management.

## Agile/adaptive environments – retrospectives

Continuous improvement works both on the product level and the team level throughout all Agile environments; therefore, the *retrospective* is an essential piece of continuous improvement and the best practice. I'm sure many of you have a lessons-learned meeting at the end of the project or phase. You might have noticed that it's a tad too late at that point to change anything in the past. It's more an opportunity to commiserate, complain, sigh, and possibly have bagels. Food is an essential aspect of meetings, by the way. In a way, that is what a retrospective is, a lessons-learned meeting, with bagels more often than not. A retrospective is an opportunity for the team to spend time checking themselves before they wreck themselves in the next iteration. The team will inspect itself, the iteration, the way they executed the work, and create a plan for immediate improvements before the next iteration begins. Continuous improvements are the process of making and correcting current mistakes so they don't happen again and learning valuable lessons the team can take with them into the future.

### The purpose of the retrospective

Scope and quality are essential, no matter what you practice or how you execute your projects. We want to make sure we are building the right thing (scope) and building that thing right (quality). For many projects, these are two ships passing each other in the night, and the focus is more on the scope of work and getting value faster than fitness for use or a correct result. During a retrospective, the team is also looking at how the last iteration went with regard to people, relationships, and team interactions, as well as processes, tools, and performance results. Once those discussions occur and the team has identified items for improvements, it is easier to work through solutions. The team is transparent about their feelings on what went well, what did not go well, and what changes they would like to see made. By the end of the retrospective, the team will have identified improvements that they will implement in the next iteration. Typically, a retrospective is two to three hours long, and the team asks some vague but tough questions about what they should start doing differently in the next iteration, what they will stop doing that is causing issues for the results or the team, and what should they keep doing. Whatever works, works. No need to reinvent the wheel to improve during the next iteration. This information helps plan the next iteration and promotes continuous improvement. Small ongoing changes for the better is the job of everyone in an Agile environment.

Here is an example of the value of Agile retrospectives. When I went to my Scrum master training through the Scrum Alliance® (<https://www.scrumalliance.org/>), our instructor broke us up into teams of five people and said we were going to play a game to show how iterations work and to see the value of retrospectives in continuous improvement. By the way, this is an excellent team-building exercise for those who are considering a more Agile approach to project management. Here's the setup: each team got two buckets. One bucket was filled with golf balls, and the other was empty. The goal was to get as many golf balls into the empty bucket as possible without any of them hitting the floor. Sounds easy, right? Nope, here were the rules.

1. The first person to touch the golf ball has to be the one that puts it into the bucket.
2. Everyone has to touch the golf ball.
3. You cannot pass or hand the golf ball to anyone next to you.
4. You have two minutes to plan your approach, two minutes to execute your strategy, and two minutes to have a retrospective.
5. The game would last three iterations (we did six iterations, but for the sake of your reading pleasure, I've condensed it).

It still sounds pretty easy...until you do it:

- **Iteration one:** The first idea was to stand in a circle and throw the golf balls across the circle to everyone until they had all caught the golf ball, and the first person would catch it last and throw it into the bucket. So, we were all whipping golf balls at each other, and some people were dropping them. Namely me, but since there isn't any finger-pointing in Agile, I was only given eye rolls and sighs instead of pointing fingers. We got about five golf balls in the bucket – an abysmal show. Then we did our retrospective and decided that throwing golf balls wasn't the best approach.
- **Iteration two:** We stood closer together and slowly, gently, handed the golf balls around the circle. Some were dropped (not naming names), and the approach was solid but sloooow and tedious. We managed to get ten golf balls into the bucket. Woo hoo, an improvement! We felt pretty good about ourselves until we heard the other teams say they got twenty or thirty into their buckets...meh. A new approach was needed.

- **Iteration three:** Our new approach was to use the concept of a waterfall, which I found totally ironic. We all stood very close together with our hands stacked on top of each other's hands over the bucket. The first person would drop it into the second person's hands, they would open their hands, and the ball would fall to the next pair of hands and so on. The first person ducked down to be the last to receive and opened their hands over the bucket. Wouldn't you know it, we got thirty golf balls into the bucket! This is how continuous improvement makes changes for the better. The moral of the story is don't throw golf balls to me; it never ends well.

In all seriousness, it taught me a valuable lesson about the importance of changing your strategy when it isn't working. We all have empirical knowledge based on our experiences, education, career choices, and the like. That knowledge gives us the ability to look back and say, *"I shall never again go on a Ferris wheel because they scare me to death."* It provides us with the ability to change what isn't working, be malleable to our situations, and adapt while reducing risk. Practicing agility and adapting our approaches with the support of the team and the organization is a freeing concept. Retrospectives allow us to look back and make changes while only being, at any given time, no more than thirty days into the work. This type of best practice isn't only at the end of the work, it runs all the way through, allowing us to change for the better and improve the quality of our results.

## Spot check

Take a few minutes to hold an internal retrospective based on your current project(s). Ask yourself what you can change or control, and then write down your responses somewhere. Keep them with you at work to remind you of the improvements you want to make. Change for the better; it's what quality management is all about! Ask yourself the following questions:

- What will I keep doing?
- What will I start doing?
- What will I stop doing?

Now that we have discussed all the reasons why quality is essential, let's review the quality management plan and the contents within.

## Planning for quality management

One of the main things to keep in mind regarding the knowledge area of quality management is that it is a cycle, rather than a straight line from the beginning to the end of a project. Quality is continuous and iterative, from the first planning meeting to the final verification from the customer that the result is fit for use. Then you can go through the Validate Scope process, get formal approval of the result, and close out the project. Quality is always considered. I want you to imagine the face of a clock:

- Noon is the plan quality management process. Planning is where we put together the quality management plan, which describes how and what we will do to accomplish the result to specifications and with as few defects as possible. We will do this by considering requirements, risks, stakeholders, and the scope of work while defining our process for creating and maintaining quality. Then we will move clockwise to 12:30 during project execution.
- At 12:30, we find the manage quality process, or what is known as **quality assurance**. This process is designed to audit the execution of our process for precision and relevance in the current project environment.
- Then we move to 12:45, where we find the control quality process as we monitor and control the project work. This process is designed to inspect the results and compare them against the requirements. If the inspection shows that the results are where they are supposed to be, we will swing back and forth between 12:30 (manage quality) and 12:45 (control quality), thus iteratively checking the process and the product.

However, if the product inspection shows we have too many defects, then that points to a problem in the way we are executing the process, or that the process itself is flawed or out of control. I don't mean out of control like a college party, I mean that out-of-control limits were set based on customer tolerance levels due to human/machinery error or an incomplete process that isn't functioning as planned. Now we are going counterclockwise to 12:30 (manage quality) to do root cause analysis to figure out what the cause is. Do we need another step in the process? Do we need to train our people? Update our machinery? Whatever the assignable cause is, we will need to go back to noon and update our quality management plan through formal change control and validate whether the defect repairs and the process updates worked before we can call our process *in control*. **Plan-Do-Check-Act.**

Because of the necessity of the process cycle to be iterative, you'll see that some of the inputs to the planning of the quality management process are items we haven't yet gone through. Some of the inputs assume that most of our management plans and baselines are completed, and work is being executed.

We may have a specific process flow for documentation already in place (organizational processes or assets) but also because you may be referring back to the quality management plan throughout and updating as needed. Much of this process is based on the collection of quality requirements, plotting out the process flow, and performing a cost-benefit analysis to protect against a *pay more later* situation.

The best way to remember this is *prevention over inspection*. Keeping errors out of the process and the product by building prevention costs into the budget is far less expensive than paying to fix it later.

One of the techniques to review your process flow is data representation, which allows for a visual overview of your quality process.

## Data representation

Let's look at different ways we can represent our quality process:

- **Flowcharts:** The **Supplier, Inputs, Process, Output, Customer (SIPOC) model** is one type of value chain flowchart and allows for the team to plot out the steps of their processes to ensure the process flow is correct and to identify issues in the individual steps. SIPOC provides a visible plot of the actions taken and allows you to look for areas where quality may be improved. In *Figure 9.2*, showing the SIPOC model, you will see the representation from the *PMBOK® Guide - 6th edition*, found on page 285 in figure 9-6:

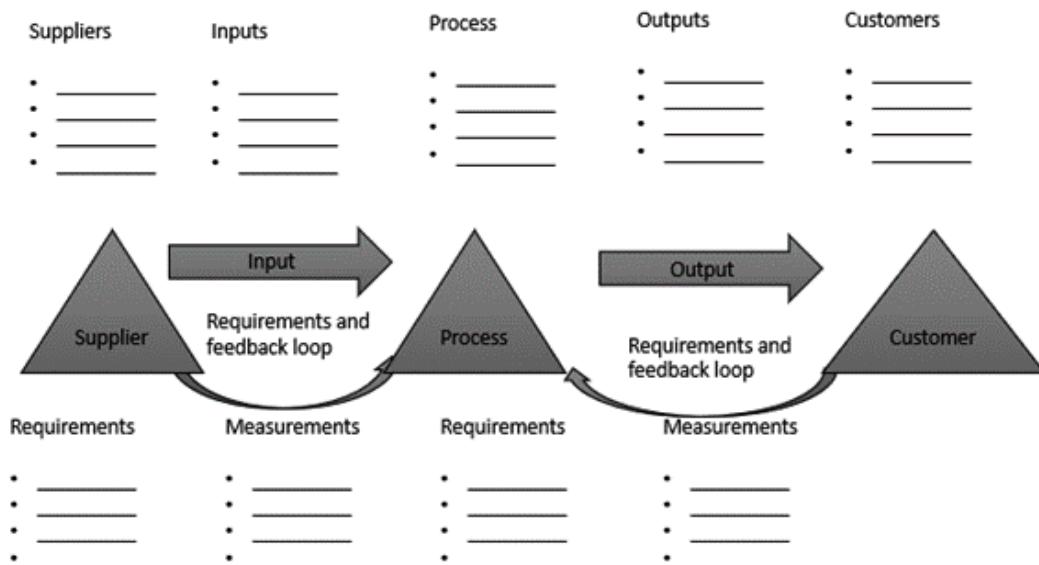


Figure 9.2 – The SIPOC model

**Reference**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Figure 9-6: The SIPOC Model, page 285.*

- **Logical data model**

A visual representation of an organization's data, which can be used to identify whether the data you are using has integrity issues or any other quality issues that may occur.

- **Matrix diagrams**

Using matrix diagrams can help the team find relationships between different factors, causes, and objectives. There are different shapes of data depending on what you are reviewing. Those can include configurations like L, T, Y, X, C, and roof-shaped data. Using the diagrams can help visually identify key metrics that are important for project success.

- **Mind mapping**

A way to visually organize information and can be used to gather project quality requirements, constraints, dependencies, and relationships.

- **Test and inspection planning**

- a) The project manager and team determine how to test or inspect the product, deliverable, or service.
- b) The planned inspections will be used to decide whether the work is meeting stakeholder expectations and needs, and is fit for use.
- c) Tests can be dependent on the given industry.

## The quality management plan

The quality management plan is an important aspect of meeting quality requirements. The headers can be updated based on your project's needs but the following is pretty standard for this plan:

- It describes the approach to implementing the quality policy.
- It can be formal or informal and is designed for stakeholder review.
- It covers quality management, quality control, and continuous improvement approaches for the project.

- Quality standards.
- Quality objectives.
- Quality roles and responsibilities.
- Project deliverables and processes.
- Quality control and quality management activities.
- Quality tools.
- **Major procedures for project quality include the following:**
  - a) Non-conformance
  - b) Corrective actions
  - c) Continuous improvement

## Quality metrics

- Quality metrics are used in the quality assurance and quality control processes and are planned and documented as an output of planned quality.
- **Some examples of quality metrics include** defect density, failure rate, availability, reliability, and test coverage.

## Quality checklists

- A quality job aid to help employees perform activities according to your quality standards.
- Used in quality control, but created in the Plan Quality process.

Even though it seems like there are a lot of different ways to set up your quality processes and track performance, for exam purposes, you are just focused on making sure you have the requirements collected for both scope and quality. You are then working to absorb a process that is put in place, and trying to improve upon that process in a continuous fashion. On the other hand, you may be creating a new process and are aware of better ways to do the same things.

There is a Japanese term called *Kaizen*, which is the combination of two words, *Kai* and *Zen*. *Kaizen*, or continuous improvement/change for the better (loosely translated), is the mindset of continuous process improvements for quality management. Rather than a process flow, it is a concept that quality is the job of everyone and there is always room for improvement. Speaking of which, we could all probably benefit from a *Zen* moment ourselves. Take one and then go forth to the execution of project work and the management of quality to ensure the deliverables are meeting requirements. If they are not, we will need to determine where in the process execution we got it wrong and work on updating our process and fixing the defects created. Again, quality is a significant constraint and ties in very closely with the scope of work. That is why we refer to all the requirements documentation, stakeholder information, and risk assessments while planning to practice continuous improvements. **Plan-Do-Check-Act.** You'll have your plan in place, and then when you begin to execute it, you'll use all of the planning to assure and control your quality process, and make sure that the result meets the requirements and is fit for use.

Many of the current processes and concepts for quality management began in the industrial age when the world began mass-producing products. Those best practices used in steel mills, automobile manufacturing, construction projects, and the like all benefited from the work of several quality management gurus beginning in the 1950s through today, and will continue forward into the future.

## The gurus of quality management

It's safe to say that many of the best practices for quality management started around the end of World War II and have stood the test of time. There were many gurus, if you will, of quality management who contributed their take on the best ways to not only improve quality but to maintain it. Some gleaned their knowledge through statistics and some through different tools or philosophies. It's unlikely that you will see all of these names on your exam, but you might, plus, it's interesting, I think. So let's begin.

### W. Edwards Deming and Walter A. Shewhart

We'll start with **W. Edwards Deming** and **Walter A. Shewhart**. Both were well versed in statistical analysis, but Shewhart and his experiences at Bell Telephone led to the creation of the **plan, do, check, act (PDCA) cycle**, which was later adapted for quality management by Deming in 1950. Often this cycle is referred to as the Deming cycle, but Deming gave credit where it was due and called it the Shewhart cycle. Other than being polite and courteous guys, they turned the world of quality into a formal approach to help organizations achieve better results.

Deming was most well known for his work in Japan after WWII in 1950. Deming presented information on what he called *Statistical Product Quality Administration*. Deming is credited by many for helping to improve Japan's economy after the war when Japan became the second-largest economy in the world through processes partially influenced by the ideas Deming presented. In the United States, Deming created the *System of Profound Knowledge*, or what you may remember in the 1980s car commercials as the *14 points of quality improvements*.

## Joseph Juran

The next guru is **Joseph Juran**. Juran also worked with Japan and had similar ideas about statistical quality management as Deming did, but he was focused more on the human side of quality management and the education and training of managers. He referred to the fear of change as the central issue in organizations lacking good quality. Hmm, fear of change. We have never seen that before in organizations, right? Wrong! Juran also utilized something called the *Pareto Principle* to determine which defects were impacting the results the most. To explain the Pareto Principle, we need to travel back to Italy in the early 1900s.

## Vilfredo Pareto

**Vilfredo Pareto** was, among many things, a sociologist and economist who created the 80/20 rule while studying the distribution of wealth in Italy in 1906. His study was mostly of income distributions and people's decisions leading to wealth or, you know...not wealth. He also coined the phrase "elite" to describe the wealthy and their solid economic choices. What does that have to do with quality, you ask? Excellent question! The 80/20 rule was used by Juran, who posited that 80% of defects come from 20% of the causes. If you find and subordinate the 20%, you could fix your quality. Now obviously, you would have to look at the other 80% as well and shore up your processes, but the Pareto Principle allows us to look at a variety of causes of defects and determine the most impactful to fix first. You see this a lot in Six Sigma projects as well, which leads me to Bill Smith.

## Bill Smith

**Bill Smith** worked at Motorola as an engineer and is the co-founder of Six Sigma, along with Dr. Mikel J Harry. In a fundamental overview, the idea of Six Sigma is to get to the point where you strive to have a maximum of 3.4 defects per million opportunities. That sounds like manufacturing, and for the most part, it was designed for that purpose, but what if you are processing medical claims? 3.4 poorly submitted claims is way better than 400. If you have ever had a battle with health insurance claim issues, then you can relate. Insert eye roll right here...

The ultimate goal is to determine the main offenders of causing defects, work to remove the root cause, and work your way up to almost perfect quality. Pareto charts are an excellent way to present that information. These are basic bar charts with a cumulative value line pointing to 100%. That can be reached if you have good data, a good process, and the time to fix the problems. Maybe just doing it right the first time is the way to go.

## Phillip Crosby

**Phillip Crosby** is the next guru we are going to review. He's probably my favorite because of his no-nonsense, no-math way of looking at things. He said (and I'm paraphrasing), "*If you just do it right the first time, then you'll have perfect quality*"...and drops the mic. Sounds good to me, so, how do we do that, you might ask? Prevention over inspection. Prevent mistakes before they are left to be found through inspection. This is like the cost of quality conversation we had earlier. It's true. Crosby said, "*quality should be free.*" What he meant by that was if you add money to the budget, have an excellent executable process that you audit, and prevent the mistakes in the first place, then you'll have perfect quality and won't be spending more to fix the defects. It makes perfect sense to me. Moving on.

## Genichi Taguchi

**Genichi Taguchi** incorporated the design of experiments, which is loosely explained as "*the design of any task that aims to describe or explain the variation of information under conditions that are hypothesized to reflect the variation.*" Thanks, Wikipedia, I think. In simpler terms, think of any experiment – what might cause the results to be skewed? What variations can we expect? If I take this bolt off the brake pads, what does it do? What happens when I put it back?

The experiments and hypothesis can lead to a better understanding of how the process affects the results and how the results affect the process. I know, it's deep. The good news is you probably won't need to know too much about the design of experiments because it's not often seen on the exam. But because it's considered a tool or technique commonly used to set up quality processes and to make sure those processes are working, it felt relevant to include it.

All of the plan quality management process is easier said than done, unless your organization is ISO compliant, has a quality assurance and quality control department, or a bunch of black belts running around. Otherwise, it is up to us to determine the best and most effective way to meet both scope and quality requirements and create something fit for use that doesn't end up on the news, or cost too much to fix after the fact. If we can do that, then we are well on our way to becoming an organization that values quality over quantity.

There are many terms under quality management planning to be aware of for your exams.

## Key phrases that pay

A list of some key phrases to note is as follows:

- Prevention over inspection
- Precision
- Accuracy
- Plan-Do-Check-Act
- Cost of quality

Now that we have a comprehensive plan put together, we can begin to execute project work and manage quality.

## The Manage Quality process

As we are now executing project work, we need to make sure that the quality management plan we created is useful and is being followed to incorporate the organization's quality policies into the project and the result. Keep in mind that quality isn't linear; it is a cycle of Plan-Do-Check-Act, and therefore, you may not know your plan isn't working until you inspect the deliverables via quality control best practices. If a defect is discovered, we need to take a look at our process and find out where in the world we missed a step. Was it human error (way to go, Bill), or is our process somehow flawed, or both? Poor Bill didn't know he was supposed to move on to step six because it wasn't documented in the management plan. Sorry, Bill!

The Manage Quality process is the job of everyone, but it may be that your organization has a quality assurance department that has a role to play in the execution of the work and the quality of the results – our goal is to assure that our design guidelines are leading to a desirable and high-quality result. If not, then we need to adapt our process flow to the most efficient and effective we can. In a predictive environment, there is likely a set process flow that is followed until it doesn't work anymore, or the quality is verified as correct. In Agile projects, it's more likely a review and the retrospective pointing out of design flaws before too much work has been accomplished.

There are so many overlaps between the Manage Quality and Control Quality processes, but an excellent way to keep them separated is to remember that managing quality is reviewing the results of quality control efforts and inspections to determine whether the process is working or not. If the process is flawed, then we need to audit that process, determine the root cause of the problems, apply the fixes, and perform defect repair on the results.

**Note**

Audits are used to review processes; inspections are used to evaluate the deliverables.

Because the Manage Quality process is considered the work of everybody at a variety of applicable levels, the goals are to design a product that has specific design guidelines; to perform audits on the quality process to make sure the product or result is built to specifications; and to confirm the methods being used for quality are valid and that everyone is working to improve both the product and the process in an iterative fashion.

You will notice as you move through the rest of this chapter that there are many tools and techniques that overlap between the management and control of quality. Therefore, we'll focus on the key differences between them and in which process each is most applicable. Remember there is also a lot of overlap between scope and quality, and both planets need to align for the result to gain approval and thus to be able to officially close the project or phase. The majority of the tools and techniques and the results of analysis become essential to the Control Quality process, and a necessity to identify defects that may point to a process that is out of control. If you consider that the definition of insanity is doing the same thing, the same way, over and over and expecting a different result, then you see the need to incorporate control over the steps of the process flow. This would also include updating the process flow if the results that were produced were not within the normal limits of expected behaviors or requirements. Therein lies the importance of the Manage Quality and Control Quality processes. They work together to make sure the results meet the requirements and are fit for use – that *you built the thing right*, if you will.

Remember, defects are defined as something outside the control of what was expected and will not be verified for quality or validated for the scope of work. Keep in mind the process you covered in *Chapter 7, Scope Management*:

1. **Step 1:** Produce the deliverables through direct and manage project work process in integration.
2. **Step 2:** Verify that the deliverables are fit for use in the Control Quality process via inspection.

3. **Step 3:** Validate the scope by gaining formal acceptance in the Validate Scope process via inspection.
4. **Step 4:** Close the project or phase in integration.

All of the results found in quality control inspections will be inputs to the Validate Scope process, resulting in accepted deliverables. Both processes' results have to be correct and meet requirements to allow you to close the project or phase.

In an Agile environment, the reviews allow for demos and inspections of the increments in their current state. The team does testing during the iteration (the Manage Quality process), and the inspections are done during the review (the Control Quality process). During retrospectives, the team reviews its performance and makes plans for immediate and continuous improvements for the scope and quality, as well as how the team is working together and even how we could improve reviews and retrospectives to better enable the team to practice continuous improvements or Kaizen.

As you move forward to the Control Quality process, keep in mind that everything works together. If something is amiss in one quality process, then the other processes probably have problems as well.

## The Control Quality process

Quality control is imperative for the successful acceptance of the deliverable. In the last section, you reviewed quality gates and governance gates that are scheduled to check for quality and to make go/no-go decisions. It is also realistic to assume that the scope of work is being inspected as well, to approve the requirements as having been met. Scope and quality are like peanut butter and jelly. They go together. Inspection of the deliverable is necessary. Riding the bike around the block or checking for chocolate chips is all part of the inspection process of quality control. Managing quality, or *quality assurance*, means making sure our team is following the steps of the process, and that quality control is properly checking that the result is fit for use and that it works. To track quality performance, it may be necessary to utilize visual charts and graphs to see trends in performance. Most quality control best practices began in the manufacturing industry where it was necessary to set up random samples or statistical sampling due to the fact that checking every single result is costly and time-consuming. Although in the case of the chocolate chip factory, I'd love to give checking every result the old college try!

These days, quality is vital in everything we do and produce. We may not be sampling, but we may be running tests on our hardware or software. Software developers do integration testing to make sure their code works, and the result functions the way it should. We all care about the quality of our work, and even though you may not use these charts or graphs, it stands to reason that there has to be a way to track quality performance, regardless of your industry. In most IT project management environments, we are more likely to use **Gantt charts**, **dashboards**, and **status reporting** as well as **knowledge management systems** such as SharePoint and the like. Still others with virtual or remote teams will utilize real-time updates on intranet and internet sites, wiki pages, or collaboration tools such as WebEx and Skype to monitor day-to-day work and project progress. **Performance measurement tools** are usually driven by organizational processes and your enterprise environment, so methods for keeping track of project performance can vary.

The goal is to have a scorecard for scope, quality, cost, schedule, and other project aspects that are tracked and communicated regularly. In earlier chapters, I brought up **key performance indicators (KPIs)**. These are the items that indicate whether our performance is up to snuff. Typically, this would come in the form of baselines or other targets for performance, as well as governance gates or phase end reviews. Our goal is to stay as close as possible to the plans and track any irregularities and communicate those transparently. Having a balanced scorecard is the goal, but things don't always work out as planned. That would be the very reason for formal change control that is integrated across all knowledge areas, as change can happen in any knowledge area, and often if one aspect is affected, so are several others. We'll cover formal change control later, but right now we are trying to figure out how our project performance is going, specifically in terms of quality and scope performance.

Many times, if we find defects outside of normal limits or tolerance levels in our quality control inspections, the result points to a problem with the way we are executing the work, or suggests that our process is flawed. There is always human error to consider, but if your results are consistently riddled with defects then your process is most likely the problem.

Going back to my fictional cookie factory, let's say my process was to use a cup of salt and half a cup of sugar. My team gets to work and follows that recipe to the exact measurement. Then when we inspect one out of every one-hundred cookies for quality, we notice that they don't taste very good. Why? Too much salt? Not enough sugar? My recipe is flawed somehow. My team's performance is exceptional, but the process is out of control. That inspection gave us a heads up that something is amiss. But what?

There are numerous ways to review your process and your results in a visual way. Most teams create a **process flow diagram** during planning, so they have a checklist to follow that is very helpful when trying to figure out what is wrong with our process. You are certainly not going to scrap an entire process, because you don't know yet what is wrong. It can't be everything! Plus, we spent the time to plan out the process and execute the work. We can't go back to the drawing board now; we have cookies to bake.

A process flow diagram allows us to look at the process visually, and often process flow diagrams have decision points. Did this happen? Yes or no? If yes, go in this direction; if no, stay the course. Process flow diagrams can be very simple or quite complex depending on your output. Even if you create a process flow diagram **after** defects are found, it's still a useful tool for communication with your team and offers a balanced approach to finding out the reason why the defect occurred. Too much salt? That would be fixed with defect repair using formal change control to update our process and then begin to execute again.

Remember, not every defect is cause for panic, and scrapping an entire process is costly in a lot of ways. Some defects are expected, and if they are within normal limits then it's considered an anomaly, human error, or time to update the machinery. If there are too many defects, we would use root cause analysis and try to figure out what is causing the defects to occur and work to fix them.

The other thing to consider is there may not be just one thing causing problems. Maybe the cookies are overcooked, which is a machinery problem. Perhaps there aren't enough chocolate chips in the cookies because I'm eating more than I'm putting into the dough, which is a human error (sorry, not sorry!), and a variety of other issues could occur that would need investigating. Just reviewing your process flowchart may not be enough. We will need to focus our inspections on a variety of potential issues and document them accordingly.

## Histograms

One way may be to use a simple bar chart that tracks the number of defects compared to when they occurred or where they occurred. Your stats are your own to track, but it's always good to have something visual to review and use to communicate. In *Figure 9.3*, you can see a very simple histogram for tracking quality and defects:

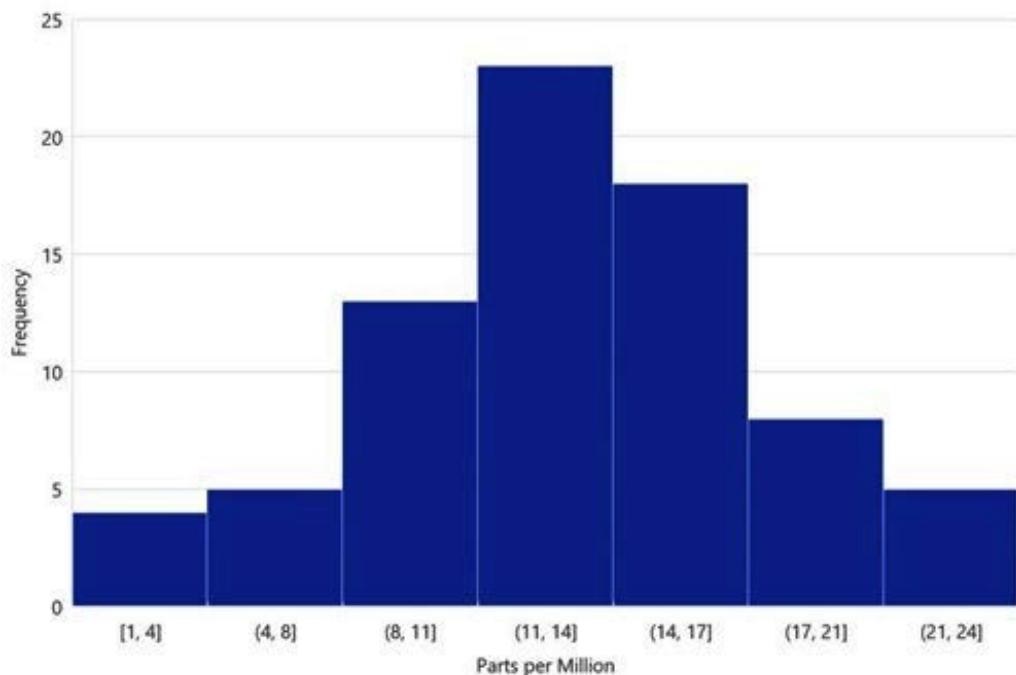


Figure 9.3 – Histogram

Without getting too statistical on you, most histograms will show a bell curve or normal distribution. Six Sigma works with the concept that there are six standard deviations between the customer's specification limit and the mean of the process. Process variations can be reduced by correcting the process itself until it is almost perfect. Getting fewer than 3.4 defects per million is the goal of Six Sigma processes. Six Sigma, as a concept, is described as a **highly disciplined process** where the primary focus is on developing near-perfect products and services:

- Six Sigma is a statistical term used to measure any deviations from a perfect result the process is causing.
- Greater deviation equals more defects.

In *Figure 9.4*, you can see the variables are presented in a bell curve (typically shown in a bar chart or histogram) and the sigma variables:

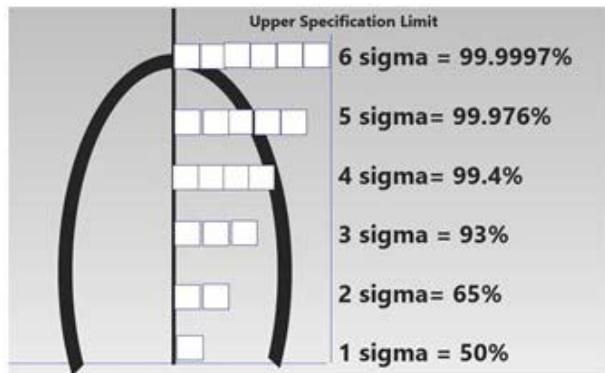


Figure 9.4 – Sigma variables

If all outputs of our process fall within six standard deviations from the mean, we will have satisfied our customers almost all the time. If we have one million customers, only 3.4 will experience a defect.

If that flew squarely over your head, do not despair; you will not be tested on anything sigma-related or statistical on the PMP® exam, it's just another way of showing your data visually and a focused attack on preventing defects. Too many defects increases the cost of non-conformance.

## Fishbone diagrams

The Ishikawa diagram was created by...wait for it...Dr. Ishikawa. It is used for root cause identification based on several categories. In *Figure 9.5*, you can see an example of a fishbone diagram in action. I remembered this as a FISHikawa diagram for my exam! Let's have a look:



Figure 9.5 – Ishikawa diagram

The **fishbone diagram** is used for visualizing risk and quality as a way to focus our conversations on why defects are occurring or in this case, why we are getting too many low customer satisfaction survey results. Is it that our prices are too high and if so, why? Is our product lower in quality and if so, why? Is it because someone had to sit on hold for two hours while listening to a poor excuse for elevator music and internally seething, only to be transferred and hung up on? Yikes! Is it all of the above? If so, what is impacting us the most right now? You can't change everything all at once, so it's crucial to determine what you can fix first and what is causing the most significant impacts and defects. That is where another chart can come in very handy. That chart is the Pareto diagram.

## Pareto diagrams

First, a little history on the Pareto diagram, because we know Pareto is one of the quality gurus we covered earlier in this chapter. Vilfredo Federico Damaso Pareto was a man with a huge name and brain and clearly hailed from Germany (just kidding). Pareto was an Italian engineer, sociologist, economist, political scientist, and philosopher. A busy guy! He is also most credited with the 80/20 rule or **the Pareto Principle** created in 1906.

Pareto was studying the distribution of wealth in Italy and determined that 80 percent of the country's wealth/land was owned by 20 percent of the population. He was also credited with the study of economic principles such as income distribution. Pareto was also responsible for the term "elite" becoming a popular way of describing the rich. Now that you have had an in-depth history lesson and are craving Italian food, let's look at the theory in the context of quality. The theory postulates that 80 percent of the output from a given situation or system is determined by 20 percent of the input.

We are looking at displays of results and trying to determine the relative importance of the defects and direct the improvement efforts to those areas. Seeking the most significant impact for the improvement of the result for the least amount of money is a pretty typical way to begin. Although the COQ is a *pay me now or pay more later* concept, we sometimes have to pay later to fix the leading causes of defects.

The Pareto Principle was not initially created for quality management; it was more a theory on economics, but a quality guru named Joseph Juran (remember him?) came along later and in 1941 implemented the principle as a way of discovering what the 20 percent of causes of defects are and how to make plans to fix those first. By the way, Joseph Juran spent his entire adult life working in quality management as a speaker, a writer, and influencer in both Japan and the United States, and from all available research, I can conclude he was an all-around nice guy as well. Juran was often quoted as saying "*the vital few and the useful many.*" By that, he meant we need to focus on the significant 20 percent of the causes of defects and work on those first but don't forget the other 80 percent either.

There is only so much we can do to check ourselves before we wreck ourselves or our product, service, or result, so focused efforts and continuous improvements are the core tenants of quality management. In *Figure 9.6*, you can see a simple Pareto diagram:

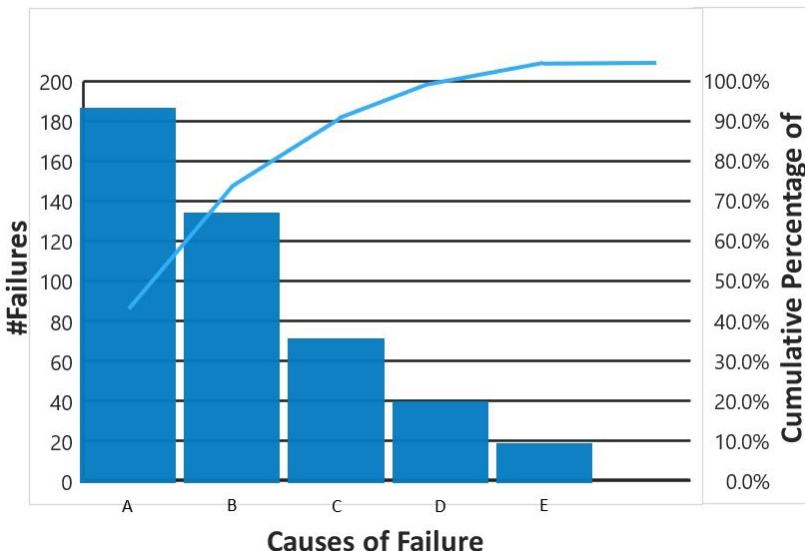


Figure 9.6 – Pareto chart

When reading a Pareto diagram, you'll see that the visual is a combination of a bar chart or histogram and a line graph. The values are in descending order, and the cumulative total is represented by the line. So, if you read the preceding chart to determine the most significant cause of defects, it would be **Parts and materials**. We would focus our efforts on fixing that problem first, then move on to manufacturing equipment, and so on. Easier said than done, for sure! What this chart is lacking is a timeline. When were these defects discovered across time? Is there a fluctuation in the results at different points in time? This is where a run chart can be helpful.

## Run charts

If you can remember back to when you were about six or seven, you may have had a school science experiment to track the weather and temperature every day for a month. Just me? I'm still running that experiment on the East Coast of the United States, and I'm here to tell you the results are grim. For the love of Pete, please stop raining and snowing!! Sorry...I went off on a weather tangent. My point is that using a run chart can help plot out results during a specified check-in event across a specified length of time. Every day at noon for one month, I log the temperature and see whether there are any wild fluctuations or whether things are pretty standard across the board. In *Figure 9.7*, you can see a basic run chart. It is also a line chart, which is typically straightforward to create and read:

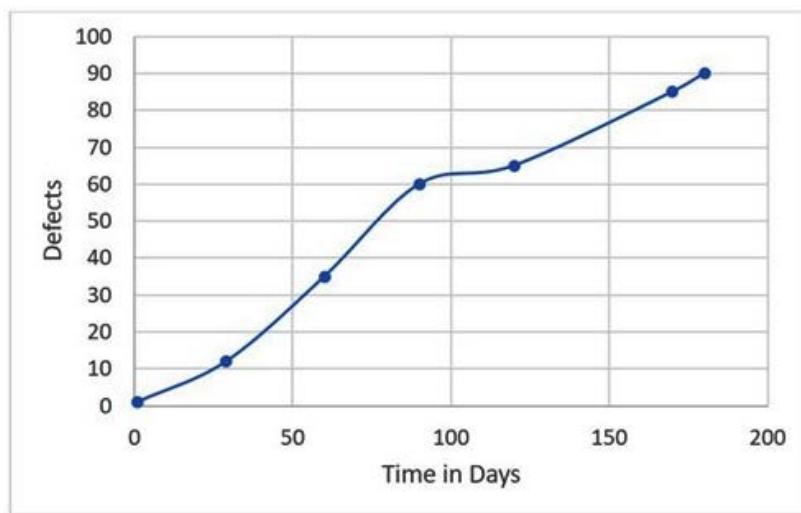


Figure 9.7 – Run chart

Our last chart will be used to compare two different variables to see whether they are working together to create a problem or whether we have two separate issues on our hands. That is called a scatter diagram.

## Scatter diagrams

As mentioned, scatter diagrams allow us to compare two separate inputs to see if they are working together to create a defect. It's possible that two things working together could create a singular problem. I'm eating too many chocolate chips; therefore, the chocolate chip shooter isn't getting enough chips into the cookie dough. Sorry about that! In *Figure 9.8*, you will see a straightforward scatter diagram. The keyword that explains this chart is a **relationship**. Is there a relationship between the two variables or not? Let's see:

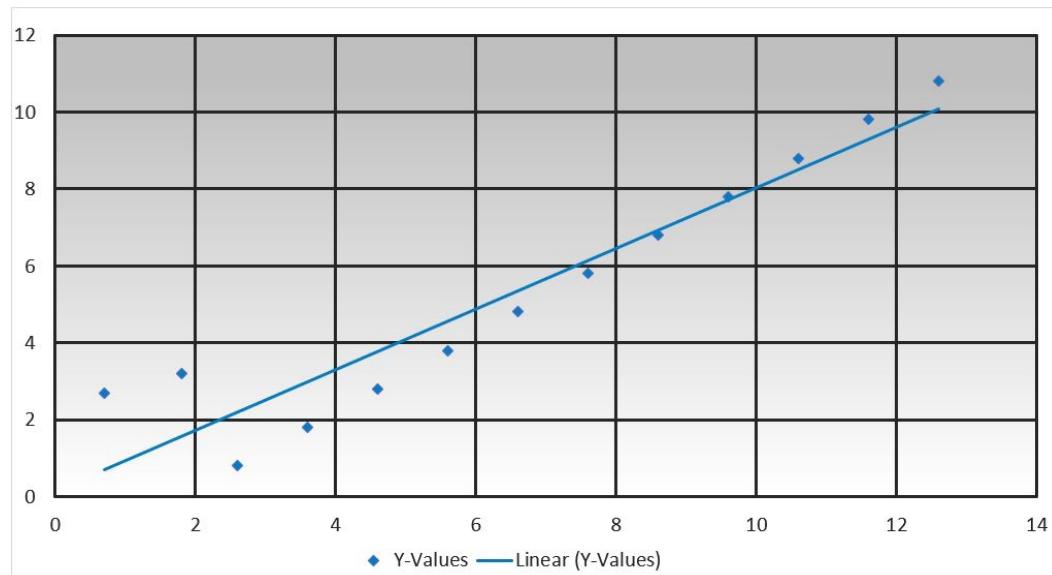


Figure 9.8 – Scatter diagram

The way to determine whether there is a relationship or not is by looking at the scatter of the plotted points. The closer the results are distributed together around the mean (diagonal line), the closer the relationship is. The further away from the scatter, the weaker the relationship is, meaning there are two separate issues causing defects and now you will have to look at each individually to decide what to focus on first.

Note that you may be asked to recognize these charts and graphs visually or identify them based on a description in a question.

## Control charts

Control charts are used with statistical sampling to plot out results over time, allowing us to determine whether our process is out of control or within control; stable or not stable. The customer has set specification limits of acceptable results and while fluctuation is expected, if the result bounces outside of those limits, this indicates a problem with our process. Either we are not performing the process correctly or the process is ineffective. Once a result is above or below the control limits, it's a red flag to perform targeted corrective actions. For the exam, a control chart is used in control quality for this purpose, but in statistical Six Sigma projects control charts can also be used to track schedule and cost performance as well as a variety of different sample types. For your purposes, it's important to know that if the results are above or below those limits, your process is out of control. In *Figure 9.9*, you will see a very simple chart that shows the **upper control limits (UCL)** and **lower control limits (LCL)** that are designated due to the tolerance levels for quality results and when defects can be identified:

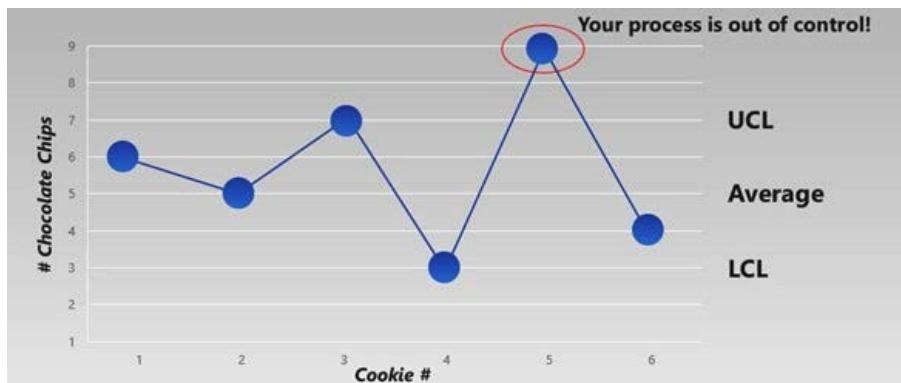


Figure 9.9 – Control chart

Managing quality and controlling defects is a constant game of whack-a-mole. As soon as one problem is fixed, another one pops up somewhere else. That is why proprietary quality control processes such as Six Sigma or ISO are so popular. They set the standards for quality in specific industries. For the rest of us, we are just trying to create the best product or service we can, and often, that is tough to quantify. We have to keep our eyes on the prize, and in many cases that means inspection first, and hopefully, the quality and scope of work are accepted as fit for use and correct.

## Summary

In this chapter, you have covered many best practices to plan, manage, and control quality, and have reviewed the importance of getting end results that are "fit for use."

In the next chapter, *Resources and Communications Management*, you will review additional processes for your resources, which can include people, equipment, and materials, as well as the knowledge area of communications.

## Assessment exam

### Question 1

You and your team are working on a crucial project for your best customer. They have asked you to create a cell phone for the elderly for mass production. The requirements state that the phone must have larger buttons and an amplifier for the earpiece, and that is it. They want a simple and usable design. Your team creates the phone, and all tests prove the phone functions the way it should. Which of the following best describes the phone?

1. High quality and high grade
2. Low quality and low grade
3. High quality and low grade
4. Low quality and high grade

### Question 2

Which of the following is the best description of the cost of poor quality?

1. Internal failure costs and external failure costs
2. External failure costs and rework
3. Loss of business and internal failure costs
4. Internal costs and training costs

### Question 3

You are a new project manager entering into a laptop battery manufacturing project halfway through. Your team is updating you, and their Quality Control process involves sampling one out of every 1,000 laptop batteries that are created as per requirements. They tell you that each battery is inspected for the time it takes to charge. The requirements state that each battery should be fully charged between one and three hours. The last sample took four hours to charge. What does this represent?

1. An attribute
2. A variable
3. A quality problem
4. An acceptable defect

### Question 4

Which of the following might represent a no-go decision?

1. The allowable range of correct results.
2. The result is missing a key element.
3. The person sampling has made a mistake.
4. The machinery needs to be repaired.

### Question 5

Your organization is working to create awareness and a commitment to meeting quality requirements. This is due to the customer finding defects in their order. Which of the following answers best describes this organizational action on the five levels of increasingly effective quality management?

1. Incorporating quality in planning.
2. Detect and correct.
3. Creating a culture.
4. Using the Manage Quality process.

### Question 6

Which of the following created the PDCA cycle in quality management?

1. Shewhart
2. Deming
3. Juran
4. Crosby

### Question 7

You have taken over in the middle of a large IT project after the previous project manager was pulled to work on something else. You are reviewing what they have accomplished so far and have determined that requirements have been collected for both scope and quality. Which document is important to work on next that will provide the metrics to meet quality?

1. Scope statement
2. Quality management plan
3. Cost-benefit analysis
4. Incorporating quality into planning

### Question 8

As your team becomes more fluent in Agile best practices, the team would like to hold a meeting at the end of every iteration. Which of the following questions would not be asked in a retrospective?

1. What should we keep doing?
2. What should we stop doing?
3. What should we start doing?
4. What should we focus on?

### Question 9

One of your organization's major competitors has been first to market with a new type of virtual reality machine. Your sponsor has called a meeting and is discussing the need to review the quality best practices of their organization in comparison to yours. Which of the following represents this practice?

1. Flowcharts
2. The SIPOC model

3. Benchmarking
4. Design of experiments

Question 10

Which of the following best describes Kaizen?

1. Changes in quality
2. Continuous improvements
3. An Agile approach
4. The tailoring approach

Question 11

The quality management plan is important for all of the following reasons except which one?

1. It describes the roles and responsibilities for quality management.
2. It describes the metrics that will be used to track quality.
3. It shows potential corrective actions.
4. It documents the cost-benefit analysis for the cost of quality.

Question 12

Your organization has a renewed focus on quality and has asked you to create or improve the process currently in use. You do a root cause analysis and realize the process is fine, but the team's execution of that process isn't precise. What might you do to help the team execute the process currently in place?

1. Give them a checklist to follow.
2. Create a quality management plan.
3. Discuss the metrics.
4. Hold a retrospective.

### Question 13

The SIPOC model represents all of the following except which one?

1. Suppliers
2. Inputs
3. Organization (output)
4. Process

### Question 14

The benefits of performing a cost-benefit analysis as it pertains to quality management planning include all of the following, except which one?

1. The primary benefit of meeting quality requirements is less rework.
2. The primary cost of meeting quality requirements is the expense associated with project quality management activities.
3. Determining the amount of money to put into the budget to meet quality requirements.
4. Understanding the cost of quality.

### Questions 15

Which of the following best describes the ISO definition of quality?

1. The degree to which a set of inherent characteristics fulfill requirements.
2. The degree to which a set of inherent characteristics fulfill quality.
3. The degree to which a set of characteristics fulfill requirements.
4. The degree to which a set of characteristics fulfill metrics.

### Question 16

Ben and Kareem are experts in quality management and are putting together a list of the process steps to help the rest of the team ensure they are executing the process correctly. Which of the following are they creating?

1. Check sheets
2. Quality management plan
3. Checklists
4. Quality control measurements

### Question 17

Jill is new to your team and was brought in as an expert in mechanical systems. You need her expertise since you will be working on a mass production project creating bicycle bells. She explains that you will need to perform statistical sampling on the population of bells and suggests that your team sample one out of every 1,000 bells and make sure that it works. Your team is performing the sampling and determines that in one of the samples the bell mechanism doesn't work, and they stop the assembly line to determine the root cause. This represents which of the following?

1. A variable
2. An attribute
3. A defect
4. A performance review

### Question 18

Your team is getting together at the end of an iteration and discussing ways that the product and its process can be improved immediately in the next iteration. The review has been done and the team has gathered a lot of great information and is now ready to put the new best practices into place. Which of the following Agile events does this represent?

1. Iteration planning
2. Daily stand-up meeting
3. Review
4. Retrospective

### Question 19

You have been a project manager in software development for ten years. Yesterday you were pulled to work on a project that is building a help desk for your organization. Software development is not necessary for this project. During the execution of the project work, you determine that you need to revisit the steps the team is taking due to the quality results not being what they should be. Which of the following processes will you be using?

1. Inspection
2. Audit
3. Manage Quality
4. Defect Repair

**Question 20**

During the control quality process, your team is trying to determine whether two separate inputs are creating a single problem. Which of the following charts or graphs will they use to do this?

1. A histogram
2. A Pareto diagram
3. A scatter diagram
4. A control chart

**Question 21**

During your statistical sampling process, you determine that four of your samples fall outside the normal control limits. One result is below the lower control limit and the other three results are above your upper control limits. What does this information show?

1. Your process is under control.
2. Your process is normal.
3. Your process has above 3.4 defects per million opportunities.
4. Your process is out of control.

**Question 22**

You and your team are working on a project that will create a better dog harness that allows for a GPS chip to be installed and an app to track your dog's location faster. There are numerous problems during your project. First, the material for the harness blocks the signal in some areas, the app has too many bugs (but you know the team will work through the tech issues as you go forward), and the ability to adjust the harness is more difficult to implement than anticipated. Which of the following charts or graphs can the team use to identify the biggest problem first and apply their time and effort to the biggest problem?

1. A Pareto diagram
2. A scatter diagram
3. A control chart
4. A run chart

**Question 23**

A root cause analysis of a quality process can best be assessed using which of the following?

1. A scatter diagram
2. A control chart
3. A run chart
4. An Ishikawa diagram

**Question 24**

Which of the following are the most necessary to gain the validation of the scope?

1. Quality control measurements
2. Verified deliverables
3. Work performance information
4. Control charts

**Question 25**

Bill is running inspections on the bicycle project and has determined that four of the tires had defects, two of the handlebars were not based on requirements, and that 13 of the bikes' saddles had problems with the stitching. Which document could Bill use to plot out all of the defects in order to communicate that information to the stakeholders, who can then make decisions about which is the most impactful on the quality of the overall project?

1. Checklists
2. Check sheets
3. A cause-and-effect diagram
4. Control charts

### Question 26

Finish this sentence by choosing one of the following sentences: "If we find defects outside of the normal limits or tolerance levels in our quality control inspections,

\_\_\_\_\_.

1. the result points to a problem with the way we are executing the work, or our process is flawed.
2. the result points to a problem with the way we are executing the work, but our process is fine.
3. the result doesn't point to a problem with the way we are executing the work, and our process is fine.
4. the result doesn't point to a problem with the way we are executing the work, and our process is flawed.

# 10

# Resources and Communication Management

In this chapter, you will review the knowledge areas of resource management and communications management. We will begin with the emerging trends and tailoring methods for your resources along with considerations to keep in mind for Agile teams. Additionally, we will look at a number of common resource management concepts and how organizational dynamics can impact resource usage and allocation. A large part of doing all of this successfully, along with engaging your stakeholders, is working on improving your communication skills to help practice excellent communication. You will review the trends, best practices, and use of Agile in communications. Additionally, the information in this chapter should help you to put together comprehensive plans and considerations for your team of individuals and other stakeholders through proper communications planning, management, and control.

In this chapter, we will cover the following topics:

- Key concepts in resource management
- Trends and emerging best practices
- Resource management planning
- Estimating activity resources
- Acquiring, developing, and managing a project team
- Controlling resources
- Key concepts in communications
- Communication management planning
- Managing communications
- Controlling communications

## **Key concepts in resource management**

A good thing to keep in mind as you work your way through this chapter is that the exam content outline is designed to test your knowledge of resource concepts. The hard part isn't the content; the hard part is answering questions based on the best practice suggested, rather than your personal enterprise environmental factors. For instance, maybe what you would do with your team isn't the recommended best practice. The PMP® exam is notoriously vague in its presentations of questions. It's one thing to ask a question about the critical path, which has a specific correct answer, but it's even more challenging to answer questions about the team environment or that environment with an Agile focus applied. Most people find that the resource and communications content is relatively easy to work through.

Key concepts in resource management fall under two categories, as follows:

- **Human resource management:** On the human side, the project manager should be both a leader and a manager. The leader aspect falls squarely under our ability to build a high-performing team that is rewarded, recognized, motivated, and can work through functional conflict with little need for interference. According to the *PMBOK® Guide – 6th edition*, there are numerous factors to consider:
  - a) The team environment
  - b) Geographical locations
  - c) Communications with stakeholders
  - d) Organizational change management
  - e) Internal and external policies for human resources
  - f) Cultural issues and organizational uniqueness

**Reference**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Page 309*

- **Physical resource management:** This involves making sure your materials, equipment, and additional supply needs for the project are managed effectively and efficiently. Several aspects to consider in physical resource management include making sure critical equipment is available and ready to use, any materials are of high quality to reduce the possibility of rework, and not keeping too much or too little inventory. Doing either of the latter can result in extra costs and, therefore, removing the said costs from potential profits.

The wonderful thing about the people and management side of project management is that there is a definitive shift in how teams work together. The culture is becoming more collaborative and less focused on rank and file. Therefore, trends and emerging best practices are a bit more exciting than they used to be, and my Agile brain digs it!

## Trends and emerging best practices

Many trends and emerging practices in project management are moving away from typical functional environments into more Agile environments. What's so great about resource management trends is that they are beginning to identify and accommodate the lack of critical resources when working on singular projects. I would imagine that every single one of you is working on more than one project at a time, and finding yourself working 100 percent of the time on one project is a thing of the past. Some of the more commonly used management methods to accommodate a lack of critical resources include lean management, **Just-in-Time (JIT)** manufacturing, Kaizen, **Total Productive Maintenance (TPM)**, and the **Theory of Constraints (TOC)**. Having multiple different types of best practices opens up the creative side of project management and the ability of project managers to tailor their projects using what works best for each unique project. The more challenging aspect is sometimes having too many choices since this renders us incapable of implementing them all effectively. At a high level, the trends mentioned here are more related to the Agile side. Here is an overview of each:

- **Lean management:** Here, the focus is on the process, and if extra steps are being taken, then that is causing a problem with the result. The goal is to keep the process lean, which also lowers costs. Your team should look for those areas in the process that they can control or actively remove in order to streamline the execution of the project while protecting the results.
- **JIT:** The goal of JIT is to use a focused approach that reduces durations within the production system along with response times from suppliers and to customers. JIT was created in Japan in the 1960s and 1970s at the Toyota plants, and it is sometimes referred to as the TPS or Toyota Production System.
- **Kaizen:** This is a combination of two Japanese words: Kai and Zen. Together, they are loosely translated as *change for the better* or *continuous improvement*.
- **TPM:** This involves having a distinct focus on machinery and equipment and making sure the maintenance of each is kept up to date to prevent any stalling or production stoppages.
- **TOC:** This is designed to stop any bottlenecks in the process. The constraint is identified and removed or it is improved to the point where it no longer impacts the process flow.

## Resource management planning

The first thing you probably think of when you hear the word "resources" is the human side of project management, and, mostly, you would be correct. However, resources also refers to equipment and materials. All three resource types need to be estimated, scheduled, and paid for; in fact, estimating resources is very tightly integrated with costs and budgeting. It makes sense that people, equipment, and materials cost money. Some of these can be considered **soft costs**, meaning that your organization is probably already paying people their hourly rate or their monthly salary through the organizational payroll. Therefore, those costs would not be considered part of your budget.

Additionally, materials and equipment could unilaterally be a part of your organizational processes via a procurement department or through the everyday needs of the organization to run the business effectively. For your exam, you need to consider your budgetary costs for resource utilization along with aspects of procurement in order to acquire any resources from outside your organization.

I'm sure it's obvious that having the team that you work with all the time is a perfect situation for project managers. You know your team, you know their skills, and you know their work styles and personalities; that makes it easier to schedule work correctly and interact with your team daily.

The PMP® exam assumes a strong matrix organization (unless otherwise stated in the question). This assumption would provide a team of core resources for the project and the potential for acquisitions outside of the team for functional resource needs or through staffing and procurement, which is why it would be necessary to acquire your team. This means acquiring the **rest** of your team when it's time to execute the work.

You may not be able to interact with your team daily, and since projects are temporary and unique, it would make sense that some of your resources are as well. The disadvantage of this type of team is that its members may be working only part-time on your project. For instance, they could have a *real job* in their functional departments, and they may be more focused on their day job than what is going on in your project. Those team members may also be more focused on their performance reviews from their manager than their performance in your project. This means that their loyalty may lie with their functional managers.

Even though we're still in the process of resource management planning, we are thinking ahead to the execution of the project and how imperative it is to estimate, acquire, manage, and use our team and physical resources to our best benefit. One of the questions that will require an answer is who is in charge of individual performance assessments? In some cases, it could be you, and in others, it could be the functional managers. That is why the resource management planning processes are performed either once or at predefined points of the project, as needed.

Much of the resource management planning process attempts to determine who and what you will need to execute the project work effectively. The majority of that will be on the human side, in terms of your team members and the specific roles and responsibilities they will have on the team, as well as looking for gaps where necessary resources would need to be acquired. That's also why I combined resource management planning and communications management planning in this chapter, because there's quite a bit of overlap when planning processes for people, equipment/material acquisition, and ensuring excellent communication.

## Plan resource management

The majority of human resource planning involves determining roles and responsibilities so that they can be clearly expressed to your team, and also explaining how team and stakeholder communications will occur. It is also essential to clearly understand the chain of command, as well as your expectations on performance reporting. Organizational charts and position descriptions can help with this. The organizational chart is a hierarchical, visual overview of department heads and their teams. It can be useful if you are new to an organization or if you are trying to figure out which functional departments you might need to engage with to suit your project team needs. I'm also a big fan of creating a project organizational chart, especially if you have a large team, multiple stakeholders, and possibly remote or virtual team members. Project organizational charts are useful for communication and are excellent for those times when someone comes to your office with lots of questions when they need to be asking those questions to someone else. It helps to keep things organized and removes the dumbfounded look from our faces when we are asked a question that we can't answer. If we go with the assumption that you have a core team of people to help you plan and that you may need to acquire others to help with the project's execution, it's safe to say that you will need to determine who does what. You may know your team well and what their skill sets are. That may be the natural part, but if you acquire others, you need to know what gaps they are filling. In some cases, you might not even know those people's names yet because they haven't been acquired or negotiated for, but you do see the role or skills needed for the project. Either way, a **Responsibility Assignment Matrix (RAM)** may be beneficial.

In *Figure 10.1*, you can see a generic RAM that shows what activities require additional resources to execute the work and how many are needed. You can adapt the RAM as you get further into planning and add names and other necessary information. However, for now, we'll keep things simple:

WBS Code of Accounts	Team Role 1	Team Role 2	Team Role 3	Team Role 4	Team Role 5
1.3.5	2			3	8
1.3.6		1			1
1.3.7	1		5		7
1.3.8				2	
1.3.9			3		1
1.3.10	5				
1.3.11			3		3

Figure 10.1: RAM

Another way you can represent resources and roles is by using a **RACI chart**.

RACI stands for the following:

- **Responsible:** These are the people who execute the work.
- **Accountable:** These are the people who will be held liable for the result of the task's execution.
- **Consult:** These are the people who can provide expert judgment on the task at hand.
- **Inform:** These are the people who need updates about the task's progress.

RACI charts are a great and easy way to show resource needs and allocation visually. Sometimes, people wonder whether someone can be both responsible and accountable, and the answer to that is yes, they can. The goal is to keep the RACI chart as simple as possible and to use it as a guide for filling gaps, reviewing the current allocation, and helping the team determine their expertise and communication strategy for the tasks.

In *Figure 10.2*, you can see a straightforward RACI chart:

RACI Chart		Person			
Task		Ann	Ben	Carlos	Dina
Create charter	A	R	I	I	I
Collect requirements	I	A	R	C	C
Submit change request	I	A	R	R	C
Develop test plan	A	C	I	I	R

R = Responsible    A = Accountable    C = Consult    I = Inform

Figure 10.2: A RACI chart

Be sure to remember what the acronyms RAM and RACI stand for in case you get a question on it, and also be aware that a type of RAM is a RACI chart.

Of course, these are not the only ways to plan for your human resources. Most of us will schedule out our resources across multiple tasks throughout the project without trying to over-allocate our resources in the process. Whatever works best for you and the team is the right way to plan for resources.

Whether you use organizational charts, negotiate with functional managers, submit resourcing needs through a procurement department, or beg, borrow, or steal your resources, it's never a bad idea to think about how you will acquire, reward, recognize, motivate the release of, and manage your team of individuals. That is the importance of planning, thinking ahead, and having the best possible plan for your resources. This is so that when it is time to execute the project work, you have the right resources in the right place at the right time with the right skill sets. Yes, I know; it's easier said than done, right? I think the biggest complaint I get from my students and clients no matter what country I'm in is the excessive lack of resources and the do-more-with-less attitude of those who are not in the trenches with us. Therefore, Agile, and collaborative, self-directed teams are becoming more crucial as well.

Other tools or documents that you can use to help you to plan effectively for your resources outside hierarchical charts and responsibility assignment matrixes include some of the other documents that you may have already created. As inputs, you have your quality management plan and your scope baseline, because resources need to do the work and follow the requirements for both the quality and scope of work. You also have your schedule, requirements documentation, risk register, and your stakeholder register. These documents, along with your enterprise environmental factors and organizational process assets, can provide information that will allow you to plan more effectively. For example, the risk register is a living and breathing document that tracks all threats and opportunities, their probabilities and impacts, your responses to these potential risks, and any risk owners. The risk owners are the human resources, who are tasked with implementing the chosen risk response. Hence, we have a text-oriented format that helps us to plan our resources.

The outputs to this process will include a resource management plan, a team charter, and potentially some updates to your assumption log and risk register.

Your enterprise environmental factors play a massive role in resource management planning. Focusing on things such as the organizational culture and structure is essential. In this way, you know where in the world your facilities or resources are, what the existing competencies of your resources are, and whether they are available for your projects. Finally, marketplace conditions could hinder your organization's ability to hire or obtain more resources for your projects. On the organizational process assets side of things, the focus of resource management is on policy and procedure for human resources, physical resources, safety and security, and any potential templates or historical information that can help you to plan.

Expert judgment is the number one tool or technique in project management. However, it is exceedingly important to ensure that you can utilize this expert judgment in a variety of different ways. These include negotiating, developing your personnel, reporting various requirements, being mindful of scheduling considerations, such as lead times for acquisition, understanding risks, knowledge of government or union regulatory compliance, as well as procurement and seller management.

The resource management plan is a formal plan integrated into the overall project management plan. There could very well be two facets of this plan: one section for the people side and another for the materials and equipment.

The standard headers of a resource management plan include the following:

- How you identify your resources
- Acquisition guidance
- Roles and responsibilities, including authority and confidence
- Project organizational charts
- Management of the project team, including staffing and release
- Training and strategies for team members as needed
- How you will reward recognize and develop your project team
- How you will ensure that you have enough physical resources and information on how you will manage your inventory, equipment, and supplies throughout the life cycle

**Note**

The team charter is also an output of the plan resource management process and is a new addition in the *PMBOK® Guide – 6th edition*.

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Pages 319-358.*

I like to think of the team charter as a mission statement for the team. If the team creates it, then they are more likely to stick to it. This is not to say that as project managers you won't have rules and responsibilities that are necessary for a high-performing team, but having clear expectations and commitments allow for precise guidelines. As things change, the team charter might need to be updated, especially with the coming and going of different human resources. Just like you will find in sports and understanding what the rules of the game are, rules of engagement and a focused commitment to your team members allows for a more successful outcome.

The potential headers for a team charter include the following:

- Team values
- Guidelines for communications
- How the team makes decisions
- Conflict resolution
- Rules for meetings
- Personal agreements by team members for the rules of engagement

The majority of the questions focus on the tools and techniques and outputs rather than the inputs. Although the inputs are important, the exam wants you to be more conscious of the different ways you should plan for your resources, that is, the inputs, tools and techniques, and outputs of a resource management plan:

**Inputs**

- **Project charter**
- **Project management plan**
  - a) Quality management plan
  - b) Scope baseline

- **Project documents**
  - a) Project schedule
  - b) Requirements documentation
  - c) Risk register
  - d) Stakeholder register
- **Enterprise environmental factors**
- **Organizational process assets**

#### Tools and techniques

- **Expert judgment**
- **Data representation**
  - a) Hierarchical charts
  - b) Responsibility assignment matrix
  - c) Text-oriented format
- **Organizational theory**
- **Meetings**

#### Outputs

- **Resource management plan**
- **Team charter**
- **Project documents updates**
  - a) Assumption log
  - b) Risk register

As we wrap up this section on resource management planning, it's crucial to look at one of the tools or techniques that we haven't yet discussed: organizational theory. Organizational theory is the internal understanding of how your organization works and how other teams and their managers interrelate. It's a bit like emotional intelligence on an organizational level. If you've ever been asked to work on a project with another manager and a bunch of people who you have never worked with before, there is a tendency to experience a bit of culture shock. Culture shock isn't just getting off an airplane in a different country; it is also being removed from a situation that you're used to and put into an unfamiliar situation. It may be the best situation you have ever been in, but there is still a slight uneasiness because it's new. As project managers, we need to be able to understand that and understand how our organization works well enough so that we can explain it to team members who might not have as deep an understanding of it as we do.

## Key phrases that pay

Here's a list of the key phrases in resource management planning:

- RAM
- RACI
- Organizational theory
- Team charter

The next resource management process we're going to go through is estimating activity resources. In the *PMBOK® Guide – 6th edition*, the location of this process was moved from schedule management to resource management. The update makes sense, and in *Chapter 8, Schedule and Cost Management*, I mentioned that this process falls between sequencing activities and estimating activity durations. That process is *estimating activity resources*, so even though it now lives as a process in resource management, it is still a significant consideration for both cost and schedule planning.

## Estimating activity resources

The process of estimating activity resources is exactly what it sounds like. We want to figure out the amount, type of people, materials, equipment, and supplies to perform our project work. It would make sense that this process is performed iteratively, as needed, throughout the life cycle.

What you'll find, as we go through the tools and techniques, is that they very closely reflect estimates of both duration and cost. However, first, as we go through the inputs, you'll note that the project documents reveal schedules, costs, resources, and potential risks:

### Inputs

- **Project management plan**
  - a) Resource management plan
  - b) Scope baseline
- **Project documents**
  - a) Activity attributes
  - b) Activity list
  - c) Assumption log
  - d) Cost estimates
  - e) Resource calendars
  - f) Risk register
- **Enterprise environmental factors**
- **Organizational process assets**

### Tools and techniques

- **Expert judgment**
- **Bottom-up estimating**
- **Analogous estimating**
- **Parametric estimating**
- **Data analysis**
  - a) Alternatives analysis
- **Project management information system**
- **Meetings**

## Outputs

- **Resource requirements**
- **Basis of estimates**
- **Resource breakdown structure**
- **Project documents updates**
  - a) Activity attributes
  - b) Assumption log
  - c) Lessons learned register

The nice thing about this section on the exam is that it's relatively self-explanatory, and the majority of the inputs, tools, and techniques have already been reviewed in other chapters. Just remember that bottom-up estimating is the most definitive because it uses the WBS. The outputs are the actual requirements for resources that you think you need at the time and could be updated in the future. The basis of estimates is to answer the question of where did you come up with that number? We have to justify the need for resources since the majority of organizations could be lacking proper project resources for the number of projects they have going on at one time. You might've noticed that there's another breakdown structure as an output; in this case, it is the **Resource Breakdown Structure (RBS)**. In *Figure 10.3*, you will see a simple rendering of your resources plotted out a visual way, which can be exceedingly helpful when you are matching up the resources to the work packages and WBS:

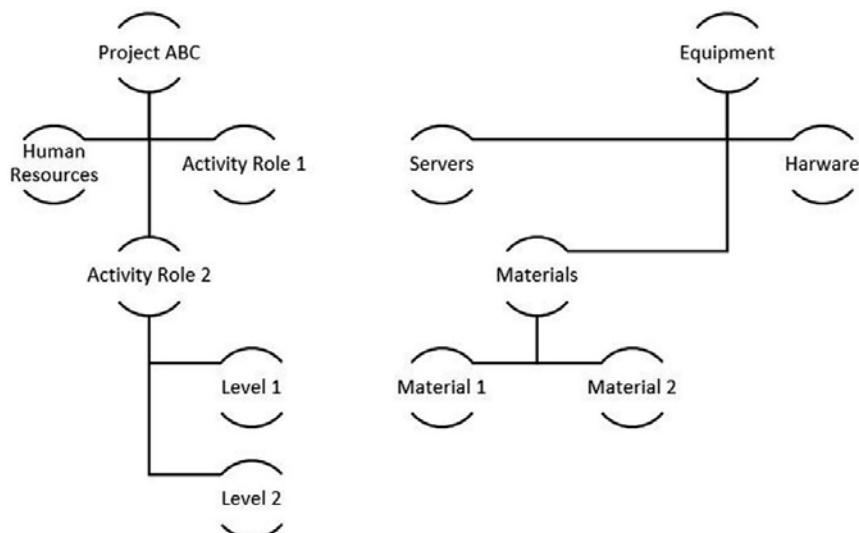


Figure 10.3 – RBS

The value of an RBS is that it can be used as a guide to acquire and monitor resources and provide a visually applicable breakout per the work breakdown structure. Another thing to be aware of is that there are two types of RBS. The first is the "resource" breakdown structure. The second is the "risk" breakdown structure, which we will discuss in *Chapter 11, Risk Management*. For now, the risk breakdown structure is a visual representation of the categories of potential risks and it allows us to compartmentalize our brainstorming of threats and opportunities as well as categorize possible causes. No matter what, the better the visuals are, the more able we are to use them to our best advantage. In this case, due to the everchanging landscape of resource management and due to more project managers having to do more with less, a visual representation of necessary resources can be an integral part of planning. In *Chapter 6, Creating and Leading a Team*, you covered the team development and management concepts that are important to the people side of project management. We will need to be aware of many of the things that we are planning for here during project execution. However, in planning, we will define team ground rules, plan to engage and support our virtual teams, address and remove impediments, obstacles, and blockers for the team, and build a shared understanding of what it is that we're trying to accomplish as a team.

## Key phrases that pay

Here's a list of key phrases in the estimating activity resources process:

- Bottom-up estimating
- Analogous estimating
- Parametric estimating
- Resource breakdown structure

Now that we have planned for resource management and estimated our activity resources, we can move on to the execution process and discuss the acquiring, developing, and managing resources processes.

# Acquiring resources, developing, and managing a team

One thing you will notice is that a lot of the content for these processes has been or will be covered in other chapters. Specifically, in *Chapter 6, Creating and Leading a Team*, you reviewed ways to overcome conflict and how to reward, recognize, and motivate your team. This section is mostly a reminder of the inputs, tools and techniques, and outputs of the *Resource management planning* section and a closer view of material and equipment acquisition. Let's start with acquiring resources.

## Acquiring resources

This section is another of those "easier said than done" sections, and it is also exactly what it sounds like, that is, the acquisition of resources. Previously, I mentioned that acquiring resources is necessary due to the need to bring in the remaining resources (such as people, equipment, and materials) that have been borrowed or acquired from other functional teams, or even externally via procurement. Because it's time to execute our work, the acquisition process may be iterative throughout, as resources come and go due to project necessity. Let's take a look at the inputs, tools and techniques, and outputs of the acquiring resources process:

### Inputs

- **Project management plan**
  - a) Resource management plan
  - b) Procurement management plan
- **Cost baseline (that is, people, equipment, and materials cost money)**
- **Project documents**
  - a) Project schedule
  - b) Resource calendars
  - c) Resource requirements
  - d) Stakeholder register
- **Enterprise environmental factors**
- **Organizational process assets**

## Tools and techniques

- **Decision making**

a) Multicriteria decision making: This technique is based on a selection criteria that we would know in advance and making the best decisions with regard to resources based on the criterion that matters the most to the project. Those decisions may be made based on the following information:

- Availability
- Costs
- Ability
- Experience
- Knowledge
- Skills
- Attitude (I would much rather have someone with a great attitude than a poor attitude and good experience. That's just me. Making these decisions for your projects can be a personal thing and for the good of your projects.)
- International factors (for example, time zones, location, and more)

- **Interpersonal and team skills**

a) Negotiation (you may need to negotiate with functional managers, or negotiation may be necessary for procurement functions. We'll cover procurement in more depth in *Chapter 12, Procurement Management.*)

- **Pre-assignment** (you get who you get because the powers that be say so.)
- **Virtual teams**

## Outputs

- **Physical resource assignments (such as materials and equipment)**
- **Project team assignments**
- **Resource calendars (for new resources)**
- **Change requests**

- **Project management plan updates**
  - a) Resource management plan
  - b) Cost baseline
- **Project documents updates**
  - a) Lessons learned register
  - b) Project schedule
  - c) Resource breakdown structure
  - d) Resource requirements
  - e) Risk register (an updatable document that defines threats, information about opportunities, and risk owners, that is, those who will implement the risk responses)
  - f) Stakeholder register (a running list of stakeholders and their levels of influence, communications needs, and requirements)
- **Updates on enterprise environmental factors**
- **Updates on organizational process assets**

Because each organization is different, and each may have a variety of influencing factors concerning resource acquisition, it's important that the project manager or team effectively negotiates and influences those who can lend or approve resources for the project. It makes sense that if we don't acquire who and what we need, the project's success could be compromised or even aborted.

I've never been part of a project that has had either enough or the best resources we could ever want, and, mostly, we are doing more with less. However, during the resource management planning process, we have hopefully documented and now understand why we may need workarounds without compromising on the budget, contracts, training, or other constraints that could impact our project's success.

## Developing and managing a team

Once you have acquired your resources, it will be important to develop your team of individuals and manage those resources and their performance accordingly. The next chapter will dig much deeper into these best practices. Any additional information is located within the inputs, tools and techniques, and outputs of each process. The inputs, tools and techniques, and outputs of the process of developing a team include the following:

### Inputs

- **Project management plan**
  - a) Resource management plan
- **Project documents**
  - a) Lessons learned register (remember, we assume that this will be updated throughout the project, not just at the end)
  - b) Project schedule
  - c) Project team assignments
  - d) Resource calendars
  - e) Team charter
- **Enterprise environmental factors** (that is, major considerations for resources, including HR policies, geographical distribution, and the skills, competencies, and specialized knowledge that may be required)
- **Organizational process assets**

### Tools and techniques

- **Colocation** (recommended for all, or at some, points in the project when virtual team members are involved)
- **Virtual teams**
- **Communications technology**
- **Interpersonal and team skills**
  - a) Conflict management
  - b) Influencing
  - c) Motivation

- d) Negotiation
- e) Team building
- **Recognition and rewards**
- **Training**
- **Individual and team assessments**
- **Meetings**

## Outputs

- **Team performance assessments:** The team performance assessments are on the entire team, rather than one performance review per team member. Ensuring that you are building or maintaining a high-performing team doesn't happen overnight, and as you evaluate the team, you are looking for skill improvements, competencies, training needs, a reduction in staff turnover, and increased team cohesiveness. With this information, you can begin to determine whether training, coaching, or changes to the team via corrective or preventative actions are necessary.
- **Change requests**
- **Project management plan updates**
  - a) Resource management plan
- **Project documents updates**
  - a) Lessons learned register
  - b) Project schedule
  - c) Project team assignments
  - d) Resource calendars
  - e) Team charter
- **Updates on enterprise environmental factors**

- **Updates on organizational process assets:** The goal of developing a high-performing team is to be able to improve its knowledge and skills through training while keeping costs low, improving schedule outputs, and improving the quality of deliverables. Whether the project is predictive, Agile, or hybrid, it's our job as project managers to work in order to improve feelings of trust and agreement and raise our team's morale. You can reduce conflict and build up teamwork through empowerment, team spirit, collaboration, and cross-training/mentoring. This is also where Tuckman's ladder comes into play: forming, storming, norming, performing, and adjourning. Now, let's take look at an overview of how to manage a project team.

We will now take a look at the inputs, tools and techniques, and outputs for managing a project team:

### Inputs

- **Project management plan**
  - a) Resource management plan
- **Project documents**
- **Issue log**
  - a) Lessons learned register
  - b) Project team assignments
  - c) Team charter
- **Work performance reports** (communications about project performance)
- **Team performance assessments** (information about the team's performance)
- **Enterprise environmental factors**
- **Organizational process assets**

## Tools and techniques

- **Interpersonal and team skills**
  - a) Conflict management (covered in *Chapter 6, Creating and Leading a Team.*)
  - b) Decision making: Guidelines recommended for effective decision making include focusing on the goals, creating and following a decision-making process, understanding the environmental factors of your organization, analyzing the information that is currently available and potentially using empirical knowledge to change its direction as needed, using the team's creativity and encouraging it, and always accounting for risk.
  - c) Emotional intelligence: The ability to identify, empathize, and manage the collective emotions of individuals and the team, and checking ourselves and how we present our emotions to the world and managing them professionally.
  - d) Influencing: The ability to clearly explain your position and that of your stakeholders, utilizing effective and active listening skills, identifying and being aware of different points of view in all situations, and gathering the correct information to make the best decisions, manage issues, and reach agreements while maintaining trust.
  - e) Leadership
- **Project Management Information System (PMIS)**

## Outputs

- **Change requests**
- **Project management plan updates**
  - a) Resource management plan
  - b) Schedule baseline
  - c) Cost baseline
- **Project documents updates**
  - a) Issue log
  - b) Lessons learned register
  - c) Project team assignments
- **Updates on enterprise environmental factors**

Be aware of ITTOs and also the nuances behind them. Many questions in the exam will focus on people and how you work with your team. As you move forward through controlling resources, be aware that this process is above and beyond some people and, in general, is much more focused on materials and equipment and ensuring they arrive on time, are utilized correctly, and that potential risk events don't throw a big old wrench that you didn't want to acquire into your project's operations.

Aside from the ITTOs, it is also crucial that you understand your team and how they are motivated.

## Supporting your team's performance

Even if you have self-directed and self-managed teams similar to those you might find on an Agile team, it is still important to coach, guide, and otherwise support your team's efforts while tracking their performance. Since the majority of the exam is based on colocated teams, it does make it a bit easier to do that in the context of questions. However, it may be one of the more difficult aspects of project management due to the many personalities, varying skills, and motivation levels of the members of your team. One of the best ways I've found to drive better team performance while considering skills and goal setting is via **Management by Objective (MBO)**.

### Peter Drucker's MBO

Peter Drucker was a major influencer of organizational development during his time as a management consultant. In 1954, based on a book he wrote, Drucker created the mnemonic **SMART**. This might be familiar to you if you have ever attended any management training courses. In fact, it was a big deal in the 1990s when I was going through my management training at a large software company, and I'm still writing about it today. The reason why setting SMART objectives is so important is because you, as a manager, are working together with your team members to help them be successful. Even though this isn't necessarily a motivational theory, it is highly rewarding for a coach or team member to see success occur and to meet goals that may have appeared unattainable prior to the objectives being set. Let's review the SMART mnemonic.

## Specific

Setting specific goals is the first step in attaining those goals. I read an article that stated that the majority of people who make yearly resolutions never keep them. This could be why workout facilities and gyms are filled the day after your holiday celebrations, and 2 months later, they are totally empty. The reason is that the resolutions were not specific. For instance, consider these statements: "I want to travel more," "I want to get healthy," and "I want to make more money." These are wishes, not goals, and that is the reason why they are impossible to meet. There is nothing quantitative about these statements, and therefore no path to follow to get to where you want to go. I had a boss who loved to say things such as "You all need to do a better job." Ummm okay...at what? Not being specific enough means nothing will improve.

## Measurable

In order to track progress, it is important to know what your goals are and how to measure them. This is where even milestones are a good way to measure progress. Typically, once you have a specific goal in mind, you can then determine how to measure the progress toward that goal. Instead of "I want to get healthy," the specifics could be "I want to lose 10 pounds." Then, we can begin to look at how to measure that: "I want to lose 10 pounds in 4 months and that means I want to lose 2.5 pounds a month." This is something that can be measured, that is, did you or didn't you?

## Attainable

This asks whether it is even possible to meet that particular goal. In my example of weight loss, you could say, "Yeah, sure, people do it all the time! Not me, but, you know, *people*." So, check whether it is something that the team member can do, and if not, there may need to be an adjustment to the goal or they may need some training, mentoring, or coaching to get them there. This isn't a race, so make sure that when you are setting measurements, you take into account the time it takes to attain the goal. If they can't do it, then they will become demotivated and deflated. So, we, as managers, need to make sure that a person has or can attain the skill sets to meet the proposed objective.

## Realistic

*Realistic* might sound a lot like *attainable*, but in this case, we are trying to determine whether this is something they should be working on right now. For instance, is it a realistic goal to be pursuing right now or at all? Maybe not. If I have a team member who is my schedule coordinator (yay!), then it might not be realistic to pull them away from that and help them attain the goal of doing my budget for me or losing 10 pounds for me. Trust me, if I could hire someone to do that for me, I'd be a happy, happy, thin person. My point is this: if what you are trying to attain isn't realistic at the time, and it is pulling the team member away from things they need to be focused on right now, then it isn't realistic. If it's a skill they want to attain, then it's something you can work with them on at another time especially as it isn't realistic right now.

## Time-based

All goals have to have a finish line, or we would never reach them. If you like to procrastinate, then you know what I mean when I write about having no finish line. A good example of this is that I have at least 20 years left on my mortgage to clean the garage, which means I can put it off indefinitely. 20 years is too far out. Even though it has a finish line, it's too much time and any skills learned could be lost later on. It's important to have a deadline for goal attainment or at least to see how far the team member has come at the time-based deadline: "I want to lose 10 pounds in 4 months and that means I want to lose 2.5 pounds a month." After 4 months, the goal was to lose 10 pounds. If, at month four, I step on the scale and have lost four pounds, which is highly likely, then it could be that my original goal wasn't attainable. But I have made some progress. It's important to celebrate those achievements, even if the goal wasn't met. Please say we are celebrating with cake!

One thing to note when setting SMART objectives is to work with the team member on their goals. You are not dictating to them, but you are working with them to set those goals. Most people know their limitations and what they want to achieve. However, they just might not know the road map to achievement, and that is where you come in. Help them to help themselves. Another rule of thumb that I follow for myself and when coaching other people is to not set more than three objectives to meet at any given time. This isn't a laundry list of improvements or goal setting. Keep it SMART.

*Ability* and *willingness* are also something I keep in mind when setting goals with my team as a group or as individuals. *Ability* is similar to *attainable*. I ask myself and the person whether they have the ability. Telling someone to do a better job when they don't have the ability to improve is the single worst coaching tactic you can use. They will become demotivated and still not be able to achieve what you are asking. At that point, it is up to us to get them some training and help mentor and coach them to success. That is so much easier than a willingness issue. If your team member isn't improving because they simply don't want to, or they are pushing back because change is being asked and they have always done something a certain way, you may be in for a battle of wills. If the team member doesn't have the willingness to improve or change when being asked, it may be time to have a serious conversation. Typically, this type of situation involving conflict ends up in the HR department or with written warnings. It may be best to remove this person from your team (if possible) because they are negative and are not helping the team be successful. A lack of willingness and personality clashes are few and far between. For the most part, we are all adults and professional people, so hopefully, this isn't something that you will encounter.

To more effectively focus on ability and its various aspects, it is important to empower your team and stakeholders. Next, let's move on to the control of resources, which is typically focused on the human side of things.

## Controlling resources

As you execute project work, you will know how well your plans are working. For instance, whether you have acquired and utilized your physical resources effectively and whether those resources were correct and were at the right place at the right time throughout the project. As you review the inputs, tools and techniques, and outputs of this process, be aware that the majority of questions will overlap with procurement, materials, and requirements along with the team utilization of them. At the same time, you will need to consider dealing with risk and the possible need for more or different resources than originally planned for. Let's take a look at the inputs, tools and techniques, and outputs of the control of resources:

### Inputs

- **Project management plan**
- Resource management plan
- **Project documents**
- Issue log
- Lessons learned register

- Physical resources assignments
- Project schedule
- Resource breakdown structure
- Resource requirements
- Risk register
- **Work performance data** (the raw data we collect from resources)
- **Agreements** (contracts, service level agreements, and more)
- **Organizational process assets**

### Tools and techniques

- **Data analysis**
- Alternatives analysis
- Cost-benefit analysis
- Performance reviews
- Trend analysis (how current work and resources are behaving compared to the baselines and any trends in the right or wrong direction that can help you to make future decisions about your resource utilization ad performance)
- **Problem-solving**
- **Interpersonal and team skills**
- Negotiation
- Influencing
- **PMIS**

### Outputs

- **Work performance information** (work performance data runs through data analysis techniques such as trend analysis and the results become work performance information. That information is processed in reports and communicated out to stakeholders.)
- **Change requests**
- **Project management plan updates**
- Resource management plan

- Schedule baseline
- Cost baseline
- **Project documents updates**
- Assumptions log
- Issue log
- Lessons learned register
- Physical resource assignments
- Resource breakdown structure
- Risk register

The process of controlling resources is iterative and should be performed continuously throughout the project's life cycle or phases. The process is also focused on materials and equipment, so even though you saw negotiating and influencing in the tools and techniques section, I want you to imagine those techniques being utilized to make sure the right materials and equipment are in the right place at the right time and with the correct needs. Controlling resources is concerned with monitoring the expenditures and costs, shortages and surpluses, usage and release criteria, any issues, the necessity for changes, and then managing those changes accordingly. The people side is covered in the managing a team aspect of resource management. While people *are* involved with materials and equipment, this process is specific to making sure you have what you need to execute your project work effectively. Any changes to the baseline or management plans accommodating the actual execution of the project would need to be processed through a formal integrated change control.

Now we are going to move on to another integral part of project management, which is communications management.

## Key concepts in communications management

The goal of planning for communications management in your projects is to ensure that we get the right information to the right people, at the right time, in the right format, and with the right impact. How we go about doing that can be either in the written form or the spoken form, either formally or informally using our tone of voice and facial expressions, via our body language through a variety of different media, and quite simply, in our choice of words.

The dimensions of communication can be effective or ineffective; our goal is to communicate as effectively as humanly possible, especially between diverse stakeholders. As a project manager, there are multiple dimensions and directions you will need to communicate.

Communication dimensions include, but are not limited to, the following:

- Internal
- External
- Formal
- Informal
- Hierarchical focus
- Official
- Unofficial
- Written and oral

Humans can't go through life without undergoing a communications misunderstanding at some point, probably daily! The need for effective communication across multiple dimensions, stakeholders, and locations in the world is so that the goal can best be met by developing an appropriate communication strategy while considering both the project and the people. The second half of that equation is to make sure that we have accurate and well-defined information regarding how we will collect, create, distribute, and store our communications. This process will also allow us to make sure that our strategies are working as we execute our project work, and allow us to monitor and control how well our plans are working. Since misunderstandings can occur at any time through any active communications, our job above and beyond creating a plan for communications is also to attempt to reduce any potential misunderstandings using something called the 5Cs of written communications:

- Correct grammar and spelling are so essential when writing because it's highly distracting when someone is expecting an Oxford comma and doesn't see one (,); it can also diminish your credibility. The good news is that we now have many different kinds of spellcheck and grammar check software to help with those things. However, I don't totally trust the software, so you still do have to spend the time double-checking your communications.
- Concise expressions and eliminating excess words are integral parts of good communications as well. Yeah...I'm still working on that one! My grammar check just told me that that's an incomplete sentence. I did it on purpose, okay?

- A clear purpose and clear expressions that are directed to the needs of the reader are an integral part of excellent communication. I hope that I have ensured that your needs and interests are factored into my messages.
- Ensure a coherent, logical flow of ideas. The recommendation is to use "markers," such as an introduction and/or summaries.
- Control the flow of ideas and words, which may include just a summarization and/or visuals.

Other communications skills that can support the 5Cs include the following:

- Active listening
- Awareness of cultural and personal differences to reduce misunderstandings in enhanced communication
- Identifying setting and managing stakeholder expectations
- **Enhancement of skills, including the following:**
  - a) Persuading to perform an action
  - b) Motivating and encouraging or reassuring
  - c) Coaching for improved performance
  - d) Negotiation
  - e) Conflict resolution

According to the *PMBOK® Guide – Sixth Edition*, the fundamentals of effective communication, both verbally and in the creation of artifacts, include the following:

- Defining the purpose of the communication and its clarity
- Understanding the receiver of the communications and assuring that those communications meet needs and preferences
- Monitoring and making sure that the communications are effective on 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 363-364*

As you can probably tell, all of these things are easier said than done, but they are good examples of what to keep in mind while you're answering questions in the exam and while you're practicing effective communications on your projects. As you look through the trends and emerging practices in communications management, be aware that a significant focus on stakeholders and stakeholder engagement is vital to encouraging, creating, and maintaining excellent communication and relationships with your stakeholder.

## Trends and emerging best practices

Because of the inclusion of Agile's best practices and expansions in the project manager's role in communications management, it is essential to note that stakeholders are included in many other communication strategies. Some of these will consist of stakeholders as part of project reviews. Allow me just a quick sidebar on the review process. Reviews in an Agile environment mostly involve vital stakeholders, the team, and potential customers either testing or doing demos on an increment or a result and providing feedback. That feedback will be used by the team to help plan the next iteration, ensuring they fully understand what the customer wants and what they do not want. That is why it is essential that a good communications management plan is created and communication strategies are appropriate and timely. They will also be updatable as the stakeholder's needs for communications adjust or change. Reviews are an essential part of making sure that the results are accepted.

Another aspect of emerging practices and trends in the communications management projects is the inclusion of stakeholders in project meetings; those meetings can include daily stand-up meetings. Stand-up meetings are an Agile way of keeping track of the day-to-day. Many of my students who take the PMP® exam prep class or the Agile Certified Practitioner (PMI-ACP)® exam prep class typically walk away knowing that they will use daily stand-up meetings in their projects going forward. The reason why the value of stand-up meetings is identified is that they allow the team to catch up on the previous day's work and what they're planning on working on in the present.

## Stand-up meetings

The team will meet in the same place at the same time every day. The meetings are by the team and for the team. I know what you're thinking: having a meeting every single day with your team can lead to a lot of analysis paralysis and circular conversations about the previous day's meeting and the next day's meeting. However, what makes a stand-up meeting so powerful is that the goal is not to create solutions, but to have effective communications regularly. For example, my team meets at 9:30 AM at the same place every day. I chose 9:30 because that means everybody's had a chance to check their email, become partially caffeinated, and possibly check their Facebook. Now that I have their attention, the team will stand in a circle, and I'll start timing the meeting. Our stand-up meetings are for 15 minutes. I know that that sounds like a brief meeting, and it is. Here's why it is so brief; each team member will answer only three questions:

- What did I work on yesterday to help the team meet its goal?
- What am I going to work on today to help the team meet its goal?
- What problems or impediments are in my way?

This meeting is informational only, and it allows the team to hear what everybody else is working on and any other problems that could be coming up in the project. That does several things. Not only are we identifying risks or potential risks daily based on the issues, impediments, or risk events that an individual is experiencing, it also is an update by the team on what they're working on and what they're planning to work on. The hardest part about these meetings once you first start them during your project is trying to keep your team focused on not creating solutions and only being informational. Changing that tendency is difficult at the very beginning, but once your team gets used to it, they'll become more efficient at expressing the answers to those three questions. Our job is to make sure that they stick to the 15-minute time frame, and even if they are mid-sentence at minute 15, end the meeting. Trust me; when somebody gets cut off several times, they'll stick to the time frames. Then, once the meeting disperses, the colocated team can go back to work and create solutions to the impediments collaboratively or potentially document risks and develop responses for them. In an actual Agile project, there is no project manager; rather, you fill the role of a coach or facilitator. If you're tailoring your plans, you can adapt or adjust and have your meetings either be longer or hold a stand-up meeting every other day for 30 minutes and include discussions about solutions. That's the beauty of Agile: you can be malleable, adapt and adjust, and roll with the punches as needed.

Other trends in communications management include social computing, which allows for collaborations using technology. I know as a mostly virtual employee, my first options for communications include email, yes, but also using social computing such as Skype and Microsoft Teams. In fact, we even goof off during our Fantasy Football league and communicate with memes as a way to have some fun and build relationships. The bottom line is that, nowadays, we have a lot more options for communicating through technology than we ever have before. I anticipate that very shortly we will be getting beamed up by Scotty and will have virtual reality avatars meeting in a shared team space and communicating that way. There are multifaceted approaches to communications, and we can communicate faster, more efficiently, and more effectively now than we ever have before.

There are many things to consider when tailoring your projects where communications are concerned. A lot of it depends on the uniqueness of your project and what communications are necessary and need to be tailored.

## Tailoring

There isn't a lot of information on the how-to of tailoring in communications management, and the reason for this is that projects are now global. There are organizational process assets and enterprise environmental factors to consider, as well as who your customers and stakeholders are. While the following information is not exhaustive, it's an excellent starting point to get you to ask the right questions and discover the right way to tailor communications for your unique projects.

If you think of the word "tailor," imagine going to buy a brand-new dress or a suit that kind of fits, but it needs some adjustments. You go to a tailor, and they pin it up, take it in, or make it larger! Ugh, I hate when that happens! But what they're doing is making sure that it fits your unique shape. It is the same in project management, where communication is concerned. You'll need to consider who your stakeholders are, whether they are internal or external, or both. Whether everybody is colocated, virtual, or spread out across multiple time zones. What language does everybody speak? And have allowances been made to make sure that everybody understands both the context and the words that are being communicated?

I know that when I traveled extensively as a consultant, I visited multiple countries where English was not the primary language. Even though everyone spoke English exceptionally well, there are some nuances in the American language, such as slang, jargon, and even hand gestures (I learned that the hard way in Brazil), that potentially might not be understood by the audience or even found to be offensive. I realized I had to adapt how I spoke and the slang that I used to make sure that my English was understood universally. At the same time, I had a translator with me just in case what I was saying was not fully understood; they would be able to translate it so that my stakeholders did not miss the communications and, at the same time, I did not take for granted that they understood everything that I was saying. That assumption can be detrimental to your communications in your projects. Another thing to consider is where you store project information and whether there is a repository that your stakeholders can access and pull the communications to them when and as needed.

The ability to tailor and consider Agile or adaptive environments is probably one of the most important skills you can have as a project manager. There is a lot of change that happens on projects, and we want to make sure that with those changes and evolving details come frequent checkpoints with the team and other stakeholders.

## Agile considerations

One of the best ways to communicate in an Agile or adaptive environment, especially if the team and other stakeholders are colocated, is to post your artifacts in a highly visible location so that anybody walking through the team space will be able to see how the team is performing. Your brain can process visuals and pictures 60,000 times faster than text. Therefore, communication about team performance that is visual can be quickly understood.

Big charts, graphs, and performance documentation presented visually will help communication and stakeholder understanding. Because communication is an aspirational skill that we all continuously work on (hopefully), the importance of this knowledge area and its overlap with stakeholder engagement is much more crucial in the real world now than it ever has been before.

## Communication considerations

We spend 90 percent of our time as project managers communicating. My guess is that during the other 10 percent, we are seeking a quiet room to eat lunch in, but the fact remains that we communicate a lot! Whether it's via email, conference calls, meetings about previous and future meetings, Skype or WebEx types of communication, performance reporting, and informal communication with our coworkers, we are regularly communicating. The larger the group or team, the more communication channels you will have. I look at this as how many ways my message can go wrong. There isn't just one channel of communication; there is a feedback loop in which we hope our message was understood, and the other party or parties respond with what they think they understood, and around and around it goes. For example, if I use the communications channels formula of  $N(N-1)/2$ , where "N" represents the number of people I will be communicating with, and you subtract "1" because the person communicating has already been considered. This allows me to see how many channels I'm dealing with at any given time. Running this formula will give you a numerical result of how communication travels through channels or people, and the possibility of perception issues increases with the number of channels. Now you can see that the more people there are, the more channels and planning for communication that is required.

Let's say I have 20 people on my team, including stakeholders, then the communication channels would look like this:

$$20(20-1)/2 = 190 \text{ channels}$$

This is a good eye-opener when you have a large team. The bigger the number, the more you need to plan for communication.

Much like everything else in this chapter, communication is an aspirational skill. We work to improve our communication. A good way that I have learned to improve my communication is via mirroring. Mirroring means that you are, in essence, copying the style of the person or people with whom you are communicating. Mirroring is more difficult face-to-face because of body language and things we do without even knowing; however, in email, it's advantageous. Are you a bullet point writer or a paragraph writer in emails? Are you more casual or more serious? How do you sign your emails? Do you use emoticons or Emojis? If I receive an email written in a bullet point format, then I respond using that format. If someone sends me a paragraph with a smiley face, then I return the favor. If someone signs off their email with "Regards," you guessed it, I also sign off with "Regards." The only two I won't use regardless of what the sender used is "Thanks" and "Cheers." In a lot of cultures, signing your email with "Thanks" is seen as dismissive:

*I'll need that report by 5 PM*

*Thanks*

Instead, try "Thank you," or add an exclamation point after to at least show you are grateful for their hard work. I try never to be dismissive, and people know me well enough that if they see a straight-up "Thanks" in my email, I am in no mood for discussion. "Cheers," on the other hand, I have an excellent reason for not using. I am not cool enough to do so. I wish I were, though! The only time I use "Cheers" is when I have a drink in my hand; otherwise, I'm not that cool or that British. Other than those two anomalies, I try to mirror communication, read and re-read my emails for tone considerations, and do my best to be clear and concise – not that you would see that side of me in this student guide. Concise is tough, but I'm working on it.

A large part of communication is making sure that you have the right information, in the right format, given to the right people, with the right impact, at the right time. That will need to be planned for, so everyone knows how and when to expect reports, meetings, and other communications. I typically let my team and other stakeholders understand what to expect on the formal communications level, so I get the right data to update reports and distribute them accordingly.

## Communications management planning

Having an effective communications management plan that suits your unique team, stakeholder, and customer is an integral part of making sure that how you distribute information is correct and that it works!

You'll see as we go through the inputs, tools and techniques, and outputs that there are many things to consider in this process. That's why the communications management plan is considered to be one of the big three management plans. Communications management, quality management, and risk management plans appear to be the ones that are hit the hardest in the exam. In *Figure 10.4*, you will see a simple example of the sender/receiver communication model. The model provides a visual example of how a sender will transmit a message and how the receiver provides feedback. All messages have to travel through the noise of personal emotional states and consider cultural or personality biases. For instance, if you don't like someone, your tone may show it, or you may be perfectly happy and someone receives your message through their emotional state and determines you are not being very friendly:

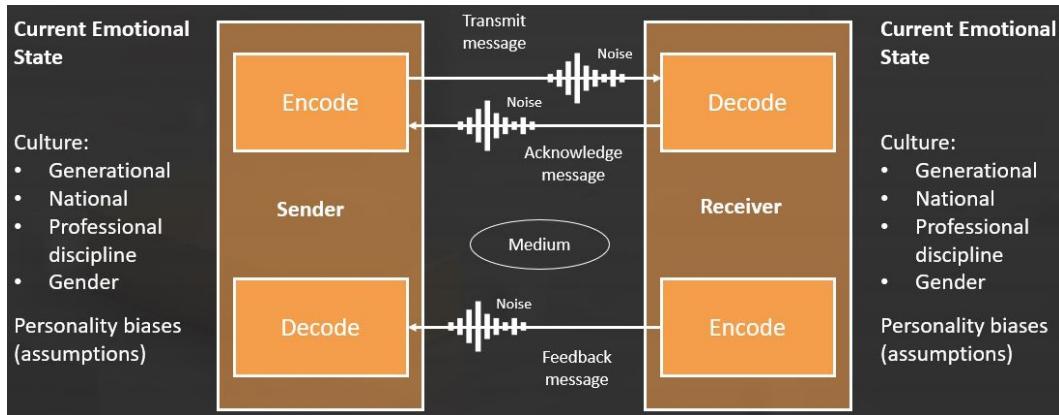


Figure 10.4: A communication model

**Note**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Figure 10-4 Communication Model for Cross-Cultural Communication Page 373.*

There are several communication methods found in the tools and techniques:

- **Communication methods**
  - a) Interactive communication
  - b) Push communications (such as sending emails or holding a meeting; you know the message was received and may get feedback)
  - c) Pull communications (such as knowledge repositories; you may not get feedback or see the message was understood or received)
  - d) Interpersonal communication
  - e) Small group communication
  - f) Public communication
  - g) Mass communication
  - h) Networks and social computing communications

- **Communications management plan headers**
  - a) Stakeholder communication requirements
  - b) Information to be communicated
  - c) Escalation processes
  - d) Reason for distribution
  - e) Time frame in frequency
  - f) Personal responsible for delivering and authorizing confidential information
  - g) Person or groups who will receive the information
  - h) Methods are technologies used
  - i) Resources allocated for communication activities
  - j) Process for updating and refining the communications management plan
  - k) Glossary of common terminology
  - l) Flow charts of the information flow
  - m) Any constraints that derived from legislation or regulation, technology, or organizational policies

Let's take a look at some key questions to ask yourself regarding communications. If you don't plan for communications, this may be a section to review again for your exam.

## Key phrases that pay in communications management

Here's a list of key phrases and terms:

- Communication requirements analysis
- Communications technology
- Communication model
- Interactive communication
- Push communications
- Pull communications
- Communications management plan

Now, let's do a quick spot check.

## Spot check

Answer the following questions to the best of your ability:

1. How well do you plan for project communications?
2. Do you have a formal plan, or do you know your team and stakeholders well enough that you can forgo the planning?
3. Has not having a plan for communications ever backfired?
4. Have you ever had a project miscommunication that led to a significant problem?
5. What would you include or remove from your plan based on the recommendations found in the *PMBOK® Guide – 6th edition*?

You can see that there are a lot of considerations for the human side of project management, and it's an important aspect. Without a motivated team who has the skills to achieve the goals of the project and without proper communication up, down, or even sideways, the entire project could fail. It doesn't matter how good your schedules, budgets, or scope of work are.

Moving on to the execution of project work, the managing communications process is designed to ensure the timely and appropriate collection, creation, distribution, retrieval, monitoring, and disposition of project communications, which is always easier said than done.

## Managing communications

The good news is that much of the information you would need to know for this section was covered in the *Communications management planning* section because you will need that information to perform this process effectively. Even if your communications don't go as planned, the processes are iterative and adaptable. The one thing to always remember in communications management is that the plan is formal. That means it doesn't matter who says they need a distribution method changed or reports by Thursday instead of Friday; *you can't change the communications management plan without formal change control*. Don't fall for any questions on the exam that make you think differently. That doesn't mean, however, that changes won't be necessary because, you know, the best-laid plans and all of that. You'll see from the inputs, tools and techniques, and outputs of this process that there is a lot of overlap with the planning communications management process. Also, keep in mind that stakeholder management is highly involved here. Both knowledge areas of stakeholder management and communications management shared the communications management section in earlier editions of the *PMBOK® Guide*, and you will see many questions that involve both areas working together.

I recommend going through the *PMBOK® Guide – 6th edition Chapter 10, Communications Management*, to make sure you understand PMI®'s overview of communications before moving on to the *Monitoring communications* section. Most of the items are fairly apparent, which is why extended overviews of the same information are tedious for you guys. I always recommend having a copy of the *PMBOK® Guide – 6th edition* close by while studying or taking practice exams.

**Note**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition, Project Management Institute, Inc., 2017, Pages 379-386*

The last process you will cover in this chapter is the monitoring communications process. The benefit of this process is to allow for an iterative review of how communication is flowing through your project and making any adjustments as needed. This process is very tightly integrated with the stakeholder engagement plan and it outlines the needs of the stakeholders in communication and other interactions to build engagement and maintain it for the good of your projects. We will review stakeholder management in *Chapter 13, Stakeholder Engagement*, but once you get to that chapter, you will notice a very fine line between the knowledge areas and how they must work together.

## Monitoring communications

Monitoring communications keep a close eye on both stakeholder engagement and how communication is working or not working during monitoring and controlling. Some of the items that are specific to stakeholder management you reviewed in *Chapter 4, Charters and Stakeholders*, especially the identifying stakeholders and the creation of the stakeholder register. We'll review some of the other stakeholder information at a high level here and then again in *Chapter 13, Stakeholder Engagement*. More specifically, we'll discuss planning for stakeholder engagement and how it applies to communications management.

The monitoring communications management process is the catalyst for changes to how you communicate, with whom, and what artifacts and activities are going well and which are not. This review and monitoring of the process will trigger changes to the communications management and stakeholder engagement plans, as needed. Remember, you are communicating not just about project performance but changes to the main constraints, risks, or conflicts affecting communications, stakeholders, or the project. And often, you will need to adapt your strategy, especially as stakeholders' requirements change or other stakeholders join the project during its execution. Stakeholder engagement through good communications is a slippery slope, especially when risk events occur. Stakeholders may change their level of interest or impact the project.

Without the human side working well together, and the communications being well planned and executed, the odds of a project being successful are slim. If your organization offers management skills training, take them up on it – you won't regret it! Plus, you'll need to take a certain number of leadership types of courses or work to maintain your certification. We'll discuss that in more detail in *Chapter 15, Next Steps and Study Tips*. We can all improve the way we communicate and plan for our team. Doing the work upfront goes a long way. If things aren't working, you can always adapt and adjust through formal change control in a predictive environment or tailor your plans further to meet the needs of an Agile or adaptive environment.

## Summary

In this chapter, you covered an in-depth review of resource and communications management. First, you reviewed resource management with the planning resource management process and the estimating your activity resources process. Then, you covered acquiring, developing, and managing your resources. Much of this section discussed how you should maintain the momentum of your project and ensure that your team has the skills and support they need to execute the project work effectively. Then, we discussed the control of resources, which is mostly about equipment and materials but involves interactions with people to make sure you have what you need.

We also reviewed some common resource management concepts and how organizational charts and position descriptions can help you allocate your resources and determine any gaps in your resourcing needs. Using a RACI chart, or something similar, and/or an RBS, can help you understand how to allocate resources and whether those allocations are working efficiently for the project.

We wrapped up the chapter with communication considerations that are tightly integrated with resources and stakeholders. The amount of work that goes into a comprehensive communications management plan is definite. It's best to review your stakeholder's needs and adapt them as necessary. Communication may be fluid, but the procedure is static and necessary so that everyone understands the flow of communications and knows what the expectations are. Planning for communication removes many of the miscommunications or misunderstandings that are typical on a large or even small project. We then looked at managing communications to protect the flow of information and ensure it's correct, and if not, discussed how to update the plan through integrated change control. Finally, we covered monitoring communications to maintain a good communication flow through a variety of communications channels and stakeholder engagement levels. If communication isn't effective, then a change would be necessary, which could also impact your stakeholder engagement plan as well.

In the next chapter, we will review the knowledge area of risk management. It's a lot of information to cover, but I'll make it as easy to understand as possible, especially if risk management isn't something your organization does well or at all.

## Assessment questions

### Question 1

Which of the following is not an aspect of the 5Cs for communication?

1. Correct grammar and spelling
2. Concise expression
3. Controlled communications
4. A coherent and logical flow of ideas

### Question 2

You have a team of five people and are planning to acquire another three team members. You also have a sponsor, a functional manager, and the procurement administrator as stakeholders as well. You are holding a meeting with all of your stakeholders and are attempting to determine how many channels of communication you will have in that meeting. How many communication channels do you have if you are the communicator?

1. 66
2. 55

3. 12
4. 15

#### Question 3

As a project manager for your team, you are very busy in the planning process. One of your team members comes to you with a concern about the order of the activities he is scheduled to perform. As he is explaining this to you, you are thinking about everything else you need to do that day. What is not being used in this interaction?

1. Emotional intelligence
2. Conflict resolution
3. Coaching for improved performance
4. Active listening

#### Question 4

Your team is meeting at the same place in the morning to discuss yesterday's work and today's work, as well as the impediments they are experiencing. Jim is a team member who hears Karen's issues that she is experiencing and determines that if she does activity A before B, she can eliminate the threat of being behind schedule. Which of the following should you say as the project manager in this situation?

1. "Jim is correct, Karen; I think that is an excellent solution."
2. "Jim, that is a great solution, but this is a stand-up meeting, and we can't have solutions discussed. Please wait until the meeting is over to work through solutions."
3. "Karen, please try not to involve problems in this meeting; it is informational only."
4. "That sounds good, Jim, what does the rest of the team think about the solution?"

#### Question 5

After working all morning on the agenda for your kick-off meeting, you attach it to an email and send it out to those who will need to be in attendance. What kind of communication method is this?

1. Pull
2. Push
3. Email
4. Internal

### Question 6

You are the project manager for a large development project. You realize that you will need to plot out what resources are required and in what category compared to the WBS. Which of the following will you use to do this?

1. A RACI chart
2. RAM
3. RBS
4. Team charter

### Question 7

You are a project manager of a large project spanning several departments, as well as your customer's organization. What would be the best document to help you get everything documented so that protocols are followed for the chain of command?

1. Project schedule
2. Project calendar
3. Project organizational chart
4. A RACI chart

### Question 8

You and your team are plotting out what tasks need to be done by which resource. Charlie is a seasoned team member and wants to know what he will be responsible for on the project. How can you show Charlie and the rest of your team the tasks and responsibility of the team members appropriately?

1. RAM
2. RBS
3. Calendar
4. Project organizational chart

### Question 9

One of your stakeholders is asking you to provide a RACI chart for them. What does RACI stand for? Check all that apply.

1. Reasonable, approved, consult, and inform
2. Responsible, accurate, consult, and inform

3. Responsible, attainable, consult, and inform
4. Responsible, accountable, consult, and inform

#### Question 10

Your project team is discussing what type of life cycle would be appropriate for the new project they are working on. You mention that it is essential that the team focus on continuously improving their execution to maintain quality and scope requirements. Which of the following resource management trends implies continuous improvements?

1. Kanban
2. JIT
3. Kaizen
4. TOC

#### Question 11

Which of the following does not reflect areas of emotional intelligence?

1. Empathy
2. Self-regulation
3. Self-awareness
4. Active listening

#### Question 12

A new stakeholder has joined the project from a functional department, and they notice that your team appears to be working without any delegation or specific scheduling. They ask you to explain why your team seems to be running the project instead of the project manager dictating who does what and when. What is the best answer to their query?

1. They are a high-performing team, so I don't need to dictate.
2. They are all subject matter experts, so I don't have to dictate work to them.
3. They are a self-directed team and perform using Agile principles.
4. They are only in the planning process, so I don't know everything yet to direct them.

Question 13

Your team is working together to determine how decisions will be made and some rules of engagement for the project. Which of the following documents are they working on?

1. RAM
2. RACI
3. Resource management plan
4. Team charter

Question 14

You have been a project manager for years at your organization, and you have an internal understanding of how your organization works, as well as how other teams and their managers interrelate. What tool or technique defines that understanding?

1. Expert judgment
2. Organizational theory
3. Enterprise environmental factors
4. Organization understanding

Question 15

You are estimating your activity resources and are using your team's historical information and those confirmed estimates to determine how many resources you will need for each activity. Which of the following best describes the tool or technique you are using?

1. Analogous estimating
2. Parametric estimating
3. Bottom-up estimating
4. Expert judgment

# 11

# Risk Management

In this chapter, you will review one of the more significant knowledge areas that may or may not be part of your organizational processes or part of the way you manage your projects. We will review planning for risk management, which has many processes and tools and techniques to be aware of for the exam. Then, we will cover the implementation of risk responses and monitoring risks throughout a project. Risk management is iterative, and each process is equally important to effectively manage risks on your projects.

In this chapter, you will review the following topics:

- Key concepts for risk management
- Trends and emerging best practices in project risk management
- Tailoring considerations for risk management
- Considerations for Agile and Adaptive environments
- Plan risk management
- Identify risks process
- Performing qualitative risk analysis
- Performing quantitative risk analysis
- Plan risk responses
- Implement risk responses
- Monitor risks

## Key concepts for risk management

All projects will contain an element of risk. Whether this is a good thing and an opportunity, or a bad thing and a threat to a project, risk will occur. Because risk will impact your project, it is thus important to plan for risk appropriately and iteratively. Risk exists at a couple of levels—first, at an individual level, and then at an overall project level. Both contain a probability that a risk event will occur, and an impact if and when it does. Most of risk management involves working with subjective information and what-if considerations. Often, risk will impact several areas at once. So, even if it constitutes an individual risk to your schedule, the domino effect could impact other substantial constraints such as scope and cost. Overall project risk involves looking at the entire project as we understand it today and determining the impact of risk on the whole project. The first place we see risk categories, hopefully, is in the project charter. The industries concerned and our experiences, as well as the backgrounds of our stakeholders, can lead to fluctuations on a project in both good and bad categories. I tend to focus more on adverse risks or threats, but then I'm a catastrophic thinker, so there is that. Our job is to manage overall project risk and keep a project's threat exposure level as low as we possibly can with the information we have, and raise opportunity levels as high as we can.

We achieve this is by keeping in mind the stakeholder's levels of risk appetite and thresholds for risk. We'll dive into that more when we get to plan risk management. Until then, the trends and emerging best practices for risk focus on a broader range of considerations, to make sure we are considering all types of risk.

*"Business people need to understand the psychology of risk more than the mathematics of risk."*

*– Paul Gibbons, The Science of Successful Organizational Change: How Leaders Set Strategy, Change Behavior and Create an Agile Culture*

## Trends and emerging best practices in project risk management

Some of the trends and emerging best practices added to the *PMBOK® Guide - 6th edition* are due to the expansion of risk considerations on projects and the understanding that some of the risks hiding below the surface that we are not considering may be the project's undoing. Non-event risk categories being one of those types, we need to review this and keep it in mind as we plan for risk management.

**Note**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Pages 398-399*

## Non-event risks

Most of us plan for project risk with the understanding that what we are identifying and creating responses for are event-based risks. These risks are events we can safely say could happen. The customer could change requirements; the seller we use could deliver late; the design could be updated. It is those risk events we focus on the most. However, the broader strokes of risk identification and management are part of the trends happening in the risk environment, called non-event risks. I get it; it sounds like something we are wasting time even considering. I mean, if it's a non-event, why even bother? The best practices would state that we continue to dig a bit deeper when brainstorming potential project risks and look for variability and ambiguity, as well as known/unknown risks. There are two main types of non-event risks, as follows:

- **Variability risks:** Variability risks include uncertainty about the critical characteristics of a planned event or decision. What if we put together a quality management plan and document that the acceptable defects are two out of every 100 samples? Then, what if we inspect and find that five defects have been discovered? Variability risk. What if we are planning to build an apartment complex in Florida in June, and there is a hurricane? Variability risk, because hurricane season doesn't begin until late August. I understand that many of these conversations could fall squarely under analysis paralysis, and you may be correct. But what if you aren't? Therein lie the subjective analysis and considerations for variability.
- **Ambiguity risks:** Ambiguity risks are looking toward the future of a project and planning for those events that could undermine its results. It's ambiguous because we haven't executed yet. We have no idea if it will come to pass, but if it does, it will impact the project and usually in a negative fashion. Our knowledge is imperfect. What? We don't know everything?? Nope, we sure don't, and therein lie the areas that may be impacted by risks. Maybe our perfect technical solution will end up being imperfect. Regulations could change mid-project and cause a do-over on planning and execution.

How, then, do we address these risks and plan accordingly? The best practice would state that variability risks can be addressed and managed using Monte Carlo analysis.

Monte Carlo analysis is the action of looking at a range of variations and their probability distributions and then taking steps to reduce the number of variable outcomes. The Monte Carlo technique is executed using a computerized analysis of many variables, often with random data entered in a variety of ways to assess the results. I often liken this technique to a casino. Why does the house always win? They know the probabilities. They know the odds. They adjust accordingly. We want to lock it down to a couple we can handle, rather than looking at a spread of results and not knowing what to do about any of them.

Ambiguity risks are a bit more exclusive to expanding our understanding of those areas we aren't sure about, and they are always a work in progress and may involve expert judgment from outside our organization or department. We will also be using incremental design, benchmarking our processes against those that are similar, and possibly using prototypes and computer simulations. Sometimes, we learn the hard way because we don't know what we don't know. Welcome to risk management!

Much of how we manage risks depends on how resilient our project is to risk. If you have ever had a risk event occur on your project, and you think to yourself, "There is NO WAY we could have ever anticipated that!" then you know hindsight is going to have to do a lot of the analysis for us, but can we build up a tolerance to risk? Can we be more resilient on a project level? Yes, we can. It may take some extra work to convince your sponsor, customer, stakeholders, and the like to make sure you have the right amount of contingency reserves for time and costs built into your baselines. Mine is always 10 percent. 10 percent more time and money built in to manage those risks, and when I run out, then management will have to step in. We also need to remain vigilant but flexible in our processes to accommodate those long days of work that you look back on when you question your sanity as a project manager.

Can we adapt and adjust and roll with the risk punches? If not, then the processes may be too rigid. It is also imperative to have a team that can be self-managed and are empowered to make the best decisions regarding risks. Usually, some red flags let us know a risk event may be headed your way. Easier said than done in most cases, but we need to iteratively review those red flags to get in front of a threat event as quickly as possible. Much of that comes down to stakeholder input as to what the lines are that can't be crossed. How flexible are we with our scope and strategy that we can realistically ebb and flow with the risks and impacts to our projects? Our stakeholders need to let us know where the lines are drawn, so we know what we can and can't adjust when a threat event occurs. Surprise!

Another risk consideration is whether our project is part of a program or portfolio. If our project is impacting the program or portfolio, then integrated risk management is necessary as well. I compare this to the kick-the-can game. If a risk from a program impacts our project, then kick the can up the chain of command. It isn't our role to manage risks on a program or portfolio level unless you are managing programs and portfolios. That doesn't mean you aren't involved; you are. It's a coordination of efforts at all levels to provide value on all levels while minimizing the effects on the organization due to threat events. Many of these determinations will come from how you manage your projects and whether tailoring your project is part of the planning processes.

## Tailoring considerations for risk management

Each project is unique, even if it doesn't feel that way much of the time. Due to this uniqueness, we need to make sure that as we tailor our project's processes and life cycles, we will also be considering how risk may impact each project individually. There are several items to consider while tailoring your project, as follows:

- The size of the project
- The complexity of the project
- How important the project is to the overall organizational significance
- The development approach we choose

All these are important for consideration and could very well impact our ability or lack thereof to manage project risks, whether they be threats or opportunities. Other factors relate to planning the scope of work. Will it be a predictive project, thus making it easier to look down the road for risks? Or, will it be an Agile approach, where the result may be unclear, rendering our risk assessments a bit foggy? The higher the variability, the higher the chances are for risk to find its way into your projects. Either way, while considering the size and complexity of your project, it may be relevant to also consider Agile or Adaptive environments that may work for your projects.

## Considerations for Agile and Adaptive environments

The great thing about Agile projects is you are never more than a month into them. Why? Because every iteration is planned for the length of the iteration. To be a bit clearer, if we are planning for 1 month's worth of work, we are also planning for 1 month's worth of risk. Does that mean we don't think ahead? Not particularly. When working with an emergent design, we can only progressively elaborate on the scope of work, knowing what we know right now. If we look too far ahead, we may inadvertently spend time planning for something that doesn't match up with current or future knowledge. Documentation without a working increment is a massive waste of time.

Risk is still identified and tracked, but we don't look as far into the future while planning as we might on a predictive project. That is why a risk management plan is an important document, not just for determining how we will manage risk but also so that everyone is on the same page with how that occurs.

## Plan risk management

Risk is a troublemaker on a project and can wreak havoc on baselines, deliverables, the team, and pretty much any area of a project if you leave the project susceptible to threats. Typically, when I'm teaching risk management, my classes fall on one extreme or the other. They either comprehensively manage risk with documentation and meetings designed just for risk assessments, or they fly by the seat of their pants and put out fires when they happen. A lot of that depends on the industry and the organization. It's safe to say that in many industries today, you will have a lot of technical risks. Cybersecurity is a massive concern these days. Every time I take a cybersecurity class, I am freaked out more and more about what is happening in the world of tech. It's our job to stay on top of those threats as much as possible. It's a lot to manage, but it isn't impossible. If you set up the project for success right from the get-go and keep a fire extinguisher there too just in case, then hopefully you can get in front of the threats and stop them in their tracks. Easier said than done? For sure.

Throughout this chapter on risk, you'll be reviewing some best practices to identify risks, analyze them, and create responses for them. Those responses are categories of reactions rather than a step-by-step guide on dealing with all risks to a project. Remember, projects are unique, and even though some risk events are expected to happen over and over, there will be some that are unique to your specific project. Those are the risks we need to plan for because there isn't any historical information or lessons learned to refer to that will help us.

The other thing to consider with risk is that nothing is 100 percent. Mostly, we are dealing with known/unknown risk events, meaning that we know it could happen, there is a probability attached, and if it does happen, then the impact is mostly unknown. It's subjective analysis, and we can guesstimate and plan, but we could also be wrong.

The other thing to consider is that your stakeholders have a variety of risk tolerance levels. Some stakeholders are risk-takers, and others are risk-averse. Still, others could be risk-neutral. Worse still, the stakeholder's tolerance levels could change during the project, depending on what is happening. An excellent way to find out the tolerance levels of your stakeholders is to ask them. I like to use extreme questions such as "Would you ever swim with sharks?" or "Would you go on the scariest roller coaster in the world?". If their answers are "Sure, I will do that!" I know they are risk-takers. If their response is "Enter the food chain??? Nope, nope, no way, no how!" then I realize they aren't. If they say, "sharks no, roller coaster, yes" then I know I have a stakeholder who can be convinced to take a risk as long as it is a calculated risk, and they fall into the risk-neutral category. I'm risk-averse in life and business. I used to be more of a risk-taker when I was younger, and some would look at my life and where I have traveled by myself and say "Yep, she's a risk-taker."

It comes down to the individual's perception of what is considered risky and what isn't. That is why it's crucial to get everyone involved in the risk management process formally. People who do the work know the risks; people who pay for projects know the cost risks; and people managing the project need to cover all of their bases. We'll start with some best practices for identifying risks. It may seem we are going linearly, as with schedule management, because we are covering one thing at a time and progressively building out our plans for risk. Instead, in the real world, it is a cycle of continuous focus.

I find that it is best to get everyone on the same page when it comes to classifying risks. I say this because risk-takers and risk-averse folks may disagree as to the severity or probability of a risk event occurring. There is also the need to determine how risks will account for probability and impact. Some teams use a 1-5 scale, 5 being a high probability or high impact, and 1 being low. Other organizations will use red, yellow, green, or high, medium, and low. There isn't a wrong way to classify risk, but it is vital to get everyone on board. What is a red classification? What does one mean, and what exactly is a medium classification? If I'm a risk-taker and I identify a risk, I may classify it as a yellow. If I'm risk-averse, I may think it should be red. Of course, there is room for discussion, but I think it is best to lay the groundwork before the execution of project work.

The most typical way to do so is to classify based on the significant constraints. If a schedule risk has been identified and determined to impact negatively at 20 percent, that is a 3, a medium, or a yellow depending on your classification system. Over budget by 30 percent is red, a high, or a 5. Once everyone agrees on the scalable system, then it's consistent when risks are identified by a variety of stakeholders with a range of risk tolerances and far easier to identify, classify, and move on to response planning. Part of the creation of a risk management plan is to consider all of this, and once that plan is approved by the powers that be, it is what it is. That is, until it no longer serves the purpose it was meant for, and then we would go through formal change control to update it. Typically, the scalable system is used as a template for future projects as well. If you don't have a strategy, you could find yourselves dealing with risk instead of executing work on time.

The risk management plan process may seem small with few tools and techniques, but expert judgment is the key. You would hold meetings to have discussions about the scalable system and categories of risk that are already presently identified. The key is to have a risk management plan that documents several items that are agreed upon and a way to move forward through the project while accommodating risk.

## The risk management plan

Because risks are specific to your industries and your organizational processes, describing the strategy or the approach you plan to take regarding risk is usually a good first step.

Other information found in the risk management plan includes the following:

- Methodology including tools and approaches
- Roles and responsibilities in risk management
- Funding, including contingency and management reserves
- Contingency reserves are part of our cost baseline and are for known/unknown risk events that can be managed with money and/or time. Management reserves are for unknown/unknowns. These are risks that were either not identified or impossible to identify in advance. Surprise!! Management reserves are that magical extra bucket of money we beg for when our contingencies have been spent, or we have a surprise risk impact that can be solved with money.
- Timing of how often risk management will be performed (weekly, daily, and the like), as well as any scheduled activities that would need to be created to accommodate an impact or a response implementation.

- Risk categories are documented and can help with grouping risks in categories, which ultimately helps identify root causes and classifies the risks that may occur. It's also entirely possible that you would use a **risk breakdown structure (RBS)**. Much like the **resource breakdown structure (RBS)**, which carries the same acronym, a risk breakdown structure is based on the identified categories of risk and used to break those categories down to more specifics. The RBS, like the **work breakdown structure (WBS)** and any other breakdown structure, is a hierarchical representation of project risks, starting from higher-level categories and breaking them down to finer-level risks.

In the following table, you will see a generic RBS based on *Figure 11.4*, an extract from a sample risk breakdown structure found in the *PMBOK® Guide - 6th edition*:

**Note**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Page 406*

All sources of project risk	1. Technical risk	List of identified risks in each category
	2. Internal risk	
	3. External risk	
	4. Weather risk	

Figure 11.1 – RBS

The rest of the risk management plan comprises the following:

- Stakeholder risk appetite, including measurable thresholds that can help define the categories of risk and how they are analyzed for probability and impact
- Definitions of probability and impact specific to the project, stakeholder appetites, and thresholds
- Probability and impact matrix, which allows for prioritization based on the organizational process assets or tailored to the project needs
- Reporting formats for risk
- Tracking documentation and how risk processes will be audited for success throughout the project

- As you can see, the risk management plan is comprehensive and will allow the entire team and other stakeholders to manage risk in a holistic manner instead of just winging it through the project. As mentioned, the **Inputs, Tools and Techniques, and Outputs (ITTOs)** are not as extensive as the resulting documentation, but all aspects are essential to the plan risk management process.

Inputs/Tools and Techniques/Outputs of plan risk management

### Inputs

- Project charter**
- Project management plan**
  - a) All components
- Project documents**
  - a) Stakeholder register
- Enterprise environmental factors**
- Organizational process assets**

### Tools and techniques

- Expert judgment**
- Data analysis**
  - a) Stakeholder analysis
- Meetings**

### Outputs

- Risk management plan**

Because you will be iteratively identifying risks throughout the project, it's best to set this up as early in the project as possible. Remember, the first place we see risk (if we are lucky) is in the project charter. The sponsor, customers, and powers that be have already assessed cost risk in the business case and have some ideas as to the major categories of risk. Whether or not the categories are clearly expressed or documented depends on your organization. As we move from the *how* to the *what*, we will review the identify risks process. This process is iterative and begins in the project charter, and ends with a review of lessons learned at the end of the project or phase.

# Identify risks process

This process, while pretty self-explanatory, will consume the bulk of your risk management discussions. Due to the iterative nature of this process and others for the management of risk, it's crucial to have a good handle on the project scope, schedule, costs, and who the stakeholders are. Everyone identifies and deals with risk. People who do the work know the risks, and uncertainty can hide anywhere. Once the risks are identified, they will be analyzed and confirmed as something to plan for or deemed not impactful in the present during qualitative risk analysis. There may also be risk owners identified in this process, those who would implement the chosen risk responses. There are numerous ITTOs. Don't get overwhelmed by the list. Just remember that risk can hide anywhere, and right now, it's subjective. It hasn't happened yet and may never happen, hence the wide variety of documents to consider and tools and techniques to utilize. ITTOs of identifying risks are listed here:

## Inputs

- **Project management plan**
  - a) Requirements management plan
  - b) Schedule management plan
  - c) Cost management plan
  - d) Quality management plan
  - e) Resource management plan
  - f) Risk management plan
  - g) Scope baseline
  - h) Schedule baseline
  - i) Cost baseline
- **Project documents**
  - a) Assumption log
  - b) Cost estimates
  - c) Duration estimates
  - d) Issue log
  - e) Lessons learned register
  - f) Requirements documentation

- g) Resource requirements
- h) Stakeholder register
- **Agreements**
  - a) Procurement documentation
- **Enterprise environmental factors**
- **Organizational process assets**

**Note**

Risk can happen in any of the significant constraints and knowledge areas; therefore, the project management plan and documents would need to be reviewed iteratively. Also, due to the iterative nature of risk management, as these documents are created, they are evaluated for potential threats and opportunities regularly. It is the tools and techniques as well as the outputs that will be important to understand and expand upon for the exam.

**Tools and techniques**

- **Expert judgment**
- **Data gathering**
  - a) Brainstorming
  - b) Checklists
  - c) Interviews
  - d) Data analysis
- e) Root cause analysis: The determining factors for why a risk event would occur. It's essential to look deeper than the proximate or most apparent causes. 90 percent of the time, the proximate cause will be correct, but there could also be an intermediate cause or an organizational cause that could impact the project more if the wrong responses are applied.
- f) Assumption and constraints analysis
- g) **Strengths, weakness, opportunities, and threats (SWOT)** analysis
- **Document analysis**
  - a) Interpersonal and team skills
  - b) Prompt lists
  - c) Meetings

## Outputs

- Risk register
- Risk report

During risk identification, it's essential to realize that some brainstorming may need to occur due to working with things that "could happen" to negatively impact a project. We'll take a look at the big items to know for the exam and your next project. Our focus on the tools and techniques will include root cause analysis, SWOT analysis, and prompt lists, and we will then look at the outputs of the risk register and the risk report. We'll start with root cause analysis as a tool or technique.

## Root cause analysis

It is crucial to identify the root causes of risk as much as possible or determine the reason why a risk event would occur. Root cause identification is a practical conversation because the closer you get to the actual reason why a threat event would happen, the better able you are to prioritize and create effective responses. This process isn't about getting through yet another best practice; this is about making sure you have everything possible to plan accordingly. Many times, the root cause is the most obvious. Our schedule risk is due to a lack of resources, but in some cases, there is something deeper lurking. It could be an intermediate cause that is less obvious but more impactful, or an organizational cause that is tough to identify, control, or respond to. Either way, you want to identify the causes as much as identify the risks. We use something called the **5 whys**. This technique was created at Toyota to determine the actual root cause. If you ask "why" five times, you will get to the real root cause. The reason you may want to use this technique is to ask enough questions to get to the root cause, so you are better able to prioritize and plan responses.

Another way to get to the root cause is to use a fishbone diagram. Dr. Ishikawa created the fishbone diagram as a way to target categories of problems and then work backward from the effect to the root cause. If you can draw, it looks like the head of a fish, which represents the effect, or the risk event, and the bones of the fish represent categories of reasons why the risk event could occur. The fishbone diagram gives the team a visual way to determine root causes. The fishbone diagram has several different names. You'll most likely see it on your exams as an Ishikawa Diagram. You saw the fishbone diagram in *Chapter 9, Quality Management (Figure 9.5)*. Root cause analysis is necessary to determine quality problems or the causes of risks.

- Ishikawa diagram—I remembered this as a FISHikawa diagram!
- Cause-and-effect diagram

- Root cause diagram
- Fishbone diagram

The fishbone diagram was created mostly to determine problems in product quality, and the original categories of potential causes were typical to those of the manufacturing industry. These days, it is used for root cause analysis in a variety of industries for both quality issues and risk assessments.

As you can see, a lot of risk identification asks the question of "What if?" A SWOT analysis can help you compartmentalize the what-ifs and analyze them further based on what is happening currently versus what could happen in the future.

## SWOT analysis

SWOT analysis is brainstorming using categories to help with focused thought. Although the origins of SWOT analysis are a bit fuzzy, this technique has been used to identify risks since the early 1960s, and allows for compartmentalization and identification.

**SWOT stands for the following:**

- Strengths
- Weaknesses
- Opportunities
- Threats

Make sure you know what SWOT stands for in the exam so that you can answer questions effectively if presented with this technique in a question.

In *Figure 11.2* here, you will see a straightforward SWOT diagram, and then we'll go through how to use it for risk identification:



Figure 11.2: SWOT analysis

The reason why SWOT is so helpful is due to the forced focus on each quadrant, outlined here:

- For strengths, we want to look at things that are going well for us now. Great team? Popular product or service? Are we first to market? All of these things can help counteract the bad aspects.
- Weaknesses identify the challenges we are dealing with at any point in a project. During planning, we want to identify potential problems as soon as possible. Not enough resources to meet a schedule constraint? Sellers who provide less than satisfactory products or services? A slim budget without contingencies? All are weaknesses that could create problems in the long run.
- Opportunities are what could go well in the future. Did people line up around the block to buy our latest and greatest? New customers, who have signed a long-term agreement with us? Better quality in our deliverables? These aren't guarantees, but they are possibilities that we can strive for by planning accordingly.
- Threats are the terrible things that can impact our projects by being behind schedule or over budget, or having poor quality or scope creep. Otherwise, we could not be first to market, losing customers due to poor-quality results, and so on.

It would make sense that strengths could produce opportunities and weaknesses could cause threats, but I also like to look at things on the diagonal as well. Which strengths have we identified that, if not leveraged, could cause a threat in the future? Conversely, which weaknesses can be overcome to produce opportunities in the future?

People who do the work know the risks. The project manager is not responsible for identifying every single risk event; nor should we be. We are not the best resources for individual identified project risks. We work on the 50,000-foot overview or total project risk. Be careful about the possibility of your team experiencing analysis paralysis, though. You could get into the weeds with brainstorming about risk, so it's essential to facilitate well and stay out of any brainstorming pitfalls. Nobody wants 8,000-line items of project problems to deal with, much like a 8,000-line-item schedule is tough to manage.

## Prompt lists

Much like SWOT allows for a focus on specific categories, a prompt list takes it a step further by using a predefined list of categories to consider for risk identification. In *Figure 11.3* here, you will see common categories of risk identification. These categories allow for a genuine focus on items for consideration and help to prompt brainstorming. Another may include VUCA, which stands for **Volatility, Uncertainty, Complexity, and Ambiguity**:



Figure 11.3: Prompt lists

**Note**

*Prompt lists can be found in PMI®'s "Practice Standard for Project Risk Management" and in the Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Page, 416.*

No matter which technique you use to identify risks, the immediate goal is to be as clear and concise as possible and begin the process of documenting identified risks in a living, breathing project document called the risk register, and update stakeholders with a risk report, which are the two main outputs of this process.

## Creating the risk register

The risk register, at this point in the process, will contain all identified risk events, potential risk owners, and possibly some responses. There may be other items to add at this point, and it's never a bad thing to document what you think could occur, and update as you go. The reason for this is there are just some things that happen on every project and you already know how to deal with them, or you think you do anyway. It may not be necessary to drill down any further with analysis techniques if you already know how it will play out. That would be analysis paralysis! For yet other risks, you may need to delve a bit deeper to analyze probability and impacts, as well as responses, to update your risk register. Remember, risk isn't a linear thing in the real world. When you identify a risk, you will analyze for root causes, probability, and impact, and determine responses all at once. For exam purposes we will go one at a time, updating the risk register as we go.

## The risk report

A risk report is generated and updated to help stakeholders understand the sources of overall risk and drivers of those categories, as well as a summarization of identified risks thus far. Creating and submitting a risk report makes risk the activity of everyone and keeps communications front and center. Of course, both outputs get updated as more information becomes more explicit. For clarity to become a reality, we will need to analyze the risks we have identified for probability and impact using qualitative risk analysis.

## Performing qualitative risk analysis

Qualitative risk analysis is about qualifying the information you have collected about risk and getting it organized by category. Then, you will determine probability and impact based on the set process you created with your stakeholders for a scalable system. High, medium, low. Red, yellow, green. 1 through 5.

Once the risks are analyzed for probability and impact, you can begin to sort them by priority. I like to use a spreadsheet program such as Excel for my risk register because I can sort, filter, color code, create tables, and have a lot of columns or tabs available for text and documentation. Most **project management information systems (PMIS)** don't do risk very well because they don't have separate sections specific to risk management. It's mostly to do with scope, schedule, and budgets.

The probability and impact matrix defines identified risks events, the category, and a scoring model. The assumption is that once you qualify the information, you can identify the risk score by multiplying the probability by the impact. Once the score is determined, you can prioritize the risks. We will cover financial implications later in this chapter under quantitative risk analysis.

If I have a risk event that we classify as a near-term threat with a high probability and impact, then that is something we need to work on first. Its proximity to the project is very close and needs to be managed quickly. You can't do that if it is way down the list of risks and could be overlooked or ignored. The qualitative risk analysis process is designed to review identified threats, assess probability and impact, and then prioritize. Some risk events could be considered watch-list items and be placed further down the list, yet others will be a high priority and move up to the top of the list. I find this to be a second vetting process as well to determine the quality of our risk information, especially from very risk-averse stakeholders. The risk data quality assessment technique is designed to keep catastrophic thinkers from throwing out a variety of unnecessary risks and taking away from the quality of the data we genuinely need to analyze. Flying dragons in the office conference room are probably not going to occur unless it's a new script written for a fantasy-themed movie. Exaggeration, sure, but believe me that some risk-averse people can go off at the deep end when addressing risk. No, not me, but you know... "people". It's best to keep it as clear, concise, and straightforward as possible but with enough information to make the best decisions. Otherwise, you'll spend all of your time updating your risk register, which could lead to sleepless nights worrying about the state of your project. ITTOs of qualitative risk analysis are listed here:

### Inputs

- **Project management plan**
  - a) Risk management plan
- **Project documents**
  - a) Assumption log
  - b) Risk register
  - c) Stakeholder register
- **Enterprise environmental factors**
- **Organizational process assets**

### Tools and techniques

- **Expert judgment**
- **Data gathering**
  - a) Interviews

- **Data analysis**
  - a) Risk data quality assessment
  - b) Risk probability and impact assessment
  - c) Assessment of other risk parameters: These could include the urgency, proximity, detectability, controllability, and other factors to help determine prioritization.
- **Interpersonal and team skills**
  - a) Facilitation
- **Risk categorization**
- **Data representation**
  - a) Probability and impact matrix
  - b) Hierarchical charts
- **Meetings**

## Outputs

- Project documents update
- Assumption log
- Risk register
- Risk report

## Key phrases that pay

Here's a list of key phrases that pay in qualitative risk analysis:

- Probability and impact
- Categories of risk
- Prioritization
- Probability and impact matrix

Not every single risk event will impact your budget or schedule at a deep level, and those risks you can address with qualitative risk analysis and then move right on to creating responses to it. Still, others may need some further investigation, especially if they may impact your budget or schedule in such a way that could dramatically affect the entire project. If that is the case, you will need to look further at those risks and make the best decisions you can. That process would be considered a quantitative risk analysis.

## Performing quantitative risk analysis

Having a probabilistic analysis of project risk and determining the impacts financially can sometimes shift stakeholders in the direction they need to go to pursue the best responses to risk, and an excellent way is to apply a price tag to identified threats. Trust me when I say most stakeholders aren't afraid of the number five; they are fearful of the number 50,000, especially when that is what you calculate as a potential project loss due to a threat event. Quantitative risk analysis is statistical and mathematically focused. Many techniques can be used to quantify objectively, even when using subjective information, but the most commonly used and tested on is **expected monetary value (EMV)**. This is due to the ability to assess risks numerically and produce a result that allows for the best decisions to be made in unknown circumstances.

### Expected monetary value (EMV)

EMV is a way to look at the probability of a risk event and the financial impact if that risk were to occur at 100 percent. Here's the thing, though: nothing is certain where risk is involved, so we have to use the information we currently have available to make the best decisions we can at the time. The formula is still probability \* impact, as we saw in qualitative risk analysis, but instead of using a 1 through 5 scale, we will use percentages and money.

**The EMV formula is probability (%) \* impact (potential cost impact at 100 percent).**

If I identify a risk to my project such as reworking quality due to defects, I could say there is a 20 percent chance we will have errors outside of standard control metrics, and if that occurs, it will cost the project 50,000 dollars. Of course, if it does happen at 100 percent, then it will cost 50,000 dollars, but right now, we are trying to determine the impact at the percentage we have identified to create the best response. In this case, the expected monetary value of that risk event is  $20\% \times 50,000 \text{ dollars} = 10,000 \text{ dollars}$ . You would have to determine if that impact would drive a specific response. I could add 10,000 dollars to my budget as the cost of quality to eliminate the probability and be no worse for wear, or I could decide that the result is an acceptable risk. If it does happen, it will cost 50,000 dollars. Threats cost money and opportunities gain or save money. If there is a 20 percent chance it will happen, then there is also an 80 percent chance it won't. These are the decisions you will have to make. Do we look at that as low probability and high impact? If so, which response should we implement to stop it from happening?

Even though you aren't dealing specifically with the full impact, you are getting a good idea as to how much a threat could cost a project, and then determine the best direction to go. Some people will combine this formula with decision-tree analysis to pick the best "branch" to follow when making tough decisions without a lot of information.

An organization may be trying to decide whether to build a brand-new high-tech data center or update the one they currently have in place. Each decision carries risk in both the threat and opportunity column. Is the threat more significant than the opportunity? That's what EMV helps you figure out. In *Figure 11.4* here, you'll see a straightforward decision tree using EMV. There would be multiple branches and leaves on an actual decision tree, and the odds are good that analysis paralysis will occur as well. You would need to decide how far to analyze your decisions to make the best ones:



Figure 11.4: Decision tree using EMV

In *Figure 11.4*, when we examine the potential losses and potential gains of both decisions, we can see that building new is the best decision for this project. There is more to gain and less to lose. Now, the organization may eventually decide that upgrading is less disruptive to the organization and consider other variables for choosing that branch. That is why the example isn't formally fleshed out. There are other considerations for sure. However, if this is what we have to work with and need to make a quick decision that is monetarily focused only, then building new looks to be the best decision. How were the cost estimates derived? Expert judgment. Same with the probabilities. You are taking subjective information and making it mathematical or objective. Sometimes, when stakeholders see the price tags and impacts, they may decide that five is a scary number after all. In this example, both choices result in good outcomes. That is not always the case.

I used EMV and a decision tree with my sponsor one time to explain why we should choose one vendor over another. He wanted to go with the least expensive option, and I wanted to prove that we would get what we paid for, even with contractual terms and conditions. Money wasn't the only consideration because I had a very stringent schedule constraint. I needed to make sure my vendors delivered quality results on time or early. I interviewed other project managers who had worked with both, and they resoundingly agreed that the more expensive vendor was the best choice due to time and money lost going with the less expensive alternative. My tree was poorly drawn but made an impact. Consequently, we chose the more expensive vendor and closed out the project on schedule. Could that be the first time that this particular vendor delivered late? Of course. I would then be subjected to many versions of "I told you so" from my sponsor. It's better to be on the delivering end rather than on the receiving end of that message. EMV and decision trees can help you do that.

**Note**

You will most likely get a question on EMV. You could see decision trees, and they may be helpful in the real world.

At this point, we would be updating our risk register with any information we could use after we quantified our data. For most of us, the act of quantifying our data is multiplying probability and impact to get a risk score, and that's okay. The majority of your identified risks will be analyzed that way. A fair few may need some deeper dives into the data, but typically EMV is used to help make decisions about responses or a change in direction.

Other tools and techniques may include simulations such as the Monte Carlo technique to simulate cost risks using software programs, to flesh out the probability and impacts of meeting cost targets or not; sensitivity analysis is used to determine which risk events have the most impact on project outcomes, for the good or not so good. The results are typically plotted out in a tornado diagram in descending strength—high-to-low impacts; this may also be used for duration impacts. When you take a look at the ITTOs, you'll see a focus on the cost and duration, as well as the scope of work impacts, and a more statistical side to the techniques since this process is determining impacts to time and money. ITTOs of quantitative risk analysis are listed here:

**Inputs**

- **Project management plan**
  - a) Risk management plan
  - b) Scope baseline
  - c) Cost baseline

- **Project documents**
  - a) Assumption log
  - b) Basis of estimates
  - c) Cost estimates
  - d) Cost forecasts
  - e) Duration estimates
  - f) Milestone list
  - g) Resource requirements
  - h) Risk register
  - i) Risk report
  - j) Schedule forecasts
- **Enterprise environmental factors**
- **Organizational process assets**

### Tools and techniques

- **Expert judgment**
- **Data gathering**
  - a) Interviews
- **Interpersonal and team skills**
  - a) Facilitation
- **Representations of uncertainty**
- **Data analysis**
- **Simulations**
- **Sensitivity analysis**
- **Decision-tree analysis**
- **Influence diagrams**

### Outputs

- **Project documents updates**
  - a) Risk report (and risk register)

No matter what, your risk events are going to need responses. Next up are the categories of responses and some key phrases you'll need to recognize each in the exam.

## Plan risk responses

Both threats and opportunities have categories of responses that can be used and adapted to your own projects. It would be really hard for anyone to say how to specifically deal with risk on your projects. Much like with conflict resolution categories, each of the responses for threats and opportunities would need to be adapted to fit your project's needs. Let's start with threat responses, since they are the majority of what you will be dealing with.

### Creating risk responses for threats

Since the majority of the risks you will be dealing with fall under the threat category, that is where you will spend the majority of your time creating responses to manage them. It's tempting to slap the response titled *mitigate* on everything. Mitigate is a buzz word, jargon, and a one-size-fits all response. It isn't the only response, though, and as you review these responses, watch out for the keywords; they can help you answer correctly in the exam. As tempting as it may be to select *mitigate* on every response question (or even *contingency*, which is another familiar risk term), there is more to the story than that. The threat responses and the key phrases that define them are essential to be aware of for the exam. There wouldn't be any way I or PMI® could state that you should unequivocally choose this response over another or specifically define your actual responses. The categories will be tested on, and, in the real world, you would need to decide what those categories look like as substantive responses.

### Escalate

There will be times when our team cannot—and should not—manage responses to threat events, especially ones that are trickling down from the portfolio and program levels. Still, other response needs may be outside the ability and purview of the project team and would need to be escalated to the right resources to manage the risk.

## Avoid

This response category makes it sound like you narrowly escaped something, but in reality, it is taking concrete steps to remove the risk from your path by changing the project management plan through formal change control. Here's the deal—remember that the project management plan is your list of YouTube videos for how to do things in each knowledge area. If you have a scope risk you want to avoid, you may need to change your scope, cost, and schedule baselines, depending on the impacts on each. You can't just update your baselines willy-nilly to avoid risk. You also need to make sure that you don't create another problem. I call this the domino effect.

## Transfer

This response involves using procurement or other agreements to protect a project by placing the brunt of the impact on a third party. These include warranties or letting someone from outside your organization be the experts instead of winging it on your project. Mostly, transferring involves insurance—health insurance, car insurance, and business insurance. It still costs money, but the impact isn't as detrimental to the project wallet.

## Mitigate

Ahh, the risk buzz word. It's the placeholder for all risk responses in the real world, but in reality, it is only the reduction of the probability, the impact, or both. You would take specific actions to reduce the full probability or impact from the project. Now, you might be thinking to yourself, "Yeah, but changing your project management plan could be reducing the probability and impact because you just said there could be secondary and residual risks. Mitigating by using contracts sounds legit as well." You would be correct in theory, but remember that this is an exam prep guide and those key phrases will help you answer questions correctly. If you want to toss around mitigating risks at work, have at it! The risk management police aren't showing up, I promise. Just make sure you keep a close eye on the questions and what they are asking before you "yeah, but" in the exam.

## Accept

Bad day at work? Things didn't quite go the way you had planned? Yep, it happens, and we sometimes can do nothing but accept it. Mostly, passive acceptance involves an identified risk event that doesn't impact too much and/or trying to implement a response would take more time, effort, and money than it is worth. Sometimes we have to sigh, roll our eyes, and move on with our day.

Active acceptance is where your contingency money comes into play. This response is for those threat events that can be solved with money. Behind schedule? Need to crash? Spend the contingency allotted for that event. It's part of your cost baseline. It's yours to manage. Not everything can be fixed with money, though, and you aren't working with an endless supply of it either, so use this response sparingly and only for risks you can respond to using your financial contingencies.

### Contingent response strategy

Another response used for threats is a contingent response strategy, which is only used in particular circumstances and is usually determined by the organization. If this happens, do that. You see this in action but may not even notice it in the world. If you have ever seen the plaque on the back of a hotel-room door anywhere in the world, you may have noticed the check-out times, the rates, and what else? It's certainly not where the ice machines are located, that's for sure! It's the fire-escape route. That escape plan is used in the case of a fire or other risk event, so you know how to get out of the building safely. You also see it happen on airplanes. The exits are here and here (with appropriate hand flourish), and here's how to use a seat belt. Seat belt? Anyone not know how to use one? Doubtful, but they do it anyway. Why? Because in the case of a risk event, you need to know how to put your seat belt on and where the flotation device is, and so on. It's contingent on something bad occurring, whether you use it or not. Well, not the seat belt because turbulence I could do without, so I always wear my seat belt. Risk-averse, remember? No matter what, your organizations have measures in place and responses to use in certain threat circumstances. You may know what those are, or you may not. It depends on your organizational processes.

## Opportunity responses

Opportunities specific to project work are typically harder to identify. An entire project may be approved via the project charter due to an opportunity, but the specifics of that opportunity or others may not be considered during planning. So, unless you have a bubbly, optimistic coworker who always reminds you about the greatness of life, you probably don't take the time to identify or document opportunities. If you do, having functional response categories is a good idea. You will notice that these responses are the opposite of the threat responses but utilize the same key phrases.

You are more likely to get questions on threat responses rather than opportunities, but it's a good idea to know the terms and that they use the same key phrases.

## **Escalate**

Just like with the threat responses, escalate implies that our team can't seize the opportunities alone and will need to kick the can up the chain of command to gain the opportunity. Typically, the portfolio- or program-level managers will need to step in with the correct resources.

## **Exploit**

Exploit is the opposite of avoiding. The team has determined that the opportunity gain is far higher than the current plan allows. The team would need to go through formal change control to add or remove something from the plan that hinders the opportunity from occurring. Formal change control will hopefully provide the ability to grab the brass ring and take advantage of an opportunity as it happens.

## **Share**

Sharing, like transferring, involves procurement, agreements, and contracts with a third party. Think of entering into a contract with an advertising firm whose job it is to get people to buy your products on a mass scale. If their campaign works well, you will share the profits with them based on the terms of the agreement.

## **Enhance**

The opposite of mitigating the goal is to increase the probability or impact of an opportunity. Enhancement is often more manageable at the beginning of a project, and often, the impact of an opportunity is heightened by making small changes to increase the chances of something positive happening. Perhaps adding additional resources to finish a critical activity earlier than planned is a minor yet effective way of increasing the impact positively.

## **Accept**

Opportunity acceptance falls under passive and active, as well. Passive is "Woo hoo! We'll take it, and we didn't have to do anything to get it!" Active acceptance is using your contingency time, money, or additional resources to gain an advantage.

Opportunities may be few and far between on your projects, but if they are identified and you can plan for them and seize those opportunities, then your project will benefit greatly. I understand being so focused on threats, though, as it is tough to see the forest through the trees. The majority of my risk register is lousy news the team has to deal with instead of good news.

## Strategies for overall project risk

Risk isn't just a one-off that affects your scope of work or your schedule. There are risks on a project level that need to be addressed as well. The good news for the exam is that those response categories are the same as the individual threat and opportunities responses, except on the project level. Only you and your team know if a risk event is on a project or individual level, and again it would be impossible for anyone to say specifically "If this happens, do this."

### Risk triggers

When putting together a comprehensive risk register, it's crucial to document risk triggers as much as possible. Triggers let you know the risk event is on its way, and it's time to implement the response. Unfortunately, triggers are typically discovered after the risk event occurs. Hindsight is 20/20 vision. Either way, we want to document them. They are lessons learned and a new red flag to watch out for on future projects. If you can record triggers in advance, then your risk owner knows it's time to implement the response once the trigger occurs, or as my 21-year-old daughter says, "I feel triggered!" If not, hindsight, lessons learned, and feeling shook as the kids say it's how it's going to be. Insert eye-roll here...

### Risk owners

Owners are the ones that implement the chosen risk response. People who do the work know the risks, and they are the best people to suggest responses and to implement them. As you execute work and implement responses, it's essential to update your risk register with the result of that response. Was there a secondary or residual risk? Did the response look good on paper but didn't work as executed? Was the response tremendous and the owner's implementation flawed? All vital information, because you and your team will be reassessing risk until the project is formally closed. Identify, qualify, quantify, respond.

That brings us full circle to the risk register. The register is updated after every step, and more information is added as it is discovered. In *Figure 11.5* here, you will see a simple risk register I hand out to my classes to use. They can change it and so can you. It's not going to hurt my feelings. It is your project, your risk, and your way of documenting. The *Figure 11.5* snapshot is merely to give you an idea of what one looks like, so we can exit theory and look at reality:

Risk Category	Description of Risk	Risk Owner	Impact	Severity of Impact 1-5	Probability of Occurrence (1-5)	Risk Score	Rating Color Code	Risk Priority Number	Risk Indicator(s) (if applicable)	Preventative Strategy/Action(s)	Mitigation Action(s) to be Taken if Risk Occurs, Activated by Threshold	Action Plan Implementation Status and Effectiveness of Action
Scope				3	4	12	○					
				1	2	2	○					
				5	5	25	○					
						0	○					
						0	○					

Figure 11.5: Risk register

Risk management is a big undertaking but is imperative for the success of a project. Depending on the size and scope of the project, your need for intense risk documentation may adjust. With smaller projects, it may be enough to know what to expect and handle it the way you always do. If the project is longer than a month, I would highly suggest you get into the practice of documenting your risks, so you stay ahead of the curve and enjoy fewer sleepless nights.

## Issue logs

Just one more aspect of the risk world to consider, and that is an issue log. An issue is a risk that has been realized. It's a surprise! Issues carry a bit less of a wallop than an identified threat event, but they still make the day longer than it could be. An issue would be five of your team members called in sick and were working on critical activities. A risk would be five of your team members quit, and you don't have anyone else.

An issue log is updated regularly, like a risk register, and all stakeholders will be communicated with regarding issues as well as risks. Typically, an issue log is a document used for communication and to keep track of things that go sideways on a project. Many project teams have an issue log and not a risk register, and some use both. It depends on your projects. You'll want to make sure the issue gets documented appropriately—who brought up the issue, who is assigned to help fix the issue, the date it was resolved, how it was resolved, and any additional information necessary. Issues can cause conflicts on a project team as well, so it's essential to keep on top of surprises as well as threats and opportunities. Even though issue logs are more a communications and stakeholder engagement tool, it feels appropriate to bring it up here as well, since threats that are unknown/unknown need a place to be documented and discussed accordingly.

There are many considerations for threats and opportunities for every project, as well as how they are identified and analyzed, and responses created for them. Risk management is iterative and constant. The first place we see risk is in the project charter, and the last place we see it is in our lessons learned review at the end of the project.

Work through the spot check and see how you do with the risk processes you have just learned.

## Spot check

List all of the risk management planning processes in order and write down the key aspects of each process. Don't worry if they don't precisely mirror the results I have. Just use your language to lock down the processes, using the following example to help you:

Risk Management Processes	Key aspects of the process

How did you do?

## Spot check answers

Take a look at the key points in the following table and use it as a cheat sheet when studying key aspects of risk management:

Risk Management Processes	Key Aspects of the Process
Plan risk management	<ul style="list-style-type: none"> <li>• Document how risk will be assessed</li> <li>• Roles and responsibilities</li> <li>• Stakeholder tolerance levels</li> <li>• Contingency reserves</li> </ul>
Identify risks	<ul style="list-style-type: none"> <li>• Brainstorming</li> <li>• SWOT</li> <li>• Prompt lists</li> <li>• Create risk register</li> <li>• Create risk report</li> </ul>
Qualitative risk analysis	<ul style="list-style-type: none"> <li>• Assess probability and impacts</li> <li>• Prioritize</li> <li>• Categorize</li> <li>• Risk quality data assessment</li> </ul>
Quantitative risk analysis	<ul style="list-style-type: none"> <li>• Expected monetary value</li> <li>• Decision tree</li> <li>• Monte Carlo</li> <li>• Statistical analysis</li> </ul>
Plan risk responses	<ul style="list-style-type: none"> <li>• Escalate</li> <li>• Avoid</li> <li>• Transfer</li> <li>• Mitigate</li> <li>• Accept</li> <li>• Exploit</li> <li>• Share</li> <li>• Enhance</li> <li>• Accept</li> </ul>

As you can see, planning for risk management is a significant undertaking, one that is iterative and constant, from the project charter to the administrative closure of a project or phase. One of the updates to the *PMBOK® Guide - 6th edition* was the inclusion of a new risk process in execution: *implement risk responses*. It makes sense that if you are going to do all the planning for those responses, at some point you will need to use them, as well as making sure they have worked. If not, then a workaround or fallback plan would be necessary.

## Implement risk responses

The act of implementing risk responses can happen at any time during the execution of project work. Things may not be working out the way they were planned, and at the same time, you are making sure that the responses you are using are working. The good thing about this process is it is precisely how it sounds. You did all the hard work, iteratively identifying, qualifying, quantifying, and creating responses. Now, it is time to implement them. Implementing risk responses is a relatively short section for the exam content but is much more influential on an actual project.

**Note**

Make sure you know where in the process groups you are when answering risk questions. If deliverables are being created or quality assurance is happening on any of the executing processes, then you are implementing the responses.

ITTOs of implementing risk responses are listed here:

**Inputs**

- **Project management plan**
  - a) Risk management plan
- **Project documents**
  - a) Lessons learned register
  - b) Risk register
  - c) Risk report
- **Organizational process assets**

**Tools and techniques**

- **Expert judgment**
- **Interpersonal and team skills**
  - a) Influencing
- **Project management information system**

**Outputs**

- **Change requests**
- **Project documents updates**
  - a) Issue log
  - b) Lessons learned register
  - c) Project team assignments
  - d) Risk register
  - e) Risk report

On any risk response, you run the risk of creating a whole other issue. These could be secondary risk events or residual risk events.

## Secondary risks

A secondary risk event is when you implement a risk response and create a whole other risk event you didn't plan for. I hate it when this happens. You think you have created the best way to avoid a schedule risk by fast tracking and, oops, you messed up your quality! Surprise! Now, you need a fallback plan, a workaround, a plan B. Someone grab a fire extinguisher because it's about to get hot in here. Domino Effect.

## Residual risk events

These types of risks mean that whatever response you created you didn't get it all. You now have risk residue. Ewww. You will also need a fallback plan because typically, this residual risk is not at an acceptable level. It is still impacting your project negatively and needs to be dealt with quickly.

The reason I bring these up here is any time you are changing anything in your project management plan, you will need to assess the impact of that decision on the other constraints before creating a response or solution, thus making sure these surprises don't happen as often as they could. This is also the reason why you see change requests as an output to implementing risk responses. You may need to update your project management plan to avoid or exploit a threat or opportunity, especially if your responses didn't work the first time and you need to change some aspect of your plan. That brings us to the last risk process: monitor risks.

## Monitor risks

The monitoring and controlling process group in its entirety was designed to keep an eye on the execution of project work and to update, change, or adjust the plans to accommodate unknowns, or to better work to produce deliverables to requirements. The monitor risks process was designed to oversee the implementation of the risk responses, but the process is also intended to identify new risks as they occur during execution, tracking identified risks to make sure they are still relevant and that we are prepared were they to happen, and evaluating our risk processes to make sure we don't need to adapt how we are running the project and managing risks.

### Note

If the exam question is asking about identifying new risks during some state of monitoring and controlling or execution and then asks you which risk process you are in, it isn't the identify risks process; it is the monitor risks process, since you are no longer in the formal planning processes.

You are also keeping an eye on your risk reserves to ensure you have enough money and time left to manage newly identified risk events that can be solved by active acceptance. If not, then management reserves may be necessary. You'll see that the inputs, tools, and techniques of the monitor risks process are pretty straightforward and incorporate reviews of the data and reports from the project that we would use to analyze our risk performance, as well as the performance of project work. You'll also see a tool or technique of audits. Any time you see the word *audit* on the exam, I want you to think "process". An audit is a review of a team's performance; the responses are chosen as to whether they worked; was the contingency reserve used appropriately; and did the team select the best risk owners as well as identify triggers in advance. You've already reviewed a quality audit in *Chapter 9, Quality Management* as a review of the quality process. You will also see a procurement audit in the next chapter on procurement. Now, let's look at the ITTOs for monitoring risks, listed here:

## Inputs

- **Project management plan**
  - a) Risk management plan (Tells us how to monitor risks)
- **Project documents**
  - a) Issue log
  - b) Lessons learned register
  - c) Risk register
  - d) Risk report
  - e) Work performance data (Raw data collected from the team)
  - f) Work performance reports (Communications to stakeholders about project performance)

## Tools and techniques

- **Data analysis**
  - a) Technical performance analysis
  - b) Reserve analysis
- **Audits** (Reviewing the risk process and adjusting as needed)
- **Meetings** (Risk should be on every meeting's agenda)

## Outputs

- **Work performance information** (The result of processing the work performance data through analysis and then creating work performance reports. In this case, it's the result of technical performance analysis, audits, and reserve analysis.)
- **Change requests**
- **Project management plan updates**
  - a) Any component (Risk hides everywhere and impacts everything.)
- **Project documents updates**
  - a) Assumption log
  - b) Issue log
  - c) Lessons learned register
  - d) Risk register
  - e) Risk report
- **Organizational process assets updates** (This is contributing to the health of the organization and could be template updates for risk or a risk breakdown structure that can be used for other projects.)

Risk is a broad topic and highly testable because a risk event can happen in any process group and any process. My best advice is to understand what goes into the risk register in every process in planning and then know which process group you are in when answering questions about identifying or analyzing risks for your project. For real-life advice, always question your assumptions, use a simplified risk register that works for your time and projects, and look over one shoulder throughout your project for any triggers or red flags headed your way. In an Agile environment, you would use a risk burndown chart that shows the team's mitigation efforts and hope the lines are trending down. The way you plan, manage, and monitor risks on your project is totally up to you. There isn't a wrong way to perform risk management, except to not perform it.

## Summary

In this chapter, you covered all of the risk management processes, including identification of risks and qualitative and quantitative risk management, which resulted in updates to your risk register to allow your team to determine the best responses, the best risk owners, and any triggers you identified that help your risk owners implement their responses during project execution. Finally, you covered the monitor risks process, which is designed to keep an eye on currently identified risks and identify new risks, while keeping track of whether responses worked and, if not, why not.

In the next chapter, you'll review another important topic, procurement management, which includes planning for procurement, conducting procurements, and controlling procurements. Risk and procurement are often tested on together due to the different contract types and who bears the cost risks, depending on the chosen agreements. While you are not expected to have an in-depth knowledge of procurement and are not assumed to be able to bind your organization to that of another legally, you may need to work with selected sellers and make sure you protect your organization from future costs and, at the worst, litigation.

## Assessment exam

### Question 1

Your project team is in the process of beginning to identify risks, and you have set up a facilitated brainstorming session in which the team can focus on categories of risk. Which of the following tools may be helpful in this process?

1. Risk register
2. Qualitative risk analysis
3. Quantitative risk analysis
4. SWOT analysis

### Question 2

Jill is one of your best team members, and she is excellent at identifying and managing risk on your team. Jill is concerned that an identified threat on the project may impact your budget more than your project can handle. Which technique could you use to determine the price tag of the identified risk event?

1. Earned value
2. Expected monetary value

3. Cost variance
4. Cost performance index

#### Question 3

Keenan and Abdul are in the conference room, discussing different strategies for overcoming a risk event. Keenan feels the best course of action is to change the project management plan through formal change control and adjust those items that are creating the potential risk event. Which risk response is Kennan suggesting?

1. Avoid
2. Mitigate
3. Exploit
4. Transfer

#### Question 4

Ben is a member of your team and is the risk owner for one of the big, impactful risk events on your project. When the risk occurred, he implemented the response but then quickly noticed that another risk had occurred elsewhere in the project due to the response he implemented. This is an example of which of the following?

1. Residual risk
2. Mitigation
3. Secondary risk
4. Contingent response strategy

#### Question 4

Two of your team members are discussing the best way to update the risk register to make it more effective, and you mention that adding categories of risk events may be helpful. Which of the following risk processes suggests categorization?

1. Identify risks
2. Quantitative
3. Qualitative
4. Response planning

### Question 5

You and your team are in a meeting discussing risk, and Jamal is concerned that one of the risk events could impact the project financially. His estimate puts the impact at 35,000 dollars. The team discusses the identified risk and agrees on the impact, and determines that the probability of that event occurring is around 20 percent. What is the expected monetary value?

1. 7,000 dollars
2. 35,000 dollars
3. 35,020 dollars
4. 6,000 dollars

### Question 6

Kareem is one of your best software developers and is also the risk owner for an identified risk to the automated testing system for your new software program to help track organizational **return on investment (ROI)**. He determined that the threat to the system is based on not using code that is integrated and may cause functionality problems later on. He also determined that he will mitigate the risk by creating a checklist for the other software developers to follow, so the code follows a strict process of testing, bug fixes, and integration while making sure the developers follow a strict protocol of simple coding without anything extra added. He has presented the checklist to the team, and everyone agrees it is the correct response. Which of the following represents the correct result if the software developers do not follow the checklist?

1. Residual risk
2. Secondary risk
3. Risk audit
4. Risk acceptance

### Question 7

Francis and Tom are the risk owners for an identified technology risk and have come to you to review a change request to make sure that all impacts have been assessed and gain the go-ahead to process a change request. You review the request and realize that the change would impact aspects of the program your project belongs to. Which of the following threat responses is the best option in this case?

1. Exploit
2. Transfer

3. Avoid
4. Escalate

#### Question 8

You and your team have used SWOT analysis to identify numerous threats to a project. According to the risk management processes, what will the team do next?

1. Perform quantitative risk analysis
2. Update the risk report
3. Perform qualitative risk analysis
4. Send out a risk report

#### Question 9

Your team is running an Agile project to create a new payroll system for the HR department. You are currently in the middle of a 4-week iteration when James, one of your team members, identifies a risk to the increment. Which risk process is the best answer in this situation?

1. Identify risks
2. Monitor risks
3. Implement risk responses
4. Qualitative risk analysis

#### Question 10

Your team is getting used to using a risk register and have faithfully been updating it as new threats and opportunities have been identified. During a risk meeting, you review the risk register and notice that someone added an entry that reflected an unknown/unknown occurrence from the previous week that didn't have much impact on the project and was dealt with as soon as it occurred. What did the team member add and was it appropriate?

1. They added a risk and it was appropriate for the risk register
2. They added a risk and it wasn't appropriate for the risk register
3. They added an issue and it was appropriate for the risk register
4. They added an issue and it wasn't appropriate for the risk register

### Question 11

During a recent meeting with key stakeholders, you mention that a threat event occurred during execution of the main deliverable. Your sponsor Rachel asks why they were not informed of the risk last week. What should the project manager have done to communicate this to the stakeholders?

1. Distributed the risk register
2. Added the information to the work performance reports
3. Updated the risk report and distributed it
4. Added risk to the agenda of every meeting, so nothing was left out

### Question 12

Which of the following risk processes is determining the probability and impact of identified risks as well as the prioritization of them?

1. Identify risks
2. Quantitative risk analysis
3. Qualitative risk analysis
4. Monitor risks

### Question 13

You are the project manager for a large manufacturing project, which includes creating a microchip for the new cell phones your company is making for release in January. Your sponsor is looking through the information in your risk register and notices that there isn't any information about the odds of meeting your budget with the current reserves you have set aside. Which tool or technique could be used to identify the odds of meeting the current budget with the given reserves?

1. Expected monetary value
2. Monte Carlo technique
3. Sensitivity analysis
4. Audits

Question 14

What information will you have after quantitative risk analysis?

1. A detailed probabilistic analysis of risk on your project
2. A detailed risk report
3. A detailed list of probability and impact
4. A detailed overview of risk triggers

Question 15

Your team is halfway through a year-long project, and Will, a senior engineer on your team, determines that a threat event he recently identified is going to impact the program level of the organization. Which of the following responses should be implemented here?

1. Mitigate
2. Exploit
3. Escalate
4. Avoid



# 12

# Procurement Management

In this chapter, we will be covering the large topic of procurement management, beginning with key concepts, trends in procurement management, and Agile considerations. Then, we will cover planning for procurement management, which includes determining whether you will make or buy items that are needed for your projects, and perhaps even hire staff to supplement your teams. After this, we will review conducting procurements to select the sellers needed for a project, as well as controlling procurements to avoid a breach of contract and to formally close out contracts.

In this chapter, you will review the following topics:

- Key concepts for procurement management
- Trends and emerging best practices in project procurement management
- Considerations for Agile/Adaptive environments
- Planning procurement management
- Conduct procurements
- Partner-centric procurement documents
- Control procurements

## Key concepts for procurement management

Procurement management is a big topic, and for many of you, working with procurement may be a very surface-level thing. Perhaps you have contractors that work on your team, or you have reviewed some procurement documentation to make sure the equipment you need is correct. There are a variety of possible levels at which a project manager may be involved in procurement for a project. As we move forward through this section, there are several assumptions to be aware of in exam questions—mostly, to keep things out of any gray areas and to focus on concepts. These concepts or assumptions may not align at all with what you do now but may do later in your project or your career. Procurement is also represented in a very surface-level way, without getting too deep into terms and conditions and legalese. The very first assumption on the exam is that you have a procurement administrator, or a legal department/finance department that is helping your organization and project fulfill procurement needs. These would be stakeholders on the project and the people who oversee all procurements. You, however, understand the scope of the work and know what is necessary from outside the organization in terms of resources. Your job is to make sure that everyone is on the same page within the scope of work and that you create and maintain good relationships with any stakeholder derived via procurement.

Another assumption to consider is that project managers cannot legally or contractually bind their organization to that of another. We are not attorneys, hence the procurement department/coordinator/administrator. These are all terms that may be used to represent the people who negotiate and manage procurement from the legal side of things. That is not to say that you are off the hook where contracts are involved. Oh, no—you will have to make sure that you are following the letter of the law and protecting your organization from future costs, arbitration, mediation, and litigation. I believe that is why this section is both comprehensive and scratches the surface of procurement. It's comprehensive because you will need to know the roles and responsibilities and all of the jargon involved in procurement, and it scratches the surface because we are not expected to know all of the ins and outs of the legal side of a business.

Another assumption is that we are the buyer because we are paying out of our budgets for goods, services, or staff, and the contractor/vendor/supplier or sellers are external to our organization. Most questions are written from the perspective of the buyer (us), unless otherwise stated in the question.

With that caveat in place, let's start with why you might need to enter into a procurement agreement and what your role will be.

If we are the buyer, then it stands to reason that we will need to understand the scope of work, what we are lacking, and what can be obtained via some agreement. Keep in mind that the term *agreement* isn't always a set, formal, legal contract. It could be an email or a handshake. The majority of what you will cover for the exam, though, is contracting types and a variety of other documents that are formal and very legally inclined.

## Trends and emerging best practices in project procurement management

Many significant trends are happening due to the influx of software programs and other technologies, as well as potential risks to either the buyer or seller—or both—and how different industries benefit from different contractual relationships.

The main trends include the following:

- Advances in tools and software
- More advanced risk management, in which the buyer will need to take on risks that contractors can't handle or have control over
- Changing practices in contracts, to include megaprojects and standardized international contracts with multiple contractors from different countries
- Logistics and supply chain management
- Technology and stakeholder relations
- Trial engagements before a long-term contract is signed

How your organization manages procurements will also drive which of these trends apply to both your industry and your project needs. In an Agile environment, contracts may need to be more flexible.

## Considerations for Agile/Adaptive environments

Typically, in Agile environments, contracts are used to extend the team and have a greater need for flexibility since the scope of work changes and is non-predicative. Due to this need, there may be a master **service-level agreement (SLA)**, or allowances for scope changes or adapting the project needs without having to renegotiate or change the contract. SLAs also allow for a shared risk of responsibility and more collaborative working relationships.

All of these factors would be determined as you plan for procurement iteratively throughout a project, depending on the procurement needs.

## Planning procurement management

What you would need to procure for your project depends on many different situations. Do you need to augment your staff? Do you need materials and equipment from outside the organization? You will need to do what is called a **make-or-buy analysis**. Can we make it if we gain the right parts from outside the organization? Can we buy what we need outright? Rental decisions are discussed, as well. Should we rent computers or buy them? Rent warehouse space or buy a warehouse? These are questions that need answers before anything is determined. Procurement can happen at any time in a project, not just during the planning stage. Sometimes, a project kicks off with a contract, and the last thing we do is close out our contracts before the project or phase can be considered closed as well.

The resulting procurement management plan will include the necessary roles and responsibilities to ensure the right resources are in place for the project.

According to *the PMBOK® Guide - 6th edition*, typical steps to be documented include the following:

- Preparing the procurement **statement of work (SOW)** or **terms of reference (TOR)**
- Preparing a high-level cost estimate to determine the budgetary needs for procurement
- Advertising the opportunity
- Identifying a shortlist of qualified sellers
- Preparing and issuing bid documents
- Preparing and submitting proposals by sellers
- Conducting a technical evaluation of proposals, including their quality
- Performing a cost evaluation of proposals
- Preparing final combined quality and cost evaluations to select the winning proposal
- Finalizing negotiations and signing a contract between the buyer and seller

All of the make-or-buy decisions will need to consider schedule constraints and resources needs, as well as those for procurements.

**Note**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Page 468*

Your organization's process assets typically drive procurement processes, as well as the types of contracts used on any project. You may need a variety of different kinds of procurement, depending on the needs of your project. It's best to understand the contract types first and then the process by which sellers are selected, the documentation to solidify the contract, and who does what, when, and where.

## Contract types

There are typically three main types of contracts, and they include the following:

- Fixed-price
- Cost-reimbursable
- **Time and materials (T&M)**

Fixed-price and cost-reimbursable contracts have a variety of different characteristics, depending on what the project needs. Sometimes we need to protect our budget and we know the scope of work implicitly, while at other times we are not clear on the scope of future work and need some flexibility. It's a good idea to understand who carries the main cost risks on each contract type in case you get a question on it or are in the process of working in the realm of procurement now.

In *Figure 12.1* here, there is a quick cheat sheet to keep in mind; we'll then cover each of the types individually:

Agreement Type	Scope of Work	Risk Bearer
Fixed Price	Well known	Seller
Cost Reimbursable	Known but not clearly defined	Buyer
Time and Material	Not well known	Shared

Figure 12.1 – Contract types

Also, keep in mind that the world of procurement isn't, of course, so cut and dry. These days, the trend is more about shared cost responsibility, especially when there is something the seller can't control affecting costs, as well as specific terms and conditions that are written into the contract.

## Fixed-price

Fixed-price contracts are great for us because we are the buyer, and if we can fix the price we can budget for it. It's static and it just is what is—unless the scope of work is changed, that is. For now, let's say we know the scope of work involves obtaining 3,000 software licenses. We know the cost of each and can calculate easily what the costs will be. It's fixed, and the scope of work is well known. This would be known as a **firm-fixed-price (FFP)** agreement. It just is what it is. That's great if it's that easy, but remember—money isn't everything. Sometimes we want to offer other incentives to sellers to deliver on time or early or to provide us with expert staff, but we still want to keep costs from getting out of control. In that case, you would use a variation of a fixed-price contract.

## Fixed-price-incentive-fee (FPIF)

A FPIF contract allows the buyer to offer incentives for meeting quality requirements, finishing on schedule, and the like. An incentive means that if you do it, you get it, and if you don't, you don't get it. Precise terms and conditions are well documented and it will be essential for you to track their performance, and if they meet all of the incentive requirements make sure they get paid, or at least that the procurement department knows they achieved their goals for incentives so that they receive them on time.

## Fixed-price-with-economic-price-adjustment (FPEPA)

With the global project market growing every single day, there may be a need for a structured agreement that accommodates inflation, currency exchange rates, costs of living, mega-long-term projects, and the like. A FPEPA contract provides a level of flexibility in specifications when the project will span many years or be influenced by the other factors I mentioned. Let's say the contract states that you will pay a certain amount for oil needed for your machinery. If oil prices rise by 5 percent, you will pay 5 percent more, and if they drop by 5 percent, you will pay 5 percent less. The contract structure does a couple of things; it allows you to still budget using a fixed-price contract, and it also protects both parties from fluctuations outside their control. It becomes a fairer type of agreement for all parties involved.

## Cost-reimbursable

In a perfect world, we would always know the true scope of work and sign fixed-price agreements and budget accordingly. As we know, we are not in a perfect world, and there may be some scope requirements that need to remain flexible to accommodate changes. This flexibility is good for the scope of work and progressive elaboration but can wreak havoc on our budget if not set up correctly. There are several types of cost-reimbursable or cost-plus agreements.

None of these make up an exhaustive list, just the most common types of each. You may see a variety of these represented in the exam questions, so make sure you understand each of them and are aware of their acronyms as well.

### Cost-plus-fixed-fee (CPFF)

With CPFF agreements, the seller is reimbursed for all allowable costs for performing contract work and receives a fixed fee, based on a percentage of initial estimated project costs. If the seller states that they will charge 100,000 dollars for the work, that essentially covers their costs. At the time of negotiation, the seller may say their fee is 10 percent of the total estimated costs for the product or service. The total price of the project would be 110,000 dollars. If the scope changes, then it will still be 10 percent of whatever the new price is. At least we can budget for the fixed fee. It makes sense that the seller would want to make a profit on what they are providing.

### Cost-plus-award-fee (CPAF)

Remember with incentives that if you do it, you get the incentives? In a CPAF contract, financial awards are granted based on milestones met, and the seller's fee is based on performance and the decision of the buyer. CPAF is an interesting contract type, simply because whether the sellers get the award or not is based on the buyer's perception of their performance. We could easily say: "Well, I don't believe you did everything we were expecting, and therefore we will not give you the award." Not everybody gets a trophy just for playing, not in the procurement world anyway. The United States Department of Defense (you saw their influence in controlling costs!) uses this type of contract a lot. The carrot versus the stick. If you do this, we'll give you that. It may be costlier, but at the same time, money may not be everything. In some cases, quality is most important.

### Cost-plus-incentive-fee (CPIF)

A CPIF contract is probably the most common type of contract. In this, the seller is reimbursed for performing the work and receives a pre-determined incentive fee after achieving certain performance goals. There is also a caveat to this; if the seller saves us money from the original estimate, then we will share some of those savings with them. If the final costs of the project are less than or greater than the original estimates, both buyer and seller share costs. The share costs are from a pre-negotiated cost-sharing formula—usually, an 80/20 split over/under target costs. The 80 is us, and the 20 is them. It is our money, after all. Let me give you an example of how this works, as follows:

- Price quote: 100,000 dollars
- Incentive fee: 20,000 dollars
- Share ratio: 80 us/20 them

The seller comes to you after their work is completed and says they finished early to gain our incentive but did the entire contract work for 90,000 dollars. Everyone gains some money back. You get some money; they get some money; everyone gets money!

Here, we can see the result of this contract type and how it would work out for them and you:

- Actual price: 90,000 dollars
- Incentive fee: 20,000 dollars
- Share ratio: 10,000 dollars (saved) \* 20 percent (share ratio) = 2,000 dollars
- The total price paid to the seller: 112,000 dollars
- What would have been paid if no cost savings occurred: 120,000 dollars
- What we saved: 8,000 dollars

And that is why CPIF contract types are pretty popular. We are incentivizing for schedule and quality performance, and also for costs.

The downside to this type of agreement is that if something goes sideways, we have to pitch in and help take the brunt of the cost risk. We pay 80 percent, and the sellers pay 20 percent. That's a typical share ratio. It could be 50/50. Just depends on the negotiated structure of the terms and conditions.

The last type of contract is a bit of a hybrid between fixed-price and cost-reimbursable, and that is a T&M contract.

## Time and material

T&M contracts are typically used when a specific scope of work isn't as clearly defined as in a fixed-price contract and are mostly used for experts to augment staff and other outside support. They can also be for materials (for example, I need a specific number of widgets and may need more later).

T&M contracts typically have a ceiling price; in fact, many of these contract types do. At some point, the project bank has to close. It's much more typical in this case, and both the buyer and seller share the cost risk. I was a contractor for many years, and I owned my own business. When I was hired as a contractor to consult or teach, it was typically for 1 year, with re-sign possibilities in the future. I charged a certain amount per hour. My hourly rate was fixed and could be budgeted for up to 1 year. That was the ceiling. If I signed up again for another year, it was the same process. The reason this was a shared risk is that the contract could have been terminated at any time, if the project fell through or if I decided to do something else. There was a risk to me, the seller, if they wouldn't re-sign me or the project was canceled, and the risk to the company was that I could cancel at any time if I got a better offer. If everyone stayed happy, the ceiling was the most they would pay and the most I would make from that company. If anything changed, it could fluctuate over time on either side of the agreement.

## Roles in procurement

Now that you have a good overview of contract types, keep in mind that the types of contracts that are used are largely up to your organization. It's important to understand what your role is versus that of a procurement administrator. In *Figure 12.2* here, you'll see a simple cheat-sheet overview of the roles at a high level. We'll then break it down more specifically into who does what:

PM:
<ul style="list-style-type: none"> <li>1. Develops the PSOW</li> <li>2. Determines Source Selection Criteria</li> <li>3. Reviews the Bids via screening and weighting</li> </ul>
Agreement Coordinator:
<ul style="list-style-type: none"> <li>1. Negotiates the Agreement</li> <li>2. Involved in control procurement including procurement change control</li> <li>3. Internal to your organization</li> </ul>

Figure 12.2: Who does what

## The role of the project manager in procurement

I mentioned earlier that you have some responsibilities when it comes to procurement, and the first step is to do the make-or-buy analysis. Once that is done, it is time to reach out to prospective sellers/vendors/suppliers and let them know your procurement needs so that they can respond accordingly.

### Procurement SOW (PSOW)

The PSOW is sometimes referred to as the SOW. Your organization is reaching out to prospective organizations that can provide the people, materials, or equipment needed for a project. Since you and the rest of the team know the scope of work, it will be up to you to construct a document that describes your procurement needs. Documentation of each requirement can be time-consuming because you may have several different procurement needs, each with their own scope of work. You may need to create a SOW for potential widget sellers, a SOW for prospective license sellers, and possibly even one for contractors or staff to extend your team, and this will be something you will need to make room in your schedule to do. You may very well have the procurement administrator looking over your shoulder to make sure everything is legal and documented correctly, but it is typically the job of the project manager to create a statement of the scope of work for procurement needs. Each SOW is tailored to the specific project needs, so there isn't a one-size-fits-all approach to this, and your organizational process assets delegate much of this responsibility.

### Source selection criteria

The other thing that you will be responsible for, in most cases, is to determine how you will select your sellers. You will need a wish list in place, and this is called source selection criteria (in other words, the criteria by which you select your seller). Think of it this way: if you were going to lease a big-ticket item such as a new car, you may have a few things in mind that are must-haves to seal the deal. That may be price, color, whether it has heated seats, the make or model, and so on. Some things are more important, and as you go to test drive, you'll be looking for your must-haves. You would be willing to give up heated seats for a price adjustment, but you cannot give up the pearlized black color for anything. You have your priorities, of course! The decisions are made based on the criteria by which you will select the vehicle to lease and enter into contract negotiations. The same concept applies to prospective sellers.

### What is most important to your project?

- Capability and capacity?
- Product and life-cycle costs?
- Delivery dates?

- Warranties?
- Technical expertise and approach?
- Specific relevant experience?
- Adequacy of the proposed approach?
- Qualifications/availability/competence of the proposed staff?
- Financial stability of the organization?

If this is your wish list, it will be important to make sure you know what is most important and what you can live with or without. Once your prospective sellers respond to your requests, you will need to know how to review their responses. Typically, there is a scoring and weighting system attached to keep any nefarious procurement activities to a minimum (as in, I know a guy, so we don't need to look further). Let's keep it legal, people.

## Reviewing the procurement documents

Once the SOW is written and the source selection criteria determined, you will also need to send out specific procurement documents that request specific items as responses from the sellers.

These can include the following:

- **Request for Information (RFI)**
- **Request for Proposal (RFP)**
- **Request for Quote (RFQ)**
- **Invitation for Bid (IFB)**

It will depend on your level of knowledge about the prospective sellers as to what you would send out with your SOW. It also depends on your organization and what they use the most. The majority of organizations I've worked with use a RFP, which has the function of asking prospective sellers to review your SOW and provide a proposal for how they will execute upon the request. A RFI is used when we don't know a lot about the prospective sellers and are looking for some background information to help make an informed decision. A RFQ is typical in cases where money is the only consideration, and an IFB falls under that category as well. That's not to say the price is the only request, but it's up there. That may be due to having worked with them before, and you know what they can do and need to see what they may charge for said project need.

It's not unusual for some industries to hold bidder conferences, in which every potential bidder replying to the same scope of work gets together in a room with the procurement administrator and the project manager to ask questions and get them answered. That way, everyone hears the same information. This information then allows the seller to make informed decisions if and when they respond to the request, which prevents collusion and conspiracy as well. It's important for project managers to attend because they have a more in-depth knowledge of the scope of work and can answer questions accordingly. I do this with potential students and organizations deciding whether we are the right vendor for them. Mostly, sales are doing the talking because they create and work on the procurement side of things. I'm there to answer questions about the content or how I run classes. I'm giving product knowledge but have nothing to do with contracts or pricing—same thing for you in bidder conferences.

There may also be some situations where there isn't a bevy of sellers out there that can provide you with what you need, because either your organization has already chosen a seller or there are not a lot of sellers that provide for your project's needs.

### **Single source**

In the case of a single-source situation, you will be working with only one seller because your organization has already vetted, approved, and signed a contract with them. They are your source. This doesn't mean negotiations won't occur or that you won't be providing them with the scope-of-work documentation; it just means you only have to do it once.

### **Sole source**

In a sole-source situation, there is only one seller that can provide you with what you need for your project, and this can be a difficult situation because they haven't been vetted yet but they are your only option. That can make quality and scope hard to determine in advance. I always use the example of the Intel Pentium processor. Remember when every single computer manufacturer had to have the Intel inside? Where did they get it? Intel. Intel could charge what they wanted, make whatever deals they wanted, and put their sticker on every single computer out there that they wanted. They were—and still are—the sole source for provision of the Intel Pentium processor.

Probably the most important aspects of plan procurement management for the exam are going to be understanding the inputs of the organizational process assets, in the form of different contract types, and the outputs. Even though the tool or technique of make-or-buy analysis is comprehensive in the real world, it's pretty easy in the exam world to determine what the question is asking. As you review the **inputs, tools/techniques, and outputs (ITTOs)** of plan procurement management, keep in mind that the questions can tend to be pretty bulky for procurement, with terms and conditions and extraneous information. Understand the core aspects of the process, and you should be good to go for the exam. ITTOs of plan procurement management include the following:

### Inputs

- **Project charter**
- **Business documents**
- **Business case**
- **Benefits management plan**
- **Project management plan**
  - a) Scope management plan
  - b) Quality management plan
  - c) Resource management plan
  - d) Scope baseline
- **Project documents**
  - a) Milestone list
  - b) Project team assignments
  - c) Requirements documentation
  - d) Requirements traceability matrix
  - e) Resource requirements
  - f) Risk register
  - g) Stakeholder register
- **Enterprise environmental factors**
- **Organizational process assets**

## Tools and techniques

- **Expert judgment**
- **Data gathering**
  - a) Market research
- **Data analysis**
  - a) Make-or-buy analysis
  - b) Source selection analysis
- **Meetings**

## Outputs

- **Procurement management plan**

How procurement will be coordinated; the headers are listed as follows:

- a) Timetable
- b) Metrics
- c) Roles and responsibilities
- d) Constraints and assumptions
- e) Legal and currency information
- f) Need for independent estimates
- g) Risk management issues for mitigation. Bonds or warranties
- h) Prequalified sellers, if any

- **Procurement strategy**

Information for the strategy is provided here:

- a) Delivery methods
- b) Contract payment types
- c) Procurement phases

- **Bid documents**

Types are listed here:

- a) RFP, RFQ, RFI

- **Procurement SOW**

Items included are listed here:

- a) Contractor tasks
- b) Standards
- c) Data for approval
- d) A detailed list of all data and services
- e) Schedule definition for initial submissions

- **Source selection criteria**

Items included are listed here:

- a) Capability and capacity
- b) Product and life-cycle costs
- c) Delivery dates
- d) Technical expertise and approach
- e) Relevant experience
- f) Proposed approach
- g) Management experience

- **Make-or-buy decisions**

- **Independent cost estimates**

- **Change requests**

- **Project documents updates**

The relevant documents are listed here:

- a) Lessons learned register
- b) Milestone list
- c) Requirements documentation
- d) Requirements traceability matrix
- e) Risk register
- f) Stakeholder register

- **Organizational process assets updates**

There are many outputs to be aware of, and without a lot of experience in procurement, the documents may be confusing or sound similar. In *Figure 12.3* here, you'll see the variety of outputs, with an overview of each:

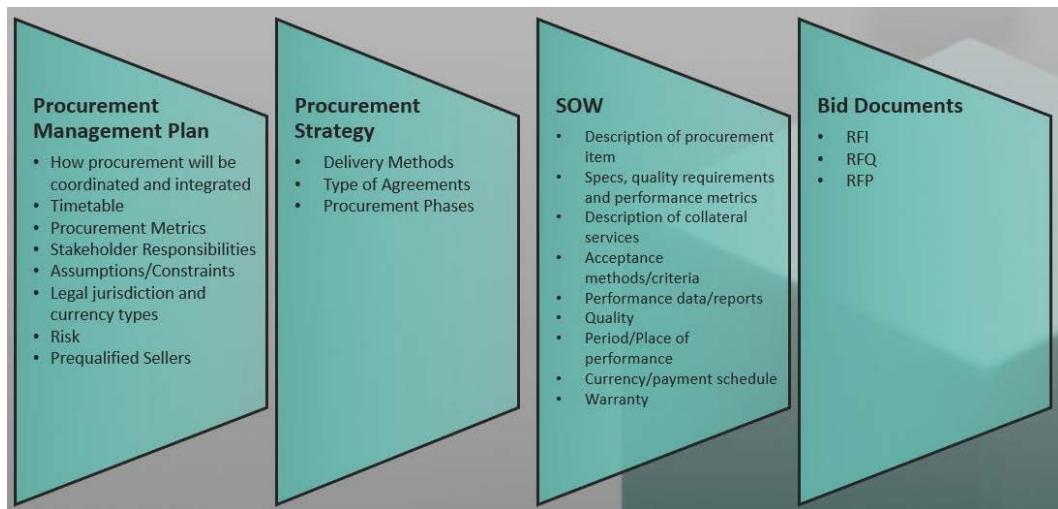


Figure 12.3: Procurement documents

Moving on to the execution of project work, we can begin to put all of the planning work into action and conduct procurements.

Long chapter, right? There was a lot of information on a variety of best practices for risk and procurement. It is also an essential chapter for exam purposes because risk can hide anywhere, and procurement needs for a variety of knowledge areas could be part of the questions you get on your exam.

## Key phrases that pay

A couple of key phrases in planning procurement management are given here:

- Contract types
- Procurement documents

Make sure you are aware of those main concepts and see how you do on the assessment questions. You can always refer back to the chapter as needed to answer them correctly. I found risk to be heavily tested on and procurement questions difficult due to their bulk and extraneous information. Read your questions and answers carefully when answering these and all questions on your exam.

Next, we'll look at the conduct procurements process during project execution.

# Conduct procurements

Remember that procurement activity may be performed throughout a project, especially a long-term project with multiple procurement needs for materials, equipment, or staff. Week 1 you need widgets; week 15 you need the staff to join the project; and so on. The conduct procurements process is designed to help you and your team obtain bids or responses from sellers based on your procurement SOW and implied project needs, vet those responses, select sellers, and award a contract. A key benefit of this is that a seller is selected for a specific scope of work and will go through the negotiation process with the contract administrator, and be offered the stated agreements that best fit both parties. That could be a formal contract, or an SLA and the like. Because this process is iterative, as needed, you'll see a lot of inputs and outputs to consider. Don't be overwhelmed by them; it is simply a cautionary list that when entering into formal legal agreements it's important to make sure the project is protected from potential legal snafus and that you have all the plans together, as appropriate, to support sellers either as additional staff or suppliers of needed materials and requirements.

Let's look first at the following list of inputs. Keep in mind there are multiple management plans and documents you may need to consider for the "how-to and what" of procurements:

## Inputs of conduct procurements

- **Project management plan**
  - a) Scope management plan
  - b) Requirements management plan
  - c) Communications management plan
  - d) Risk management plan
  - e) Procurement management plan
  - f) Configuration management plan (for formal scope changes)
  - g) Cost baseline
- **Project documents**
  - a) Lessons learned register
  - b) Project schedule
  - c) Requirements documentation
  - d) Risk register
  - e) Stakeholder register

- f) Procurement documentation
- g) Seller proposals
- **Enterprise environmental factors**
- **Organizational process assets**

Now, let's look at the tools and techniques that are the main testable items other than the resulting selected sellers and agreements, as follows:

### Tools and techniques

- **Expert judgment**
- **Advertising**
- **Bidder conferences**
- **Data analysis proposal evaluation**
- **Interpersonal and team skills**
- **Negotiation**

Even though the tools and techniques may look simple and understandable, keep in mind that procurement questions tend to be bulky and filled with innocuous terms and conditions. You'll have to read carefully to fully get the gist of the question. If you don't have experience in procurement, that's totally fine; if you understand the basics, you'll be able to answer questions correctly. Let's review some of the big tools and techniques you'll see on your exams. We will start with bidder conferences, and then proceed to data analysis of the proposal evaluation.

## Bidder conferences

Bidder conferences are fairly normal for construction or government projects and are basically what they sound like: a conference for bidders. The main point of such conferences is that they are formal meetings between all prospective sellers who are responding to the same, specific scope of work. These could be referred to as contractor conferences, vendor conferences, and pre-bid conferences, based on your organizational semantics. It isn't unusual for organizations to have their favorites when it comes to prospective sellers, but to avoid this or any collusion or conspiracy, the conferences are designed to make sure that all prospective widget sellers get all of their questions asked and answered at the same time. This ensures that they all get the information they need to go back and put together a proposal or bid that matches the direct project or product scope of work they are bidding for. It's a best practice for the project manager to attend because they know the scope of work, but it's typical to run conferences with the contract administrator or legal department running the show.

## Proposal evaluation

On large projects, it isn't unusual to have multiple sellers. That means as each proposal or bid comes in, you and your team—working with the procurement administrator in most cases—will select your sellers using a screening and/or weighting system.

### Screening system

This is easier said than done, of course, but a screening system is essentially the *yes/no* piles. Did they meet our price? Yes? Then that proposal moves into the scoring and weighting process. No? Goes in the trash. Easier said than done, but it is a quick way of vetting the proposals. Is it or isn't it the right fit for our project based on our source selection criteria?

### Weighting system

Remember your source selection criteria? Each criterion will have a weight attached to it. If price is most important, it will carry the most weight. Let's say price carries a weight of 20 and being on schedule carries a weight of 15. As you go through each proposal in the *yes* pile, you will score the proposal using a 1 through 10 scale.

In the following table, you can see three vendor bids and how they are scored and weighted. Essentially, the one with the highest score wins:

Vendor	Price Bid Score	Price Weight	Price Final Score
Vendor 1	4	20	80
Vendor 2	7	20	140
Vendor 3	10	20	200

It's clear that Vendor 3 has the highest bid score and the highest overall score. Now, add to that the entire list of source selection criteria and follow the same process. Score \* Weight = Final Score. That way, you have shortlisted the top-several high scorers. They will then enter the room with the contract administrator as selected sellers to negotiate the contract.

### Contract administrator/agreement coordinator/procurement team

The reason they have so many names is that different organizations call them different things. Either way, these procurement department people are the ones who can legally and contractually bind your organization to that of another. The assumption on the exam is that they are internal to your organization and, as the buyer, the negotiations would happen for the good of your project. I realize that isn't always the way things happen, so read the questions carefully and ask yourself if you are the buyer in the question or the seller.

The contract negotiation is designed to gain a fair and reasonable price and have a representative that can legally bind your organization to that of another. It's assumed we project managers don't have those roles on a project. The procurement team's job is to make sure that if a change is necessary on the contract due to a change in scope or even a simple administrative change, they are present in the decisions for solution implementation. It's essentially integrated change control with an attorney present. They are also there to support any alternative disputes and resolve first with negotiation and second with the other options available, and they explain the terms and conditions to us, so we don't inadvertently breach the contract.

Another item to consider is that even though the legal folks are there, it doesn't mean that you are not in charge of creating and maintaining good relationships with the seller. It's your job to explain what a breach or the needs of the project could be. If you tell them to go speak with your attorney, those are fighting words! They are stakeholders and it's your job to make sure that they are doing what they are supposed to do, and you are doing what you are supposed to do as well.

Once the contracts are negotiated, the seller is contractually bound to the project due to mutually binding documents in the form of a formal agreement or contract. With that come many terms and conditions specific to the contract and the buyer/seller relationship.

The outputs of the conduct procurements process include the selected sellers, the agreements, and any change requests, as well as updates to just about every single document you have reviewed thus far. Why? Because once a contract is signed there may be some adjustments to the schedule, cost, and scope baselines, as well as risk updates, change requests, and resource information. I don't want you to assume that every single procurement document labeled *agreement* is a locked-down contract. There may be other documentation that suits the project needs and may come before the actual agreement or be the resulting agreement. Some of the legal information that follows may not be found in the *PMBOK® Guide - 6th edition* but could be found in your day-to-day work with any procurement needs of your projects.

## Partner-centric procurement documents

While there are several procurement documents to consider knowing for the exam you may not be tested on all or any of them, but I wouldn't be surprised if you are familiar with some of them already. The following documents can cross the conducting procurements and controlling procurements processes we'll discuss in the next section. All are considered legal and it's important to know, at least at the surface, what they represent:

- Letter of intent
- Memorandum of Understanding (MOU)

- Breach of contract
- **Service Level Agreements (SLAs)**
- **Purchase Order (PO)**
- **Non-disclosure agreement (NDA)**
- Cease and desist letter

## Letter of intent

During the negotiations of a potential contract with a selected seller, there may be some back and forth over terms and conditions until both parties agree on them. A letter of intent is drafted for both parties to sign and agree to before anyone signs on the dotted line in the form of a legally binding contract. Typically, this would be the job of the procurement department in the buyer's organization, who would then negotiate on with the sellers until an agreement on terms and conditions is reached.

## Memorandum of Understanding (MOU)

In some cases, a contract is unnecessary or a formal agreement on terms and conditions cannot be reached. In this case, a MOU would be drafted. A MOU is similar to a contract in the respect that terms and conditions are outlined for performance metrics and product/service requests. It differs from a formal contract because it isn't necessarily a legal document like a contract is. If one or another party doesn't meet performance expectations then neither party can take the other to court. In contracts such as fixed-price, cost-reimbursable, and T&M, if a breach of contract occurred, a court date could be forthcoming.

## Breach of contract

I'm sure you know what a breach of contract is. It's when one side or another doesn't meet contractual obligations. There are two types of breach of contract to consider. A breach of contract doesn't always mean a court date, nor does it mean that both parties don't have to pay and do the work depending on who breached. They do. Much like if you leased a car and then left it on the side of the road because you decided you didn't want to drive it anymore, you would still be responsible for the payments and the welfare of that vehicle. A material breach of contract is egregious and a court date will be forthcoming, and damages can be awarded.

## Service Level Agreements (SLAs)

I would imagine SLAs are pretty familiar in your world since we see a lot of these types of agreements in the IT industry rather than full-blown contracts. This would be an agreement that sets performance guidelines and expectations between two or more parties. Those parties could even be in the same organization and document how quickly your IT team will respond to certain tech issues and within a certain time frame. Patch Tuesdays!

There may also be a **Master SLA (MSLA)** in place, and this streamlines future agreements between parties because each party agrees to the majority of the terms that will be in place in future agreements. This allows for a faster negotiation and turnaround time for future interactions where the specifics don't need to be constantly renegotiated.

## Purchase Order (PO)

If my team needed a certain number of monitors to help with business expansion and technical upgrades, they may decide to use a PO instead. The PO would be written by the buyer (us) and very specifically describe our monitoring needs and quantities to the seller (them). Even though it's not a fixed-price agreement, POs are legally binding.

## Nondisclosure agreement (NDA)

Many organizations use NDAs when they hire from outside their organization. An NDA is signed by the seller, stating they will not communicate trade secrets or internal conversations outside of the organization. You may have noticed a lot on the news lately about people being sued or prosecuted for breaking an NDA; that is because they signed a legal document stating they wouldn't do just that. This is how organizations protect themselves from their competition.

## Cease and desist letter

These are exactly what they sound like. A cease and desist letter is sent out when one organization discovers that another organization is using its trademarked content/products and re-creating them. You see these a lot in the entertainment industry where artists of all kinds have trademarked their brand, their music, or their writing. If someone tries to duplicate their brand in any way, even seemingly, then an attorney will send out a cease and desist letter. If that letter is ignored, a lawsuit is forthcoming.

This brings us to control procurements. Much of what you just reviewed would be managed in the control procurements process as well. Now, we'll move on to the last procurement process of controlling procurements.

## Control procurements

The controlling of procurements is an important step in the entire procurement process because it includes protecting your organization from breach of agreement, keeping track of the seller's performance, maintaining good relationships with your sellers, paying out of your budgets for contract work and incentives, processing formal changes (as needed), and closing out any procurement documents once the work has been completed and approved. Your organization may also have knowledge bases just for your vendors where everything is kept and updated. I know we had to hold on to our contracts for 8 years after they were closed, in order to be compliant. Your mileage may vary. The inputs list is again a long one because there are multiple documents to consider as well as your enterprise environment for this process and your organization process assets, so we'll focus on the main items for the exam.

**The main inputs to be aware of include the following:**

- Agreements
- Procurement documentation
- Approved change requests (formal change control with an attorney present)
- Work performance data (about procurement activities)

The main goal of this process is to follow the legalities of each contract and at points throughout the project and to perform administrative activities related to procurement. Depending on your organization, some of the following areas will be your responsibility and other areas will fall on the procurement department/administrator/legal team. In terms of administrative activities, this will include the collection of data and managing project records to track the performance of sellers. Remember that some of their incentives and awards are dependent on performance and following terms and conditions. This work performance data allows us to refine procurement plans and schedules as needed, analyzing and reporting on that performance to the organization, making any adjustments as needed, and paying out invoices.

The financial management on the procurement side of things needs to be well controlled, whether it's your job or not. Obviously, the payments will occur, but some of the cascading payments are based on performance and the specific terms, conditions, and legalities of the agreements that were signed. One of the main concerns is to make sure you're making payments based on work performed. The project outputs and deliverables via procurements are better suited than labor hours. Just because they worked a lot of hours doesn't mean you're getting the results you intended.

The tools and techniques are again the testable items to be aware of. Even though the list is short, there is a lot going on. We'll review the tools and techniques and focus on the items you need to know to answer questions on your exams.

### Tools and techniques of control procurements

These include the following:

- Expert judgment
- Claims administration
- Data analysis
- Performance reviews
- **Earned value analysis (EVA)** (Don't worry—you don't have to relive it here!)
- Trend analysis
- Inspections
- Audits

Let's take a look at the main tools and techniques to know. The first of these is claims administration.

## Claims administration

Contested and potential changes where agreements cannot be reached between buyer and seller could cause a claims administration procedure to kick in. This only occurs if neither party can agree on the changes. The contested changes are referred to as claims. If neither party can agree after this point then they become disputes, and hopefully appeals will follow. A claim would need to be very well documented without bias or conflict of interest throughout the contractual life cycle. If the parties involved can't or don't want to resolve the claim, an **alternative dispute resolution (ADR)** may be in the offing. Obviously, negotiation is going to be the best way to resolve a dispute, but if not, arbitration, mediation, and litigation could occur. All the bad shuns! Never let a judge make a decision for you that you can make for yourself. I had a judge tell me that. It's not what you're thinking—I used to be a news reporter, not a defendant!

## Data analysis

Data analysis includes performance reviews, typically on the cost side of the house but also with actual performance reviews of work packages completed, quality requirements met, and the like. Then, there is the money side of things for schedule and budgetary performance and forecasting the **estimate at completion (EAC)**.

## Inspections and audits

Remember that inspections are designed to review the results and audits are designed to review a process. It makes sense that you would be inspecting the work of your sellers to make sure they align with terms and conditions and your project management plan, and to determine if incentives are going to be paid out for the work completed.

Remember that any time you see the word *audit*, it means you are reviewing a process. There may be quality audits, risk audits, and procurement audits. In this case, a procurement audit is reviewing the procurement process internally. Did we do our due diligence when selecting our sellers? Did we use the right contract types? Did our sellers perform the way we needed them to? If not, could we have done a better job selecting our sellers? This process is formal and may include a procurement coordinator. It's your job to protect your organization from future costs or litigation on the current project and then take your lessons learned and apply them in the future. It's always a good idea to audit your processes to see if they are working.

Another best practice we follow is seller surveys, discussed next.

## Seller surveys

The survey for your sellers is an important step, whether the results were great, terrible, or somewhere in between. If their performance was great and they got all of their incentives and we were happy with the entire result, a survey can be a really good relationship move for future work. They have been vetted and approved, and now other project managers and the organization know they have a stable seller to work with in the future. If the performance wasn't good, then we know who to steer clear of in the future. There isn't a set best practice for this, but standard templates are a good way to go since each seller is graded on the same items.

### Note

The outputs of the control procurements process include the main output of **closed procurements** as well as any work performance information that may be used to formally close out the contracts, change requests, and updates to your project management plan components and project documents updates.

The process by which contracts are closed out depends on the contract/agreement type, your organizational processes for procurement, and the terms and conditions stated in said contract/agreement. Procurement closure can happen at any time in a project, and hopefully because the work was done correctly and the seller's piece is completed. Early termination could also occur if a project is canceled or a buyer or seller breached the agreement. Either way, the assumption on the exam is that contracts need to be closed out before the phase or project can be closed out. I know we had some payment structures that were net 30, 60, 90 days out past the work being completed. I'm not suggesting we wait around for all of that to happen before we close down our project and work on something else. Quite the contrary. We need to make sure all work has been completed and validated and all contractual obligations for both sides have been met. Many times, this is done with a waiver.

## **Warranty**

A warranty comes into play when you buy a new washing machine and they promise it will work for 1 year and if it doesn't, the company will pay to fix it. 1 year and 1 day later it breaks! No? Just me? I joke (not really). Most warranties apply most to equipment, vehicles, manufactured goods, technology, and the like. Once the warranty period has expired, the organization is no longer liable for fixing the product.

That brings us to control procurements, which are designed to manage procurement relationships, monitoring the execution of procurement items, and closing out procurements throughout the project. Something to be aware of from the *PMBOK® Guide - 5th edition* to the *PMBOK® Guide - 6th edition* is that the closing of procurements was moved from the closing process group to monitoring and controlling. Closing procurements used to be its own entity and process, but with the 6th-edition updates, it was placed as the number-one output in control procurements. This was done because procurements can be closed at any time throughout a project based on work completed and the like, not just at the end of a project. With that said, it's important to make sure all procurements are closed out before the final project closure or phase closures (as needed) occur.

## **Waivers**

A waiver is a procurement document that protects both parties—the seller and the buyer—from future legal issues. Typically, a waiver is necessary to close out a contract, and essentially both sides agree all contractual terms and conditions have been met. On our side, we would sign off and say the seller did everything to meet the terms and conditions and had completed the work. The seller would also sign, stating that we had paid them everything based on the agreement and that no future payments were owed. This allows for a legal guarantee that neither side plans to sue or take the other to court.

The last waiver I signed was when I decided to jump out of a perfectly good airplane, and they made me sign a document that if anything happened, I knew the risks and nobody in my family for 1,000 years could sue them if I plummeted to the ground without a working parachute. As disconcerting as that was, it was a legal way to protect the party with the offer. I didn't need them to sign a waiver that guaranteed that wouldn't happen, but methinks I should have pushed the issue.

Obviously, I made it without any scratches and formed a healthy fear of heights, but was otherwise unscathed.

That is a waiver. It protects the party or parties from future litigation. In the case of procurement closure, the buyer (us) would sign the waiver, stating that the seller (them) had completed all of the work they were hired to do. The seller would then sign the waiver, stating that we had paid them everything they were due. Now, both parties have protected themselves.

In the case of an *alternative dispute resolution (ADR)*, the waiver would not be signed because one party disagrees with a change or an outcome and is not willing to let the other party off the hook. In this case, your procurement administrator would step in and try to negotiate an acceptable conclusion, and if that didn't work then arbitration, mediation, and litigation would be considered. That's not good at all. That is something we project managers need to keep in mind. Create and maintain good relationships with your sellers; keep track of their performance; pay incentives and other payments on time; follow the terms and conditions to the letter of the law; and if you have questions or concerns, get your procurement department involved. They are, after all, there for that very reason. Auditing allows us to look back on our procurement decisions and relationships and make changes for the better going forward.

Make sure you are aware of the main concepts of procurement management and see how you do on the assessment questions. You can always refer back to the chapter as needed to answer them correctly. I found procurement questions difficult due to their bulk and extraneous information. Read your questions and answers carefully when answering these and all questions in your exam.

## Summary

In this chapter, you reviewed an in-depth overview of procurement management, including different types of contracts and the role you play as project manager, as well as selecting your sellers and control procurements.

In *Chapter 13, Stakeholder Engagement*, and *Chapter 14, Integration Management*, you will review how to engage your stakeholders and create a plan to do so, as well as reviewing the final integrated project management plan, creating deliverables, managing changes, and closing out the project or phase. Then, all the processes will be complete!

## Assessment questions

### Question 1

You are working with your procurement administrator and determining what the best contract type should be for acquiring the equipment you need. You are concerned about your budget because you are working with a funding limit and need to keep the cost risks low. What is the best contract type to use in this situation?

1. Fixed-price
2. Cost-reimbursable
3. Time and materials
4. Service level agreement

### Question 2

Your organization has used the ABC company for years to help with large installs of server upgrades in multiple locations, and Doug has been the resource assigned to your projects. You and Doug have a good working relationship, and you trust him to get the job done. The ABC company has signed a fixed-price incentive fee contract and has stipulated that Doug will get his incentives when the customer validates the scope. In the middle of the project, Doug comes to you and ask for his incentives early because he always gets his work done and he could use the money. What should your response be?

1. "Sure, let me process a change request to see if we can get you some of your incentives early."
2. "Sorry Doug, I can't make that decision. You're going to have to talk to Larry, my procurement administrator."
3. "Sorry Doug, I know you'll get your work done and make your incentives easily, but that would be a breach of contract, and I can't pay you early. I'm really sorry about that!"
4. "Sure Doug, let me write you a check for half of your incentives."

### Question 3

You and your team are trying to determine what you will need from outside sellers in the form of materials and equipment. During your discussions, you are attempting to figure out what can be done in-house and what can't be. This could be an example of which of the following?

1. Make-or-rent analysis
2. Make-or-buy analysis
3. Source selection criteria
4. Plan procurements

### Question 4

After a good hard look at your procurement needs, you have put together a document that clearly states your needs for that particular type of seller, as well as the requirements for the product you are building. Which document does this best represent?

1. RPF
2. RFQ
3. RFI
4. PSOW

### Question 5

The project you and your team are currently working on needs a unique piece of equipment that only one vendor has. You will have to pay what they ask and can't confirm the quality until the part is delivered. What kind of seller are you working with?

1. Single-source
2. Sole-source
3. Vendor bid analysis
4. Selected seller

### Question 6

You work for a large organization with multiple locations and departments. You and another IT team from another building are working together on a project. Both departments feel it is necessary to outline each team's responsibilities and **key performance indicators (KPIs)** clearly, but a legal contract isn't necessary. Which of the following may work instead?

1. Letter of intent
2. Fixed-price contract
3. Service Level Agreement (SLA)
4. Purchase Order (PO)

### Question 7

You and your team are working through prospective procurement needs for a project during a make-or-buy analysis and have decided that your project would benefit from renting laptops rather than spending part of your budget to buy them. Your team has determined that each laptop needs to have a long battery life since they travel so much, and a specific amount of **random-access memory (RAM)**. You have determined that the rentals in total can be no more than 1,000 dollars a month. What are you and your team determining?

1. Make-or-buy decisions
2. Source selection criteria
3. Procurement management planning
4. Request for proposal information

### Question 8

You have a variety of procurement needs for a large manufacturing project. The main need is to find a supplier that can deliver quickly and meet the quality specifications of the components necessary to create the end result. You have received several bids from different sellers bidding on the same scope of work, and you and your team determine that you'll need several categories to review them and decide. The weight and the scoring system have been designed by your **project management office (PMO)**, and you have determined that to keep things fair you'll choose the seller with the highest score. Which of the following procurement tools or techniques are you using while performing this review?

1. Weighting system
2. Scoring system

3. Conduct procurements
4. Control procurements

#### Question 9

A representative from your legal department has called a meeting to review the scope of work with sellers who can provide the specific scope of work needed. In the meeting several of the prospective sellers have questions, and you provide them with the specifics of the scope of work so that they can put together a comprehensive proposal with all of the information necessary. What kind of meeting is this?

1. Bidder conference
2. Audit meeting
3. Lessons learned meeting
4. Status meeting

#### Question 10

Colleen and her marketing team have worked with your organization for years as a selected seller providing marketing campaigns for your company's newest products, and have been very successful. You have reached the end of the approval phase for their newest campaign and their work is completed on the project. You have asked Colleen and her legal team to sign off on the payments they received for their work and to also have your team sign off on the document, stating they had done everything they were contractually bound to do. Which of the following procurement documents are you and Colleen signing?

1. Warranty
2. Service level agreement
3. Memorandum of understanding
4. Waiver

#### Question 11

Before your team closes out the project and the final contract, you review the procurement process from beginning to end and determine that your selection process worked very well and the sellers you selected met all contractual obligations within schedule and scope requirements. This allows you to put them on a shortlist of sellers for future projects based on their performance. What is this tool or technique called?

1. Inspection
2. Lessons learned

- 3. Audit
- 4. Supplier survey

#### Question 12

Your building project is nearing the end, and you and your team are doing a walkthrough of the building to make sure that everything on your punch list is completed within requirements. You meet up with the foreman and let them know that everything looks to be in order, and they can receive their final payments and incentives and the contract can be closed out successfully. Which tool or technique are you executing in this situation?

- 1. Audit
- 2. Contract closure
- 3. Waiver
- 4. Inspection

#### Question 13

During the execution of a contract with a seller you have worked with on many projects, you ask for a change to be made to the scope of work. The seller is irritated because during negotiations the contract administrator assured them that they would not have to perform the specifics of what you are asking for. The seller disagrees with the change request and refuses to execute the work. It has been determined that the claim cannot be resolved. Which of the following will occur due to this situation?

- 1. Claims administration
- 2. Alternative dispute resolution
- 3. Negotiation
- 4. Litigation

**Question 14**

As you plan out your scope of work for a large megaproject, you know that there are specific needs of the project. As you and your contract administrator start putting together the SOW and investigating possible sellers, you realize that there is only one seller who can provide you with the materials you need. While this makes the selection process easier, you are concerned that it may be difficult to track quality, and ask for specific terms and conditions to be added to the SOW before it gets sent out. Which of the following best describes this situation?

1. This is a single-source situation
2. This is due to not advertising effectively
3. This is due to a sole-source situation
4. This is due to not having enough background info on specific seller types

**Question 15**

You are in a room with the legal department who is negotiating a cost-plus incentive fee contract. The selected seller states that they believe the entire costs would be 150,000 dollars. You agree to the costs as they fit your cost estimates for the work. You have also agreed to a 15,000 dollars incentive fee if they meet the quality requirements on your project. As the negotiations continue, you mention that if the costs were to come in below the quoted amount you would be willing to do a share ratio of 80/20 to help incentivize the seller to keep costs low. When the contractual work is completed, the seller states that the final costs are 135,000 dollars and they have met all requirements for their incentives. How much will you pay out for this contract based on the given situation?

1. 153,000 dollars
2. 150,000 dollars
3. 162,000 dollars
4. There is not enough information to answer this question



# 13

# Stakeholder Engagement

In this short chapter, we'll cover the extensive topic of stakeholder management. In *Chapter 4, Charters and Stakeholders*, we covered trends and emerging practices, Agile influences, and the first stakeholder management process of identifying stakeholders in the initiation process. This led to an analysis of power and interest and the creation of the stakeholder register, which describes who your stakeholders are and what their requirements might be. This chapter will pick up the planning process group and "plan our stakeholder engagement." Then, we will move on to managing stakeholder engagement during the execution of the project. Finally, we will discuss monitoring stakeholder engagement in the monitoring and controlling phase of the project.

In this chapter, we'll cover the following topics:

- Planning stakeholder engagement
- Managing stakeholder engagement
- Monitoring stakeholder engagement

## Planning stakeholder engagement

At this point in the stakeholder management knowledge area, you have already created the stakeholder register. Now, you will take that information, along with your plan for communications, and utilize both of those to craft an engagement plan. This process will be iterative because stakeholders come and go, and the ones that stay might change their engagement needs throughout the project. I'm sure you have experienced situations where you have an extremely supportive stakeholder at the beginning and they need very little in the way of engagement to keep them happy and communicate effectively. Then, a risk event occurs. Dun dun duh! Rut roh. Now that stakeholder becomes irritated and demanding. So, what do you do? Update how you engage with them. Evidently, something has gone sideways, and you'll need to adapt the plan accordingly. The goal of this process is to involve your stakeholders based on *their* needs, expectations, impacts, and interests, not yours. This is tough to do when you're walking around inside your own thoughts, needs, and expectations. Our responsibilities lie in the effective communication and engagement of our stakeholders. Can we make everyone happy all of the time? Certainly not. Here and there, some expectations will be missed or glossed over. As long as we are cognizant of that fact and work to improve, then we are on the right track.

The main output of this process is the stakeholder engagement plan, and even though you're reading about this after numerous other processes, the engagement plan is actually created early on in the project and is updated as needed. The initial management plan is created shortly after the stakeholder register is created. That makes sense because you have just identified who they are and their power and impact on the project. While it's still fresh in your mind, it is a good time to begin this process. There are several triggers (I feel triggered!) that could lead to updates, and not all of them will come from your stakeholders. The organization might change how they do things and put stakeholders into a tailspin. Alternatively, a new phase could begin, and people could be coming to or going from the project. The main reason to update your engagement plan stems from having to review the project work, especially when that review involves stakeholders. For example, it could result in a formal change control process and risk or issue management. These triggers or drivers could lead to a revamp of your current strategies to those that are more appropriate for the immediate situation. To get to that point, there are some considerations regarding the inputs, tools, and techniques that we need to address. Let's take a look at the key inputs because, by this point, you will have already covered every management plan, baseline, and the like.

Here are the inputs of the stakeholder engagement planning process:

- **Project charter (which lists key stakeholders)**
- **Project management plan**
  - a) Resource management plan
  - b) Communications management plan
  - c) Risk management plan (this could include escalation protocols or risk owners)
- **Project documents**
  - a) Assumption log
  - b) Change log
  - c) Issue log (one of the main aspects of true engagement and communication is to keep everyone in the loop)
  - d) Project schedule
  - e) Risk register
  - f) Stakeholder register (a project document that has all stakeholders listed and their relevant information)
- **Agreements (this includes stakeholders via procurement activities)**
- **Enterprise environmental factors**
- **Organizational process assets**

**Reference**

*A Guide to the Project Management Body of Knowledge (PMBOK® Guide)-Sixth edition. The PMBOK is a registered mark of the Project Management Institute Inc.*

Any time you work with people organizationally, you can expect major influencing factors coming from your organization's culture and standard working process. Enterprise environmental factors include the political climate of your organization, your stakeholders' risk appetites, the communication channels, and the geographic distribution of those stakeholders. What if they are global or simply remote or virtual stakeholders? Therein lies the need for an effective plan. Some project managers would argue that the engagement plan and the communications management plan are the same or very similar. Remember, there is a symbiotic relationship between the two knowledge areas, and while I agree that you could make one big management plan, it's important to separately look at the best practices from each area for the exam.

On the organizational process side of things, you could experience power structures and hierarchical politics, how communication occurs, and utilize the lessons learned, or empirical knowledge from similar past projects. Corporate policies and procedures for social media, ethics, and cybersecurity, even the software you use, and organizational communications requirements (read that as red tape) will all affect your interactions with your stakeholders. Even in Agile environments, where the stakeholders engage with the product owner and transparent communications are the norm, a plan may still have to be there. People over process doesn't mean that there isn't a plan or a process of continuous improvement in communication and stakeholder engagement. Empirical knowledge can provide that, and we learn as we go.

### Tools and techniques

- **Expert judgment**
- **Data gathering**
  - a) Benchmarking
- **Data analysis**
  - a) Assumption and constraint analysis
  - b) Root cause (not just for risk but also to determine why engagement strategies aren't working)
  - c) Decision making
  - d) Prioritization or ranking
- **Data representation**
  - a) Mind mapping
  - b) Stakeholder engagement assessment matrix
- **Meetings**

Let's review the big item you'll see on the exam since many of the other tools and techniques have been covered before. This is the stakeholder engagement assessment matrix.

The job of this technique is to review your stakeholders and determine what their engagement level is currently, and what our desired engagement level is. As you review this topic, keep in mind that, for many of us, this process is mental and verbal only. In the exam, it is a very tangible analysis of the levels of engagement on your projects. The matrix will be created with the stakeholders listed down the left-hand side column and their level of engagement along the top. The classifications would include a "C" for "current" and a "D" for "desired."

The recommended categories of engagement to use in this process would be the following:

- **Unaware:** That is, they are not aware of the project or any potential impacts. I mean, I've worked with some clueless people in my life, but that isn't what this means. It means that someone isn't involved now or aware they may be in the future. It could be a functional manager who isn't aware that you may be borrowing their resources in the future. So that designation would change once you acquire their resources. For now, we don't need to focus our engagement energies until that occurs.
- **Resistant:** That is, they are aware of the project but are resistant to changes; they are unsupportive and not fun to work with.
- **Neutral:** That is, they are aware but wishy-washy.
- **Supportive:** Now we are getting somewhere!
- **Leading:** They are actively engaged in helping the project become a success. Awesome! How many of these can I get for every project?

Now you can see why this is potentially a mental exercise. However, I see the value in labels in this case because how you structure your stakeholder engagement plan will be driven by a variety of personalities and support, or lack thereof.

The output of the stakeholder engagement plan not only identifies the actions and strategies that are required but also helps to gain an understanding of how to pull your stakeholders into productive and active involvement. If they are labeled as leading or supportive, we need to keep them that way. If they aren't, we need to craft a plan to bring them into the light. It's easier said than done, and unfortunately some people have personality issues. I know, right? Say it ain't so. Oh, I'm saying it! So, it will be up to you to look up from the documentation and get your head in the game to execute engagement appropriately outside of the documentation. Words on a page don't translate to the stage unless the actors can be convincing enough to sell the story. You are the harbinger of your own stakeholder engagement. Once you have your plan, you will need to manage that engagement throughout the project.

## Managing stakeholder engagement

The managing stakeholder engagement process during project execution is the act of stepping outside of the plan and making it work in the real world. You'll see it as you go through the tools and techniques, especially the focus on conflict resolution, feedback, and other interpersonal skills that provide the labels for human interactions – for instance, words such as negotiation and cultural and political awareness. As previously mentioned, all of these are easier said than done. You know who your stakeholders are, how they act, and, in general, the hope is that we are all professional adults..."all" is a bit inclusive, I think. Therein lies the need for these considerations. The benefit of paying attention to this process is that it allows you to increase support and stakeholder involvement while working toward conflict resolution.

Here, the main focus is on the tools and techniques, and any potential updates that might be necessary once you actually put your plans into action:

### Tools and techniques

- **Expert judgment**
- **Communication skills**
  - a) Feedback
- **Interpersonal and team skills**
  - b) Conflict management
  - c) Cultural awareness
  - d) Negotiation
  - e) Observation/conversation
  - f) Political awareness
  - g) Ground rules
- **Meetings**

### Outputs

- **Change requests**
- **Project management plan updates**
  - a) Communications management
  - b) Stakeholder engagement plan

- **Project documents updates**

- a) Change log
- b) Issue log
- c) Lessons learned register
- d) Stakeholder register

The majority of the tools and techniques and outputs are designed to keep on top of what is going on with your stakeholders. Are they still committed to the success of the project? Do they have any concerns where we would need to use negotiation or good communication to resolve? Are there any risks or anticipated future issues to be aware of, or have those issues been resolved thus far?

As you can see, there is not much content as per the exam, but this process is an integral step in maintaining your stakeholder's expectations and using good communication, negotiation, conflict resolution, and the like, to work through issues transparently and resolve as necessary. Because there is so much overlap between communications and stakeholder engagement, read the questions carefully. If you are executing project work, then you are also managing stakeholder engagement, using good communication to do so.

## **Monitoring stakeholder engagement**

Much like managing engagement, monitoring stakeholder engagement is happening as well. If we become more efficient and effective at engaging our stakeholders and working through issues, then as things on the project change, are we able to adapt and keep up? If not, then we would need to adapt our strategy. The goal is to maintain or increase support while reducing conflicts and resistance. We can do this by monitoring relationships and tailoring our strategies according to the stakeholder's needs. As you review the tools and techniques and outputs, you'll notice an overlap with other stakeholder processes but with a larger focus on analysis and the actions happening during the monitoring and controlling process group. The inputs are relatively the same across the knowledge area with communications, engagement, issue logs, lessons learned, project communications, risks, and stakeholder registers:

### **Tools and techniques**

- **Data analysis**

- a) Alternatives analysis
- b) Root cause analysis
- c) Stakeholder analysis

- **Decision making**
  - a) Multicriteria decision analysis
  - b) Voting
- **Data representation**
  - a) Stakeholder engagement assessment matrix
- **Communication skills**
  - a) Feedback
  - b) Presentations
- **Interpersonal and team skills**
  - a) Active listening
- **Cultural awareness**
  - a) Leadership
  - b) Networking
  - c) Political awareness
- **Meetings**

The tools and techniques suggest that in the midst of everything else going on in the project, you will need to remain both cognizant and vigilant about how and what you communicate, and how your interpersonal skillsets are working for you or against you. The outputs represent the work performance information gained from decision making and data analysis, as well as requests for change and updates.

As you can see, this is a pretty short chapter. Just make sure you read carefully because you will see a lot of questions, and the correct answers might not reflect what you would do in the real world. Herein lies the importance of the tools and techniques, as well as the ethics of human interactions, that you could see on the exam. Also, remember that a large part of this knowledge area was covered in *Chapter 4, Charters and Stakeholders*. Make sure that you review that chapter as needed to tie everything together.

## Summary

In this chapter, you reviewed the remaining stakeholder management processes, such as planning for stakeholder engagement and managing and monitoring that engagement throughout the project. Project managers have the responsibility to engage their stakeholders throughout the project, even if the stakeholders change their engagement needs. Even though this chapter is shorter than most, it is perhaps one of the more important aspects of project management. This is because we need to be sure that we are interacting appropriately with our stakeholders and ensuring their needs are met.

In the next chapter, you will review the integration knowledge area, the finalized version of the project management plan, how to execute project work and produce deliverables. Additionally, we will look at formal change control monitoring, controlling project work, and how to close out the project or phase. The integration chapter will wrap up everything we have covered so far, and it should give you a well-rounded overview of all the topics we have covered in this book.

## Assessment questions

### Question 1

You are working with your stakeholders to determine what information they need to be updated on weekly. One of your key stakeholders, Joan, has asked to be kept up to date on any surprises that occur on the project that result in a negative impact. Which of the following documents is Joan asking to see weekly?

1. The stakeholder register
2. The risk management plan
3. The issue log
4. The assumption log

### Question 2

Which of the following documents can help you plan for stakeholder engagement on the seller side of the project?

1. Agreements
2. SOW
3. RFP
4. The procurement plan

### Question 3

Power structures, politics, and how communication flows in your organization are influenced by which of the following?

1. Enterprise environmental factors
2. The industry
3. The organizational setup
4. Organizational process assets

### Question 4

You are a project manager working on a large construction project and have the help of a project coordinator. During the project, several stakeholders express concerns about the updates they are getting and the lack of communication. You review everything with your coordinator, and it appears they have done everything according to the engagement plan, as have you. Which tool or technique would be helpful in this situation?

1. Stakeholder engagement assessment
2. Expert judgment
3. Root cause analysis
4. Benchmarking

### Question 5

Claudia is a functional manager in your organization who you typically borrow resources from. Your new project is developing an app that tracks calories, and it needs a good developer. Claudia has just the right person. You have jotted down on your calendar to review the project needs with her next week. At this point, what kind of current stakeholder engagement category is Claudia in?

1. Neutral
2. Supportive
3. Leading
4. Unaware

### Question 6

Joaquin is a new member of your team and has recently arrived from Spain to work on your development project. Some of your team members are concerned that he won't be able to keep up due to the language and cultural differences. What is the best thing to do in this situation?

1. Call a meeting to introduce Joaquin to the team formally and ask him to put together some information on his country and culture.
2. Call a meeting and tell the team they will need to work closely with Joaquin until he knows the way the team works together.
3. Send out an email introducing Joaquin to the team and send a short video about Spain to the team.
4. Tell the team that they need to be more culturally sensitive.

### Question 7

You have a team of seven people and three key stakeholders. During a meeting, one of the key stakeholders suggests that everyone should be on time for meetings and that no cell phones should be allowed so that time isn't wasted. The rest of the team agrees that this is a good idea. What has the team just done during this discussion?

1. Set ground rules
2. Kept the peace
3. Used negotiation
4. Deferred to a key stakeholder

### Question 8

Which of the following is NOT an output of managing stakeholder engagement?

1. Change requests
2. Issue log updates
3. Stakeholder engagement assessment matrix
4. Project management plan updates

### Question 9

Jill has been a stakeholder on many of your projects and is always very supportive of your initiatives. Lately, Jill seems less interested and vocal with her support. What is the best thing to do in this instance?

1. Review the stakeholder engagement plan and update it to help engage Jill.
2. Talk to Jill and find out why she is less supportive, and craft a new approach.
3. Review the stakeholder engagement plan and decide how best to move forward.
4. Start updating Jill more often with the project information so that she can see how well the project is running.

### Question 10

You are in the breakroom and overhear two stakeholders discussing how they were not invited to meetings they were supposed to be invited to and are not being updated regularly on project performance. What is the first thing you should do?

1. Review the stakeholder engagement and communications management plan to determine whether they are supposed to be updated, and then update the plans to include them as needed.
2. Review the stakeholder engagement and communications management plan, and update them to include the stakeholders.
3. Hold a meeting to discuss what information they need.
4. Hold a meeting with the team to find out why they aren't being updated or being invited to meetings.

# 14

# Integration Management

In this chapter, we will be covering the remaining processes in integration management. The importance of integration management processes, while seemingly high-level, shows the best practices for managing all the other knowledge areas. In *Chapter 4, Charters and Stakeholders*, we reviewed the importance of having a project charter giving us formal authorization to begin project work. Now we will pick up with the project management plan, which we also reviewed at a high level in *Chapter 2, Introduction to Project Management*. Using that project management plan, we will be able to execute project work and produce deliverables, manage project knowledge, perform integrated change control, as well as to control project work, and then we will move on to closing the project or phase.

The topics we will cover in this chapter include the following:

- Developing the project management plan
- Directing and managing project work
- Managing project knowledge
- Monitoring and controlling project work
- Performing integrated change control
- Closing the project or phase

## Developing the project management plan

Since we have essentially covered all of the documents that will be part of the integrated project management plan, it makes sense to put the integration as the last chapter under process. At this point, we have covered every single management plan and baseline that would be integrated into the overall project management plan and then used to execute, monitor and control, and close out the project or phase. Remember, the project management plan is your YouTube video channel for how you will work your way through the project and make sure that any changes to the management plans and baselines go through integrated change control to be updated. With that being said, you'll notice that the inputs, tools and techniques, and outputs are pretty straightforward for this process even though it's taken us several chapters to get all of the subsidiary plans and baselines together to integrate it. The inputs, tools and techniques, and outputs of developing the project management plan are as follows:

### Inputs:

- Project charter:
  - a) Outputs from other processes
- Enterprise environmental factors
- Organizational process assets

### Tools and techniques:

- Expert judgment
- Data gathering:
  - a) Brainstorming
  - b) Checklists
  - c) Focus groups
  - d) Interviews
- Interpersonal and team skills:
  - a) Conflict management
  - b) Facilitation
  - c) Meeting management
- Meetings

**Outputs:**

- **Project management plan:** Project management plan components include subsidiary management plans:
  - a) Scope management plan (covered in *Chapter 7, Scope Management*)
  - b) Requirements management plan (covered in *Chapter 7, Scope Management*)
  - c) Schedule management plan (covered in *Chapter 8, Schedule and Cost Management*)
  - d) Cost management plan (covered in *Chapter 8, Schedule and Cost Management*)
  - e) Quality management plan (covered in *Chapter 9, Quality Management*)
  - f) Resource management plan (covered in *Chapter 10, Resources and Communications Management*)
  - g) Communications management plan (covered in *Chapter 10, Resources and Communications Management*)
  - h) Risk management plan (covered in *Chapter 11, Risk Management*)
  - i) Procurement management plan (covered in *Chapter 12, Procurement Management*)
  - j) Stakeholder engagement plan (covered in *Chapter 13, Stakeholder Engagement*)
- **Baselines:**
  - a) Scope baseline (covered in *Chapter 7, Scope Management*)
  - b) Schedule baseline (covered in *Chapter 8, Schedule and Cost Management*)
  - c) Cost baseline (covered in *Chapter 8, Schedule and Cost Management*)
- **Other components:**
  - a) Change management plan (covered in this chapter)
  - b) Configuration management plan (covered in this chapter)
  - c) Performance measurement baseline (an integrated scope-schedule-cost plan to compare project execution against)
  - d) Project life cycle (what phases the project will pass through from initiation to close)
  - e) Development approach (predictive, Agile, hybrid, and the like)
  - f) Management reviews (define when management will review project performance with the project manager and relative stakeholders and determine whether corrective or preventive actions need to be taken)

**Reference**

*Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition, Project Management Institute, Inc., 2017, Pages 87-88.*

Remember, you also covered a lot of project documents that do not need to be updated through formal change control. These are the living, breathing documents outlined in *Chapter 2, Introduction to Project Management*.

Once the project management plan is approved, it is a formal plan to begin project execution and begin to develop the deliverables.

## **Directing and managing project work**

The main aspect of the direct and manage project work process is to execute based on the currently approved project management plan and its baselines to produce the deliverables as per the requirements. You spent so much time putting together all of these management plans, collecting requirements, tracing those requirements, and building out a schedule and a budget and scope baseline that you are now ready to begin executing the project work. This process is iterative as deliverables will be created throughout execution until the final product, service, or result is approved and you can close out the project. Keep in mind that when we covered scope management and quality management, I showed you a process flow that began with the deliverables, traveled through control quality to be verified as fit for use, then through the validate scope process so that the deliverables could be accepted. After this, the project or phase can be closed. In this chapter, we will cover both the creation of the deliverables in the direct and manage project work process and the close project or phase process. You'll see from the list of outputs that deliverables are number one, but there are also many updates to any components of the project management plan as you execute work and compare the plan versus the actual. The inputs, tools and techniques, and outputs of direct and manage project work are as follows:

**Inputs:**

- Project management plan:
  - a) Any component
- Project documents:
  - a) Change log
  - b) Lessons learned register

- c) Milestone list
- d) Project communications
- e) Project schedule
- f) Requirements traceability matrix approved change requests
- Enterprise environmental factors
- Organizational process assets

**Tools and techniques:**

- Expert judgment
- **Project Management Information System (PMIS)**
- Meetings

**Outputs:**

- Deliverables
- Work performance data
- Issue log
- Change requests
- Project management plan updates:
  - a) Any component
- Project documents updates:
  - a) Activity list
  - b) Assumption log
  - c) Lessons learned register
  - d) Requirements documentation
  - e) Risk register
  - f) Stakeholder register
- Organizational process assets updates

Keep in mind that as we direct and manage project work, we are collecting the raw work performance data and comparing it against the actual implementation. The information gained from this allows us to make decisions about project changes, and it gives us the ability to communicate with stakeholders in the form of work performance reports. That brings us to our next process, which is managing project knowledge.

Managing project knowledge is a new process in *the PMBOK® Guide - 6th edition*, and a lot of times, people confuse this for a communications management process. But if you think about managing all of the project knowledge in one place, it not only allows us to leverage organizational knowledge and lessons learned from past projects but also helps us to support and update our organizational process assets and operations for future projects or phases. Think about it as integrating all project knowledge from past projects, collecting it for current projects, and iteratively updating as needed.

## Managing project knowledge

As mentioned, this process is about using existing knowledge and creating new knowledge; this is designed to achieve the project objectives and contribute to your organizational learning processes. You will also notice that a lot of the project documents, as inputs, cross numerous knowledge areas that would provide helpful information that can be utilized in an integrated fashion. Be aware, for exam purposes, that this process, while not fully vetted and perceivable as quite vague, is an important new aspect of an integrated project management experience. The inputs, tools and techniques, and outputs of managing project knowledge are as follows:

### Inputs:

- Project management plan:
  - a) All components
- Project documents:
  - a) Lessons learned register
  - b) Project team assignments
  - c) Resource breakdown structure
  - d) Source selection criteria
  - e) Stakeholder register

- Deliverables
- Enterprise environmental factors
- Organizational process assets

**Tools and techniques:**

- Expert judgment
- Knowledge management
- Information management
  - a) Interpersonal and team skills
  - b) Active listening
  - c) Facilitation
  - d) Leadership
  - e) Networking
  - f) Political awareness

**Outputs:**

- Lessons learned register
- Project management plan updates:
  - a) Any components
- Organizational process assets updates

One of the main things to be aware of in this process is that knowledge typically comes in two forms: explicit and tacit knowledge. Explicit knowledge uses words, pictures, and numbers. Thus, explicit knowledge would be used in things such as performance reports, meetings, presentations, and the like. Tacit knowledge, on the other hand, is internal and personal and often difficult to express to others. Explaining things such as your beliefs, insights, and experiences is difficult in a lot of cases. This process is very concerned with managing explicit knowledge so that existing knowledge can be reused and new knowledge can be absorbed and created.

According to *the PMBOK® Guide - 6th edition*, there is a common misconception that managing knowledge is all about documentation that is being prepared to be shared or that it is just about collecting lessons learned when the project is over. Only codified explicit knowledge can be shared this way, but it lacks context and is open to different interpretations by different personalities. Even though it's easily shared, emailed, or presented, it isn't necessarily always understood or applied correctly. Tacit knowledge has context built in, but it's based on the individual and their social groups and situations, and is often applied via conversation and interactions with other people.

The goal at an organizational level is really to make sure that your project team and other stakeholders' skills, experience, and expertise are utilized effectively before, during, and after the project. As we know from Agile-influencing factors, transparent communication is necessary, and for transparent communication to work effectively, people need to be motivated to share that information. You can have the absolute best-written reports and presentations in the entire world, but if your entire audience isn't paying attention because they're demotivated, then what good are the reports and presentations, after all?

Because it takes a combination of both explicit and tacit knowledge to engage, communicate, and report to your stakeholders, knowledge needs to be shared utilizing a variety of tools and techniques, both formal and informal. These tools allow us to gain and share that knowledge appropriately.

As we move into the next section, we will discuss monitoring and controlling project work and integrated change control to update our project management plan components as necessary to produce the deliverables to requirements.

## Monitoring and controlling project work

The integrated iterative process of monitoring and controlling project work is designed to allow stakeholders to know the current state of the overall project. This process also allows stakeholders to be kept up to date on any corrective or preventative actions as well as the overall cost and schedule forecasts to determine the future state of the project. You'll see from the inputs, tools and techniques, and outputs of this process that there are a lot of similar data analysis tools that you have already reviewed. Keep in mind that using those tools and techniques here is done to gain an understanding of the overall project performance and isn't specific to one knowledge area. The inputs, tools and techniques, and outputs of monitor and control project work are as follows:

### Inputs:

- Project management plan:
  - a) Any component

- Project documents:
  - a) Assumption log
  - b) Basis of estimates
  - c) Cost forecasts
  - d) Issue log
  - e) Lessons learned register
  - f) Milestone list
  - g) Quality reports
  - h) Risk register
  - i) Risk report
  - j) Schedule forecasts
- Work performance information
- Agreements
- Enterprise environmental factors
- Organizational process assets

**Tools and techniques:**

- Expert judgment
- Data analysis:
  - a) Alternatives analysis
  - b) Cost benefit analysis
  - c) Earned value analysis
  - d) Root cause analysis
  - e) Trend analysis
  - f) Variance analysis
- Decision making
- Meetings

**Outputs:**

- Work performance reports
- Change requests
- Project management plan updates:
  - a) Any component
- Project documents updates:
  - a) Cost forecasts
  - b) Issue log
  - c) Lessons learned register
  - d) Risk register
  - e) Schedule forecasts

Monitoring project work is an important aspect of keeping your projects on track, which is why it's an iterative process. If you continuously monitor your project, your project management team will understand the health of the project as well as any areas that need improvement or attention. The controlling of a project works with integrated change control procedures while determining corrective or preventative actions, which may lead to re-planning and resolving performance issues.

Some aspects of the monitoring and controlling project work processes include the following:

- Comparing planned versus actual work
- Determining corrective or preventative actions
- Checking individual project risks and their status
- Providing information to support your status reports, progress reports, and forecasts
- Monitoring implemented and approved changes to ensure that they have worked
- Providing reports to the right people at the right time in the right format with the right impact to ensure that the project is still aligned with the needs of the business

All of these actions will help to keep the project on track and the stakeholders involved in the project's performance. The monitor and control project work processes work very closely with the next process of integrated change control.

## Performing integrated change control

Performing integrated change control is concerned with reviewing change requests, approving changes, and managing changes. These changes can be to deliverable project documents and aspects of the integrated project management plan. It is also concerned with communicating the decisions of change requests. Integrated change control is very formal, and all changes would be documented and considered, but at the same time, there are concerns about overall project risk impacts, which is more typical when there isn't a formal change control procedure. The same could be said for scope creep because that never happens! Keep in mind that there are some very specific assumptions that the Project Management Institute makes about formal change control, one of which is that there is a **Change Control Board (CCB)** whose entire job is to deny change requests. Just kidding; their entire job is to analyze change requests and make the best decision for the project, other programs, and portfolios, as well as the impact on the organization.

Let's take a look at the inputs, tools and techniques, and outputs of the perform integrated change control process:

### Inputs:

- Project management plan:
  - a) Change management plan
  - b) Configuration management plan
  - c) Scope baseline
  - d) Schedule baseline
  - e) Cost baseline
- Project documents:
  - a) Basis of estimates
  - b) Requirements traceability matrix
  - c) Risk report
  - d) Work performance reports
  - e) Change requests
- Enterprise environmental factors
- Organizational process assets

**Tools and techniques:**

- Expert judgment
- Change control tools
- Data analysis:
  - a) Alternatives analysis
  - b) Cost benefit analysis
- Decision making:
  - a) Voting
  - b) Autocratic decision making
  - c) Multicriteria decision analysis
- Meetings

**Outputs:**

- Approved change requests
- Project management plan updates:
  - a) Any component
- Project documents updates
- Change log

The integrated change control process is iterative from the very beginning of the project, from the creation of the project charter through to formal closure. Change requests will occur throughout the project, and even though the assumption is that there is a Change Control Board, it is the ultimate responsibility of the project manager to work with change requests. While changes can be requested by any stakeholder involved in the project life cycle at any time, the level of change control is based on the complexity of contracts and the environment of the project.

It's important to note that until your baselines are all approved, including your scope, cost, and schedule baselines, formal change control is unnecessary. Once those baselines are approved, however, change requests would need to be processed formally. Updating baselines can differ from organization to organization, but for example purposes, your configuration management plan should clearly define any elements that would require a change request. I'm sure you've experienced change requests that are verbally given to you by key stakeholders, but it's going to be important to make sure that it is formally documented and once documented, would need to be approved, deferred, or rejected.

In many cases, the project sponsor, or even us, the project managers, can approve. But if there is a CCB, you would need to go through them to approve or deny changes. Then your job would be to communicate the decisions. It may be necessary for the customer or the sponsor to approve even after the CCB has made its decision.

Another major aspect of this process is to make sure that any prospective changes to the major baselines are assessed for impact on the rest of the project management plan, including the other baselines. For example, if there is a small scope change that could impact the budget, the schedule, or the quality and potentially cause risks in other areas, it is important to look at the other constraints and identify the potential for negative impacts in other areas. It is our job, then, to be proactive and assess the impacts, come up with potential solutions by brainstorming with our team and other stakeholders, and then get internal approval from the sponsor or the CCB, depending on your organizational process assets and as needed by the customer.

For example, let's say that your customer wants a bell on a bicycle. You would assess the impact of that scope change on the schedule and the budget, as well as quality concerns, risks, and resources. Then, you want to come up with solutions to implement the scope change and add a bell to the bicycle. Once you think you have the best solution, you would then take it to your CCB for internal approval. The big question is, would your customer need to sign off on your solution? The answer is yes, even though they requested the scope change, they may not know what the impact is on their budget or how it could extend the schedule; they will need to review your solution and then approve or deny it.

**Note**

If you memorize the order of change control, you should be able to answer any question about integrated change control. Be sure to read carefully to understand what has been done in the process as the exam may ask you what to do next.

**The process to memorize is as follows:**

1. Assess the impact.
2. Create solutions.
3. Gain internal approval (CCB for the exam).
4. Gain customer approval.

In some organizations, there are manual or automated tools that can be used to facilitate configuration and change management. Configuration control is focused on the specification of the deliverables and the processes, while change control is focused on identifying, documenting, and approving or rejecting changes to the project documents, deliverables, or baselines. Your organizational process and your environment will be designating what tools you use to do so.

That brings us to the final process, closing the project or phase.

## Closing the project or phase

According to the *Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition*, the close project or phase process is about finalizing activities, not only for the project or phase but also to be sure that contracts are closed out as well. Even though the formal closing of contracts occurs in the control procurements process, it's still important to make sure that all the ducks are in a row rather than running around the backyard going in different directions. In some cases, you will have go-no-go decisions, phase gate reviews, and other types of formal phase closures. The close project or phase process is making sure that project or phase information is archived, all work is completed, and as needed, all resources are released to work on other projects or returned to their functional departments. If the project is phase-oriented, this process could happen several times throughout the life cycle of the project, but if the project is not phase-oriented, this process would occur once at the end.

If you take a look at the inputs, tools and techniques, and outputs of the close project or phase process, you'll notice that a lot of the inputs include numerous project documents that would need to be formally archived as "lessons learned." The inputs, tools and techniques, and outputs of the closed project or phase process are as follows:

### Inputs:

- Project charter
- Project management plan:
  - a) All components
- Project documents:
  - a) Assumption log
  - b) Basis of estimates
  - c) Change log

- d) Issue log
- e) Lessons learned register
- f) Milestone list
- g) Project communications
- h) Quality control measurements
- i) Quality reports
- j) Requirements documentation
- k) Risk register
- l) Risk report
- Accepted deliverables
- Business documents:
  - a) Business case
  - b) Benefits management plan
- Agreements
- Procurement documentation
- Organizational process assets

#### **Tools and techniques:**

- Expert judgment
- Data analysis
- Document analysis:
  - a) Regression analysis
  - b) Trend analysis
  - c) Variance analysis
- Meetings

**Outputs:**

- Project documents updates:
  - a) Lessons learned register
- Final product, service, or result transition
- Final report
- Organizational process assets updates

As you can probably tell based on all the documents that you will be reviewing, we project managers have to perform activities that are necessary not just for project closure but also for the administrative closure of the project or phase.

The actions and/or activities that are necessary to close out a project or phase include the following:

- Making sure that all documents and deliverables are up to date
- Ensuring all issues are resolved
- Confirming that the customer has formally accepted the deliverables and confirming the delivery of those deliverables
- Ensuring that all costs are charged
- Closing project accounts
- Reassigning personnel
- Dealing with excess project materials
- Re-allocating project facilities, equipment, and other resources
- Delivering and explaining the final project reports based on your organizational process assets

Some activities have to do with contractual agreements being completed and closed out. As project managers, we would need to make sure that the seller's work has been formally accepted, that all open claims have been finalized, and that records are updated based on the final results and are then archived for future use.

We will also be collecting records about the project or phase and auditing the success or failure of the project. It's also important to manage knowledge sharing and the transfer of that information, including identified "lessons learned" during the project or administrative closure and then archiving the project information. Once administrative closure occurs, you can transfer the project's product, services, or results to the next phase of production and/or operations. Another important aspect of formal closure on the administrative side is to measure stakeholder satisfaction and collect any suggestions for improvements to the organizational policies and procedures to maintain the health of the organization by updating the organizational process assets for future use.

Keep in mind that all of these actions would need to take place if the project was terminated, and all reasons for the termination would need to be documented appropriately. As the project manager, we need to focus on engaging all proper stakeholders in the process and communicating the reasons for project termination as appropriate.

One of the key inputs of this process is getting the accepted deliverables to the customer or operations. Remember the process that we took a look at in directing and managing project work, control quality, and validating scope to get the deliverables to the completion of the project.

You can see that progression. Remember, this could help you answer about 25 questions; not because you'll be asked the order in which these occur, but understanding the processes and their outputs and how they fit together can go a long way in answering numerous questions from all the processes. This process is, after all, the entire reason for project management.

#### Reference

*Project Management Body of Knowledge (PMBOK® Guide) - Sixth Edition Pages  
82-187*

And with that, we close out Domain II: Process. At this point, you have reviewed all 49 processes based on their knowledge areas and how they all work together to produce the final result. This is a good time for a spot check and a review of the processes, knowledge areas, and process groups. One of the best exam tips I can give you is to know where you are in the project while answering questions. When you read the question, ask yourself, am I in initiation? Planning? Execution? Monitoring and controlling? Close project or phase? Knowing where you are in the life cycle will help you know what has already been done and what is still to come in the project.

## Spot check

Do your best to fill in each process:

Knowledge Areas	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management					
5. Project Scope Management					
6. Project Schedule Management					
7. Project Cost Management					
8. Project Quality Management					
9. Project Resource Management					
10. Project Communications Management					
11. Project Risk Management					
12. Project Procurement Management					
13. Project Stakeholder Management					

## Summary

You have covered the entire knowledge area of integration management, with the exception of "develop the project charter," which we covered early on. Integration ties everything together and allows us a coordinated way of initiating, planning, executing, monitoring and controlling, and closing out the project. This is done through the creation of a project charter at initiation, the creation of an integrated project management plan during planning, deliverable creation when directing and managing project work, managing all project knowledge in execution, monitoring and controlling project work and integrated change control in monitoring and controlling, and the final closure of the project and/or phase.

In the next chapter, you will review the next steps and study tips! Woohoo!  
You made it!! :-)

## Assessment questions

Question 1: Which of the following would not be considered a subsidiary plan of the project management plan?

1. Risk management plan
2. Scope baseline
3. Cost management plan
4. Quality management plan

Question 2: You and your team have put together a comprehensive project management plan and you feel it will be executed effectively. What do you need to do before you can begin executing project work?

1. Hold a kick-off meeting.
2. Acquire your resources.
3. Gain formal approvals.
4. Communicate the plan to your customer.

Question 3: What is the main output of direct and manage project work?

1. Issue log
2. Change requests
3. Work performance data
4. Deliverables

Question 4: Your team is in the process of executing project work and gathering information that allows you to make decisions about project changes to be made, and it gives the team the ability to communicate with stakeholders in the form of work performance reports. What process is this describing?

1. Manage project knowledge.
2. Direct and manage project work.
3. Perform integrated change control.
4. Monitor and control project work.

Question 5: Your customer has come to ask you to add a bell to the bicycle project you are working on. You have determined that adding the bell will cost \$2,000 and will add another week to the schedule. What do you do next?

1. Assess the impact.
2. Create solutions.
3. Get internal approvals.
4. Get customer approvals.

Question 6: A key stakeholder has come to you to gain an understanding of the current state of the entire project. They are asking you to present that information in the next status meeting. Which of the following processes would you be using to do this?

1. Direct and manage project work.
2. Develop the project management plan.
3. Monitor and control project work.
4. Integrated change control.

Question 7: Kevin is a core team member who you have worked with on many projects. He has come to you to discuss a situation that involves a critical activity. He is concerned that the activities prior to his are behind schedule and he will be going on vacation when they are anticipated to finish. He mentioned that another team member has the skills and the float time and will step in as needed. Which of the following best describes what Kevin is suggesting?

1. Corrective action
2. Preventative action
3. Scope change
4. Schedule change

Question 8: Frank is a software developer on a large project that you are managing. The software you are developing will protect your organization from future hacking and is a cybersecurity preventative measure. Frank explains to you that he has made some slight changes to the scope of work based on his own expert judgment. The problem is he didn't inform anyone prior to making the changes, resulting in scope creep. After explaining everything, you agree the changes are good for the project. What do you do next?

1. Communicate the changes to the rest of the team.
2. Communicate the changes to the organization.
3. Update your plans and lessons learned.
4. Go through integrated change control for formal approvals.

Question 9: The project you have been working on isn't going well and after speaking with your sponsor, the decision is to close out the project. What must be done before formal closure can occur?

1. Validation of scope with formal signatures from the customer.
2. Close out the contracts.
3. Release the team.
4. Communicate the decision to other stakeholders.

Question 10: All of the following are part of formal project or phase closure except:

1. Confirming that the customer has formally accepted the deliverables and confirming the delivery of those deliverables
2. Ensuring that all costs are charged
3. Closing project accounts
4. Performing root cause analysis for project issues

Question 11: Your team is getting ready to wrap up the project and is excited that the project went well. They are waiting for approvals from the customer so that the scope of work is validated, and the project can be closed out. The customer is taking a long time to sign off, so a team member suggests you just release the team so that they can go work on other projects. How do you respond to their request?

1. "No problem, I know this is taking a long time, so I'll release the borrowed team members now."
2. "Sure, go ahead and let your functional managers know you are ready to return to their department."

3. "I'm sorry, I can't release the team until all contracts are closed out."
4. "I'm sorry, I can't release the team until the scope of work is formally accepted."

Question 12: Which of the following is a formal group that decides what changes can and can't be made to project work?

1. Change control department
2. Directive PMO
3. Controlling PMO
4. Change Control Board

Question 13: Which of the following is best described as "any action taken to bring performance back in line with the plan"?

1. Corrective action
2. Preventative action
3. Formal change control
4. Defect repair

Question 14: Which of the following integration processes allows for go-no-go decisions?

1. Develop project charter.
2. Plan project work.
3. Integrated change control.
4. Close project or phase.

Question 15: Which of the following inputs is absolutely necessary to close a project or phase?

1. Enterprise environmental factors
2. Organizational process assets
3. Accepted deliverables
4. Closed procurements

# Section 3: Revision

You have completed the project management journey! Congratulations! Now we will focus on the next steps and study tips. The PMP® exam is challenging, but not impossible. Revisit this chapter as many times as needed to get your study plan together. When you are ready, take your final exam and see how you do. Those areas where you missed questions are those areas that you will need to go back and review. Do not worry, you've got this! Good luck!

This section comprises the following chapters:

- *Chapter 15, Next Steps and Study Tips*
- *Chapter 16, Final Exam*



# 15

# Next Steps and Study Tips

In this chapter, we'll explore an overview of things to keep in mind in relation to your PMP® exam. You'll also have some information on how to apply for the exam and some study tips to get you started. All this information can be found online in multiple areas and throughout this guide. However, everything you need to know is in one place in this chapter to avoid searching for similar information elsewhere.

The topics we will cover in this chapter are as follows:

- Why project management certification?
- Study tips
- Stuff to know about projects
- Final thoughts

## Why project management certification?

Project management has been around since the dawn of time. Imagine trying to figure out the best way to build a fire for the very first time or to catch a large mammoth without being hurt! Humans have always figured out a way to improve the way things are done. In Late Middle Ages, imagine the scale of the Sistine Chapel artwork and other great works of art commissioned, and the building of incredible architecture, and, in a lot of cases, creating better ways of doing battle and organizing their troops. In the industrial age, project management applied to constructing tall buildings, ships, and trains, and utilizing new machinery to improve commerce and living. Now, we are in the technological age and even though we are still constructing buildings, trains, planes, and automobiles, we are finding ourselves with new types of projects that require best practices all of their own.

Many project management best practices have stood the test of time, scheduling, budgeting, resourcing, and determining what the result will be. The reason why they have stood the test of time is that they work.

How we utilize the tools and best practices also needs to be adapted so that they work for technological projects such as cybersecurity, server or software installation and development, help desk management, and the like. There isn't a one-size-fits-all approach to project management in any industry, and much of the time our organizational processes and cultures influence our projects the most. But what if you had multiple tools and knowledge at your disposal to adapt and adjust as needed to meet the demands of your projects? What if you could adapt those best practices to conform to your organizational processes and industry? Then it wouldn't matter whether you were catching dinosaurs, building the Colosseum, or building a data center; you could pick and choose what would work. That is the beauty of learning best practices. On top of that, if you can prove that you know these best practices before or while being asked to use them through certification, you now have some project management clout in your back pockets!

The PMP® exam is designed for people like you, individuals who have set best practices based on their organization but are looking for a common language to use, common tools and best practices that have been proven over and over again to work, but yet are adaptable to your environment.

Having one or multiple project management certifications shows your willingness to learn, try new things, and improve your organization's projects, which, in turn, provides value to the organization. Congratulations on taking the first step to career improvement! Currently, project management is in high demand globally. Project managers make anywhere from \$70,000 to \$150,000 annually based on their location and targeted project management categories.

Everything you covered in this guide will not just prepare you for certification and passing an exam, but my hope is that it will also give you the tools you can use right away on your current or impending projects.

You may have seen some things in this guide and on your exams that don't necessarily align with your organization's best practices or simply "won't work" in your current environment. That is totally okay! You will need that information to answer questions correctly in your exams.

Everything you have covered can be found in the PMP® exam content outline overview at [www.pmi.org](http://www.pmi.org).

For sure you will want to review the topics that are tested on and how each topic weighs as far as your score is concerned.

## Where can I find the information?

While the steps for gaining your PMP® certification may seem fairly easy, it's important to know what those steps are so that you can begin to prepare for your exams. The following steps will help guide you through the process.

### Review the exam objectives

Super important!! Make sure you review the exam content outline and what they will test you on:

- Review the certification objectives to make sure you know what is covered in the exam.
- Review the handbook for your application and exam information: <https://www.pmi.org/certifications/types/project-management-pmp>.
- Practice for the exam.
- After you have studied for the exam, review and answer as many sample questions as you can to prepare for it.

Once you are clear on the objectives, you'll want to apply for and pay for your exam.

### The application

The application is a lot less confusing than it has ever been before, so you'll get through it! As of June 2020, the application got a facelift and is far easier than it was previously! Here are some tips and tricks to make it a less frustrating process.

## Updates to the application

The new application process only calculates your hours using the start and finish dates. That is a huge update because you used to have to track your hours across the process groups and calculate months and now it's just total time from start to finish. You also no longer have to include those individuals who can validate your experience in relation to every project. There has also been an update to the project explanation section. Instead of the previous 550 characters, now there is space for 500 words. The normal explanation is between 200 and 500 words. Now you can really explain what you did on the project instead of bullet pointing all your hard work. There are also some new drop-down lists that enquire about team size, industry, total budget, and the like. Super easy!

## How do I calculate the hours needed to apply?

- 3 to 5 years, depending on your level of education, must have been spent leading and directing projects.
- PMI® assumes a 40-hour working week.
- Hours can overlap if you are working on multiple projects. For example, on Project A you spent 20 hours a week, and on Project B, 20 hours. Don't go above 40 hours a week!

## Things to remember

1. Be honest.
2. Be prepared in advance.
3. You can start your application and then save and continue for 90 days.
4. Once you submit your application, it takes about 5 business days for approval.
5. Once approved, you have 1 year to sit the exam.
6. When you submit the payment, you will find out whether you are being audited.

## AUDIT!!!!?????

An audit is how to maintain the integrity of the exam and it isn't personal, so don't worry! It's just a way to make sure people aren't lying on their applications. Even though you don't have to document all those individuals who can validate your experience on the new application, you will need to provide that information in the case of an audit. It is therefore best to have that information handy, just in case:

- **1 out of 4** applications are randomly selected for audit.
- In the event of an audit, have all your materials ready to submit in advance.

- Copy your application into Word prior to submission and email it to all contacts so they are ready to go just in case.

Once your application is approved, you will be ready to pay for and schedule your exam.

## Ready for your exam?

Pay for your exam on PMI®'s website and then find a testing center and schedule your exam at a location near you. You can now take your PMP® from home as a response to the COVID-19 pandemic. While some test sites may be open around the world, why not take it from home in your pajamas?! Please always visit the Pearson VUE site for updates. The online exams can be taken from home 24/7. You will need a webcam, a microphone, and a system that has a strong internet connection. You will have a digital whiteboard as scratch paper and a calculator is built into the questions with math.

## Other changes and information

- The PMP® exam now includes two 10-minute breaks! You will answer the first 90 questions and then submit, take a break, then the next 90 and so on. You will not be able to go back and review them following submission.
- You can leave the test area to take a break but you must be back within the break time or forfeit the rest of your exam.
- After the break, you will answer the next 100 questions and submit them for your score.
- Pearson VUE is the proctor for in-person and online exams, so you will need to create an account there as well.
- Pearson VUE also offers scheduling via phone if you are having trouble scheduling online.
- PMI's website is <https://certification.PMI.org/testing/schedule-exam>.
- Pearson VUE's website is <https://home.pearsonvue.com/pmi>.

I know the first chapter covered much of this information, but it's always good at the end to remind you of where you started.

## What to expect on exam day for in-person exams

On exam day, be prepared to show up a few minutes early so that you can sign in. You will be asked to provide two forms of identification, and to leave your belongings in a locker provided by Pearson VUE. The proctor will give you something to write on and something to write with, and then take you to your computer station.

- The exam will be computer-based with one question at a time and you will easily be able to navigate the exam by using the next and back buttons.
- You also have the ability to mark questions for later review in case there's a question you're not sure of or that you cannot answer.
- Regarding any questions that involve formulas, you will have access to a calculator built into the question, so you don't have to do any math in your head.
- The exam will present you with situational questions and will ask you to put yourself in the shoes of a variety of project manager duties and responsibilities. The majority of the questions are written from the project manager's perspective, but be prepared to understand all of the roles in the project team.
- You may find that some questions have two or more correct answers, so do your best to select the BEST answer. It is also likely that you will get questions that have extraneous information in them but don't actually pertain to the correct answer. Remember that there are different types of questions now – click and drag, check all that apply, and hot spot questions as well.
- Once you submit your exam you will find out within a minute whether you have passed your exam and Pearson VUE will give you a certificate proving you have passed. PMI® will mail out your certification shortly after. You may want to buy a frame for it. It's a big accomplishment and you should be very proud!
- Another thing to note is that you will be in a room with other test takers. Some of those test takers will be taking different types of exams, some of which will include typing. Try not to get too distracted by what everyone else is doing so you are able to focus on your exam.

Study tips are important to understand and use for your best success, and we will cover these next.

## Study tips

Take and retake practice exams until you score approximately 85-90 percent several times in a row. Be aware that the practice questions in your student guide will not be the exact same questions you will get in your exam as there is a test pool of thousands of questions.

You never know which questions you will get on your exam. You could be sitting next to someone taking their PMP® exam and they would have a different pool of questions to answer. The content is the same, but it is presented in different ways.

The exam itself is not adaptive, so the pool of questions you get when you sit down will not change based on your knowledge of one topic over the other.

I highly recommend that you use practice questions as a way to solidify the information rather than to rote memorize it, as you will find that the actual exam questions will differ.

If you do find yourself memorizing the answers without actually knowing why one answer is correct versus incorrect, it may be time to locate some additional practice exams.

PMI® can provide you with a couple of free questions from their website, and there are multiple websites that can provide some additional practice questions if needed.

### Note

Just make sure that any practice questions you find outside of the student guide are referring to the latest version of the PMP® exam. With the number of questions that you have in this guide, you should not need to look elsewhere unless you deem it necessary for your own success.

Make sure that you read the questions carefully! If you don't read the questions carefully, you may miss a better answer or the nuance of the question itself.

Use this study guide to review all pertinent information, best practices, and suggested processes. You may find if you are already working on projects that you do not do what is suggested as a best practice in a student guide and during the exam. The reason for this may be because of your organizational processes and your enterprise environment.

Remember that project management is not a one-size-fits-all situation. You may learn some new best practices that you want to incorporate in your day-to-day work, and you may learn some best practices that are not relevant in your day-to-day work. The best advice is to learn the content as it's presented to pass your exam and then determine ways in which you can incorporate the recommended best practices in your current or future projects.

Don't forget to breathe! The exam is comprehensive but not impossible. Cramming won't help you, so my best advice is to get into the mindset of the best practices, take and re-take practice exams, and read through this guide as much as needed to solidify the concepts.

Now, what items do I absolutely need to know or memorize?

## Stuff to know about projects

Even though you have covered many items in a variety of places throughout this guide, it's always nice to have a one-stop shop for the key items to be aware of for the exam:

- A project is a temporary endeavor to create a unique product, service, or result compared to operations that are ongoing.
- Projects drive changes in the organization and create business value and help attain organizational goals.
- Projects operate in an environment that regards **Organizational Process Assets (OPAs)** and **Enterprise Environmental Factors (EEFs)** as inputs to many planning processes.

### **OPAs include the following:**

- a) Standard processes
- b) Lessons learned and historical information
- c) Proposal evaluation criteria
- d) WBS templates
- e) Risk templates
- f) Project closure guidelines
- g) Change control procedures
- h) Financial processes and control systems
- i) Schedule templates
- j) Defect management
- k) Other files for usage on multiple projects

**EEFs include the following:**

- a) Organizational culture, processes, and infrastructure
- b) Standards for product management
- c) Databases for risk
- d) Work authorization systems
- e) Quality standards
- f) Government standards
- g) Codes of conduct
- h) Communication channels
- i) **Project Management Information Systems (PMIS)**

## Why projects are necessary

There are many reasons why an organization would decide to undertake a project above and beyond a product, service, or new processes. They could undertake it for the following reasons as well:

- Regulatory/legal/social requirement changes
- Stakeholder needs/requests
- Changes in technology/business
- Improvements to processes/products/services

A project can be subdivided into phases, where each phase is a collection of logically related project activities that result in the completion of deliverable(s). At the end of each phase is a "phase gate", which determines whether the project will proceed.

Processes are defined by PMI® in the current version of the *Project Management Body of Knowledge (PMBOK® Guide)*.

**Note**

*The PMBOK Guide is a registered trademark of the Project Management Institute Inc.*

As of the time of writing, the sixth edition is the most current with 49 processes. The exam is still based on the 6th edition as well as other suggested reading. The 7th edition will be based on standards of project management and will compliment the 6th edition but not result in an updated exam. Always make sure that you are working with the correct edition's information. Processes are grouped in the *PMBOK® Guide* into five process groups: initiation, planning, execution, monitoring and controlling, and closing.

## What is the difference between a portfolio, program, and project?

The main differences between these three are as follows:

- A portfolio is a group of unrelated programs and/or projects to achieve organizational strategic goals.
- A program is a group of related projects managed in a coordinated fashion.
- A project is temporary and unique.

**Organization Project Management (OPM)** is related to the coordination and management of portfolios, programs, and projects to achieve strategic business goals.

Project management has a lot of different, yet important, aspects to it. This is why the definition of project management is important to be aware of for the exam.

Project management is "the application of knowledge, skills, tools, and techniques that are deemed appropriate to manage project activities in order to meet the project requirements and achieve customer satisfaction."

Part of that alignment is to be sure that stakeholder expectations are aligned with the project requirements. That is why you spend about 90 percent of your time communicating!

Project management also allows for tailoring to be able to select the correct processes, inputs, tools, techniques, outputs, and life cycle phases according to the unique needs of each individual project. This is one of the most important skills you can have as a project manager. There simply isn't a one-size-fits-all approach to managing projects.

In order to effectively manage a project, we have to be both aware and prepared to manage competing constraints of scope, schedule, cost, quality, risk, and resources. There is a myriad of documents that can help us do so.

## Project management documents

There are several important documents that you will need to review and understand for exam purposes:

- The **Business Case** documents the economic feasibility and the identified benefits of undertaking a project and is used for the authorization of project management activities. Project selection techniques such as Net Present Value (NPV; always choose the highest), Benefit Cost Ratios (BCR; needs to be above 1.0 to be considered more benefit than cost), Internal Rates of Return (IRR, always choose the largest percentage), and Payback Period (always choose the fastest; also, this is lowest in consideration and part of the formula for NPV) are used to determine the financial aspects of the project.
- The **Project Benefits Management Plan** describes what the benefits are and how they will be measured, including alignment with organization strategies, assumptions, and risks. Even though there isn't a specific process for this, it is assumed on the exam.
- The **Project Charter** names the project manager formally and gives them formal authorization to begin project work and utilize organizational resources. The charter will also document information about the business case, scope, schedule, and any additional information at a high level, and is usually signed by the project sponsor and other key stakeholders. A project cannot begin without a project charter!
- The **Project Management Plan** is an integrated plan that provides the "how to" guides and baselines to track project performance. Once approved, any subsidiary plan or baseline needs to be updated through formal change control. It's your YouTube channel for project management.

## Skills of a project manager

We wear a lot of hats as project managers and, in doing so, have a lot of responsibilities that need certain skills. Some of the following are important, but this isn't an exhaustive list, rather a generic list as an overview for exam purposes:

- Technical project management skills, include tailoring, planning, managing competing constraints, and determining what is necessary in order for the project to be successful
- Strategic and business management skills
- Performing integration at the process level, cognitive level, and context level
- Leadership

**Leadership styles to know for the exam are as follows:**

- Laissez-faire
- Transactional
- Servant leader
- Transformational
- Charismatic
- Interactional

Many of the technical and leadership skills are influenced by the organizational structures you work in.

## Organizational structure types

Be aware of the structures and where the level of powers of the project manager falls:

- Organic or simple organizations are typically small businesses without a lot of employees.
- Virtual.
- Projectized is the best for project managers because you have full authority over the project, team members are often co-located, and the organization is designed for projects. This may include a PMO.
- A matrix organization can be broken down into three types – strong, balanced, and weak. The exam assumes a strong matrix unless otherwise stated in the question. This is because the PM has full authority over project work, a core team that helps them plan, and may borrow resources from functional departments as needed.
- Functional organizations are the least effective for projects because there isn't a PM role and the functional manager has full control. It is dysfunctional as regards projects.
- Composite/hybrid organizations can be a combination of different types, depending on the actual requirements, and may have multiple projects running with a variety of organizational influences.

**Note**

Tight Matrix probably won't be included in your exams, except perhaps as a distractor answer. It is simply that the team is co-located in a common area rather than an organizational type.

Another influencing factor is whether your organization has a project management office, or PMO.

**Project Management Offices (PMOs)** standardize governance, provide training, and share tools, templates, resources, and the like across projects/programs/portfolios. I often think of a PMO as a functional department for project management. Typically, it is found in a strong matrix to projectized organizations and falls under one of three categories:

- Supportive PMOs have the least amount of power over your projects and are typically there in a support role with templates and assist with project prioritization and resources.
- Controlling PMOs will dictate the way in which some aspects of project work are executed, what software to use, and what templates, and will oversee project performance.
- Directive PMOs have the most power over project work and will be the main source of documents, lessons learned storage, and the rules to follow, and will be one of the key stakeholders on the project. They will "direct" the project work.

I'm sure you know by now that there is a LOT of terminology and documentation to be aware of for the exam, but wait... there's more!

## Other important terms to be aware of

While many of the questions will focus on the main concepts, rather than rote memorization of the following, it's always a good thing to know how other aspects and content fit into the terminology and the project as well as the exam. Since integrated change control is a large aspect of project management, we'll start with configuration management:

- The **Configuration Management Knowledge Base** contains baselines of all organizational standards and can be used as historical information for current projects.
- **Lessons learned** allows the team to review project information from the past and use it to help manage in the present. You are collecting lessons learned throughout the project. Once the project is concluded, that information becomes historical information.
- The **work authorization system (WAS)** is a system used during project integration management to make sure that the right work gets done at the right time and may be used specifically for virtual teams.
- **Project Management Information System (PMIS)** includes the configuration management system and change control system.

- Project **Statement of Work (SOW)** describes the business need, the high-level scope of deliverables, and the strategic plan of the organization. It isn't unusual to have an SOW be created by an external customer to begin a contractual relationship, define their needs for the project, or provide a description of the deliverables to help define project needs. This typically is the catalyst for a project charter to be created.
- **Requirement Traceability Matrix (RTM)** is a visual matrix connecting deliverables to requirements and their sources for managing scope and confirming that scope requirements have been met during the validate scope process. It is also an excellent way to track changes to requirements and assess the impact of change on other requirements.
- **Work Breakdown Structure (WBS)** is a hierachal decomposition of 100 percent scope of work.
- The **Activity List** is created during the define activities process and contains a list of all known activities decomposed from the WBS to be performed on the project as well as attributes to help sequence, estimate, and create a schedule.
- **Activity Attributes** include additional information of all the activities in the activity list, as needed, to help with scheduling, including activity resource estimates, duration information, procurement needs, and the like. These are updated iteratively, as many project documents are.
- **Responsibility Assignment Matrix (RAM)** is a matrix connecting people to the work. An RACI matrix (responsible, accountable, consult, inform) is the most common.
- The **Resource Breakdown Structure (RBS)** is a hierarchical chart listing all the resources by category.
- A **Risk Breakdown Structure (RBS)** is a hierarchical chart listing all risks by category.

As you execute your project, you will be collecting data that can help show whether your project is on track compared to the original baselines. This information is important to make adjustments as needed and to report to stakeholders.

## Project management data and information

Work performance data is the raw data collected from the team based on what is happening today.

Work performance information is analyzed against baselines to determine variations. This may include earned value analysis, control quality measurements, and the like.

Work performance reports use the work performance information that is documented as per the communication needs of stakeholders and sent out in weekly or bi-weekly reports. Remember that they are in alphabetical order – data; information; reports.

Sunk costs include the money already spent and not being returned as per the original business case and assumed ROI. Sunk costs should not be considered when determining whether to cancel a troubled project, at least from a project manager's perspective.

The law of diminishing returns is the point at which the more you put into something, the less you get out of it. Typically this is crashing your schedule with more resources or my golf game. Whatever works!

Working capital is determined during the business case creation and includes the organizational assets minus the financial liability. This is typically narrowed down to how much the company has to invest in the projects

The payback period is the time period in which the original investment is returned and a profit attained. Always choose the fastest.

The **Benefit-cost ratio (BCR)** information is used to summarize the overall value for money of a project and whether the benefits outweigh the costs. Always choose the highest. A figure of over 1.0 means that the benefits outweigh the costs.

The **Net present value (NPV)** is the sum of the present values (PVs) of the individual cash flows and helps define profits and the value of today's money tomorrow. Always choose the highest amount of money.

**Present value (PV)** is a future amount of money that has been discounted to reflect its current value as if it existed today with inflation and currency exchange rates.

**Future value (FV)** is the assumed value of an asset at a specific date in the future.

**Internal Rate of Return (IRR)** is the discount rate or investment yield rate produced by the project's deliverables over a pre-defined period of time. Always choose the highest.

**Journey to Abilene (Abilene's Paradox)** refers to a situation when a group makes a collective decision that is different from the thoughts and feelings of its individual members. This is due to the fear of raising objections. This is rarely seen nowadays in the exam, nor is it found in most study documentation.

Typically, the formulas tend to freak people out unless they are awesome at math. Remember, there won't be tons of math on the exam, perhaps 20 questions maximum, and even that seems like a big number. Don't stress the math. You'll have a calculator and something to write on and with. Maybe take a minute (no more) to jot down the formulas once you start your exam. That takes the pressure off.

## Formulas

Common formulas you will encounter in the exam include the following:

The results	The formulas	The hints
Schedule Performance Index (SPI)	$SPI = EV/PV$ EV = Earned Value PV = Planned Value	Less than 1.0 - Behind schedule Equal to 1.0 - On schedule Greater than 1.0 - Ahead of schedule
Cost Performance Index (CPI)	$CPI = EV/AC$ EV = Earned Value AC = Actual Cost	Less than 1.0 - Over budget Equal to 1.0 - On budget Greater than 1.0 - Under budget Cumulative CPI = the CPI from the start to the current assessment
Schedule Variance (SV)	$SV = EV - PV$ EV = Earned Value PV = Planned Value	Negative \$\$ Behind schedule Equal to zero means on schedule Positive \$\$ Ahead of schedule Even though it is schedule performance, it is represented in currency.
Cost Variance (CV)	$CV = EV - AC$ EV = Earned Value AC = Actual Cost	Negative - \$\$ Over budget Equal - \$\$ On budget Positive - \$\$ Under budget
Estimate at Completion (EAC) if original is flawed	$EAC = AC + \text{New ETC}$ AC = Actual Cost New ETC = New Estimate to Completion	Used if the original estimate is based on incorrect data/assumptions or when project circumstances have changed.

The results	The formulas	The hints
Estimate at Completion (EAC) if BAC remains the same	$EAC = AC + BAC - EV$ AC = Actual Cost BAC = Budget at Completion EV = Earned Value	Caused by a one-time risk event and is NOT likely to happen again.
Estimate at Completion (EAC) if CPI remains the same	$EAC = BAC/CPI$ BAC = Budget at completion CPI = Cost Performance Index	If the CPI remains the same until the end of project. May occur if the original estimate is/was not accurate.
Estimate at Completion (EAC) if poor performance continues and schedule is the cause	$EAC = AC + [(BAC - EV)/ (CPI*SPI)]$ AC = Actual Cost BAC = Budget at Completion EV = Earned Value CPI = Cost Performance Index SPI = Schedule Performance Index	Typically, not seen on the exam.
To-Complete Performance Index (TCPI) is designed to determine whether current performance will meet management's original goal of the BAC. If not, then the EAC would need to be worked toward.	$TCPI = (BAC - EV)/ (BAC - AC)$ OR $TCPI = (BAC - EV)/ (EAC - AC)$ BAC = Budget at Completion EV = Earned Value AC = Actual Cost EAC = Estimate at Completion TCPI = Remaining Work/ Remaining Funds BAC = Budget at Completion EV = Earned Value CPI = Cost Performance Index	Less than 1.0 More money/ less work Equal to 1.0 Performance is on track Greater than 1.0 Less money/ More work

The results	The formulas	The hints
Estimate to Complete	$ETC = EAC - AC$ EAC = Estimate at Completion AC = Actual Cost	
Variance at Completion	$VAC = BAC - EAC$ BAC = Budget at Completion EAC = Estimate at Completion	If the BAC is less than the EAC, the project is over budget. If the BAC is greater than the EAC, the project is under budget. Zero means the project is on track in terms of planning and forecast.
PERT Beta distribution $[O + (4ML) + P]/6$  PERT Triangular distribution $(O + ML + P)/3$	Program evaluation and review technique O = Optimistic estimate M= Most Likely estimate P= Pessimistic estimate	Follow normal rounding procedures. If you don't see your answer and you know you did the math correctly, try rounding up.
Standard Deviation	$(P - O)/6$ O= Optimistic estimate P= Pessimistic estimate	Usually, a rough estimate for the standard deviation +/-
Float/Slack	LS – ES LS = Late Start ES = Early Start LF – EF LF = Late Finish EF = Early Finish	Critical path has zero float time.
Communication Channels	$n(n-1)/2$ n = Number of stakeholders	"n" includes the project manager, but read the question carefully! They may ask how many MORE channels and you would need to run the formula with the two variables and subtract the difference.

## Final thoughts

I know it's a lot of information, but you've got this I promise!

Where to begin:

1. Create an account at [www.pmi.org](http://www.pmi.org).
2. You could join PMI® or simply apply. Either way, you will need a login.
3. Take and re-take practice exams.
4. Read the *PMBOK® Guide*.
5. Read the code of conduct.
6. Read through other exam prep books.
7. Get used to answering questions for 4 hours in a row.
8. Read the questions first, then the answers, and then the questions again.
9. Think as PMI® thinks.
10. **Review the exam content outline for your planned exam dates!!**

## On exam day

Bring the authorization letter sent via email by PMI®. Also, bring two forms of ID with the exact same name you put on your application:

- You will be given something to write on and write with.
- Your exam will be computer-based with one question at a time.
- You can mark questions for later review.
- Write down all formulas on rough paper before you begin.
- You will get your results once you click **Submit**.

Your exam requires and tests actual experience knowledge and, out of 180 questions, 90 percent are situational questions. and 5 questions do not count toward your score. Some questions have two or more "correct" answers; pick the best answer. Many questions have extra information that doesn't apply to the actual answer. Some questions have made-up terms in the question or answer.

**Note**

There are only 8 to 12 formula-based questions on average, but no promises!

## Question types

1. Situational questions that require you to have experience as a PM.
2. Two (seemingly) correct answers.
3. Extraneous information.
4. Out-of-the-blue questions.

Keep in mind that your score will be based on whether you are above target, on target, or below target in each one of the domains. The exam is pass/fail and you will get a notarized copy of your exam results. That day, you can add your certification after your name and your actual certificate will be mailed to you and you will receive communications regarding certification maintenance, professional development units (PDUs), and other useful information to help you navigate your journey! Best of luck in this and all future endeavors; I just know you are going to crush this exam! :-)

## Summary

In this chapter, you reviewed all the necessary information pertaining to the PMP® exam as well as study tips and why certification is beneficial to your career. It's never a bad idea to re-read this chapter after you finish your studies to remind you of what to expect. Use the review as a guide to focus your studies prior to your exam. It's a great checklist for a knowledge review. The assessment test in the next chapter is a great overall gauge of current knowledge and where your focus could be as you move forward. This chapter doesn't have any practice questions and is more a final glance at exam information and helpful tips and documents to know.

# 16

# Final Exam

## Questions

### Question 1

You have been assigned as the project manager for a large Six Sigma quality improvement project and the charter has been created. You invite multiple stakeholders to discuss the charter. What facilitation technique is best for this situation?

1. Focus groups
2. Meeting management
3. Delphi technique
4. Project initiation

### Question 2

During the control risks process, you have collected work performance data and now have work performance information. What will this information be used for?

1. To update the outcomes of risk reassessments
2. To recommend corrective or preventative actions
3. To communicate to stakeholders and support decision making
4. To make sure all risks are being considered

Question 3

A large manufacturing project is underway. Your team has been informed that key stakeholders are confirming that quality requirements have been met by doing a walk through the plant. This is also known as which of the following?

1. Quality inspections
2. Quality assurance
3. Punch lists
4. Statistical sampling

Question 4

A project manager leaves in the middle of a project to work on a higher priority project. You have been assigned to take over from them. You find that there are change requests that need to be reviewed to determine their impact on the scope of work. Which of the following should be reviewed to help with those decisions?

1. Project charter
2. Requirements management plan
3. **Work breakdown structure (WBS)**
4. Change management plan

Question 5

You have been assigned to a large construction project that will result in three large office complexes being built. You and your team have finished the designs, completed procurement, and are ready to begin the execution phase. Before your team is able to begin, your legal department stops the execution due to not having been consulted about certain permits that were needed prior to execution. Which of the following may have occurred?

1. You should not have completed procurements without talking to the legal department.
2. You did not engage all of your stakeholders throughout the process.
3. You failed to identify all of the project stakeholders.
4. Your resource estimations were not completed correctly.

**Question 6**

Which of the following could be considered an organizational process asset for procurement on a project?

1. Payment schedules
2. Procurement management plan
3. Statement of work
4. Warranties

**Question 7**

You are in the process of closing out your year-long project. Which of the following actions is not part of closing out the project or phase process?

1. Exit criteria
2. Creating a final report
3. Administrative closure
4. Scope acceptance

**Question 8**

According to the PMBOK® Guide – 6th E edition, where are formal change requests necessary?

1. In projects with a configuration management system
2. In projects with a change control board
3. All projects
4. Large projects

**Question 9**

Which of the following is most important when managing a virtual team to ensure they feel like a team, rather than individuals working on project work?

1. Effective communications planning
2. Effective reward and recognition strategies
3. Understanding of motivational theories
4. Creation of a team charter

### Question 10

A 2-year long megaproject has been assigned to you. You know that you will need resources from multiple countries around the world and while considering the budgetary constraints, you determine that you will acquire resources with the skillsets you need but with lower exchange rates to maintain your budget. As you estimate your resources, what information may help you get the best resources for the least amount of money?

1. Published estimating data
2. Bottom-up estimating
3. PERT formula
4. Parametric estimating

### Question 11

You have a new team member who has little experience working on a help desk. They are hardworking and learn quickly, so what used to take them 8 hours to do now takes them 2 hours to do. Which of the following could be the reason for that?

1. They have been trained effectively.
2. They have been well-motivated.
3. Their learning curve has improved.
4. They have implemented an automated system.

### Question 12

You are in charge of presenting the idea of a **Change Control Board (CCB)** to your organization. Which of the following best describes a CCB?

1. CCBs are used to review, evaluate, approve, or deny/delay change requests.
2. An organization that is necessary for all projects.
3. Managed by the project manager.
4. Composed of certain team members who have experience in change control.

**Question 13**

Your organization is working on a megaproject that comes with many risk events. During one risk analysis, the team determined that one risk could, with a very high probability, cause a loss in customers and millions of dollars in business. Which of the following would be the best risk analysis method for this?

1. Probability and impact matrix
2. Qualitative risk analysis
3. Quantitative risk analysis
4. Insurable risk assessment

**Question 14**

During the close project or phase process, your team will be updating your organizational process assets. Which of the following is not an organizational process update?

1. Final product, service, or result transition
2. Project files
3. Lessons learned
4. Project or phase closure documents

**Question 15**

Your project is progressing and is about halfway completed. You make a point of reviewing the project's performance weekly. Your current review of performance shows the following metrics: EV = 30,000, AC = 28,000, and PV = 22,000. What is the cost variance?

1. -2,000
2. 22,000
3. 2,000
4. 20,000

#### Question 16

Your current project spans many years and currently, there is some conflict between the customer and the contractors that have been brought into the project. The disagreement stems from quality metrics, the schedule, and the final deliverables. As the project manager, which of the following should you do to resolve the conflict?

1. Compromise.
2. Review the project management plan with everyone, including the schedule baseline.
3. Discuss this with the team to see if any adjustments can be made to the metrics.
4. Make sure the customer approves and signs off on the quality management plan.

#### Question 17

While developing the process improvement plan, a new team member asks why the plan is necessary. You explain the plan's details and the steps to follow for reviewing your processes so that you can identify activities. This enhances which of the following?

1. Value
2. Technical performance
3. Quality
4. Overall quality performance

#### Question 18

Which of the following ratios is used to show performance for a specified time period and also for trend analysis?

1. Critical path and float
2. Schedule and cost performance indexes
3. Estimate at completion
4. Estimate to complete

**Question 19**

Which of the following is the best way to handle a regulatory requirement changing in the middle of a project?

1. Create a change request.
2. Update the WBS with this new information.
3. Update the schedule and budget to accommodate inevitable changes.
4. Communicate out to your stakeholders that the change is imminent.

**Question 20**

You are sending out performance reports to all the project stakeholders, stating that the project is over budget. Your sponsor stops you in the break room and mentions they didn't receive the update. What should you have done to prevent this oversite?

1. Reviewed whether the sponsor was actively engaged during the communications planning process.
2. Confirmed that everyone on the team was working to engage all stakeholders.
3. Reviewed the communications management plan and methods to see if the correct information for distribution was noted and if not, update it through change control so that it includes the sponsor on cost performance.
4. Invited the sponsor to future performance meetings so that they stay up to date on the project's performance.

**Question 21**

During your project, there is a contested change to the contract from the seller. You know you'll need to use an alternative dispute resolution (ADR). Which tool or technique is best to use in this situation?

1. Conflict resolution
2. Report performance
3. Communication skills
4. Claims administration

Question 22

During the middle of your project, you are actively working to control your schedule. You know you are behind schedule and need to take corrective action. Which of the following is the best tool or technique to identify the causes of variations?

1. Adjust leads and lag.
2. Re-baseline.
3. Update the schedule management plan.
4. Change the project calendar.

Question 23

Your team is very high performing due to your ability to develop your team effectively. What is the direct result of a high performing team?

1. Your team is motivated.
2. Your stakeholders are engaged.
3. Improved project performance.
4. The team now understands that the PM is responsible for project performance, so they work to help the PM do that.

Question 24

As part of a directive PMO, you are responsible for acquiring multiple resources for a large project. You have discussed the project needs with the project manager, who states they need an expert in code development, as well as additional management skills. The person you acquire is an expert in coding but has not had any formal training in project management. Which of the following is the best example of what occurred?

1. Effective hiring due to the expert's skill level
2. Following the code of conduct and equal opportunity hiring practices
3. Effective problem solving
4. The halo effect

### Question 25

You are in the middle of the *direct and manage project work* process and need to inspect the quality of the results. What is the main input that will be used for this?

1. The project management plan
2. The WBS
3. Deliverables
4. Organizational process assets

### Question 26

One of your functional team members is concerned that they don't have enough time to do their functional work because they are attending too many meetings. They don't want to say no to the project manager but are concerned. What should the project manager review to determine how this happened?

1. The schedule
2. Resource calendar
3. Work performance information
4. Project calendar

### Question 27

Your company has just been sued by a local bird sanctuary for building a data center too close to the nesting places of rare birds. The judge has mandated that you pull up the concrete slab you were going to build on and move it 1 mile away by October 8th. This is known as which of the following?

1. Milestone
2. Constraint
3. Mandatory dependency
4. External dependency

Question 28

Variance analysis is primarily utilized in which of the following?

1. Performance reporting
2. Control schedule
3. Control quality
4. Control risks

Question 29

Which of the following subsidiary plans addresses definitions of probability and impact?

1. Cost management plan
2. Quality management plan
3. Schedule management plan
4. Risk management plan

Question 30

Your resources have been overallocated and there is some conflict due to resource conflicts on critical activities. Whose role is it to address these issues?

1. Senior management
2. The sponsor
3. The CCB
4. Functional managers

Question 31

While planning your quality requirements, you added additional funds to your project cost requirements to fund inspection and appraisal efforts to avoid a lot of defects and rework. This is known as which of the following?

1. Expected value
2. Sunk costs
3. Inspection costs
4. Cost of quality

**Question 32**

Your project has reached the end and your inspector comes to you and explains that the current deliverables have similar defects to deliverables in earlier phases. What can you do, as the project manager, to avoid repetitive mistakes in the future?

1. Employ better inspection practices.
2. Better define your scope of work.
3. Implement lessons learned management techniques.
4. Decompose the WBS to a lower-level work package.

**Question 33**

You and your team are estimating activity durations and need a very definitive estimate. Which of the following tools or techniques will provide the best estimate?

1. Parametric
2. Progressive elaboration
3. PERT formula
4. Precedence diagrams

**Question 34**

During the plan procurement process, you are working on source selection criteria and need to make sure that the potential sellers have the correct methodologies, techniques, and services to meet the project's need. Which of the following categories would this fall under as selection criteria?

1. Technical capability
2. The response to your RFP
3. Questions asked in a bidder conference
4. Technical approach

Question 35

During the control scope process, you are reviewing which of the following documents as an input to this process?

1. Network diagram
2. Requirements traceability matrix
3. Risk register
4. Change management plan

Question 36

You are working in a strong matrix organization and have been working with your team to plan the project. You know you will need to acquire functional resources, and you are also aware that the team will go through team development stages. Which of the following represents the team's ability to work together, adjust their work habits, and begin to trust each other?

1. Norming
2. Forming
3. Storming
4. Performing

Question 37

Schedule reserves are necessary in the case of a threat that is going to be actively accepted. All the following could be considered part of the contingency reserves except for which one?

1. Schedule buffer time
2. Fixed number of work periods
3. Adding 10% to the activity durations
4. Project metrics

**Question 38**

During risk assessments, the team utilizes the Delphi technique. This will do which of the following for the project?

1. Open brainstorming
2. Determine root causes faster
3. Reduce bias and keep stronger voiced stakeholders from influencing the outcome
4. Allow bias to be discussed in a coordinated fashion

**Question 39**

During the control risks process, you are reviewing your team's overall performance with response implementation, probability and impact assessments, and the overall process's efficiency. This is an example of which of the following?

1. Risk audit
2. Identify risk responses
3. Qualitative risk analysis
4. Quantitate risk analysis

**Question 40**

A new team member asks why it is necessary to have a schedule management plan when you have been doing schedules for projects for years. How do you explain the importance of the plan?

1. The plan is specifically for new stakeholders who have never done schedules before.
2. The plan defines how the schedule will be created, updated, and managed throughout the project.
3. The plan is created by the PMO and must be reviewed by the project manager.
4. The plan defines how the WBS will be broken down to the activity level.

Question 41

Which of the following contract types could be considered a direct cost?

1. Cost reimbursable
2. Time and materials
3. Unit price
4. Firm fixed price

Question 42

Which of the following stakeholders is directly responsible for reviewing change requests and accepting or rejecting them?

1. Change control board
2. Directive PMO
3. Project sponsor
4. Project manager

Question 43

You are managing a team of 20 people and notice that the team isn't working well together; there is a lot of conflict and they just don't seem to be able to reach a consensus. What stage is your team in and what approach is best for you to use?

1. Norming; high supportive and low directive
2. Storming; high directive and high supportive
3. Storming; low directive and low supportive
4. Norming; high directive and high supportive

Question 44

Most project deliverables are tangible, but there are also intangible ones. Which of the following would represent an intangible deliverable?

1. Your team applies the Agile training you provided effectively.
2. You create software code for type, spell check, and print functionalities.
3. You create the curriculum for a new program.
4. You check the team's work by reviewing their burndown chart.

**Question 45**

Which of the following best describes the communications knowledge area?

1. It is concerned with using your PMIS to document and store lessons learned.
2. It is concerned with having timely meetings with stakeholders.
3. It is concerned with the processes to ensure the right information gets to the right people in the right format.
4. It is concerned with effectively engaging stakeholders using communication.

**Question 46**

You have been asked by a project sponsor to begin working on a new project that will address cybersecurity effort improvement. You ask the sponsor to draft which of the following to make sure you are formally assigned to the project?

1. Business case
2. Benefits management plan
3. Stakeholder register
4. Project charter

**Question 47**

Determining quality metrics and processes happens in which of the following process groups?

1. Initiating
2. Planning
3. Execution
4. Monitoring and controlling

**Question 48**

External auditors have been called to review your quality approaches during the *manage quality* phase. They will most likely be concerned with all of the following except \_\_\_\_?

1. Your team's performance
2. Cost of quality
3. Effective process execution
4. Customer satisfaction

Question 49

Your organization has been designed as a weak matrix and as a project manager, you will be acquiring team members who may be more loyal to their functional managers. This can create some resource risks for the project. Whose job is it to make sure that doesn't happen?

1. PMO
2. Sponsor
3. Functional manager
4. Project manager

Question 50

You are working on a project that you know will not have the number of resources you will need to complete the critical path as currently scheduled. What technique can you use to accommodate limited resources on your schedule?

1. Smoothing
2. Fast tracking
3. Leveling
4. Critical chain method

Question 51

During the qualitative risk analysis process, you will refer to a document that will help with your analysis. Which of the following is the input you will use?

1. Risk categorization
2. Risk management plan
3. Cost baseline
4. Risk register

**Question 52**

You are in the midst of developing your team using reward and recognition and motivation. You are also documenting how the team is doing overall. Which of the following documents will you be creating?

1. Team performance assessments
2. Individual reviews
3. Project document updates
4. Staff assignments

**Question 53**

You are kicking off a large software development project with stakeholders in multiple countries. As the project manager for this project, you need to make sure your stakeholders are aligned and engaged during the project. What will you be creating to help with this?

1. Stakeholder engagement assessment matrix
2. Power/interest grid
3. Stakeholder engagement plan
4. Communications management plan

**Question 54**

When and how risk processes will be performed during the project are documented in the risk management plan. What might the header be for this information?

1. Timing
2. Response planning
3. Categories of risk
4. Project schedule

#### Question 55

One of your team members has mentioned that they feel like every time there is a meeting, you and the project sponsor run the meetings with little consideration for the team's thoughts. Due to this, the team is becoming demotivated. What can you do, as a project manager, to help with this issue?

1. Take the team to an off-site team-building event to make them feel included.
2. Bring in a mediator to help discuss the team's concerns.
3. Tell the team that you appreciate their concerns, but meetings are for information that only you and the sponsor have.
4. Tell the team that you have heard their concerns and will begin including team member's thoughts in every meeting and practice better team building in those meetings.

#### Question 56

Having just acquired your virtual team through a work authorization system, you need to be concerned with which of the following the most when planning out the project's work and recurring meetings?

1. Time zones
2. Cultural differences
3. How to track their work
4. How to hold meetings with everyone

#### Question 57

You have been assigned to a long-term project and know that all the requirements may not be immediately evident. Whose responsibility is it to progressively turn high-level information into detailed plans?

1. Sponsor
2. PMO
3. Program manager
4. Project manager

**Question 58**

A brand-new project has just kicked off and the project charter has formally assigned you to the project. Since the charter provides higher-level information, it is a valuable document as input for which of the following?

1. Identify stakeholders.
2. Plan communications.
3. Plan stakeholder engagement.
4. Develop the project team.

**Question 59**

You have been told by your sponsor that it is imperative that you meet the original cost baseline. You will run an analysis to see how much work is left compared to how much money so that you can determine whether you can meet management's goal. Which of the following will give you that information?

1. SPI
2. CPI
3. EAC
4. TCPI

**Question 60**

Estimating resource requirements can be time-consuming and utilize many variables, including the number of work packages and your activity list. You are about to begin creating your schedule. You have determined that there are about 10 activities that you can't estimate with high accuracy. Which of the following can help you determine resource estimates with a releasable amount of confidence?

1. Bottom-up estimates
2. PERT
3. Published estimating data
4. Precedence network diagram review

### Question 61

A new product is being created that your organization has never created one before. There are multiple internal and external customers who have a vested interest in the outcome. You determine that an in-depth stakeholder management strategy is necessary. Which of the following will help you create that strategy?

1. Determine and prioritize each stakeholder's level of interest and roles in the project.
2. Conduct a stakeholder analysis to assess what their information needs will be.
3. Determine the probability and impact of stakeholder interests on the result.
4. Develop a comprehensive communications management plan.

### Question 62

All projects have a variety of knowledge areas that need to be considered. Which of the following knowledge areas identifies iterative and interactive project activities?

1. Scope
2. Performance baselines
3. Integration
4. Stakeholder engagement

### Question 63

The processes that are used in a project help describe the work to be done, and the product life cycle is defined by what the product will be. Which of the following describes their relationship?

1. They will overlap and interact with each other throughout the project.
2. They are not concerned with each other except for when it comes to the scope of work.
3. They are the same thing.
4. It depends on the life cycle choices regarding whether they intersect.

**Question 64**

You are working with your team to sequence activities and are depending on the expert judgment of your team. One of your team members explains that you must install a certain software program before you can run the tests. This is an example of what kind of dependency?

1. Finish to start
2. Internal
3. External
4. Mandatory

**Question 65**

During the plan quality management process, you will need to do an analysis of the metrics and any necessary aspects of the plan. Which of the following techniques will you use?

1. Cost-benefit analysis
2. Scope definition
3. Assumptions analysis
4. Design of experiments

**Question 66**

The project you are running has a lot of schedule risk and you know you will need to add contingencies to the schedule baseline. All the following could be considered useful as a reserve except \_\_\_\_\_?

1. Buffers
2. An estimated extra 10% of the activity's duration estimate
3. Productivity metrics associated with risk
4. Set iteration length

Question 67

Which of the following make up the scope baseline?

1. Project charter, scope management plan, and WBS
2. Scope statement, WBS, and the WBS dictionary
3. Project charter, WBS, and scope statement
4. Scope management plan, scope statement, and WBS

Question 68

You have been a project manager for many years and your organization recently hired a new sponsor from outside the organization to help run a large project. The sponsor catches you in the hall and says that work needs to begin and to start the process of identifying stakeholders. You ask about the project charter and they state they never use them. What should your response be?

1. Okay, no problem. We usually use charters but if that isn't a best practice you use, that's fine.
2. Okay, I'll need to check with the PMO about that, but I'll start the process.
3. I'm sorry, but the implications of starting a project without formal authorization to begin and utilize organizational resources is risky. We always use a charter to kick off the project.
4. Okay, I'll have to escalate the matter to the program manager and see what they want to do.

Question 69

What is the first document risk that's identified?

1. Risk register
2. Project charter
3. Scope statement
4. WBS

### Question 70

Your team is putting together cost and duration estimates for a large project, and team members come to you to explain that even though they attempted to be as accurate as possible, they simply don't have the expert knowledge it will take to estimate a totally unique set of activities. Where else would information need to be taken into consideration?

1. Identifying risks
2. Creating the schedule and cost baselines
3. Acquiring resources
4. Determining buffer time

### Question 71

Many of your schedule dependencies are mandatory due to the nature of the project's work, but there are some areas of flexibility where you can shift your resources around and perform tasks in whatever order aligns with their availability. Which process is used to determine dependencies?

1. During the define activities process
2. During the estimate durations process
3. During the sequence activities process
4. Before the sequence activities process

### Question 72

Your team contains seven members, including yourself. How many channels of communication are there among these members?

1. 7
2. 14
3. 21
4. 28

Question 73

You are performing quantitative risk analysis and are using a tool and technique that is a quantitative method of analyzing the potential impact of risk events. This tool can also be used to determine stakeholder risk tolerance levels. What tool and technique is this question referring to?

1. Sensitivity analysis
2. Decision tree analysis
3. Simulation
4. Risk probability and impact

Question 74

Which element of the project plan can affect the plan procurement management process and vice versa?

1. Schedule
2. Resources
3. WBS
4. Staffing management plan

Question 75

During code inspection in a major software development project, a project management team identified frequent occurrences of critical programming errors. These errors are scattered across the code and occur without a discernible pattern. Which tool is most likely to help the team identify areas of error concentration in order to develop a prioritized response strategy?

1. Checksheet
2. Influence diagram
3. Decision tree
4. Process decision program chart

**Question 76**

You are a project manager performing a quality audit. While the team's inspecting the results, they notice many more defects than expected. What could be the reason for this?

1. The team executed the process incorrectly.
2. Gold plating may have occurred.
3. The PM wasn't trained in quality audits.
4. The quality management plan is incorrect.

**Question 77**

During project execution, you found out that work is often not performed at the right time nor in the right order. Deliverables are made by one team member that cannot be processed by another. This already leads to timely reworks and bad morale among team members. Which project management tool is the most appropriate for dealing with problems like this?

1. Organization chart
2. RACI matrix
3. Communications management plan
4. Work authorization system

**Question 78**

What is not true about change requests?

1. Change requests should always be handled in a controlled and integrative fashion.
2. Change requests surpassing the formal change control processes can lead to scope creep.
3. When they're professionally managed, change requests can help improve a project and resolve emerging problems.
4. Change requests are always a sign of bad planning and should be avoided.

Question 79

The members of your project team have been assigned to your project with general availability levels of 50%. Yesterday, they reported to you that significant variances occurred during project execution. You have noted that the team members have been spending less than 50% of their time working on your project. Your project schedule is about to become heavily delayed, and deadlines are in jeopardy. What do you do?

1. Talk to your sponsor and try to get more resources assigned on similar conditions as the existing ones.
2. Talk with functional managers. Negotiate clear and written assignments with reliable scheduling priorities.
3. Ignore the difficulties, adjust your schedule, and negotiate new deadlines according to the slower progress.
4. Focus on internal charges. Make sure that your project is not getting charged for more than the actual work.

Question 80

A project was budgeted at \$1,000,000. Meanwhile, the project is executed, and the following current figures have been assessed: PV: \$500,000, EV: \$450,000, AC: \$550,000. Assuming that the cost variance was caused by one-time cost drivers, which are no longer effective in estimations, what **estimate at completion (EAC)** can you derive from these figures?

1. \$900,000
2. \$1,000,000
3. \$1,100,000
4. \$1,222,222

Question 81

Monte Carlo is used to analyze risks in which of the following processes?

1. Qualitative risk analysis
2. Risk management planning
3. During brainstorming
4. Quantitative risk analysis

### Question 82

You are the manager of a major software development project. Together with your team, you created a code of conduct stating that the change control board must be immediately notified of gifts when the value exceeds \$150. The same applies to invitations when the value exceeds \$200. Today, an executive sent you an invitation to join them in their skybox for your favorite team's Monday night football game with a value of \$200. It is a big event and you tried to obtain tickets by yourself without success. The person told you that he would like to join you, but he will not be available on that day, and he could get hold of only one ticket anyway. What must you do?

1. You can accept invitations with a value of up to \$200, so there should be no problem.
2. You may regard the ticket as a gift, but it does not go over the limit: you do not have to notify the CCB.
3. The ticket is a gift and over the limit. You must notify the CCB, who will make the decision for you.
4. You are the project manager. The rules are in place to strengthen your position. They do not apply to you.

### Question 83

During the *define scope* process, you are utilizing the best information you can. Which of the following tools or techniques is integral to defining scope?

1. PMIS
2. Templates
3. Decomposition
4. Expert judgment

### Question 84

Which of the following is critical to effective leadership in project management?

1. Respect and trust
2. Negotiation
3. Conflict management
4. Political awareness

Question 85

You are a project manager working on a large project with many scope and quality requirements. You have recently taken over this project now that the previous project manager has created the project management plan. The majority of your first week is spent reviewing the non-conforming product scope and making changes to it. This is otherwise known as which of the following?

1. Corrective actions
2. Preventative actions
3. Defect repair
4. Project management plan updates

Question 86

The *monitor risks* process includes identifying new risks and auditing the responses and the risk owner's performance. Which of the following could be considered a tool or technique that's used in this process?

1. Technical performance measurement
2. Quantitative risk analysis
3. Decision tree
4. Expected monetary value

Question 87

Which of the following is a process that happens during monitoring and controlling?

1. Qualitative risk analysis
2. Conduct procurements
3. Control costs
4. Manage quality

### Question 88

Which of the following is an output of the *collect requirements* process?

1. WBS
2. Scope statement
3. Scope management plan
4. Requirements traceability matrix

### Question 89

During a review meeting with your stakeholders, you find that several stakeholders are concerned that the deliverables don't meet the expected requirements. Other stakeholders disagree and explain that all acceptance criteria have been met. What could be the source of confusion?

1. The PM didn't meet with all stakeholders to ensure they understood the success criteria.
2. The PM didn't evaluate the project management plan with stakeholders.
3. The PM didn't define the scope correctly.
4. The PM didn't hold a backlog refinement meeting.

### Question 90

Your team is working closely with a quality assurance department on a large cybersecurity software implementation. During the project, many issues were detected during quality assurance measures. The project team doesn't trust the results or the QA team's results. What should the project manager do to address this confusion and conflict?

1. Bring in an outside mediator to help dissolve the conflict.
2. Explain the QA plan to all team members, make the changes that are necessary, and gain consensus on the plan so that everyone agrees on the next steps.
3. Hold a meeting with the team, ask them to trust the results, and make the necessary changes.
4. Hold a meeting with the team and QA department and ask everyone to be respectful of the results and work together to achieve the requirements.

### Question 91

Your project requires a more flexible scope of work and needs to procure a seller who can accommodate that flexibility. Your organization negotiates a cost-plus-fixed-fee contract. The contract is estimated at \$100,000 and the fixed fee is 10% of the total. Once the procurement work is completed, the total costs are \$80,000. Which of the following is the total price of the contract your organization will pay?

1. \$90,000
2. \$110,000
3. \$10,000
4. \$100,000

### Question 92

Your project is facing the major risk of the project shutting down if the final product isn't completed within the 2-week deadline. This will impact the program that the project is contributing to. Which of the following risk responses should be used to handle this situation?

1. Mitigate
2. Escalate
3. Active acceptance
4. Avoid

### Question 93

While reviewing project performance, you determine that your earned value is \$750,000 and that your planned value is \$800,000. What should you do, as the project manager, about this variance?

1. Rebaseline your schedule and your budget to utilize the new EAC.
2. Ask the sponsor for management reserves to help with the variance.
3. Determine corrective actions.
4. Do nothing – you are still within your 10% tolerance level.

**Question 94**

Ambiguous jurisdictions are best described as what?

1. Two or more party's work boundaries and role descriptions are unclear.
2. Only found in projectized organizations.
3. Communication barriers.
4. Conflicting interests at the functional and project levels.

**Question 95**

You are working on a project that contains 105 potential communication channels. How many stakeholders are involved in this project?

1. 10
2. 15
3. 25
4. 40

**Question 96**

Which of the following best describes accuracy?

1. Quality
2. Correctness
3. Precision
4. Grade

**Question 97**

Which resource(s) is responsible for providing the inputs for the original estimates of activity durations?

1. The person who is most familiar with them
2. The sponsor
3. The PM
4. The team

Question 98

Which of the following cost management processes has the tool or technique of funding limit reconciliation?

1. Estimate costs
2. Plan cost management
3. Determine budget
4. Control costs

Question 99

You are working with your team to estimate activity resource requirements. Which of the following will contain the most valuable information for this process?

1. RBS
2. WBS
3. Published estimating data
4. Resource calendars

Question 100

You have been verbally assigned as the project manager for the next installation project in your IT department. When you ask to review the project charter, the sponsor tells you to start working without one. Which of the following is the best response?

1. Explain the risks of beginning a project without a charter.
2. Escalate this to the PMO.
3. Start working on the project.
4. Create the charter yourself.

Question 101

Which of the following is the output of the *create WBS* process?

1. WBS
2. Requirements traceability matrix
3. Scope statement
4. Scope baseline

**Question 102**

You and your team are waiting for a permit to begin project work. The permit process is taking longer than it should and, consequently, the permit is delayed. This is also known as which of the following?

1. Event
2. Impact
3. Schedule delay
4. Response

**Question 103**

Your team is having repeated conflicts about major deliverables and is unable to remove the conflict without your facilitation as a project manager. Which of the following is occurring?

1. The team is in the forming stage.
2. The team is performing, and conflict is normal.
3. The team is in storming and needs facilitation by the project manager.
4. The team is not colocated.

**Question 104**

Which of the following is not an element of the project charter?

1. High-level risks
2. Detailed information about the scope of work
3. The business case
4. The sponsor's signature

Question 105

You have been asked by your organization to develop a business case for a potential project. What information would be included?

1. Necessary information to determine if the project is worth the investment from a business perspective.
2. A detailed breakdown of all costs, sunk costs, and net present values.
3. Information from the SOW and customer requirements to determine any upfront costs for the project and ROI.
4. Information from your perspective about the feasibility and success of the project.

Question 106

Why is a requirements management plan so important?

1. It describes how requirements will be planned, tracked, and reported.
2. It describes the roles and responsibilities of the team in collecting requirements.
3. The requirements management plan helps to decompose the scope of work.
4. The requirements can be documented in the plan and then used to create the WBS.

Question 107

Which of the following is the best way to ensure that a contracted company can meet the quality requirements of the project?

1. Control quality
2. Procurement management
3. Scope management plan
4. Quality audits

### Question 108

Which of the following techniques is used to avoid "groupthink" when identifying risks?

1. SWOT
2. Risk meetings
3. The Delphi technique
4. Quantitative risk analysis

### Question 109

The **point of total assumption (PTA)** on a fixed-price incentive fee agreement can best be described as what?

1. The point at which the seller assumes all costs above the PTA.
2. The point at which the seller effectively bears all the costs of a cost overrun.
3. The point at which the project manager must assume more costs to complete the project.
4. The assumption that all sellers will meet the fixed price and gain their own incentives.

### Question 110

You have just taken over as the project manager in the middle of a project. You have discovered that resources on a time and materials agreement have charged for work they never did. Which of the following is the best course of action?

1. Remove them from the project and communicate the situation with the customer while stating that a refund is forthcoming.
2. Do nothing; otherwise, you would be breaching the agreement.
3. Find work for them to do to make up for the costs they charged.
4. Remove them from the project and report them to the better business bureau.

### Question 111

You are managing a global team across many different countries. After performing analysis on the project's process, you notice that several team members are falling short of the goals and that others are behind schedule. What is the best way to handle this situation?

1. Colocate the team members and have a face-to-face meeting about the situation.
2. Provide training.
3. Send an email containing progress details and ask for suggestions.
4. Do research on different cultures to see if you can figure out why some global players are more productive than others.

### Question 112

When choosing a vendor for your software design project, you realize that many different companies can provide you with the same level of quality and service. In order to determine the correct vendor, what is the best thing to add to the procurement package and **invitation for bid (IFB)** to ensure your responses will be comparable?

1. The detailed scope statement, along with the procurement management plan.
2. A statement of work that has been formally agreed upon by both parties and is therefore part of an agreement.
3. A statement of work that contains the specific needs and metrics of the deliverable in detail.
4. The procurement administrator is responsible for this task.

### Question 113

Virtual teams come across challenges that aren't found in colocated teams. Which of the following is the best way to help overcome these challenges?

1. Always colocate your teams to avoid these challenges.
2. Develop a comprehensive communications management plan.
3. Have virtual meetings more often in different time zones.
4. Send out daily emails addressing these challenges and ask for feedback.

#### Question 114

There is a conflict with one of your customers about changes to the scope of work. They want to increase the scope and you feel it will affect the quality of the final deliverable. Neither side is backing down and there is a fixed price agreement in place. What is the best thing to do in this case?

1. The customer is always right, so change the scope of work and charge them more.
2. Communicate your concerns and the risks of increasing the scope of work along with increasing the costs.
3. Communicate your concerns transparently and if there is still a dispute, implement an **alternative dispute resolution (ADR)** procedure.
4. Talk to your procurement administrator and ask for advice on how to handle the customer and the agreement.

#### Question 115

You are performing an audit or review for all the projects you are managing and realize that your project managers are not updating their project management plans, so nothing is up to date. Which of the following is not true?

1. Projects should not be executed without diligent updates being made to the project management plan.
2. Poor planning and a lack of updated plans can result in time and cost overruns.
3. Updating a project management plan takes a lot of administrative time but is necessary for project success.
4. The project management plan being updated is secondary in nature to executing the work.

Question 116

After reviewing your risk register, you have determined that an identified risk will be responded to with active acceptance. What have you decided to do?

1. Not do anything since you are accepting the risk is going to happen.
2. Do nothing since active acceptance is for opportunities and it's a good thing for your project.
3. Have the risk owner take over and implement an appropriate response once the risk event occurs.
4. Create contingency reserves of time or money to actively accept the risk.

Question 117

You are estimating durations and have been given data from your experts about the length of a key activity. The optimistic is 5 days, the most likely is 8 days, and the pessimistic is 15 days. What is the standard deviation?

1. 1.67 days.
2. 2 days.
3. 5 days.
4. There isn't enough information to answer this question.

Question 118

During the *control quality* process, your team uses a control chart to track trends and determine if the process is in control. Which of the following will set the tolerance levels to determine when or if corrective action needs to be taken?

1. The mean of the process
2. There being seven data points in a row
3. Upper and lower control limits
4. When your sigma levels are lower than Six Sigma

**Question 119**

Which of the following processes is recommended to be done early and often?

1. Quality management planning.
2. Develop the project charter.
3. Resource management planning.
4. Communication management planning.

**Question 120**

Which of the following tools or techniques is used during qualitative risk analysis to help determine near-term urgent risks?

1. Risk urgency assessment
2. Expected monetary value
3. Decision tree analysis
4. Trend analysis

**Question 121**

During the plan schedule management process, you determine resource availability and the organization's culture and structure. Which of the following inputs will help you do this?

1. Organizational process assets
2. Enterprise environmental factors
3. Lessons learned
4. Org charts

**Question 122**

You are a team member working on a large project. You were assigned by your functional manager to work full-time on the project until its completion. What is one benefit of being in a functional department?

1. You can split your time between project and functional work.
2. You are part of two teams.
3. You have a home department to return to.
4. You don't have a home department to return to.

Question 123

Which of the following is the best key benefit of a stakeholder engagement plan?

1. Allows you to create appropriate strategies for engagement
2. Provides a clear and actionable plan for interacting with stakeholders to support the project
3. Allows a stakeholder register to be created
4. Allows you to plan appropriate meetings and interactions with stakeholders

Question 124

Which of the following are outputs of the *control communications* process?

1. Work performance information and change requests
2. Project management plan updates and work performance information
3. Expert judgment and approved change requests
4. Issue logs and enterprise environmental factor updates

Question 125

You are a PM on a multi-million-dollar project. The customer has asked that you add a scope improvement. You evaluated that the impact of the addition will affect your schedule and the overall budgetary baseline. What is the next thing you should do?

1. Identify the impact of the changes.
2. Have the customer review the agreement with the procurement coordinator.
3. Implement the new improvement.
4. Create alternative solutions for implementation that you can present them to the sponsor.

Question 126

The **work breakdown structure (WBS)** is what?

1. The main input to schedule creation
2. A grouping of work packages
3. A review of the scope of work
4. A deliverable oriented hierarchical display of the scope

**Question 127**

You are the PM for a company known as ABC. You have taken over the project in the middle of its creation. You have reviewed the previous PM's planning progress and determined that they have defined the activities and created an activity list. What should you do next?

1. Update the WBS.
2. Sequence activities.
3. Estimate durations.
4. Check to make sure the definition was created correctly.

**Question 128**

The \$850,000 chocolate chip cookie project is exactly halfway completed. While collecting work performance data, your team reports that they have completed 40% of the work and that the costs to date are \$400,000. What does this tell you about the project?

1. The project is over budget and on schedule.
2. The project is behind schedule and the costs are lower than planned.
3. The schedule and cost performance are used as work performance information.
4. You can't determine anything about the project's performance based on this information.

**Question 129**

During a review of your large manufacturing project, you are inspecting using statistical sampling. You have determined that many of the samples have defects outside of the normal control limits. What is the best thing to do?

1. Audit your quality process.
2. Fix the defects by performing a defect repair.
3. Report the defects to your sponsor and their effect on the cost of quality.
4. Communicate with the customer and make decisions about how to proceed.

### Question 130

One of your team members is reviewing their schedule for the next week and is checking on performance. They notice that the tasks that must be completed for them to do their work are currently behind schedule. If things continue the way they are going now, they will be on vacation when it's time to perform their work. What is the best thing for the team member to do?

1. Update the issue log and leave for vacation.
2. Contact the PM and recommend preventative action.
3. Give the project manager their schedule immediately.
4. Catch the PM in the hall and ask if they can fast track the activities so that the team member can go on vacation.

### Question 131

One of the sellers on your project is working from a fixed-price-incentive-fee agreement. In the terms and conditions, it clearly states that the seller would be paid all monies when the project is completed. During the course of the project, the seller asks for an installment of the payment because they have met all the requirements for incentives and have a medical concern that they need money for. They have always been a great asset to your projects in the past and it's very important to maintain good relationships with your sellers. What is the best thing to do in this case?

1. Explain to the seller that while you understand their need, you are not willing to breach the agreement and pay them early based on the specifications documented in the agreement. You are, however, willing to give them some time off to handle their medical issues since they have met all the requirements for incentives.
2. Put in a change request to pay them early, even though the project has not closed.
3. Discuss this with your procurement administrator and have them determine the best course of action.
4. Do nothing as the seller is aware of the stipulations in the agreement.

**Question 132**

A functional organization is what?

1. The best environment for successful projects
2. The least successful environment for project management
3. Better than a weak matrix organization
4. Something that works as a composite organization within organizational structures

**Question 133**

The critical chain is what?

1. A project schedule network diagramming technique that accommodates limited resources with buffer time
2. The near critical path
3. Part of the critical path
4. Float time on the critical path

**Question 134**

Who carries the cost risk on a firm-fixed-price agreement?

1. The PMO
2. The project
3. The seller
4. The buyer

**Question 135**

While working with your team to determine durations for a section of the project that is similar in nature to a part project, you refer to historical information for guidance with your estimations. This is an example of which of the following estimate types?

1. Parametric modeling estimate
2. Analogous estimate
3. PERT estimate
4. Expert judgment

Question 136

A RACI chart expresses which of the following in Human Resource Management?

1. Responsible, Accountable, Consult, and Inform
2. Responsible, Accurate, Communicate, and Inform
3. Risk, Accountable, Consult, and Inform
4. Responsible, Accountable, Communicate, and Inform

Question 137

The acronym PERT stands for what?

1. Project, Evaluation, and Review Technique
2. Program, Evaluation, and Review Technique
3. Program, Evolution, and Reviewing Technique
4. Project Management Evaluation and Risk Technique

Question 138

A risk trigger can best be described as what?

1. An event that produces a secondary risk event
2. An event that lets you know a risk even is about to occur
3. A part of all contingent response strategies
4. An event that produces a residual risk

Question 139

Kaizen is what?

1. A Japanese word
2. A signaling system
3. Continuous improvements
4. A part of quality assurance

**Question 140**

After a 360-degree review, you have learned that your team thinks you are a micromanager and, in general, believe that people come to work for their paychecks but not for the work itself. According to Douglas McGregor's theory, what type of manager are you?

1. A "Y" manager
2. An "X" manager
3. A self-actualized manager
4. A terrible manager

**Question 141**

Your team is in the performing stage and is getting along very well and working hard, but you overhear two of your team members arguing in the break room about something political. Which of the following conflict resolution techniques is best to use in this case?

1. Collaboration
2. Compromise
3. Avoid
4. Smooth

**Question 142**

According to Herzberg's Theory of Hygiene, money is what?

1. A motivator
2. A satisfier
3. Necessary for motivation
4. A need, not a motivator

Question 143

You are a project manager working overseas and you notice that there is a conflict of interest with many of the team members in the global corporation. What is the best thing to do?

1. Communicate this conflict of interest to appropriate the parties.
2. Ignore it; you are a visitor, and it may be cultural.
3. Have a discussion with the involved parties and try to help solve the conflict of interest through good communication.
4. Report them to the human resource department.

Question 144

You are the buyer of a multi-million-dollar design project with a need for a large number of vendors. One aspect of this project involves the need for 1,000 copies of a specific software program and someone to come in and install the software. You have already determined that no additional copies of the software will be needed and once it is installed, you will have no further need for support. You have budgeted \$150,000 for this aspect of the project. Which of the following is the best agreement type for this need?

1. Fixed price incentive fee
2. Cost reimbursable
3. Time and materials
4. Firm fixed price

Question 145

One aspect of your project's scope isn't clearly defined, and you know you will need an outside vendor to complete the work. You have determined that you are willing to spend a certain amount in costs, as well as a percentage of those costs as a fee for the vendor. This is an example of what?

1. Cost plus fixed fee
2. Cost plus incentive fees
3. Fixed price incentive fees
4. Cost plus award fees

**Question 146**

You are a project team member who is working on several projects at a time. You are not sure which project is a priority. Which of the following could supply you with that information?

1. The project manager
2. The project sponsor
3. The PMO
4. Other team members

**Question 147**

Which of the following is a tool or technique of the *develop project team* process?

1. Acquire team
2. Motivate team
3. Organizational theory
4. Virtual teams

**Question 148**

While monitoring performance, you determine that your EV = \$50,000, your AC = \$52,000, and your PV = \$48,000. How is your project performing?

1. On schedule and over budget
2. Behind schedule and under budget
3. Ahead of schedule and over budget
4. Can't determine from the information provided

**Question 149**

Your current project has a major schedule constraint. Your customer is adamant that the project must finish on time. Currently, your project performance is SPI = 0.7 and your CPI is 0.9. What may be the best way to improve schedule performance?

1. There isn't anything you can do.
2. Remove the scope of work to help the schedule.
3. Discuss the issue with your customer and explain the problem.
4. Ask your team to work overtime and crash the schedule.

Question 150

Your team is working on a software project and the life cycle choice is Agile project management. What best describes your team?

1. Self-directed and self-managed
2. T-shaped people
3. Scrum team
4. Product owners

Question 151

Which of the following best describes an enterprise environmental factor?

1. Lessons learned
2. Policies of the organization
3. Marketplace conditions
4. Procedures of the organization

Question 152

Competing constraints include which of the following?

1. Scope, schedule, cost, quality, risk, and resources
2. Scope, schedule, and costs
3. Scope, schedule, costs, and quality
4. Scope, schedule, costs, and resources

Question 153

What is the major output of the *direct and manage project work* process?

1. Activity lists
2. WBS
3. Verified deliverables
4. Deliverables

**Question 154**

Your customer has been invited to review the increment you have created and collect feedback. After the review, you ask them to sign a formal document that states they accept the increment. What process best describes this?

1. Verify quality
2. Validate quality
3. Verify scope
4. Validate scope

**Question 155**

You and your team are working on a difficult project that is rife with issues and sunk costs. The project sponsor asks you to terminate the project, but you are almost finished with all the deliverables. What do you do first?

1. Ask the sponsor about the possibility of continuing the project to completion.
2. Cancel the project.
3. Go through administrative closure.
4. Go through change control to stop the cancellation.

**Question 156**

Which of the following is a schematic display of your project schedule activities?

1. Gantt chart
2. Milestone list
3. Activity list
4. Precedence network diagram

Question 157

The team is performing qualitative risk analysis. Which of the following inputs will they refer to that helps with this process?

1. Risk register
2. Risk data quality assessment
3. Risk categories
4. Organizational process assets

Question 158

You are going to take over a new project as the project manager in an enterprise unknown to you. What should you investigate during the chartering process?

1. Enterprise environmental factors
2. Project management plan
3. Project risk register
4. Team performance reports

Question 159

A project was budgeted at \$950,000. Meanwhile, the project is executed, and the following current figures have been assessed: PV: \$130,000, EV: \$120,000, AC: \$150,000. Assuming that the cost variance was caused by one-time cost drivers that will continue to impact the project, what **estimate at completion (EAC)** can you derive from these figures?

1. \$900,000
2. \$1,000,000
3. \$1,100,000
4. \$1,187,500

Question 160

Which characteristics do effective project managers use?

1. Collaboration and performance metrics
2. Leadership and project management knowledge
3. Allowing their team to self-direct their efforts
4. Project management knowledge, performance skills, and personal effectiveness

**Question 161**

What is the least important when it comes to archiving project records?

1. A well-designed records management system
2. Integrating the archive with business software
3. Updated records reflecting final results
4. Easy availability of information for future use

**Question 162**

Which of the following are not necessarily used to establish the cost baseline of a project?

1. Schedule activity or work package cost estimates
2. The work breakdown structure and the WBS dictionary
3. The project schedule and resource calendars
4. The risk breakdown structure and the risk register

**Question 163**

You took over a customer project for your company. From the inputs available, including the agreement, statement of work, and project charter, you have developed a project management plan. You have already presented that plan in a meeting with key stakeholders, including your project sponsor and some representatives from the customer organization. During the meeting, you sensed a high level of dissatisfaction from the customer executives, who signaled that the project might not produce the results that their company had expected. From your understanding, all the necessary actions have been planned to meet the customer's requirements. What should you do next?

1. Request a written statement from the customer detailing the requirements that they believe are not addressed by your plan. Use this statement to update the project plan.
2. Arrange meetings with the customer to identify their needs, wants, and expectations for the project. Then, create a narrative scope statement from this information to document the agreed-upon project scope.
3. Request a formal meeting at the top executive level to get the misunderstandings sorted out, then arrange a change request, re-plan your project where necessary, and go ahead with the project work.
4. Do not overreact. When performed according to your plan, the project will produce a convincing product for the customer. As soon as the executives see it, they will probably change their opinion and accept it.

Question 164

A project was assessed, and the following earned value data has been found: PV: \$750,000, EV: \$750,000, AC: \$900,000. What is the burn rate of the project?

1. 1.2
2. 1.1
3. 1
4. 0.83

Question 165

What is not true about project deliverables?

1. Project deliverables should be identified, described, and agreed upon as early in the project as possible.
2. Project deliverables may be products, capabilities for services, or other kinds of results.
3. Once project deliverables have been identified, their description should not be changed anymore.
4. The acceptance process for deliverables and how rejection will be addressed should be described in the agreement.

Question 166

Your project, which you have run for a customer, is coming to an end. The customer has been granted a 3-year warranty period for the product for the project. What should you do first?

1. Hand all relevant documentation over to the organizational unit responsible for handling the warranty.
2. There is no additional work to be done. The agreement should describe all the processes in enough detail.
3. Any changes that are made to the product can affect warranty clauses. Ensure that these clauses are aligned with the final specifications.
4. According to many legislations, you cannot formally close a project before the end of the warranty period.

**Question 167**

Being the project manager in a high-risk electronics project with a lot of new technologies, you've developed a risk management plan and identified risks that you then documented in a risk register. Then, the risks were analyzed, and the response was planned. During the risk control meetings, it became obvious that the documents you created are not very helpful. What have you probably done wrong?

1. You failed to use an RBS.
2. You did the first processes alone.
3. You did not identify any triggers.
4. You did not calculate any EMVs.

**Question 168**

Which of the following best describes the main difference between the critical path and critical chain?

1. Resource limitations.
2. The critical chain is the second-longest path.
3. The critical path accommodates limited resources.
4. There aren't any differences.

**Question 169**

You have just been told that your project is being canceled. Which document do you refer to in order to make sure everyone knows of this development?

1. Stakeholder engagement matrix
2. RACI chart
3. Communications management plan
4. Stakeholder register

Question 170

Which of the following should not be considered a procurement document that solicits any offers from any prospective sellers?

1. Request for proposal
2. Request for information
3. Request for quote
4. Invitation for bid

Question 171

You are putting together an agenda for your kick-off meeting and have invited all stakeholders to attend. Which of the following wouldn't be on your agenda for discussion?

1. Reviewing all subsidiary plans for ease of understanding
2. Discussing standard formats for communications and establishing working relationships
3. Discussing specific terms and conditions and the legal aspects of your contracts
4. Discussing the scope of work

Question 172

Which is generally not regarded as one of the three categories of culture that managers should master?

1. National culture
2. Organizational culture
3. Project culture
4. Functional culture

Question 173

A post-mortem analysis after the scheduled finish date of a project shows a CPI of 0.8 and an SPI of 1.25. What is a plausible explanation for this?

1. The project was terminated early. At that time, it was over budget and ahead of schedule.
2. The project has produced additional deliverables that were originally not required.
3. The project has evidently been finished under budget and behind schedule.
4. The project has evidently been finished on budget and ahead of schedule.

**Question 174**

Some colleagues told you that they are planning, executing, monitoring, and controlling a project by using milestones with durations between 1 and 4 weeks. What do you think about this?

1. The approach is erroneous. A milestone is a significant point with a zero duration to highlight achievements.
2. It is a good approach if the milestones reflect fixed or imposed dates during the project life cycle only.
3. It is a good approach if the milestones are used for reviews between consecutive project phases only.
4. It is a good approach because it saves progress measurement being done on activities and work packages.

**Question 175**

Together with your team, you have applied a three-point estimation to a critical path. The optimistic estimate = 50 days, the pessimistic estimate = 95 days, and the most likely estimate = 62 days. These tasks have been performed in the past, so you trust your expert, but several risks have been identified, so you want to make sure your estimate is as accurate as possible. What is the expected duration?

1. 21 days
2. 42 days
3. Not possible to answer from the information provided
4. 65.5

Question 176

You are just leaving a meeting during which you were assigned as the manager of a project. You must build a sub-station that is part of a major electric power distribution system. The decision to run the project was made before your assignment and without your involvement. Some basic decisions on deliverables, staffing, budgeting, and so on regarding the completion date have already been made as well. What should you do first?

1. Obtain or create a project charter that links the project to the strategy and any ongoing work being done by the organization. This should include any documents for the initial decisions. You should also obtain signatures from the sponsor.
2. Create a project schedule for your project that shows all the major milestones and any deadlines linked to them. Then, try to obtain approval for the schedule.
3. Start developing a detailed risk register that includes identified risks, along with their qualitative and quantitative assessments, and a response plan.
4. Start the quality assurance process by developing test procedures for the final deliverables and defining metrics that the tests will be performed against.

Question 177

Which of the following is not a goal in both project management and quality management?

1. Prevention over inspection
2. Customer satisfaction
3. Management responsibility
4. Managing the triple constraints

Question 178

You've created a baseline of your system configuration and added several changes to it as amendments. Meanwhile, you are afraid that the big number of Deltas may cause inconsistencies and make you unable to understand the current system configuration. What should you do?

1. Proclaim a design freeze.
2. Go on with amendments.
3. Revise the baseline.
4. Create an entirely new configuration.

**Question 179**

A request, demand, or assertion of an agreement partner for consideration, compensation, or payment under a legally binding agreement, such as a disputed change, is often referred to as a what?

1. Claim
2. Trial
3. Refinement
4. Audit

**Question 180**

Projects may be initiated by all the following except what?

1. The project team
2. A sponsor
3. A PMO
4. A portfolio review board

**Question 181**

During your planning processes, you used Monte Carlo simulation to quantitatively assess the costs and schedule risks for your project. During risk control, you repeat this technique, and it leads to different results. What should not be the reason for this occurring?

1. Some assumptions during planning have become fact-based knowledge so that the risks related to them have vanished or have become certain problems.
2. New risks may have been identified. These influence the input data that's been used for Monte Carlo simulation in a way that it could not be predicted at the time the simulation was run.
3. Some of the constraints were identified originally, but their influence on the project was unclear when the simulation was run for the first time. At this point, the team understands these constraints much better and has been able to adjust the simulation.
4. Some dummy activities in the network logic have an element of uncertainty, and this gets bigger over time. While the project proceeds, it gets even harder to predict how the team members that have been assigned to them will perform.

Question 182

As a project manager, you can assign any one of two team members to a highly coveted task. Both are equally capable, but one of them is a member of your in-group. You have far more distance from the other member. How should you behave?

1. You should disclose the situation to your stakeholders and solicit a joint decision.
2. You should take the person not in your in-group to avoid any misunderstandings.
3. You should choose the in-group person. The trustful relationship between you two will benefit the project.
4. You should delegate the decision to a third team member to avoid any conflicts.

Question 183

You need a batch of 100 identical valves, all of which will be custom made, for your project to build a food processing plant. There is a risk of the food deteriorating during processing; therefore, you have placed requirements on the quality of the raw materials for the valves. However, this will make production very costly. Unfortunately, in order to test the valves against these requirements, you would have to destroy them, and you have no experience with the vendors at all. What should you do?

1. Do 0% inspection. You must trust the selected supplier that they will use the materials according to your specification.
2. Negotiate an agreement for more than 100 items and perform acceptance sampling for the surplus of the batch on delivery.
3. Make the seller supply the valves, along with the appropriate certificates, from their raw materials suppliers.
4. Do 100% inspection on delivery to your premises, then order another batch of 100 valves.

**Question 184**

Which statement is false? Progressive elaboration of project scope...

1. ...is a characteristic of projects that accompanies the concepts of temporary and unique.
2. ...means developing in steps. It should not be confused with scope creep.
3. ...signals a weak spot in the scope definition process that's caused by incomplete agreements and specifications.
4. ...when properly managed, integrates elaboration of project and deliverable specifications.

**Question 185**

You are managing an internationally dispersed project team. The members of your team have different cultural backgrounds and primary languages, but all are educated and able to communicate eloquently in English. Nevertheless, you should bear in mind that...

1. ...there are cultural differences. You should write one code of conduct for each nationality. You should then limit access to these codes.
2. ...you may have to accept that team members from one country may not be prepared to work with colleagues from certain other countries.
3. ...spoken communications can cause misunderstandings you may not find in written communications. These may be hard to identify.
4. ...certain groups will be happy to stay awake overnight to join telephone and video conferences during other members' working time.

**Question 186**

When finishing a project, which factors that influence customer satisfaction the most should you be aware of?

1. The attractive price of the project and the low running costs of the product.
2. The friendliness of the project manager and their effective after-project service.
3. The efficiency of the project and the skills of the project manager.
4. How people conform to the requirements of the project and how the deliverables are fit for use.

Question 187

When identifying the basis of the business needs for a project, all the following can be considered except for what?

1. Regular plant maintenance
2. Market demands
3. Technological advances
4. Legal requirements

Question 188

During a performance review, you try to determine whether performance is improving. What can you use to help determine this?

1. Variance analysis
2. Trend analysis
3. Earned value analysis
4. Cost-benefit analysis

Question 189

During the quality control inspection, your inspector documents the results of the measurements. These results are used as inputs to which of the following processes?

1. Plan quality management
2. Manage quality
3. Plan scope management
4. Control scope

Question 190

A regulation is changing in the middle of your project. It's a complete surprise and will impact your project negatively. What should you do first?

1. Review the risk management plan.
2. Review the stakeholder register.
3. Discuss it with your sponsor.
4. Review your communications management plan.

**Question 191**

Which of the following can provide information on your project's organization and its structure?

1. WBS
2. RAM
3. OBS
4. RACI

**Question 192**

You are working with your team to identify threats and opportunities at the beginning of planning. What would be the best tool or technique to do this?

1. Sensitivity analysis
2. Expected monetary value
3. Monte Carlo simulation
4. Brainstorming

**Question 193**

Inspection is the main reason that errors are kept...

1. ...in control
2. ...out of the hands of the customer
3. ...at a minimum
4. ...within normal limits

**Question 194**

While creating your schedule, you determine that you must install the hardware before the software. This is an example of which of the following?

1. A constraint
2. An external dependency
3. A mandatory dependency
4. A requirement

Question 195

You have been asked for a definitive estimate for your budget. Which of the following techniques will give you an estimate with less room for error?

1. Bottom-up estimate
2. PERT estimate
3. Analogous estimate
4. Expert judgment

Question 196

You have identified a threat event that could occur with 30% probability and that has an impact of \$450,000. What is the expected monetary value?

1. \$1,500,000.
2. \$135,000.
3. \$585,000.
4. This question can't be answered using the information provided.

Question 197

Which of the following is one of the outputs of the control scope?

1. Formal sign-off
2. Accepted deliverables
3. Variance information
4. Change requests

Question 198

You and your team determine that you will need to take preventative actions to stop a threat event from occurring. You have determined that the change will cost the project \$20,000 and will take an extra 2 weeks, but that it's worth it to prevent a major impact. What do you do next?

1. Create solutions.
2. Assess the impact.
3. Create a change request.
4. Talk to the CCB.

### Question 199

As you and your team plan, you know very specific aspects of scope in the short term, but the long-term specifics aren't clear yet. What will you need to do?

1. Alternative analysis
2. Collect requirements
3. Alternatives analysis
4. Rolling wave planning

### Question 200

During activity sequencing, you determine that there will be a waiting period between activity A and the delivery of materials for activity B. What will you need to do to the sequence to accommodate this?

1. Add lead time.
2. Add an activity for the delivery.
3. Add buffer time.
4. Add lag time.

## Answers

### Question 1

You have been assigned as the project manager for a large Six Sigma quality improvement project and the charter has been created. You invite multiple stakeholders to discuss the charter. What facilitation technique is best for this situation?

1. Focus groups
2. **Meeting management**
3. Delphi technique
4. Project initiation

Meeting management is the best answer here. Focus groups are coordinated around the scope definition, the Delphi technique is anonymous expert judgment, and project initiation is a process group.

### Question 2

During the control risks process, you have collected work performance data and now have work performance information. What will this information be used for?

1. A way to update the outcomes of risk reassessments
2. **A way to recommend corrective or preventative actions**
3. A way to communicate to stakeholders and support decision making
4. A way to make sure all risks are being considered

Work performance information shows the differences between planned and actual performance, which can then lead to corrective or preventative actions via integrated change control.

### Question 3

A large manufacturing project is underway. Your team has been informed that key stakeholders are confirming that quality requirements have been met by doing a walk through the plant. This is also known as which of the following?

1. **Quality inspections**
2. Quality assurance
3. Punch lists
4. Statistical sampling

Inspections are the physical reviews of a deliverable to determine if the requirements have been met and that the result is "fit for use."

#### Question 4

A project manager leaves in the middle of a project to work on a higher priority project. You have been assigned to take over from them. You find that there are change requests that need to be reviewed to determine their impact on the scope of work. Which of the following should be reviewed to help with those decisions?

1. Project charter
2. Requirements management plan
3. **WBS**
4. Change management plan

The WBS is the number one most important planning tool and documents 100% of the scope of work. The management plans are the "how-to guides", and the project charter would have been completed and approved prior to execution and processing change requests.

#### Question 5

You have been assigned to a large construction project that will result in three large office complexes being built. You and your team have finished the designs, completed procurement, and are ready to begin the execution phase. Before your team is able to begin, your legal department stops the execution due to not being consulted about certain permits that were needed prior to execution. Which of the following may have occurred?

1. You should not have completed procurements without talking to the legal department.
2. You did not engage all of your stakeholders throughout the process.
3. **You failed to identify all of the project stakeholders.**
4. Your resource estimations were not completed correctly.

Many of the answers are seemingly correct, but the best answer is that you failed to identify all stakeholders. Therefore, you did not collect the correct requirements regarding permits.

### Question 6

Which of the following could be considered an organizational process asset for procurement on a project?

1. **Payment schedules**
2. Procurement management plan
3. Statement of work
4. Warranties

Typically, the organization and procurement administrator/department will determine how procurement will be paid out of your cost baseline and the schedule for it. The statement of work is created to solicit bids, and warranties are determined during the negotiation and via the terms and conditions. Warranties may be part of why a seller is chosen but not necessarily an OPA.

### Question 7

You are in the process of closing out your year-long project. Which of the following actions is not part of closing out the project or phase process?

1. Exit criteria
2. Creating a final report
3. Administrative closure
4. **Scope acceptance**

Scope acceptance or the *validate scope* process is necessary for the project to be able to close out, but it is part of the monitoring and controlling process rather than closing the project or phase.

### Question 8

According to *the PMBOK® Guide - 6th edition*, where are formal change requests necessary?

1. In projects with a configuration management system
2. In projects with a change control board
3. **All projects**
4. Large projects

Formal integrated change control is necessary in all projects, according to *the PMBOK® Guide - 6<sup>th</sup> edition*.

### Question 9

Which of the following is the most important when managing a virtual team to ensure they feel like a team, rather than individuals working on project work?

1. **Effective communications planning**
2. Effective reward and recognition strategies
3. Understanding of motivational theories
4. Creation of a team charter

All of the answers are important for virtual team management, but communication planning needs to be more specific and focused on ensuring the team feels connected.

### Question 10

A 2-year-long megaproject has been assigned to you. You know that you will need resources from multiple countries around the world and while considering the budgetary constraints, you determine that you will acquire resources with the skillsets you need but with lower exchange rates to maintain your budget. As you estimate your resources, what information may help you get the best resources for the least amount of money?

1. **Published estimating data**
2. Bottom-up estimating
3. PERT formula
4. Parametric estimating

Published estimating data can help provide information on exchange rates from other countries. The other answers are ways to estimate but if the data isn't there, the estimates would be off.

### Question 11

You have a new team member who has little experience working on a help desk. They are hardworking and learn quickly, and what used to take them 8 hours to do now takes them 2 hours to do. Which of the following could be the reason for that?

1. They have been trained effectively.
2. They have been well-motivated.
3. **Their learning curve has improved.**
4. They have implemented an automated system.

There isn't anything in the question that confirms training has occurred, motivation has occurred, or that an automated system has been implemented. The best answer is that their learning curve has improved.

#### Question 12

You are in charge of presenting the idea of a change control board to your organization. Which of the following best describes a CCB?

1. **CCBs are used to review, evaluate, approve, or deny/delay change requests.**
2. An organization that is necessary for all projects.
3. Managed by the project manager.
4. Composed of certain team members who have experience in change control.

The correct answer is the definition of a CCB.

#### Question 13

Your organization is working on a megaproject that comes with many risk events. During one risk analysis, the team determined that one risk with a very high probability could cause a loss in customers and millions of dollars in business. Which of the following would be the best risk analysis method for this?

1. Probability and impact matrix
2. Qualitative risk analysis
3. **Quantitative risk analysis**
4. Insurable risk assessment

Quantitative risk analysis uses statistics and financials to determine impacts to budgets.

#### Question 14

During the close project or phase process, your team will be updating your organizational process assets. Which of the following is not an organizational process update?

1. **Final product, service, or result transition**
2. Project files
3. Lessons learned
4. Project or phase closure documents

The final product, service, or result transition is part of the close project or phase process. Therefore, it is not an OPA.

### Question 15

Your project is progressing and is about halfway completed. You make a point of reviewing the project's performance weekly. Your current review of performance shows the following metrics: EV = 30,000, AC = 28,000, and PV = 22,000. What is the cost variance?

1. -2,000
2. 22,000
3. **2,000**
4. 20,000

The question is asking about the cost variance. The formula is EV-AC, which means that the formula is  $30,000 - 28,000 = 2,000$ .

### Question 16

Your current project spans many years and currently, there is some conflict between the customer and the contractors that have been brought into the project. The disagreement stems from quality metrics, the schedule, and the final deliverables. As the project manager, which of the following should you do to resolve the conflict?

1. Compromise.
2. Review the project management plan with everyone, including the schedule baseline.
3. Discuss this with the team to see if any adjustments can be made to the metrics.
4. **Make sure the customer approves and signs off on the quality management plan.**

In this case, there is a conflict situation, but compromise isn't the correct answer based on the information provided or when quality metrics are involved. In this case, reviewing or adjusting metrics isn't the best answer. Since the conflict is between the customer and the contractors, it's important to make sure everyone is in agreement on the quality metrics and process by gaining approvals before a conflict can occur, or to help alleviate one.

### Question 17

While developing the process improvement plan, a new team member asks why the plan is necessary. You explain the plan's details and the steps to follow for reviewing your processes so that you can identify activities. This enhances which of the following?

1. **Value**
2. Technical performance
3. Quality
4. Overall quality performance

Most of the answers could be correct here, but you are attempting to improve processes to enhance your quality, which, in turn, will provide value to the organization and the customer.

### Question 18

Which of the following ratios are used to show performance for a specified time period and also for trend analysis?

1. Critical path and float
2. **Schedule and cost performance indexes**
3. Estimate at completion
4. Estimate to complete

Indexes show a ratio of performance and overtime can allow for trend analysis.

### Question 19

Which of the following is the best way to handle a regulatory requirement changing in the middle of the project?

1. **Create a change request.**
2. Update the WBS with this new information.
3. Update the schedule and budget to accommodate inevitable changes.
4. Communicate out to your stakeholders that the change is imminent.

Any changes would be processed through formal change control.

### Question 20

You are sending out performance reports to all the project stakeholders, stating that the project is over budget. Your sponsor stops you in the break room and mentions they didn't receive the update. What should you have done to prevent this oversite?

1. Reviewed whether the sponsor was actively engaged during the communications planning process.
2. Confirm that everyone on the team was working to engage all stakeholders.
3. **Reviewed the communications management plan and methods to see if the correct information for distribution was noted and if not, update it through change control so that it includes the sponsor on cost performance.**
4. Invited the sponsor to future performance meetings so that they stay up to date on the project's performance.

You would always review the plan to determine if everything is correct and if not, update through change control.

### Question 21

During your project, there is a contested change to the contract from the seller. You know you'll need to use an **alternative dispute solution (ADR)**. Which tool or technique is best to use in this situation?

1. Conflict resolution
2. Report performance
3. Communication skills
4. **Claims administration**

This is the only answer that deals directly with procurement and an ADR.

### Question 22

During the middle of your project, you are actively working to control your schedule. You know you are behind schedule and need to take corrective action. Which of the following is the best tool or technique to identify the causes of variations?

1. **Adjust leads and lag.**
2. Re-baseline.
3. Update the schedule management plan.
4. Change the project calendar.

In this case, the best answer is adjusting your lead and lag time, since you are not given fast-tracking or crashing as answers.

#### Question 23

Your team is very high performing due to your ability to develop your team effectively. What is the direct result of a high performing team?

1. Your team is motivated.
2. Your stakeholders are engaged.
3. **Improved project performance.**
4. The team now understands that the PM is responsible for project performance, so they work to help the PM do that.

Once your team is performing, the result is better project performance.

#### Question 24

As part of a directive PMO, you are responsible for acquiring multiple resources for a large project. You have discussed the project needs with the project manager, who states they need an expert in code development, as well as additional management skills. The person you acquire is an expert in coding but has not had any formal training in project management. Which of the following is the best example of what occurred?

1. Effective hiring due to the expert's skill level.
2. Following the code of conduct and equal opportunity hiring practices.
3. Effective problem solving.
4. **The halo effect.**

In this case, the person who got the position may have had something in common with the person they hired or thought they could maybe pull it off, instead of choosing the best resource.

#### Question 25

You are in the middle of the *direct and manage project work* process and need to inspect the quality of the results. What is the main input that will be used for this?

1. The project management plan
2. The WBS
3. **Deliverables**
4. Organizational process assets

The outputs of direct and manage project work are deliverables, which are then inputs to verifying quality as part of control quality.

#### Question 26

One of your functional team members is concerned that they don't have enough time to do their functional work because they are attending too many meetings. They don't want to say no to the project manager but are concerned. What should the project manager review to determine how this happened?

1. The schedule
2. **Resource calendar**
3. Work performance information
4. Project calendar

Reviewing the resource's calendar, you can determine if you allocated enough time for them to work on both the project and their functional work. Then, you can update their calendar as needed. The project calendar is for working/non-working days of the organization.

#### Question 27

Your company has just been sued by a local bird sanctuary for building a data center too close to the nesting places of rare birds. The judge has mandated that you pull up the concrete slab you were going to build on and move it 1 mile away by October the 8th. This is known as which of the following?

1. Milestone
2. Constraint
3. Mandatory dependency
4. **External dependency**

Because this is mandated by a judge, it is an external influence on your project timeline and will incorporate the necessary activities to move the project 1 mile away.

Question 28

Variance analysis is primarily utilized in which of the following processes?

1. Performance reporting
2. **Control schedule**
3. Control quality
4. Control risks

Variance analysis is used during the control schedule process to show the difference between planned and actual schedule performance. This may lead to performance reports, but this isn't the best answer here.

Question 29

Which of the following subsidiary plans addresses definitions of probability and impact?

1. Cost management plan
2. Quality management plan
3. Schedule management plan
4. **Risk management plan**

The risk management plan clearly defines how risk will be assessed, as well as how probability and impact will be determined.

Question 30

Your resources have been overallocated and there is some conflict due to resource conflicts on critical activities. Whose role is it to address these issues?

1. **Senior management**
2. The sponsor
3. The CCB
4. Functional managers

This question doesn't provide enough details for us to confidently say that the sponsor, functional managers, or CCB are involved in this situation. Therefore, senior management covers the gamut and is the best answer.

### Question 31

While planning your quality requirements, you added additional funds to your project cost requirements to fund inspection and appraisal efforts to avoid a lot of defects and rework. This is known as which of the following?

1. Expected value
2. Sunk costs
3. Inspection costs
4. **Cost of quality**

Cost of quality is the money spent to prevent defects from occurring by including money in the budget for quality activities. Cost of quality can also be the cost to fix defects because no money was put in the budget for inspections or appraisals. This is also known as the cost of poor quality.

### Question 32

Your project has reached the end and your inspector comes to you and explains that the current deliverables have similar defects to deliverables in earlier phases. What can you do as the project manager to avoid repetitive mistakes in the future?

1. Employ better inspection practices.
2. Better define your scope of work.
3. **Implement lessons learned management techniques.**
4. Decompose the WBS to a lower-level work package.

In this case, there is already an experienced inspector who alerts you about any defects. The inspection isn't the problem here – it is the results. The PM would need to determine why the defects are still occurring via lessons learned.

### Question 33

You and your team are estimating activity durations and need a very definitive estimate. Which of the following tools or techniques will provide the best estimate?

1. **Parametric**
2. Progressive elaboration
3. PERT formula
4. Precedence diagrams

Parametric estimate is the best answer because bottom-up isn't one of the options.

#### Question 34

During the plan procurement process, you are working on source selection criteria and need to make sure that the potential sellers have the correct methodologies, techniques, and services to meet the project's need. Which of the following categories would this fall under as selection criteria?

1. Technical capability
2. The response to your RFP
3. Questions asked in a bidder conference
4. **Technical approach**

You would want to make sure the potential sellers respond with their approach so that you can make sure they can do the work.

#### Question 35

During the control scope process, you are reviewing which of the following documents as an input to this process?

1. Network diagram
2. **Requirements traceability matrix**
3. Risk register
4. Change management plan

The requirements traceability matrix is the only scope document in the list of answers and the only document that contains all the requirements. This would be reviewed to make sure no scope creep has occurred in the deliverables.

#### Question 36

You are working in a strong matrix organization and have been working with your team to plan the project. You know you will need to acquire functional resources, and you are also aware that the team will go through team development stages. Which of the following represents the team's ability to work together, adjust their work habits, and begin to trust each other?

1. **Norming**
2. Forming
3. Storming
4. Performing

When the team begins to trust each other and adjust their work habits, they are in norming.

#### Question 37

Schedule reserves are necessary in the case of a threat that is going to be actively accepted. All the following could be considered part of the contingency reserves except for which one?

1. Schedule buffer time
2. Fixed number of work periods
3. Adding 10% to the activity durations
4. **Project metrics**

Metrics are not part of a contingency reserve but may lead to a risk being identified.

#### Question 38

During risk assessments, the team utilizes the Delphi technique. This will do which of the following for the project?

1. Open brainstorming
2. Determine root causes faster
3. **Reduce bias and keep stronger voiced stakeholders from influencing the outcome**
4. Allow bias to be discussed in a coordinated fashion

The Delphi technique removes groupthink from the risk identification process through anonymous, expert judgment.

#### Question 39

During the control risks process, you are reviewing your team's overall performance with response implementation, probability and impact assessments, and the overall process's efficiency. This is an example of which of the following?

1. **Risk audit**
2. Identify risk responses
3. Qualitative risk analysis
4. Quantitate risk analysis

Because you are in the control risks process and you are reviewing the performance of the risk process, you are performing an audit.

#### Question 40

A new team member asks why it is necessary to have a schedule management plan when you have been doing schedules for projects for years. How do you explain the importance of the plan?

1. The plan is specifically for new stakeholders who have never done schedules before.
2. **The plan defines how the schedule will be created, updated, and managed throughout the project.**
3. The plan is created by the PMO and must be reviewed by the project manager.
4. The plan defines how the WBS will be broken down to the activity level.

A schedule management plan is the "how to" guide for schedule creation, updates, and managing schedule changes. While this is good for newer stakeholders, it is also important to have one regardless, since the project is considered unique, which means the schedule management may be too.

#### Question 41

Which of the following contract types could be considered a direct cost?

1. Cost reimbursable
2. Time and materials
3. Unit price
4. **Firm fixed price**

Direct costs are known and can be budgeted for. A firm-fixed-price contract is a set price. The others have variable costs.

#### Question 42

Which of the following stakeholders is directly responsible for reviewing change requests and accepting or rejecting them?

1. **Change control board**
2. Directive PMO
3. Project sponsor
4. Project manager

The CCB is the best answer since they are the board that accepts and rejects changes.

#### Question 43

You are managing a team of 20 people and notice that the team isn't working well together; there is a lot of conflict and they just don't seem to be able to reach a consensus. What stage is your team in and what approach is best for you to use?

1. Norming; high supportive and low directive
2. **Storming; high directive and high supportive**
3. Storming; low directive and low supportive
4. Norming; high directive and high supportive

It's important for the PM to be direct to help the team get through the conflict, though they much also be supportive of the team's efforts so that they don't get demotivated by the conflict.

#### Question 44

Most project deliverables are tangible but there are also intangible ones. Which of the following would represent an intangible deliverable?

1. **Your team applies the Agile training you provided effectively.**
2. You create software code for type, spell check, and print functionalities.
3. You create the curriculum for a new program.
4. You check the team's work by reviewing their burndown chart.

Training the application is an intangible deliverable. Although it may produce something tangible due to good training, it is the only answer you can't review, test, or use as a value for the organization in the shape of an increment.

#### Question 45

Which of the following best describes the communications knowledge area?

1. It is concerned with using your PMIS to document and store lessons learned.
2. It is concerned with having timely meetings with stakeholders.
3. **It is concerned with the processes to ensure the right information gets to the right people in the right format.**
4. It is concerned with effectively engaging stakeholders using communication.

This is the best answer because the communications knowledge areas are for making sure the information that's been planned and distributed is effective. This may lead to effective engagement but is specific to communications.

#### Question 46

You have been asked by a project sponsor to begin working on a new project that will address cybersecurity effort improvement. You ask the sponsor to draft which of the following to make sure you are formally assigned to the project?

1. Business case
2. Benefits management plan
3. Stakeholder register
4. **Project charter**

The project charter gives the PM formal authorization to begin project work and utilize organizational resources. A charter is necessary to begin the project.

#### Question 47

Determining quality metrics and processes happens in which of the following process groups?

1. Initiating
2. **Planning**
3. Execution
4. Monitoring and controlling

During plan quality management, you will develop the management plan, which includes the metrics you will track for quality and your process to execute the work.

#### Question 48

External auditors have been called to review your quality approaches during the *manage quality* phase. They will most likely be concerned with all of the following except \_\_\_\_?

1. **Your team's performance**
2. Cost of quality
3. Effective process execution
4. Customer satisfaction

External auditors for quality are not concerned with your team's performance. Their job is to make sure the cost of quality is sufficient, your quality process is effective, and that customer satisfaction is met.

### Question 49

Your organization has been designed as a weak matrix and as a project manager, you will be acquiring team members who may be more loyal to their functional managers. This can create some resource risks for the project. Whose job is it to make sure that doesn't happen?

1. PMO
2. Sponsor
3. **Functional manager**
4. Project manager

In a weak matrix, the functional managers have more power than the project manager. In many cases, the PM would be more of a coordinator and the functional manager would oversee human resources, many of whom will be part-time.

### Question 50

You are working on a project that you know will not have the number of resources you will need to complete the critical path as currently scheduled. What technique can you use to accommodate limited resources on your schedule?

1. Smoothing
2. Fast tracking
3. Leveling
4. **Critical chain method**

The critical chain is the only technique that accommodates limited resources on the critical path. Smoothing and leveling are for overallocations, and fast tracking is a corrective action for being behind schedule.

### Question 51

During the qualitative risk analysis process, you will refer to a document that will help with your analysis. Which of the following is the input you will use?

1. Risk categorization
2. Risk management plan
3. Cost baseline
4. **Risk register**

Once the risk register is created during the *identify risks* process, it will be used as an input and updated throughout the rest of the risk processes. Qualitative risk analysis determines probabilities and impacts, as well as priority.

#### Question 52

You are amid developing your team using reward and recognition and motivation. You are also documenting how the team is doing overall. Which of the following documents will you be creating?

1. **Team performance assessments**
2. Individual reviews
3. Project documents updates
4. Staff assignments

During the *develop team* process, you will perform a team assessment to see how the team is performing as a whole.

#### Question 53

You are kicking off a large software development project with stakeholders in multiple countries. As the project manager for this project, you need to make sure your stakeholders are aligned and engaged during the project. What will you be creating to help with this?

1. Stakeholder engagement assessment matrix
2. Power/interest grid
3. **Stakeholder engagement plan**
4. Communications management plan

While all the answers could lead to engagement, the only answer that addresses and documents the engagement strategies is the stakeholder engagement plan.

#### Question 54

When and how risk processes will be performed during the project are documented in the risk management plan. What might the header be for this information?

1. **Timing**
2. Response planning
3. Categories of risk
4. Project schedule

Because the question is asking about when and how risk processes will be performed, the correct answer is the timing category.

#### Question 55

One of your team members has mentioned that they feel like every time there is a meeting, you and the project sponsor run the meetings with little consideration for the team's thoughts. Due to this, the team is becoming demotivated. What can you do, as a project manager, to help with this issue?

1. Take the team to an off-site team-building event to make them feel included.
2. Bring in a mediator to help discuss the team's concerns.
3. Tell the team that you appreciate their concerns, but meetings are for information that only you and the sponsor have.
4. **Tell the team that you have heard their concerns and will begin including team member's thoughts in every meeting and practice better team building in those meetings.**

The correct answer shows you practiced active listening and are adapting your strategies accordingly.

#### Question 56

Having just acquired your virtual team through a work authorization system, you need to be concerned with which of the following the most when planning out the project's work and recurring meetings?

1. **Time zones**
2. Cultural differences
3. How to track their work
4. How to hold meetings with everyone

All these answers are important regarding virtual teams. However, this question is specific to planning out meetings and project work, so the best answer is being aware of time zones.

### Question 57

You have been assigned to a long-term project and know that all the requirements may not be immediately evident. Whose responsibility is it to progressively turn high-level information into detailed plans?

1. Sponsor
2. PMO
3. Program manager
4. **Project manager**

Based on the answers, it is the PM's job to collect requirements and progressively elaborate as new information is determined.

### Question 58

A brand-new project has just kicked off and the project charter has formally assigned you to the project. Since the charter provides higher level information, it is a valuable document as input for which of the following?

1. **Identify stakeholders.**
2. Plan communications.
3. Plan stakeholder engagement.
4. Develop the project team.

The project charter is a valuable input when you're identifying stakeholders, which also happens in initiation. This can lead to planning communication, engaging stakeholders, and developing the project team.

### Question 59

You have been told by your sponsor that it is imperative that you meet the original cost baseline. You will run the analysis to compare how much work is left compared to how much money so that you can determine if you can meet management's goal. Which of the following will give you that information?

1. SPI
2. CPI
3. EAC
4. TCPI

The to-complete performance index (TCPI) is the only metric that compares how much work is left with how much money is left to determine if you can meet a management goal.

#### Question 60

Estimating resource requirements can be time consuming and utilize many variables, including the number of work packages and your activity list. You are about to begin creating your schedule. You have determined that there are about 10 activities that you can't estimate with high accuracy. Which of the following can help you determine resource estimates with a releasable amount of confidence?

1. **Bottom-up estimates**
2. PERT
3. Published estimating data
4. Precedence network diagram review

Bottom-up estimates are the most definitive. PERT takes optimistic, pessimistic, and most likely estimates into consideration to create an average. Published estimation data doesn't fit the questions and a review of the network diagram only shows the sequence of activities.

#### Question 61

A new product is being created that your organization has never created one before. There are multiple internal and external customers who have a vested interest in the outcome. You determine that an in-depth stakeholder management strategy is necessary. Which of the following will help you create that strategy?

1. Determine and prioritize each stakeholder's level of interest and roles in the project.
2. **Conduct a stakeholder analysis to assess what their information needs will be.**
3. Determine the probability and impact of stakeholder interests on the result.
4. Develop a comprehensive communications management plan.

All but the third answer could contribute to a management strategy. However, you would need to identify and analyze your stakeholders before you can determine their level of interest and impact.

### Question 62

All projects have a variety of knowledge areas that need to be considered. Which of the following knowledge areas identifies iterative and interactive project activities?

1. Scope
2. Performance baselines
3. **Integration**
4. Stakeholder engagement

Integration is the knowledge area that contains interactive and iterative activities such as integrated change control, direct and manage project work, and monitor and control project work.

### Question 63

The processes that are used in a project help describe the work to be done, and the product life cycle is defined by what the product will be. Which of the following describes their relationship?

1. **They will overlap and interact with each other throughout the project.**
2. They are not concerned with each other except for when it comes to the scope of work.
3. They are the same thing.
4. It depends on the life cycle choices regarding whether they intersect.

Many processes are iterative and overlap and interact throughout the project.

### Question 64

You are working with your team to sequence activities and are depending on the expert judgment of your team. One of your team members explains that you must install a certain software program before you can run the tests. This is an example of what kind of dependency?

1. Finish to start
2. Internal
3. External
4. **Mandatory**

Mandatory dependencies are based on hard logic. If something must be done in a specific order to work, it is a mandatory dependency.

### Question 65

During the plan quality management process, you will need to do an analysis of the metrics and any necessary aspects of the plan. Which of the following techniques will you use?

1. **Cost-benefit analysis**
2. Scope definition
3. Assumptions analysis
4. Design of experiments

During the plan quality management process, you will be determining the cost of quality and will need to determine the costs and the benefits to do that effectively.

### Question 66

The project you are running has a lot of schedule risk and you know you will need to add contingencies to the schedule baseline. All the following could be considered useful as a reserve except \_\_\_\_\_?

1. Buffers
2. An estimated 10% of the activity's duration estimate
3. **Productivity metrics associated with risk**
4. Set iteration length

All the other answers deal with some kind of contingency plan. Productivity metrics associated with risks wouldn't be part of reserves.

### Question 67

Which of the following make up the scope baseline?

1. Project charter, scope management plan, and WBS
2. **Scope statement, WBS, and WBS dictionary**
3. Project charter, WBS, and scope statement
4. Scope management plan, scope statement, and WBS

The scope baseline is made up of the three main scope documents. The project charter gives the project manager formal authorization to begin project work and describes the scope at a high level. Management plans are the "how to" guides.

Question 68

You have been a project manager for many years and your organization recently hired a new sponsor from outside the organization to help run a large project. The sponsor catches you in the hall and says that work needs to begin and to start the process of identifying stakeholders. You ask about the project charter and they state they never use them. What should your response be?

1. Okay, no problem. We usually use charters but if that isn't a best practice you use, that's fine.
2. Okay, I'll need to check with the PMO about that, but I'll start the process.
3. **I'm sorry, but the implications of starting a project without formal authorization to begin and utilize organizational resources is risky. We always use a charter to kick off the project.**
4. Okay, I'll have to escalate the matter to the program manager and see what they want to do.

Beginning a project without a charter is risky and the PM's job is to make sure stakeholders understand that.

Question 69

What is the first document risk that's identified?

1. Risk register
2. **Project charter**
3. Scope statement
4. WBS

The project charter will list categories of risks or any known risks at the beginning of the project.

### Question 70

Your team is putting together cost and duration estimates for a large project, and team members come to you to explain that even though they attempted to be as accurate as possible, they simply don't have the expert knowledge it will take to estimate a totally unique set of activities. Where else would information need to be taken into consideration?

1. **Identifying risks**
2. Creating the schedule and cost baselines
3. Acquiring resources
4. Determining buffer time

All these answers could be correct. However, to effectively estimate the schedule and costs with limited knowledge, there would be considerations you would need to take into account for risk for contingency purposes.

### Question 71

Many of your schedule dependencies are mandatory due to the nature of the project's work but there are some areas of flexibility where you can shift your resources around and perform tasks in whatever order aligns with their availability. Which process is used to determine dependencies?

1. During the define activities process
2. During the estimate durations process
3. **During the sequence activities process**
4. Before the sequence activities process

The *sequence activities* process determines the dependencies and relationships of those activities.

### Question 72

Your team contains seven members, including yourself. How many channels of communication are there among the members?

1. 7
2. 14
3. **21**
4. 28

This question can be confusing. Since it relates to the total of seven, including the PM, you would run the math with seven total; that is,  $N(N-1)/2$  or  $7(7-1)/2 = 21$ .

#### Question 73

You are performing quantitative risk analysis and are using a tool and technique that is a quantitative method of analyzing the potential impact of risk events. This tool can also be used to determine stakeholder risk tolerance levels. What tool and technique is this question referring to?

1. **Sensitivity analysis**
2. Decision tree analysis
3. Simulation
4. Risk probability and impact

Even though all these answers can lead to determining impacts, the question also mentioned stakeholder tolerance levels, so the best answer is sensitivity analysis. Had it mentioned money, then decision tree analysis would have been correct.

#### Question 74

Which element of the project plan can affect the plan procurement management process and vice versa?

1. **Schedule**
2. Resources
3. WBS
4. Staffing management plan

It may make sense that resources would be the best answer. However, the schedule directly influences the terms and conditions for deliveries and any date constraints that would be important to consider before a contract is negotiated. The other consideration is the time it takes to plan for procurements and create PSOW and RFPs.

### Question 75

During code inspection in a major software development project, a project management team identified frequent occurrences of critical programming errors. These errors are scattered across the code and occur without a discernible pattern. Which tool is most likely to help the team identify areas of error concentration in order to develop a prioritized response strategy?

1. **Checksheet**
2. Influence diagram
3. Decision tree
4. Process decision program chart

Checklists keep a running tabulation of defects within certain categories. This allows the team to determine where to apply the defect repair.

### Question 76

You are a project manager performing a quality audit. While the team's inspecting the results, they notice many more defects than expected. What could be the reason for this?

1. The team executed the process incorrectly.
2. Gold plating may have occurred.
3. **The PM wasn't trained in quality audits.**
4. The quality management plan is incorrect.

An audit is a review of the quality process. If the person running the audit isn't trained, they may miss something that could be producing defects.

### Question 77

During project execution, you found out that work is often not performed at the right time and in the right order. Deliverables are made by one team member that cannot be processed by another. This already leads to timely reworks and bad morale among team members. Which project management tool is the most appropriate for dealing with problems like this?

1. Organization chart
2. RACI matrix
3. Communications management plan
4. **Work authorization system**

Work authorization systems let the team members know when it is their time to perform the project work. This is more typical on virtual teams.

#### Question 78

What is not true about change requests?

1. Change requests should always be handled in a controlled and integrative fashion.
2. Change requests surpassing the formal change control processes can lead to scope creep.
3. When they're professionally managed, change requests can help improve a project and resolve emerging problems.
4. **Change requests are always a sign of bad planning and should be avoided.**

Change requests are a sign that progressive elaboration, corrective actions, preventative actions, and defect repair are necessary. All projects should have a formal change control system.

#### Question 79

The members of your project team have been assigned to your project with general availability levels of 50%. Yesterday, they reported to you that significant variances occurred during project execution. You have noted that the team members have been spending less than 50% of their time working on your project. Your project schedule is about to become heavily delayed, and deadlines are in jeopardy. What do you do?

1. Talk to your sponsor and try to get more resources assigned to similar conditions as the existing ones.
2. **Talk with functional managers. Negotiate clear and written assignments with reliable scheduling priorities.**
3. Ignore the difficulties, adjust your schedule, and negotiate new deadlines according to the slower progress.
4. Focus on internal charges. Make sure that your project is not getting charged for more than the actual work.

Since the resources are borrowed, it's important to negotiate with the functional managers to ensure they have the resources set clear and written assignments.

### Question 80

A project was budgeted at \$1,000,000. Meanwhile, the project is executed, and the following current figures have been assessed: PV: \$500,000 EV: \$450,000 AC: \$550,000. Assuming that the cost variance was caused by one-time cost drivers, which are no longer effective in estimations, what **estimate at completion (EAC)** can you derive from these figures?

1. \$900,000
2. \$1,000,000
3. **\$1,100,000**
4. \$1,222,222

In this question, the EAC formula is based on a one-time event and the future information will be different. The formula would be AC + (BAC-EV), or  $\$550,000 + (\$1,000,000 - \$450,000)$ .

### Question 81

Monte Carlo is used to analyze risks in which of the following processes?

1. Qualitative risk analysis
2. Risk management planning
3. During brainstorming
4. **Quantitative risk analysis**

The Monte Carlo technique is used in statistical analysis during quantitative risk analysis using a software program that runs the data using random number generation. This is computer-generated and iterative so that we can gain the results or the "odds" of meeting certain constraints – usually cost impacts.

### Question 82

You are the manager of a major software development project. Together with your team, you created a code of conduct stating that the change control board must be immediately notified of gifts when the value exceeds \$150. The same applies to invitations when the value exceeds \$200. Today, an executive sent you an invitation to join them in their skybox for your favorite team's Monday night football game with a value of \$200. It is a big event and you tried to obtain tickets by yourself without success. The person told you that he would like to join you, but he will not be available on that day, and he could get hold of only one ticket anyway. What must you do?

1. You can accept invitations with a value of up to \$200, so there should be no problem.
2. You may regard the ticket as a gift, but it does not go over the limit: you do not have to notify the CCB.
3. **The ticket is a gift and over the limit. You must notify the CCB, who will make the decision for you.**
4. You are the project manager. The rules are in place to strengthen your position. They do not apply to you.

This is an ethical question and anything over the limit must be reported, no matter what.

### Question 83

During the *define scope* process, you are utilizing the best information you can. Which of the following tools or techniques is integral to defining scope?

1. PMIS
2. Templates
3. Decomposition
4. **Expert judgment**

The people who do the work, know the work, so this is the best answer. Decomposition is the tool/technique for creating the WBS.

#### Question 84

Which of the following is critical to effective leadership in project management?

1. **Respect and trust**
2. Negotiation
3. Conflict management
4. Political awareness

All the other answers are more typical to management actions but in order to be a good leader, respect and trust are necessary.

#### Question 85

You are a project manager working on a large project with many scope and quality requirements. You have recently taken over this project now that the previous project manager has created the project management plan. The majority of your first week is spent reviewing the non-conforming product scope and making changes to it. This is otherwise known as which of the following?

1. Corrective actions
2. Preventative actions
3. **Defect repair**
4. Project management plan updates

Defect repair is a formal process of fixing non-conforming products, typical to quality or scope issues. Key work is non-conforming. Corrective action is taken to bring performance back in line with the plan, while preventative is to keep something from happening or being affected.

#### Question 86

The *monitor risks* process includes identifying new risks and auditing the responses and risk owner's performance. Which of the following could be considered a tool or technique that's used in this process?

1. **Technical performance measurement**
2. Quantitative risk analysis
3. Decision tree
4. Expected monetary value

All the other answers happen during planning, and reviewing performance can help audit and determine how risk is impacting the project.

Question 87

Which of the following is a process that happens during monitoring and controlling?

1. Qualitative risk analysis
2. Conduct procurements
3. **Control costs**
4. Manage quality

Control costs is the only process that's performed during monitoring and controlling. The others are either planning or execution.

Question 88

Which of the following is an output of the collect requirements process?

1. WBS
2. Scope statement
3. Scope management plan
4. **Requirements traceability matrix**

The requirements traceability matrix is the only output on the list from the collect requirements process. The scope management plan is from plan scope management, the scope statement is the output of define scope, and the WBS is created in the create WBS process, which results in the completed scope baseline.

Question 89

During a review meeting with your stakeholders, you find that several stakeholders are concerned that the deliverables don't meet the expected requirements. Other stakeholders disagree and explain that all acceptance criteria have been met. What could be the source of confusion?

1. **The PM didn't meet with all stakeholders to ensure they understood the success criteria.**
2. The PM didn't evaluate the project management plan with stakeholders.
3. The PM didn't define the scope correctly.
4. The PM didn't hold a backlog refinement meeting.

All stakeholders have not been kept up to date with the success criteria, so this is causing confusion. You should have met with all stakeholders to ensure everyone was on the same page.

#### Question 90

Your team is working closely with a quality assurance department on a large cybersecurity software implementation. During the project, many issues were detected during quality assurance measures. The project team doesn't trust the results or the QA team's results. What should the project manager do to address this confusion and conflict?

1. Bring in an outside mediator to help dissolve the conflict.
2. **Explain the QA plan to all team members, make the changes that are necessary, and gain consensus on the plan so that everyone agrees on the next steps.**
3. Hold a meeting with the team, ask them to trust the results and make the necessary changes.
4. Hold a meeting with the team and QA department and ask everyone to be respectful of the results and work together to achieve the requirements.

The only true action-based answer is #2. The goal is to get everyone on the same page. Holding meetings only provides information, so bringing in an outside mediator who doesn't understand the issue regarding the project isn't the best option.

#### Question 91

Your project requires a more flexible scope of work and needs to procure a seller who can accommodate that flexibility. Your organization negotiates a cost-plus-fixed-fee contract. The contract is estimated at \$100,000 and the fixed fee is 10% of the total. Once the procurement work is completed the total costs are \$80,000. Which of the following is the total price of the contract your organization will pay?

1. **\$90,000**
2. \$110,000
3. \$10,000
4. \$100,000

In this case, the fixed fee is a percentage of the original contract price of 10% of \$100,000, or \$10,000. The final number was \$80,000 + \$10,000.

### Question 92

Your project is facing the major risk of the project shutting down if the final product isn't completed within the 2-week deadline. This will impact the program that the project is contributing to. Which of the following risk responses should be used to handle this situation?

1. Mitigate
2. **Escalate**
3. Active acceptance
4. Avoid

Since the project is part of a program and impacts the program as well as the project, the best answer is to escalate to the program level.

### Question 93

While reviewing project performance, you determine that your earned value is \$750,000 and that your planned value is \$800,000. What should you do, as the project manager, about this variance?

1. Rebaseline your schedule and your budget to utilize the new EAC.
2. Ask the sponsor for management reserves to help with the variance.
3. **Determine corrective actions.**
4. Do nothing – you are still within your 10% tolerance level.

You are behind schedule by \$50,000 and will need to take corrective actions to get the schedule back in line with the plan, if possible.

### Question 94

Ambiguous jurisdictions are best described as what?

1. **Two or more party's work boundaries and role descriptions are unclear.**
2. Only found in projectized organizations.
3. Communication barriers.
4. Conflicting interests at the functional and project levels.

Ambiguous means unclear, so in this case, more information would need to be gathered to determine boundaries and roles.

### Question 95

You are working on a project that contains 105 potential communication channels. How many stakeholders are involved in this project?

1. 10
2. **15**
3. 25
4. 40

The best way to answer this question in the exam is by running the math with each of the answers to get the backward math correct. In this case, the answer is based on 15 stakeholders; that is,  $15(15-1)/2 = 105$  stakeholders.

### Question 96

Which of the following best describes accuracy?

1. Quality
2. **Correctness**
3. Precision
4. Grade

Accuracy means that the result meets your requirements, is correct, and is fit for use.

### Question 97

Which resource(s) is responsible for providing the inputs for the original estimates of activity durations?

1. **The person who is most familiar with them**
2. The sponsor
3. The PM
4. The team

In this case, whoever has the best information should be the person providing that information. It could be all the above, so the best answer is the person who is most familiar to give the best estimates.

### Question 98

Which of the following cost management processes has the tool or technique of funding limit reconciliation?

1. Estimate costs
2. Plan cost management
3. **Determine budget**
4. Control costs

A funding limit reconciliation means that there is a limit to large outflows of money over the course of a time-phased budgetary baseline. This would be accommodated in the determine budget process prior to the baseline being approved.

### Question 99

You are working with your team to estimate activity resource requirements. Which of the following will contain the most valuable information for this process?

1. RBS
2. WBS
3. Published estimating data
4. **Resource calendars**

Estimating activity resources involves creating or reviewing resource calendars so that you can most effectively estimate who, what, and when.

### Question 100

You have been verbally assigned as the project manager for the next installation project in your IT department. When you ask to review the project charter the sponsor tells you to start working without one. Which of the following is the best response?

1. **Explain the risks of beginning a project without a charter.**
2. Escalate this to the PMO.
3. Start working on the project.
4. Create the charter yourself.

A project charter is necessary to begin project work. You would need to explain the risks of beginning without one.

### Question 101

Which of the following is the output of the create WBS process?

1. WBS
2. Requirements traceability matrix
3. Scope statement
4. **Scope baseline**

This one is difficult because it makes it sound like the WBS IS the scope baseline. This only means that when the WBS is completed, so will be the entire scope baseline.

### Question 102

You and your team are waiting for a permit to begin project work. The permit process is taking longer than it should and, consequently, the permit is delayed. This is also known as which of the following?

1. Event
2. Impact
3. Schedule delay
4. Response

While it may be a schedule delay as well, the "event" is caused by a longer process beyond the team's control.

### Question 103

Your team is having repeated conflicts about major deliverables and is unable to remove the conflict without your facilitation as a project manager. Which of the following is occurring?

1. The team is in forming.
2. The team is performing, and conflict is normal.
3. **The team is in storming and needs facilitation by the project manager.**
4. The team is not colocated.

The team is in storming and can't get out of that phase without help from the PM.

Question 104

Which of the following is not an element of the project charter?

1. High level risks
2. **Detailed information about the scope of work**
3. The business case
4. The sponsor's signature

The scope is high level and often, it documents the expected finished deliverables but nothing in detail.

Question 105

You have been asked by your organization to develop a business case for a potential project. What information would be included?

1. **Necessary information to determine if the project is worth the investment from a business perspective.**
2. A detailed breakdown of all costs, sunk costs, and net present values.
3. Information from the SOW and customer requirements to determine any upfront costs for the project and ROI.
4. Information from your perspective about the feasibility and success of the project.

If you were creating the business case as the PM, it would provide information on the financial ROI. If you were asked to review the business case or contribute to the project charter, then #4 would have been a better answer.

Question 106

Why is a requirements management plan so important?

1. **It describes how requirements will be planned, tracked, and reported.**
2. It describes the roles and responsibilities of the team in collecting requirements.
3. The requirements management plan helps to decompose the scope of work.
4. The requirements can be documented in the plan and then used to create the WBS.

The scope management and requirements management plans are both outputs of plan scope management. The requirements management plan is specific to managing requirements.

### Question 107

Which of the following is the best way to ensure that a contracted company can meet the quality requirements of the project?

1. Control quality
2. Procurement management
3. Scope management plan
4. **Quality audits**

Audits allow for the quality process to be reviewed. In this case, you would want to make sure the contracted company can meet the quality needs based on their process or way of performing the work.

### Question 108

Which of the following techniques is used to avoid "groupthink" when identifying risks?

1. SWOT
2. Risk meetings
3. **Delphi technique**
4. Quantitative risk analysis

Delphi is an anonymous expert judgment that's designed to remove groupthink from a conversation.

### Question 109

The **point of total assumption (PTA)** on a fixed-price incentive fee agreement can best be described as what?

1. The point at which the seller assumes all costs above the PTA.
2. **The point at which the seller effectively bears all the costs of a cost overrun.**
3. The point at which the project manager must assume more costs to complete the project.
4. The assumption that all sellers will meet the fixed price and gain their own incentives.

The PTA is a contractual term and condition whereby once a certain number has been hit in costs, the seller will take over any overage. This is mostly done because they have gone over budget and the contract is fixed. (This may be an out-of-the-blue question in the exam. It's not heavily hit, but it could show up. It was not covered in the student guide, but this explanation should be enough to help you answer this question if you were to get it.)

#### Question 110

You have just taken over as the project manager in the middle of a project. You have discovered that resources on a time and materials agreement have charged for work they never did. Which of the following is the best course of action?

1. **Remove them from the project and communicate the situation with the customer while stating that a refund is forthcoming.**
2. Do nothing; otherwise, you would be breaching the agreement.
3. Find work for them to do to make up for the costs they charged.
4. Remove them from the project and report them to the better business bureau.

The best response is to remove them and provide a refund to the customer. This was a material breach of contract, which is egregious and fraudulent behavior.

#### Question 111

You are managing a global team across many different countries. After performing the analysis on the project's process, you notice that several team members are falling short of the goals and that others are behind schedule. What is the best way to handle this situation?

1. **Colocate the team members and have a face-to-face meeting about the situation.**
2. Provide training.
3. Send an email containing progress details and ask for suggestions.
4. Do research on different cultures to see if you can figure out why some global players are more productive than others.

If possible, colocating the team is the best way to address these issues. If this is not possible, then you should set up a virtual team meeting to discuss the same points.

### Question 112

When choosing a vendor for your software design project, you realize that many different companies can provide you with the same level of quality and service. In order to determine the correct vendor, what is the best thing to add to the procurement package and **invitation for bid (IFB)** to ensure your responses will be comparable?

1. The detailed scope statement, along with the procurement management plan.
2. A statement of work that has been formally agreed upon by both parties and is therefore, part of an agreement.
3. **A statement of work that contains the specific needs and metrics of the deliverable in detail.**
4. The procurement administrator is responsible for this task.

The SOW or PSOW will provide the specifics about the scope of work you are requesting a bid for. This will allow prospective sellers to know what you are looking for and if they are able to provide it.

### Question 113

Virtual teams have come across challenges that aren't found in colocated teams. Which of the following is the best way to help overcome these challenges?

1. Always colocate your teams to avoid the challenges.
2. **Develop a comprehensive communications management plan.**
3. Have virtual meetings more often in different time zones.
4. Send out daily emails addressing these challenges and ask for feedback.

It isn't always possible to colocate the team, and virtual teams pose more challenges to communication. Therefore, you would want to put together a comprehensive plan to describe how communications will occur.

#### Question 114

There is a conflict with one of your customers about changes to the scope of work. They want to increase the scope and you feel it will affect the quality of the final deliverable. Neither side is backing down and there is a fixed price agreement in place. What is the best thing to do in this case?

1. The customer is always right, so change the scope of work and charge them more.
2. Communicate your concerns and the risks of increasing the scope of work with increasing the costs.
3. Communicate your concerns transparently and if there is still a dispute, implement an **alternative dispute resolution (ADR)** procedure.
4. **Talk to your procurement administrator and ask for advice on how to handle the customer and the agreement.**

Usually, you wouldn't go to the administrator for questions, but in this case, you are involved in a potential ADR and it would be necessary to get the procurement administrator involved.

#### Question 115

You are performing an audit or review for all the projects you are managing and realize that your project managers are not updating their project management plans, so and nothing is up to date. Which of the following is not true?

1. Projects should not be executed without diligent updates being made to the project management plan.
2. Poor planning and lack of updated plans can result in time and cost overruns.
3. Updating a project management plan takes a lot of administrative time but is necessary for project success.
4. **The project management plan being updated is secondary in nature to executing the work.**

It is always important to update your project management plans with any approved changes and to track performance based off the current baselines. The updates happen before the actual changes can be made, so the updates are not secondary or unimportant.

### Question 116

After reviewing your risk register, you have determined that an identified risk will be responded to with active acceptance. What have you decided to do?

1. Not do anything since you are accepting the risk is going to happen.
2. Do nothing since active acceptance is for opportunities and it's a good thing for your project.
3. Have the risk owner take over and implement an appropriate response once the risk event occurs.
4. **Create contingency reserves of time or money to actively accept the risk.**

Active acceptance involves knowingly using contingency reserves to work through any risks.

### Question 117

You are estimating durations and have been given data from your experts about the length of a key activity. The optimistic is 5 days, the most likely is 8 days, and the pessimistic is 15 days. What is the standard deviation?

1. **1.67 days.**
2. 2 days.
3. 5 days.
4. There isn't enough information to answer this question.

SD is calculated as  $(P-O) / 6$ , so  $(15-5) / 6 = 1.67$  rounded.

### Question 118

During the *control quality* process, your team uses a control chart to track trends and determine if the process is in control. Which of the following will set the tolerance levels to determine when or if corrective action needs to be taken?

1. The mean of the process
2. There being seven data points in a row
3. **Upper and lower control limits**
4. When your sigma levels are lower than Six Sigma

On a control chart, the upper and lower control limits represent the maximum and minimum acceptable results. If the result falls outside of these levels, corrective action is necessary.

Question 119

Which of the following processes is recommended to be done early and often?

1. Quality management planning
2. Develop the project charter
3. Resource management planning
4. **Communication management planning**

All processes except developing the project charter may be iterative, but communications should be done early and often as needs change.

Question 120

Which of the following tools or techniques is used during qualitative risk analysis to help determine near-term urgent risks?

1. **Risk urgency assessment**
2. Expected monetary value
3. Decision tree analysis
4. Trend analysis

Qualitative risk analysis is determining probability, impact, categories, and near-term risks. The other tools/techniques are qualitative risk analysis techniques.

Question 121

During the plan schedule management process, you determine resource availability and the organization's culture and structure. Which of the following inputs will help you do this?

1. Organizational process assets
2. **Enterprise environmental factors**
3. Lessons learned
4. Org charts

EEFs, including the organizational culture, may be used to plan schedule management.

### Question 122

You are a team member working on a large project. You were assigned by your functional manager to work full-time on the project until its completion. What is one benefit of being in a functional department?

1. You can split your time between project and functional work.
2. You are part of two teams.
3. **You have a home department to return to.**
4. You don't have a home department to return to.

Functional resources will return to their home department once project work is over. In a projectized organization, the team doesn't have a home department, though this may allow them to work on multiple projects. A balanced matrix allows a split to be made between project and functional work.

### Question 123

Which of the following is the best key benefit of a stakeholder engagement plan?

1. Allows you to create appropriate strategies for engagement
2. **Provides a clear and actionable plan for interacting with stakeholders to support the project**
3. Allows a stakeholder register to be created
4. Allows you to plan appropriate meetings and interactions with stakeholders

The engagement plan is specific to plans regarding how to interact with stakeholders and update them as needed.

### Question 124

Which of the following are outputs of the *control communications* process?

1. **Work performance information and change requests**
2. Project management plan updates and work performance information
3. Expert judgment and approved change requests
4. Issue logs and enterprise environmental factor updates

Per the PMBOK® Guide – 6th Edition, the outputs include work performance information and change requests.

#### Question 125

You are a PM on a multi-million-dollar project. The customer has asked that you add a scope improvement. You evaluated that the impact of the addition will affect your schedule and the overall budgetary baseline. What is the next thing you should do?

1. Identify the impact of the changes.
2. Have the customer review the agreement with the procurement coordinator.
3. Implement the new improvement.
4. **Create alternative solutions for implementation so that you can present them to the sponsor.**

*Create solutions* is the second step of the integrated change control process. Then, gather internal approvals from the CCB and potentially customer approvals as needed.

#### Question 126

The **Work Breakdown Structure (WBS)** is what?

1. The main input to schedule creation
2. A grouping of work packages
3. A review of the scope of work
4. **A deliverable oriented hierarchical display of the scope**

This is the best definition from the answers provided.

#### Question 127

You are the PM for a company known as ABC. You have taken over the project in the middle of its creation. You have reviewed the previous PM's planning progress and determined that they have defined the activities and created an activity list. What should you do next?

1. Update the WBS.
2. **Sequence activities.**
3. Estimate durations.
4. Check to make sure the definition was created correctly.

Sequence activities is the next process once activities have been defined. It may be tempting to choose to review the definition (it's likely that you would do this in the real world). The assumption is that the organization is a strong matrix, so the first PM would have followed best practices, which means a check shouldn't be necessary.

#### Question 128

The \$850,000 chocolate chip cookie project is exactly halfway completed. While collecting work performance data, your team reports that they have completed 40% of the work and that the costs to date are \$400,000. What information does this tell you about the project?

1. The project is over budget and on schedule.
2. The project is behind schedule and the costs are lower than planned.
3. **The schedule and cost performance are used as work performance information.**
4. You can't determine anything about the project's performance based on this information.

In this question, you can determine the earned value (EV), the planned value (PV) as the project is halfway completed, along with the actual costs. Therefore, you can calculate the schedule and budget performance using the earned value technique.

#### Question 129

During a review of your large manufacturing project, you are inspecting using statistical sampling. You have determined that many of the samples have defects outside of the normal control limits. What is the best thing to do?

1. **Audit your quality process.**
2. Fix the defects by performing a defect repair.
3. Report the defects to your sponsor and their effect on the cost of quality.
4. Communicate with the customer and make decisions about how to proceed.

If defects outside normal control limits are discovered during inspection, this means your process is out of control and needs to be audited and potentially updated.

### Question 130

One of your team members is reviewing their schedule for the next week and is checking on performance. They notice that the tasks that must be completed for them to do their work are currently behind schedule. If things continue the way they are going now, they will be on vacation when it's time to perform their work. What is the best thing for the team member to do?

1. Update the issue log and leave for vacation.
2. **Contact the PM and recommend preventative action.**
3. Give the project manager their schedule immediately.
4. Catch the PM in the hall and ask if they can fast track the activities so that the team member can go on vacation.

Anyone can recommend corrective/preventative/defect repair actions.

### Question 131

One of the sellers on your project is working from a fixed-price-incentive-fee agreement. In the terms and conditions, it clearly states that the seller would be paid all monies when the project is completed. During the course of the project, the seller asks for an installment of the payment because they have met all the requirements for incentives and have a medical concern that they need money for. They have always been a great asset to your projects in the past and it's very important to maintain good relationships with your sellers. What is the best thing to do in this case?

1. **Explain to the seller that while you understand their need, you are not willing to breach agreement and pay them early based on the specifications documented in the agreement. You are, however, willing to give them some time off to handle their medical issues since they have met all the requirements for incentives.**
2. Put in a change request to pay them early, even though the project has not closed.
3. Discuss this with your procurement administrator and have them determine the best course of action.
4. Do nothing as the seller is aware of the stipulations in the agreement.

Even though you want to create and maintain good relationships with your sellers, this is a breach of contract and you would need to explain that to them.

### Question 132

A functional organization is what?

1. The best environment for successful projects
2. **The least successful environment for project management**
3. Better than a weak matrix organization
4. Something that works as a composite organization within organization structures

There are pros and cons to each dynamic, but functional is the least supportive of project work unless it's within the functional department. Even then, the functional manager is in charge and there isn't a PM position.

### Question 133

The critical chain is what?

1. **A project schedule network diagramming technique that accommodates limited resources with buffer time**
2. The near critical path
3. Part of the critical path
4. Float time on the critical path

The critical chain adds buffer time to the critical path to accommodate limited resources.

### Question 134

Who carries the cost risk on a firm-fixed-price agreement?

1. The PMO
2. The project
3. **The seller**
4. The buyer

Fixed price contracts are good for the buyer because they can be budgeted for. If the seller goes over budget or raises their prices during the contract term, they take on all the cost risks above the agreed-upon original price.

Question 135

While working with your team to determine durations for a section of the project that is similar in nature to a part project, you refer to historical information for guidance with your estimations. This is an example of which of the following estimate types?

1. Parametric modeling estimate
2. **Analogous estimate**
3. PERT estimate
4. Expert judgment

Historical knowledge to determine duration or cost estimates is considered an analogous estimate or top down.

Question 136

A RACI chart expresses which of the following in Human Resource Management?

1. **Responsible, Accountable, Consult, and Inform**
2. Responsible, Accurate, Communicate, and Inform
3. Risk, Accountable, Consult, and Inform
4. Responsible, Accountable, Communicate, and Inform

A RACI chart is a type of responsibility assignment matrix (RAM).

Question 137

The acronym PERT stands for what?

1. Project, Evaluation, and Review Technique
2. **Program, Evaluation, and Review Technique**
3. Program Evolution and Reviewing Technique
4. Project Management Evaluation and Risk Technique

The correct answer reflects the acronym for PERT.

### Question 138

A risk trigger can best be described as what?

1. An event that produces a secondary risk event
2. **An event that lets you know a risk even is about to occur**
3. A part of all contingent response strategies
4. An event that produces a residual risk

Triggers can be documented prior to in the risk register but more typically, they are documented after the risk occurs if they weren't originally identified as lessons learned.

### Question 139

Kaizen is what?

1. A Japanese word
2. A signaling system
3. **Continuous improvements**
4. A part of quality assurance

Kai and Zen represent "change for the better" and are a form of philosophy for continuous improvements in quality management.

### Question 140

After a 360-degree review, you have learned that your team thinks you are a micromanager and, in general, believe that people come to work for their paychecks but not for the work itself. According to Douglas McGregor's theory, what type of manager are you?

1. A "Y" manager
2. **An "X" manager**
3. A self-actualized manager
4. A terrible manager

"X" managers believe their team needs to be micromanaged and threatened with punishment to meet organizational goals. A "Y" manager is participative and thinks the opposite.

Question 141

Your team is in the performing stage and is getting along very well and working hard, but you overhear two of your team members arguing in the break room about something political. Which of the following conflict resolution techniques is best to use in this case?

1. Collaboration
2. Compromise
3. **Avoid**
4. Smooth

Keep walking! It isn't necessary to get involved at this point.

Question 142

According to Herzberg's Theory of Hygiene, money is what?

1. A motivator
2. A satisfier
3. Necessary for motivation
4. **A need, not a motivator**

Hygiene needs are recommended to be in place and once they are, you can motivate. Herzberg felt that if an organization didn't pay people what they needed in order to live and afford their lives, then the organization wouldn't be able to recruit or retain the best employees.

Question 143

You are a project manager working overseas and you notice that there is a conflict of interest with many of the team members in the global corporation. What is the best thing to do?

1. **Communicate this conflict of interest to the appropriate parties.**
2. Ignore it; you are a visitor, and it may be cultural.
3. Have a discussion with the involved parties and try to help solve the conflict of interest through good communication.
4. Report them to the human resource department.

As per the Code of Professional Conduct and Ethics published by the Project Management Institute (PMI)<sup>®</sup>, reporting conflicts of interest is a mandatory skill, regardless of what country you are working in.

**Question 144**

You are the buyer of a multi-million-dollar design project with a need for a large number of vendors. One aspect of this project involves the need for 1,000 copies of a specific software program and someone to come in and install the software. You have already determined that no additional copies of the software will be needed and once it is installed, you will have no further need for support. You have budgeted \$150,000 for this aspect of the project. Which of the following is the best agreement type for this need?

1. Fixed price incentive fee
2. Cost reimbursable
3. Time and materials
4. **Firm fixed price**

Since you know the scope of work and have already budgeted a set amount, the best contract is firm fixed price.

**Question 145**

One aspect of your project's scope isn't clearly defined, and you know you will need an outside vendor to complete the work. You have determined that you are willing to spend a certain amount in costs, as well as a percentage of those costs as a fee for the vendor. This is an example of what?

1. **Cost plus fixed fee**
2. Cost plus incentive fees
3. Fixed price incentive fees
4. Cost plus award fees

Cost plus contracts are best if the project needs scope flexibility and the fixed fee is determined based on a percentage of the estimated costs.

Question 146

You are a project team member who is working on several projects at a time. You are not sure which project is a priority. Which of the following could supply you with that information?

1. The project manager
2. The project sponsor
3. **The PMO**
4. Other team members

The PMO will always know the priority of projects and are the best resource. If you ask the project managers, they will likely say their project is a priority!

Question 147

Which of the following is a tool or technique of the *develop project team* process?

1. Acquire team
2. Motivate team
3. Organizational theory
4. **Virtual teams**

The first answer is a process; motivate the team falls under the tool or technique of reward and recognition; and organizational theory is part of the acquire team process. Virtual teams are a tool or technique for developing the project team.

Question 148

While monitoring performance, you determine that your EV = \$50,000, your AC = \$52,000, and your PV = \$48,000. How is your project performing?

1. On schedule and over budget
2. Behind schedule and under budget
3. **Ahead of schedule and over budget**
4. Can't determine from the information provided

The earned value is greater than the planned value and shows that you are ahead of schedule, as well as that the earned value is less than the actual costs. This shows that you are over budget.

### Question 149

Your current project has a major schedule constraint. Your customer is adamant that the project must finish on time. Currently, your project performance is SPI = 0.7 and your CPI is 0.9. What may be the best way to improve schedule performance?

1. There isn't anything you can do.
2. Remove the scope of work to help the schedule.
3. Discuss the issue with your customer and explain the problem.
4. **Ask your team to work overtime and crash the schedule.**

The best answer is to crash your schedule. The budgetary performance is still within normal limits, but the schedule needs to get back on track. There are only two ways to speed up your schedule and that is crashing or fast tracking. Usually, fast tracking is the best option, but it hasn't been presented here, so the best answer is crashing.

### Question 150

Your team is working on a software project and the life cycle choice is Agile project management. What best describes your team?

1. **Self-directed and self-managed**
2. T-shaped people
3. Scrum team
4. Product owners

Agile teams are self-directed and self-managed. They can also be considered T-shaped people because they are specialists and have additional necessary skills for keeping the team's size small. However, the best answer is #1.

### Question 151

Which of the following best describes an enterprise environmental factor?

1. Lessons learned
2. Policies of the organization
3. **Marketplace conditions**
4. Procedures of the organization

This is the best answer and represents enterprise environmental factors.

Question 152

Competing constraints include which of the following?

1. **Scope, schedule, cost, quality, risk, and resources**
2. Scope, schedule, and costs
3. Scope, schedule, costs, and quality
4. Scope, schedule, costs, and resources

The constraints are no longer the triangle of scope, schedule, and costs. Competing constraints include quality, risk, and resources.

Question 153

What is the major output of the *direct and manage project work* process?

1. Activity lists
2. WBS
3. Verified deliverables
4. **Deliverables**

Deliverables are the main outputs of *direct and manage project work* in the integration knowledge area. They will then be inputs to verify quality.

Question 154

Your customer has been invited to review the increment you have created and collect feedback. After the review, you ask them to sign a formal document that states they accept the increment. What process best describes this?

1. Verify quality
2. Validate quality
3. Verify scope
4. **Validate scope**

Formal acceptance by the customer is the output of the validate scope process. Verified deliverables is the output of the control quality process.

### Question 155

You and your team are working on a difficult project that is rife with issues and sunk costs. The project sponsor asks you to terminate the project, but you are almost finished with all the deliverables. What do you do first?

1. **Ask the sponsor about the possibility of continuing the project to completion.**
2. Cancel the project.
3. Go through administrative closure.
4. Go through change control to stop the cancellation.

The first step would be to explain to the sponsor that your team is almost finished and that after so much time and money has already been spent, it may be realistic to complete the project. If not, then you would begin formal closure procedures, including verifying the project's quality, validating the project's scope, and then closing the project or phase process.

### Question 156

Which of the following is a schematic display of your project schedule activities?

1. Gantt chart
2. Milestone list
3. Activity list
4. **Precedence network diagram**

The precedence network diagram is a schematic of your schedule. A Gantt chart could be considered this as well but per the exam, #4 is the best answer.

### Question 157

The team is performing qualitative risk analysis. Which of the following inputs will they refer to that helps with this process?

1. **Risk register**
2. Risk data quality assessment
3. Risk categories
4. Organizational process assets

The risk register is created during the identify risks process and will be an input and updated output for the other risk processes.

Question 158

You are going to take over a new project as the project manager in an enterprise unknown to you. What should you investigate during the chartering process?

1. **Enterprise environmental factors**
2. Project management plan
3. Project risk register
4. Team performance reports

You are at the very beginning of the project in a new organization. It will be important to understand the organizational culture in order to determine the next steps in initiation and planning.

Question 159

A project was budgeted at \$950,000. Meanwhile, the project is executed, and the following current figures have been assessed: PV: \$130,000, EV: \$120,000, AC: \$150,000. Assuming that the cost variance was caused by one-time cost drivers that will continue to impact the project, what **estimate at completion (EAC)** can you derive from these figures?

1. \$900,000
2. \$1,000,000
3. \$1,100,000
4. **\$1,187,500**

In this case, the risk event will continue to impact your project, so the formula for EAC would be BAC/CPI. First, you would determine the CPI; that is,  $\$120,000 / \$150,000 = 0.8$ . Then, you would use the BAC and divide it by the CPI  $\$950,000 / 0.8$ . This is a forecasted EAC of \$1,187,500. You would finish over budget if performance remains the same throughout the project.

### Question 160

Which characteristics do effective project managers use?

1. Collaboration and performance metrics
2. Leadership and project management knowledge
3. Allowing their team to self-directed
4. **Project management knowledge, performance skills, and personal effectiveness**

All answers may be relevant, but the best answer encompasses all the above.

### Question 161

What is the least important when it comes to archiving project records?

1. A well-designed records management system
2. **Integrating the archive with business software**
3. Updated records reflecting final results
4. Easy availability of information for future use

The best answer is the LEAST important compared to the other answers.

### Question 162

Which of the following are not necessarily used to establish the cost baseline of a project?

1. Schedule activity or work package cost estimates
2. The work breakdown structure and the WBS dictionary
3. The project schedule and resource calendars
4. **The risk breakdown structure and the risk register**

Even though there may be some responses related to contingency reserves and you would need to consider the contingency reserves as part of your cost baseline, the others are bigger drivers of determining costs on a project.

**Question 163**

You took over a customer project for your company. From the inputs available, including the agreement, statement of work, and project charter, you have developed a project management plan. You have already presented that plan in a meeting with key stakeholders, including your project sponsor and some representatives from the customer organization. During the meeting, you sensed a high level of dissatisfaction from the customer executives, who signaled that the project might not produce the results that their company had expected. From your understanding, all the necessary actions have been planned to meet the customer's requirements. What should you do next?

1. Request a written statement from the customer detailing the requirements that they believe are not addressed by your plan. Use this statement to update the project plan.
2. **Arrange meetings with the customer to identify their needs, wants, and expectations for the project. Then, create a narrative scope statement from this information to document the agreed upon project scope.**
3. Request a formal meeting with top executive level to get the misunderstandings sorted out, then arrange a change request, re-plan your project where necessary, and go ahead with the project work.
4. Do not overreact. When performed according to your plan, the project will produce a convincing product for the customer. As soon as the executives see it, they will probably change their opinion and accept it.

Since you have taken over a project in its early stages, you still have time to determine and define the scope of work to everyone's approvals. Having a meeting allows for discussions and consensus and an agreement to be reached on the scope of work going forward.

**Question 164**

A project was assessed, and the following earned value data has been found: PV: \$750,000, EV: \$750,000, AC: \$900,000. What is the burn rate of the project?

1. **1.2**
2. 1.1
3. 1
4. 0.83

The burn rate can be calculated in two ways: via 1/CPI or AC/EV. In this case, the correct answer is 1.2.

### Question 165

What is not true about project deliverables?

1. Project deliverables should be identified, described, and agreed upon as early in the project as possible.
2. Project deliverables may be products, capabilities for services, or other kinds of results.
3. **Once project deliverables have been identified, their description should not be changed any more.**
4. The acceptance process for deliverables and how rejection will be addressed should be described in the agreement.

Change can occur in the project related to deliverables as needed through formal integrated change control. This is also an absolute statement, and these are typically not correct answers.

### Question 166

Your project, which you have run for a customer, is coming to an end. The customer has been granted a 3-year warranty period for the product for the project. What should you do first?

1. Hand all relevant documentation over to the organizational unit responsible for handling the warranty.
2. There is no additional work to be done. The agreement should describe all the processes in enough detail.
3. **Any changes that are made to the product can affect warranty clauses. Ensure that these clauses are aligned with the final specifications.**
4. According to many legislations, you cannot formally close a project before the end of the warranty period.

Since the customer has been granted a warranty clause, you'll want to protect your organization from future costs or litigation, so making sure the clauses align with the final results is important to protect both the customer and the organization.

### Question 167

Being the project manager in a high-risk electronics project with a lot of new technologies, you've developed a risk management plan and identified risks that you then documented in a risk register. Then, the risks were analyzed, and a response was planned. During the risk control meetings, it became obvious that the documents you created are not very helpful. What have you probably done wrong?

1. You failed to use an RBS.
2. **You did the first processes alone.**
3. You did not identify any triggers.
4. You did not calculate any EMVs.

You didn't use expert judgment to identify risks or determine stakeholder tolerance levels. The risk processes need to be carried out with the appropriate expert judgment.

### Question 168

Which of the following best describes the main difference between the critical path and critical chain?

1. **Resource limitations.**
2. The critical chain is the second longest path.
3. The critical path accommodates limited resources.
4. There aren't any differences.

The critical path is the longest path in the network diagram, while the critical chain adds buffer time to accommodate limited resources.

### Question 169

You have just been told that your project is being canceled. Which document do you refer to in order to make sure everyone knows of this development?

1. Stakeholder engagement matrix
2. The RACI chart
3. **Communications management plan**
4. The stakeholder register

The communications management plan describes the *how*, *who*, and *what* concerning the distribution of information.

### Question 170

Which of the following should not be considered a procurement document that solicits any offers from any prospective sellers?

1. Request for proposal
2. **Request for information**
3. Request for quote
4. Invitation for bid

RFI is looking for information on the potential seller because you have never worked with them before; they would solicit a bid until you have reviewed the information they provide. All the rest are money-oriented.

### Question 171

You are putting together an agenda for your kick-off meeting and have invited all stakeholders to attend. Which of the following wouldn't be on your agenda for discussion?

1. Reviewing all subsidiary plans for ease of understanding
2. Discussing standard formats for communications and establishing working relationships
3. **Discussing specific terms and conditions and the legal aspects of your contracts**
4. Discussing the scope of work

It is unnecessary to discuss the legal aspects of contracts and terms and conditions during a kick-off meeting. The other answers are more important in that type of meeting.

### Question 172

Which is generally not regarded as one of the three categories of culture that managers should master?

1. National culture
2. Organizational culture
3. **Project culture**
4. Functional culture

It seems counterintuitive, but you are a project manager and should know all about project culture. The others are needed and can be unique to each project and project manager.

Question 173

A post-mortem analysis after the scheduled finish date of a project shows a CPI of 0.8 and an SPI of 1.25. What is a plausible explanation for this?

1. **The project was terminated early. At that time, it was over budget and ahead of schedule.**
2. The project has produced additional deliverables that were originally not required.
3. The project has evidently been finished under budget and behind schedule.
4. The project has evidently been finished on budget and ahead of schedule.

There isn't anything in the question that points to additional deliverables, and the other answers don't reflect the CPI or SPI results accurately. The only answer it can be is that the project was terminated early.

Question 174

Some colleagues told you that they are planning, executing, monitoring, and controlling a project by using milestones with durations between 1 and 4 weeks. What do you think about this?

1. **The approach is erroneous. A milestone is a significant point with a zero duration to highlight achievements.**
2. It is a good approach if the milestones reflect fixed or imposed dates during the project life cycle only.
3. It is a good approach if the milestones are used for reviews between consecutive project phases only.
4. It is a good approach because it saves progress measurement being done on activities and work packages.

Milestones reflect dates and contain a zero duration.

### Question 175

Together with your team, you have applied three-point estimation to a critical path. The optimistic estimate = 50 days, the pessimistic estimate = 95 days, and the most likely estimate = 62 days. These tasks have been performed in the past, so you trust your expert, but several risks have been identified, so you want to make sure your estimate is as accurate as possible. What is the expected duration?

1. 21 days
2. 42 days
3. Not possible to answer from the information provided
4. **65.5**

The expected duration is based on the PERT formula of  $TE = [O + (4 * ML) + P] / 6$  because the expert judgment is trusted more due to them having done the task before.

### Question 176

You are just leaving a meeting during where you have been assigned as the manager of a project. You must build a sub-station that is part of a major electric power distribution system. The decision to run the project was made before your assignment and without your involvement. Some basic decisions on deliverables, staffing, budgeting, and so on regarding the completion date have already been made as well. What should you do first?

1. **Obtain or create a project charter that links the project to the strategy and any ongoing work of the organization. This should include any documents for the initial decisions. You should also obtain signatures from the sponsor.**
2. Create a project schedule for your project that shows all the major milestones and any deadlines linked to them. Then, try to obtain approval for the schedule.
3. Start developing a detailed risk register that includes identified risks, along with their qualitative and quantitative assessments, and a response plan.
4. Start the quality assurance process by developing test procedures for the final deliverables and defining metrics that the tests will be performed against.

You always want to begin a project with a project charter, even if the information is basic at this point.

Question 177

Which of the following is not a goal in both project management and quality management?

1. Prevention over inspection
2. Customer satisfaction
3. Management responsibility
4. **Managing the triple constraints**

The other answers are actions that are taken in project and quality management. The triple constraints are no longer the correct term and the constraints are completing. They include scope, schedule, cost, quality, risks, and resources.

Question 178

You've created a baseline of your system configuration and added several changes to it as amendments. Meanwhile, you are afraid that the big number of Deltas may cause inconsistencies and make you unable to understand the current system configuration. What should you do?

1. Proclaim a design freeze.
2. Go on with amendments.
3. **Revise the baseline.**
4. Create an entirely new configuration.

If the current baseline isn't realistic, then it would be necessary to re-baseline through integrated change control.

Question 179

A request, demand, or assertion of an agreement partner for consideration, compensation or payment under a legally binding agreement, such as a disputed change, is often referred to as a what?

1. **Claim**
2. Trial
3. Refinement
4. Audit

Claim administration would have to be enacted in this situation.

**Question 180**

Projects may be initiated by all the following except what?

1. **The project team**
2. A sponsor
3. A PMO
4. A portfolio review board

A project team cannot initiate a project. Senior management provides organizational permissions and a project charter.

**Question 181**

During your planning processes, you used a Monte Carlo simulation to quantitatively assess the costs and schedule risks for your project. During risk control, you repeat this technique, and it leads to different results. What should not be the reason for this occurring?

1. Some assumptions during planning have become fact-based knowledge, so that the risks related to them have vanished or have become certain problems.
2. New risks may have been identified. These influence the input data that's been used for Monte Carlo simulation in a way that could not be predicted at the time the simulation was run.
3. Some of the constraints were identified originally, but their influence on the project was unclear when the simulation was run for the first time. At this point, the team understands these constraints much better and has been able to adjust the simulation.
4. **Some dummy activities in the network logic have an element of uncertainty, and this gets bigger over time. While the project proceeds, it gets even harder to predict how the team members that have been assigned to them will perform.**

This is the least accurate answer. The other answers are more suited to the question.

**Question 182**

As a project manager, you can assign any one of two team members to a highly coveted task. Both are equally capable, but one of them is a member of your in-group. You have far more distance from the other member. How should you behave?

1. **You should disclose the situation to your stakeholders and solicit a joint decision.**
2. You should take the person not in your in-group to avoid any misunderstandings.
3. You should choose the in-group person. The trustful relationship between you two will benefit the project.
4. You should delegate the decision to a third team member to avoid any conflicts.

You would want to avoid the halo effect, and you are also in the midst of a conflict of interest. It's best to disclose this and make a joint decision with your stakeholders.

**Question 183**

You need a batch of 100 identical valves, all of which will be custom made, for your project to build a food processing plant. There is a risk of the food deteriorating during processing; therefore, you have placed requirements on the quality of the raw materials for the valves. However, this will make production very costly. Unfortunately, in order to test the valves against these requirements, you would have to destroy them, and you have no experience with the vendors at all. What should you do?

1. Do 0% inspection. You must trust the selected supplier that they will use the materials according to your specification.
2. **Negotiate an agreement for over more than 100 items and perform acceptance sampling for the surplus of the batch on delivery.**
3. Make the seller supply the valves, along with appropriate the certificates, from their raw materials suppliers.
4. Do 100% inspection on delivery to your premises, then order another batch of 100 valves.

In this case, it's best to run tests on excess parts to make sure they will work for your projects. Since they will be destroyed, you should make an order that exceeds the amount needed to complete the project and then inspect the results before proceeding.

#### Question 184

Which statement is false? Progressive elaboration of project scope...

1. ...is a characteristic of projects that accompanies the concepts of temporary and unique.
2. ...means developing in steps. It should not be confused with scope creep.
3. **...signals a weak spot in the scope definition process that's caused by incomplete agreements and specifications.**
4. ...when properly managed, integrates elaboration of project and deliverable specifications.

Progressive elaboration is expected and not a sign of project weakness.

#### Question 185

You are managing an internationally dispersed project team. The members of your team have different cultural backgrounds and primary languages, but all are educated and able to communicate eloquently in English. Nevertheless, you should bear in mind that...

1. ...there are cultural differences. You should write one code of conduct for each nationality. You should then limit access to these codes.
2. ...you may have to accept that team members from one country may not be prepared to work with colleagues from certain other countries.
3. **...spoken communications can cause misunderstandings you may not find in written communications. These may be hard to identify.**
4. ...certain groups will be happy to stay awake overnight to join telephone and video conferences during other members' working time.

This could be due to slang or jargon that may be misunderstood or differences in accents.

Question 186

When finishing a project, which factors that influence customer satisfaction the most should you be aware of?

1. The attractive price of the project and the low running costs of the product.
2. The friendliness of the project manager and their effective after-project service.
3. The efficiency of the project and the skills of the project manager.
4. **How people conform to the requirements of the project and how the deliverables are fit for use.**

This would be determined by inspecting the project's quality to verify that the result is fit for use and that the validate scope process gains a signature from the customer, stating that the requirements have been met.

Question 187

When identifying the basis of the business needs for a project, all the following can be considered except for what?

1. **Regular plant maintenance**
2. Market demands
3. Technological advances
4. Legal requirements

The other answers are categories of projects. Plant maintenance is part of operations.

Question 188

During a performance review, you try to determine whether performance is improving or not. What can you use to help determine this?

1. Variance analysis
2. **Trend analysis**
3. Earned value analysis
4. Cost-benefit analysis

All these answers represent some kind of performance review, but the only way to know if performance is improving is to follow the trends of the results of the performance analysis.

### Question 189

During the quality control inspection, your inspector documents the results of the measurements. These results are used as inputs to which of the following processes?

1. Plan quality management
2. **Manage quality**
3. Plan scope management
4. Control scope

If inspections show a defect or problem with the quality, then the quality processes would need to be audited to determine where the defects are coming from. Therefore, the results would be inputs to the manage quality or QA process.

### Question 190

A regulation is changing in the middle of your project. It's a complete surprise and will impact your project negatively. What should you do first?

1. **Review the risk management plan.**
2. Review the stakeholder register.
3. Discuss it with your sponsor.
4. Review your communications management plan.

A complete surprise is an unknown/unknown threat event, so it would be necessary to review your risk management plan for how to deal with that risk. This may involve management reserves.

### Question 191

Which of the following can provide information on your project's organization and its structure?

1. WBS
2. RAM
3. **OBS**
4. RACI

The organizational breakdown structure would document your project's organizational structure.

### Question 192

You are working with your team to identify threats and opportunities at the beginning of planning. What would be the best tool or technique to do this?

1. Sensitivity analysis
2. Expected monetary value
3. Monte Carlo simulation
4. **Brainstorming**

Brainstorming is a technique that's used to identify risks. The other answers are tools and techniques used for quantitative risk analysis.

### Question 193

Inspection is the main reason that errors are kept...

1. ...in control
2. **...out of the hands of the customer**
3. ...at a minimum
4. ...within normal limits

All these answers are seemingly correct, but the main goal is to keep errors out of the hands of the customers and minimize the cost of poor quality.

### Question 194

While creating your schedule, you determine that you must install the hardware before the software. This is an example of which of the following?

1. A constraint
2. An external dependency
3. **A mandatory dependency**
4. A requirement

Mandatory dependencies represent hard logic. Do this first and then that.

**Question 195**

You have been asked for a definitive estimate for your budget. Which of the following techniques will give you an estimate with less room for error?

1. **Bottom-up estimate**
2. PERT estimate
3. Analogous estimate
4. Expert judgment

Bottom-up estimates use the WBS and are considered the most accurate or definitive estimates for costs and durations.

**Question 196**

You have identified a threat event could occur at a 30% probability and that it has an impact of \$450,000. What is the expected monetary value?

1. \$1,500,000.
2. **\$135,000.**
3. \$585,000.
4. This question can't be answered using the information provided.

This is using the expected monetary value formula of probability (%) \* Impact (\$), so the formula would be  $\$450,000 * .30 = \$135,000.00$ .

**Question 197**

Which of the following is one of the outputs of the control scope?

1. Formal sign-off
2. Accepted deliverables
3. Variance information
4. **Change requests**

If scope creep is determined, then the scope of work would need to be updated using integrated change control.

### Question 198

You and your team determine that you will need to take preventative actions to stop a threat event from occurring. You have determined that the change will cost the project \$20,000 and will take an extra 2 weeks, but that it's worth it to prevent a major impact. What do you do next?

1. **Create solutions.**
2. Assess the impact.
3. Create a change request.
4. Talk to the CCB.

Following the *change control* process, you have already determined the impacts of the costs and schedule activities. The next step would be to determine solutions with the team.

### Question 199

As you and your team plan, you know very specific aspects of scope in the short term, but the long-term specifics aren't clear yet. What will you need to do?

1. Alternative analysis
2. Collect requirements
3. Alternatives analysis
4. **Rolling wave planning**

Rolling wave planning is a type of progressive elaboration. You will get the next "wave" of information and use that to plan in more depth once the information crashes into your project.

### Question 200

During activity sequencing, you determine that there will be a waiting period between activity A and the delivery of materials for activity B. What will you need to do to the sequence to accommodate this?

1. Add lead time.
2. Add an activity for the delivery.
3. Add buffer time.
4. **Add lag time.**

Lag is a non-cost, non-resource-oriented duration that is necessary. In this case, building time to support deliveries would be lag time. You wouldn't pay someone to wait for the deliveries or use their availability for a non-executable task.

How did you do? Hopefully, you did a great job!

Don't worry if you got some of the questions wrong – this is just showing you where to go back and review so that you can study what you don't know, rather than what you do. I wish you the best of luck in your studies and your journey to becoming a PMP® certified project manager. It's been a pleasure taking your journey this far with you.

All the best for all future endeavors!

Ashley :-)



# Assessment

## Assessment exam answers (Chapter 1)

### Question 1

The definition of a project is what?

1. Progressively elaborated on and unique
2. Temporary and chartered
3. **Temporary and unique**
4. Unique and has a life cycle

That is the best answer based on the definition provided in *The PMBOK® Guide - 6th Edition*.

### Question 2

Which of the following is the correct order for the process groups of project management?

1. Initiation, executing, monitoring, and controlling and closing the project or phase
2. Planning, execution, monitoring, and controlling and closing the project or phase
3. Initiation, execution, and project or phase closure
4. **Initiation, planning, executing, monitoring, and controlling and closing the project or phase**

The correct answer shows all five process groups in order.

### Question 3

Which of the following are key activities that are performed on the initiation process group?

1. Creating the risk register and developing the business case
2. Creating a schedule baseline and budget

3. **Creating the project charter and identifying stakeholders**
4. Developing a business case and holding a kick-off meeting

Developing the project charter and identifying stakeholders are the two processes in the initiation process group.

#### Question 4

Which of the following is the main goal of planning?

1. **To create a comprehensive project management plan**
2. To create a schedule baseline
3. To create a budget that meets the business plan
4. To understand the scope of work

The integrated project management plan contains all the subsidiary plans and baselines for the project.

#### Question 5

Which of the following process groups is where the project deliverables are produced?

1. Initiation
2. Planning
3. Monitoring and Controlling
4. **Execution**

The Execution process group is where deliverables are created.

#### Question 6

To process a change request, which of the following departments would you most likely need to get approval from?

1. The PMO
2. **The CCB**
3. The sponsor
4. The customer

Even though you may have to gain approval from the sponsor or the customer, you would need to gain formal approval from the change control board.

### Question 7

You are working on a long-term project with 25 stakeholders. In the middle of the project, the customer asks for a change in scope that will impact the entire project and consequently will not align with the project charter. Which of the following is the best way to handle this?

1. Process a change request with the CCB.
2. Discuss everything with your sponsor.
3. **After approvals go through, perform formal project closure for this project.**
4. Explain to the customer that the change is too different from the original scope of work and can't be done.

Even if the project is canceled halfway through, formal project closure would need to be done after scope validation/acceptance.

### Question 8

You have received a project charter to work on a project that involves installing data centers at multiple client sites with a very tight timeline. Based on your current team and understanding of the scope of work, the team has decided that after planning and delivering the equipment, each team member could work in pairs at a variety of locations at approximately the same time. What type of project phase configuration would be the best for this?

1. Adaptive
2. Sequential
3. **Overlapping**
4. Predictive

The team is performing work at multiple locations at the same time, thus overlapping the phases of the project.

### Question 9

What are the major differences between predictive project management and adaptive project management?

1. **Predictive projects know the full scope of work in advance, while adaptive projects typically correlate with knowledge work.**
2. Predictive projects don't really know the scope of work in the beginning, while adaptive projects are only for software development.

3. Adaptive projects need formal change control, while predictive projects don't.
4. In predictive projects, the scope of work is flexible, while in adaptive projects, the scope of work is not flexible.

A predictive project is fully planned for in advance and any changes are managed through formal change control. Adaptive projects are typically for knowledge work such as software design and is the best answer, given the other choices.

#### Question 10

What is the main goal or objective of the project charter from the project manager's perspective?

1. To explain the scope of work to stakeholders
2. To define the business case
3. **To formally authorize the project manager to begin project work**
4. To get it signed by the sponsor

All these answers are seemingly correct, but for a project manager to begin project work, they must have formal authorization to begin project work and utilize organizational resources.

#### Question 11

Which of the following represents a PMIS?

1. The project charter
2. The stakeholders involved in the project
3. The project management system or framework
4. **The software and hardware used to manage communications, reporting, and performance**

A project management information system is best described as the software and hardware that's used in a project for reporting and communications.

#### Question 12

Which of the following would be considered an assumption in the project charter?

1. Who the project manager will be
2. Who the sponsor is
3. Who the customer is
4. **The business case**

Because the charter clearly states who the PM, sponsor, and customer are and these are the only specifics documented, the business case has yet to be proven correct.

#### Question 13

An agile charter differs from a project charter for which of the following reasons?

1. Offers less flexibility for the scope of work
2. **Offers more flexibility for the scope of work**
3. Offers more information about the software design
4. Doesn't document how the project will be run

Agile charters need to be more flexible to accommodate rapid changes in the scope of work.

#### Question 14

You are about to hold a kick-off meeting for a large group of stakeholders to announce a new project and get buy-in. What is the best document to present to everyone prior to the meeting?

1. A schedule
2. A budget
3. The names of the team members
4. **An agenda**

An agenda is necessary prior to the meeting so that everyone attending knows what will be covered. This may include schedule, budget, and the like, but the agenda is the correct answer.

#### Question 15

What is the main goal of any kick-off meeting?

1. **To confirm everyone understands the goals and objectives of the project**
2. To get everyone's thoughts on the project
3. To assign your team to work in the charter
4. To begin planning

You may be getting feedback from the stakeholders in attendance, but the main goal is to get everyone on the same page before project execution begins.

### Question 16

Jillian is a new project manager and is not totally clear on the customer requirements. As her team kicks off the project, Jillian notices that some stakeholders are upset about the project plan she has put together. What would be the best reason for the stakeholders not buying into Jillian's plans?

1. Jillian didn't explain the way the plan works during the kick-off meeting.
2. Jillian didn't fully understand the scope of work.
3. **Jillian did not practice stakeholder engagement in order to know the correct requirements.**
4. Jillian knows that she will progressively elaborate on the plan, and this is just the first draft.

If the stakeholders are not buying into the plans, it is because they were not communicated with or engaged properly to collect all the requirements needed and to address any concerns they may have before project work begins.

### Question 17

During a very difficult project, Sam, who is a team member, explains to the project manager that they have identified a risk event that may threaten the schedule. Sam explains that if he just had a few more people to work on the critical activities, he could get the project back to the original baseline. Which of the following schedule compression techniques is Sam describing?

1. Fast-tracking
2. Risk contingency
3. Re-baselining
4. **Crashing**

Crashing is where you add additional resources or costs to critical activities for the least incremental costs.

### Question 18

Karen and Bill are two of your best software developers and they have been working together for several years. Bill is suddenly transferred to another department and another project team. Karen experiences a bit of disappointment and low motivation. Which of the following team development processes best describes Karen's reaction?

1. Forming
2. Performing

3. **Adjourning**
4. **Mourning**

Adjourning is when a team member leaves the team for another project or the team disbands at the end of the project or phase.

#### Question 19

Which of the following is at the top of Maslow's hierarchy of needs?

1. Physiological
2. Norming
3. Social
4. **Esteem**

Given the choices, esteem is the highest on Maslow's hierarchy of needs.

#### Question 20

You and your team are working together to gather requirements and create your scope baseline. Which of the following best represents the documents that make up the scope baseline?

1. The WBS, WBS register, and the scope management plan
2. **The scope statement, WBS, and the WBS dictionary**
3. The scope management plan, schedule, and cost baselines
4. The requirements management plan, the project charter, and the scope statement

Those three documents make up the scope baseline and is the best answer, given the other choices.

#### Question 21

Review the following network diagram and determine the critical path:

1. A C D E
2. **B E**
3. A B C D E
4. A C D

Path BE = 20 days, path AC = 13 days, and path AD = 5 days. The critical path is the longest path in duration.

**Question 22**

Conya is trying to determine how long an activity will take. She has two team members that have differing opinions on how long it should take. The first team member identifies a risk event and thinks it will impact the duration, so she says the activity should take about 39 days. The second team member is more optimistic and thinks the activity should take about 28 days. Conya firmly believes that because she has done a similar activity in past projects, it should take 32 days. Using the PERT Beta distribution formula, how long should the activity take?

O: 28 P: 39 ML: 32

1. **48.75**
2. 32.45
3. 39.25
4. 32.75

The PERT beta distribution formula is  $[O + (4 \cdot ML) + P]/6$  or  $[28 + (4 \cdot 32) + 39]/6$ .

**Question 23**

While monitoring and controlling your schedule and cost baselines, the project manager runs Earned Value Analysis and discovers that the schedule variance is -2,300 and that the cost performance index is 1.3. How is the project performing?

1. Ahead of schedule and over budget
2. Over budget and behind schedule
3. **Behind schedule and under budget**
4. Ahead of schedule and under budget

If the schedule variances are negative, it means that less work was done than planned and that the team is behind schedule. If the cost performance index is above 1.0, it shows that the team is doing \$1.30 worth of work and you are paying \$1.00 for it, which means the team is under budget.

**Question 24**

Which of the following contract types carries the most cost risk for the project team?

1. **Cost reimbursable**
2. Firm fixed price
3. Time and materials
4. A fixed-price incentive fee

A cost-reimbursable contract may be needed if the scope of work needs to be flexible. However, that leads to more cost risks for the buyer since the absolute estimate cannot be created in planning.

#### Question 25

Which of the following best describes an organizational process asset?

1. **Standard templates**
2. Government regulation
3. Market conditions
4. Infrastructure

Templates that are standardized by your organization are considered an organizational process asset that can be used by employees in their projects.

## Assessment exam answers (Chapter 2)

#### Question 1

Which of the following is not an enterprise environmental factor?

1. Organizational culture, structure, and governance
2. Marketplace conditions
3. Government or industry standards/regulations
4. **Organizational knowledge bases**

Organizational knowledge bases are considered an organizational process asset.

#### Question 2

Kathy is a newer project manager and is attempting to determine which plans to create to manage her project effectively. She knows that she will need an integrated project management plan to understand how to manage the project. Which of the following would not be included in the project management plan and instead could be considered a project document?

1. Stakeholder engagement plan
2. **Issue log**
3. Life cycle approach
4. Project charter

The issue log is a project document that is updated regularly. Issues are prevalent in projects and therefore wouldn't benefit from formal change control.

#### Question 3

Which of the following could be considered a commonly used tool and technique grouped by intent?

1. **Decision-making**
2. Project document updates
3. Performance measurement baseline
4. Risk register

Decision-making is a tool/technique that places itself as a header for a variety of techniques to make decisions in a project. When you see the ITTOs for the processes that use decision-making, you will see several examples of ways to make good decisions.

#### Question 4

Amin has just been hired as a project manager and will be in charge of an extensive project. Which of the following is something Amin will need to understand first before progressing to planning the project?

1. What plans he will need to create
2. Who his team is
3. What stakeholders are involved
4. **The enterprise environment and organizational processes**

That is a tricky question. Expect to see numerous questions that may have multiple answers that look correct. The key phrase to consider is "just been hired." Until Amin understands the EEFs and OPAs, he may not know what plans to create or whether there are templates or rules for such documents. He may not have acquired his team yet or identified the stakeholders involved. How he will do all of those comes from an understanding of the processes and the environment of his organization.

#### Question 5

Numerous processes interact and repeat throughout the life cycle of the project. Which of the following would be used once or at predefined points?

1. Acquire resources.
2. **Project charter.**

3. Conduct procurements.
4. Define activities.

The project charter is done once at the beginning of a project. The other answers could be considered iterative or done more than once.

#### Question 6

Karem is determining what plans may be necessary for managing risk in his project. Based on the following, which document or plan would be best for Karem to include in his integrated project management plan?

1. Risk register
2. Risk report
3. **Risk management plan**
4. Risk audit instructions

All these risk documents are important for the project; however, the management plans are the "how-to" guides in this case for the risk management plan. The other risk documents are updated regularly. The risk audit instructions would be in the management plan as necessary information.

#### Question 7

Antonio is a team member on a large project and is trying to understand what documents he is responsible for contributing to. As the project progresses, he determines that the stakeholder engagement plan needs to be updated. What process, if any, will Antonio need to go through to update the plan?

1. Go to the project manager and get approval to update.
2. Go to the sponsor and get approval to update.
3. Go to the stakeholders and get approval to update.
4. **Go to the change control board to get approval to update.**

Again, this is tricky because based on your own experiences, you may have to go to the PM, sponsor, or other stakeholders. In this case, the best answer is the change control board. It's also a reasonable assumption to make on your exam.

### Question 8

As a project manager, Laura knows that she will need an integrated project management plan to keep everything organized. She knows that not every single component of the plan is created in a separate process, and that those she does create will be part of the develop project management plan process. Which documents would be considered part of that process?

1. **Performance measurement baseline**
2. Bid documents
3. Resource calendars
4. Cost forecasts

The performance measurement baseline is created based on the integrated project management plan and its components, rather than a separate process altogether.

### Question 9

Which of the following could be considered the best knowledge area to determine whether the product is working correctly?

1. Scope
2. **Quality**
3. Communication
4. Risk

Quality management is making sure the product/service/result is fit for use, meaning it is working correctly. While the scope of work may be involved, it is quality that determines whether the product is working correctly.

### Question 10

Ted wants to refer to *The PMBOK® Guide - 6th edition* to determine the best practices for communications management. In what chapter in *The PMBOK® Guide - 6th edition* could he find that information?

1. Chapter 9
2. Chapter 11
3. Chapter 5
4. **Chapter 10**

Chapter 10 is where the knowledge area of communication can be found.

### Question 11

Which of the following is not considered a knowledge area?

1. Scope management
2. **Manage quality**
3. Schedule management
4. Procurement management

Manage quality is a process involved in checking the process to make sure it is working (quality assurance) rather than a knowledge area in total.

### Question 12

How many processes are recommended by PMI® to run a comprehensive project?

1. 48
2. 47
3. **49**
4. 50

There are 49 processes that can be found across 10 knowledge areas and five processes. You are not expected to use every process in your projects, but you are expected to know and understand all 49 to pass your exam.

### Question 13

Which of the following best describes ITTOs?

1. **A specific group of information needed to plan, execute project work, and produce a result**
2. A group of suggestions for use throughout the project
3. A list of items to consider during the project
4. 1,452 items to be aware of in case they are necessary for the project

There will be some answers in your exam that may all sound good, or none will sound like the correct answer. It's essential to read carefully and choose the best response from the four. You may have gone back and forth with a couple. In this case, the closest to correct would be the first answer, because the inputs, tools/techniques, and outputs are necessary to plan effectively, execute, and produce deliverables.

### Question 14

As a project manager, you are reviewing the current availability of internal resources to determine whether you'll need to look outside the organization for the resources you may need. The review of the internal resources could best be described as what?

1. Organizational process assets
2. **Internal enterprise environmental factors**
3. External enterprise environmental factors
4. Resource management

Internal resources and their availability are part of the internal environment of your organization.

### Question 15

What is the difference between management plans and project documents?

1. Plans are updated weekly, while documents must go through change control for updates.
2. Plans are not integrated, while documents are.
3. **Documents are updated weekly, while plans must go through change control for updates.**
4. Both management plans and documents can be updated as needed by the project manager.

This concept comes back to change control, and the necessity to make sure that you are staying up to date on the day-to-day updates and processing changes being made to the management plans or baselines. This is usually done through formal change control procedures.

## Assessment exam answers (Chapter 3)

### Question 1

What is the definition of a project?

1. **A temporary endeavor that produces a unique product service or result**
2. A temporary endeavor managed in a coordinated fashion
3. A temporary endeavor managed by a project manager
4. A unique endeavor managed by a project manager

That is the definition of a project according to *The PMBOK® Guide – 6th Edition*.  
Temporary and unique.

#### Question 2

What is the definition of a program?

1. A group of unrelated projects
2. Temporary and unique
3. A type of organizational structure
4. **A group of projects managed in a coordinated fashion**

Programs are a group of projects managed in a coordinated fashion. You are setting up servers at 10 locations. You use the same vendors, the same skills, and the same positions on the team; you have a plan that can be followed across multiple client sites.

#### Question 3

Which of the following represents a portfolio?

1. **A group of unrelated projects and programs**
2. A group of related projects and portfolios
3. A program and multiple projects
4. A group of unrelated projects managed by the PMO

Portfolios are defined as a group of unrelated projects and programs managed by a portfolio manager.

#### Question 4

Chris has just accepted a position at the ABC manufacturing company. Her position requires that she support the functional manager in project work as a coordinator, as needed, and to keep the dashboards up to date daily. What type of organization dynamic is she working in?

1. **Weak matrix**
2. Project-based
3. Strong matrix
4. Hybrid

A weak matrix can only support part-time help to support the functional manager on necessary projects. Because she needs to update the dashboards and maybe help as a coordinator, the only answer is a weak matrix. There isn't enough information for a hybrid to be considered.

### Question 5

Connie has been promoted and now carries the title of project manager. She is excited to get started with project work and has been introduced to her team. She knows that, from time to time, she will have to supplement her team with outside resources via procurement, as well as internal experts from a variety of different functional departments. What organizational dynamic does Connie's organization best represent?

1. Weak matrix
2. **Strong matrix**
3. Functional
4. Balanced matrix

A strong matrix is the best dynamic compared to the other choices. She also carries the title of project manager, which tells you that it can't be functional or weak, and that even the balanced matrix is not guaranteed to have a full-time PM. She also has a core team and the ability to borrow functional resources. The only answer is a strong matrix.

### Question 6

A strong matrix is a good organization dynamic for project managers because of what reason?

1. The project manager reports to the functional manager.
2. The project manager is not in charge of the project and the team.
3. The project manager is in charge of the project and the team.
4. **The project manager shares resources with functional departments but is still in charge of the project.**

A strong matrix organization allows the project to have a core team, but also allows for additional resources to be borrowed as needed to effectively execute project work, all while the PM remains in charge of the project.

### Question 7

Ryan is working in a large organization and has been asked to create a supportive PMO to help manage the number of projects the growing organization has. His job role has been explained as offering help to project managers, providing templates, and helping projects with additional resources as needed. What type of PMO has Ryan been asked to create?

1. Controlling PMO
2. Directive PMO
3. **Supportive PMO**
4. Composite PMO

A supportive PMO is there to help guide the project manager and the project by offering templates, resource support, and the like but doesn't have any control over the project itself.

#### Question 8

In a balanced matrix, which of the following situations could be considered true?

1. Project work is valued over operational work.
2. **There is an equal amount of focus on project and functional/operational work.**
3. There is more focus on functional work.
4. The project manager and the PMO have equal power.

The words *equal amount* are a good way to identify a balanced matrix. It is often vaguely described in the exam, so make sure you read the question carefully!

#### Question 9

All the following describe the soft skills that are important to project management except for which one?

1. Leadership
2. Team building
3. **Scope management**
4. Communication

Scope management skills are super important for project managers but are not considered leadership or soft skills. Scope management is considered a technical skill.

#### Question 10

All the following are generally true for project managers who exhibit leadership skills except for which one?

1. They can get people to do things for the good of the project because they are in charge of the project.
2. Leadership allows the focus to be put on the efforts of a group of people trying to reach the goal of the project.
3. The project manager may garner respect and trust from the team through good leadership.
4. **Leadership is very important throughout all project phases but is most important while planning a project.**

Leadership skills are utilized throughout the project, not just in planning. In fact, the team may need supplemental resources that are acquired in execution and that are monitored and controlled throughout, as well as part of the closing process.

#### Question 11

Kareem is a project manager who is working on a large IT implementation project. He knows he will need a lot of different resources and will need to carefully collect the correct requirements to end the project successfully. Which of the following is least likely to be part of Kareem's role as a project manager?

1. **Ensuring that operations are functioning effectively in order to begin acquiring resources**
2. Participating in the project selection analysis, by offering expert judgment
3. Analysis of project-related activities prior to the project being formally chartered
4. Assisting in business case development and having discussions with the portfolio manager about their concerns regarding the initiative

The keyword that provides the answer is operations. Project managers will not be part of ensuring that operations are functioning properly. They are concerned with temporary and unique endeavors rather than the day-to-day operations of the organization.

#### Question 12

You are a new project manager who has just started discussing project selection and working with your PMO to help solidify the project's expectations and high-level scope of work. The head of the PMO, William, discusses the concept of governance and how important it is for correctly executing the project work and the inevitable result. Which of the following best describes what is not part of project governance?

1. Policies
2. **Stakeholders**
3. Rules
4. Technique

Governance describes how the project will run, as well as the rules, techniques, and policies that will govern the project work. On the other hand, relationship building is an integral part of project management. It falls more squarely on stakeholder engagement and communication, as well as team development.

### Question 13

Which of the following is probably not part of a project manager's day-to-day work?

1. Working with the project team
2. Discussing the project with the sponsor
3. Working to collect requirements from the customer
4. **Discussing project governance and improvements that could be made**

Governance is typically not something the project manager can change. They can offer improvements but are rarely the catalyst for process and procedure changes. Your focus should be on the other choices.

### Question 14

The selection committee has many potential projects to analyze. Which of the following would be a reason the selection committee might not approve a potential project based on *The PMBOK® Guide – 6th Edition*'s list of categories of project types?

1. Advances in technology
2. **Operational improvements**
3. Legal or regulatory compliance
4. Environmental considerations

Improving your organization's operations may very well be a reason to charter a project, but operational improvements are not part of the categories of projects and why they would be undertaken. The closest category that describes this is a business need or opportunity. Ugh... I know, I totally get it!

### Question 15

Your organization has been working within the constructs of a functional dynamic for years and would like to put equal emphasis on project and functional work. The CEO has put together an initiative to get the organization up to speed within a year. They are asking for functional managers to work with a member of each team who can be promoted to a project management position, so that they can act as a mixed authority of functional manager and project manager. They haven't determined that a full-time project manager is necessary, but they want to make sure they have trained resources in the field of project management. Which of the following structures are they trying to create?

1. Weak matrix
2. **Balanced matrix**

3. Strong matrix
4. Hybrid organization

In a balanced matrix, there is a shared focus on both project and functional work. While the PM may not be in a full-time role, there is a need to have PMs on hand for projects that need more governance in project management than in the functional departments.

#### Question 16

The selection committee is trying to determine what project to charter and has several options to choose from. Which project is not the best for the committee to choose based on the information provided?

1. Project A has a payback period of 1 year.
2. Project B has a payback period of 2 years and a net present value of \$350,000.
3. **Project C has a benefit-cost ratio of 0.6.**
4. Project D has a payback period of 1 year and a net present value of \$350,000.

A benefit-cost ratio weighs the benefits compared to the costs. A BCR under 1.0 means the cost is more than the benefit and isn't the best choice compared to the other options.

#### Question 17

The project selection committee is working with a business analyst who is predicting that the projects the organization is considering have different financial implications. Project A has a net present value of \$250,000 and a payback period of 3 years. Project B has a net present value of \$550,000 and an internal rate of return of 1.3. Project C has a payback period of 1 year and a net present value of \$35,000. Finally, Project D has a net present value of -\$25,000. Based on this information, which of the following would not be a consideration for the selection committee?

1. Project A
2. Project B
3. Project C
4. **Project D**

It is the only project with a negative net present value. All the rest are positive and could be considered viable projects.

### Question 18

Which of the following project selection methods is the most influential?

1. Payback period
2. Organizational process assets
3. **Net present value**
4. What the PMO chooses to analyze the projects

The net present value takes the payback period into consideration already. The payback period is the least influential and the others are not considered project selection methods.

### Question 19

During project selection, the business analysts use integer programming. Which of the following categories of project selection techniques is this part of?

1. Expert judgment
2. Economic models
3. Scoring models
4. **Constrained optimization**

Any project selection technique with programming will be a constrained optimization technique that uses computers and software to perform financial analysis for project selection.

### Question 20

During project selection, the selection committee decides to take on a project with a negative **net present value (NPV)**. Which of the following is the reason why an organization would make this decision?

1. **The organization needs to change a process or product for regulatory compliance.**
2. The organization knows the lower the NPV the better.
3. The organization is only concerned with the payback period.
4. The organization needs to produce a new product or service.

A negative NPV offers no ROI financially to an organization and is often looked upon as a financially risky project to undertake. However, if an organization isn't compliant, they will need to pay to gain compliance, often at a financial loss. The ROI is being compliant and staying in business.

## Assessment exam answers (Chapter 4)

### Question 1

You have just started as a project manager in a new company and have been assigned a large project via a project charter. You will need to make the best determinations regarding what to plan and implement to achieve the most appropriate result. Since it is the beginning of the project, which of the following would be the best for you to determine?

1. **Observe the organizational landscapes in order to collect information about the project.**
2. Identify stakeholders.
3. Contribute to the selection of key requirements.
4. Discuss the charter with your sponsor.

While all these options may be considered in the initiation of a project, the question is related to you understanding the organization and how the organization works to determine the next steps.

### Question 2

Carmen has been officially assigned as the project manager for a large software development project. What kind of power does Carmen now hold?

1. Expert
2. Situational
3. Informational
4. **Positional**

The question is specifically asking about the power being formally assigned as the project manager to the project. This power is considered a positional or formal power to the project.

### Question 3

You have been a project manager for 10 years and have worked with your current team for five of those years. You know your team performs at a high level and your role is as a facilitator and coach when and if needed, rather than as a manager delegating goals to the team. Which leadership style is most appropriate for your team?

1. Transactional
2. Charismatic
3. **Laissez-faire**
4. Interactional

Because your team is high-performing and has worked with you for years, your role is more of a coach or facilitator in terms of your interactions with your team. This is referred to as a laissez-faire approach.

The transactional approach has a major focus on the project goals, providing feedback, and determining rewards based on milestones met. PMI® refers to this as *management by exception*.

Charismatic is the ability to inspire, as well as being high-energy and extroverted, self-confident, and having strong convictions.

Interactional is a combination of transactional, transformational, and charismatic.

#### Question 4

At the beginning of your current project, you know that in order to fully integrate the project plan and determine what success looks like, you will need to understand integration at a variety of different levels. Which of the following is not a consideration for integration to understand strategic objectives for your project?

1. Process level
2. Context level
3. **Project level**
4. Cognitive level

The project level is not considered part of the different levels to consider for full project integration. The rest of the answers are the considerations for project integration.

#### Question 5

During your long career as a project manager, you have determined that there isn't a one-size-fits-all way to manage your projects. The current project charter is broken out with high-level information and not much is known about the true scope of work. You have determined that you will need to update the method you use to manage your project from predictive to adaptive. Which of the following best describes an adaptive project?

1. **Predictive projects know the full scope of work in advance, while adaptive projects do not.**
2. Adaptive projects typically correlate with a descriptive charter, while a predictive charter provides a simple overview.
3. Predictive projects don't really know the scope of work in the beginning, and the expectation is that the scope of work will change throughout the project.
4. Adaptive projects are only for software development.

Predictive projects are very clear on the scope of work from the very beginning. Even though you will need to process changes and adapt the scope as needed, the final result will be what was expected. In adaptive or Agile approaches, the scope of work is an emergent design and is based on a simple overview at the beginning of a project.

#### Question 6

What is the main goal or objective of the project charter from the project manager's perspective?

1. To explain the scope of work to stakeholders
2. To define the business case
3. **To formally authorize the project manager to begin project work**
4. To be signed by the sponsor

This may have been a tricky question since all these aspects are important to the project manager. However, the specifically mentioned authority or positional power is needed for the project manager to act on the other information.

#### Question 7

Which of the following represents a PMIS?

1. The project charter
2. The stakeholders involved in the project
3. The project management system or framework
4. **The software and hardware used to manage communications, reporting, and performance**

The project management information system or PMIS is what is used to manage communications, reporting, and performance. The software and hardware used to manage those items are a PMIS.

#### Question 8

Which of the following would be considered an assumption in the project charter?

1. Who the project manager will be
2. Who the sponsor is
3. Who the customer is
4. **The business case**

This is one of those questions where every single answer may appear to be correct, and you may be thinking that the business case is based on hard numbers and project selection techniques. But, in the project charter, it will have the name of key stakeholders, who the project manager is, and who the sponsor is since they are typically the ones that draft the charter and/or sign it off. The only question mark is whether the business case is actually accurate based on the high-level scope of work. Until proven otherwise, with your cost baseline created based on the true scope of work, the business case stands as an assumed ROI.

#### Question 9

An agile charter differs from a project charter for which of the following reasons?

1. Offers less flexibility for the scope of work
2. **Offers more flexibility for the scope of work**
3. Offers more information about the software design
4. Doesn't document how the project will be run

Agile project charters tend to begin with high-level information of who, what, where, when, and why. Since the scope of work is variable, it will be difficult to truly document the expected outcome. Therefore, the agile charter is kept vague on purpose. The charter may be updated numerous times as the design or the scope emerges. Until then, it is a high-level overview only.

#### Question 10

You are a project manager who has been formally assigned, via the project charter, to a large international project. One of your key stakeholders is new to project management and asks you why a charter is even necessary before project work can begin. They were ready to start work on the project and are not happy about how long it's taking to get started. How do you best explain the value and necessity of a project charter and why you can't begin project work without it?

1. **"The project charter shows a direct link between the project manager and the objectives of the organization. This gives us a formal record of the commitment to the project objectives."**
2. "There are many elements of a project charter to consider and even though there may only be high-level information right now, getting all of that information in one place is important."
3. "Project charters, like projects, come in all shapes and sizes. There are some standardized headers that can be used as templates."
4. "It's part of our organizational process assets to begin each project with a charter."

In this case, the best answer is: "The project charter shows a direct link between the project manager and the objectives of the organization. This gives us a formal record of the commitment to the project objectives." While other answers may be part of your organization dialog, the correct description from *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – 6th Edition, Project Management Institute, Inc., 2017*, is the best answer.

### Question 11

All the following are tools and techniques of the identify stakeholders process except for which one?

1. Data gathering
2. Data analysis
3. Data representation
4. **Data processing**

Data processing is not a tool or technique that's used to identify stakeholders.

### Question 12

John is in the process of using a classification model to determine the categories that each identified stakeholder falls into. This will help John create an engagement strategy during the planning process group. John determines that he will classify those stakeholders using the categories of urgency, level of authority or power, and legitimacy or proximity to the team. Which of the following data representation models is John using?

1. Power/interest grid
2. Stakeholder cube
3. **Salience model**
4. Directions of influence

The salience model is the only option that categorizes stakeholders by urgency, power, and legitimacy. The power/interest grid analyzes the levels of stakeholder power to make decisions and influence the project, as well as their level of interest in day-to-day updates. The stakeholder cube takes that information and builds a 3D model for review. The directions of influence have to do with the ability to communicate up, down, and sideways as needed.

### Question 13

Which of the following tools or techniques results in a list of stakeholders and any additional information that can help engage those stakeholders throughout the project?

1. **Data analysis in the form of stakeholder analysis**
2. Expert judgment in the form of stakeholder analysis
3. Data representation in the form of stakeholder analysis
4. Data gathering in the form of stakeholder analysis

Data analysis includes a review of key stakeholders and information to help you determine how to engage them:

- **Data analysis:**
  - a) Stakeholder analysis
  - b) Document analysis
- **Data gathering:**
  - a) Questionnaires and surveys
  - b) Brainstorming or brainwriting
- **Data representation:**
  - a) Power/interest
  - b) Stakeholder cube
  - c) Salience model
  - d) Directions of influence
  - e) Prioritization

### Question 14

Which of the following are not outputs that are included in the initiation process group?

1. Project charter
2. **Identify stakeholders**
3. Stakeholder register
4. Change requests

Identify stakeholders is the correct process. The rest are considered outputs of developing the project charter and identifying stakeholders.

### Question 15

You are creating the stakeholder register during the initiation of your current project. You will need to include all the following information except for what?

1. Stakeholder classification
2. **Project risk categories**
3. Identification information
4. Assessment information

Stakeholder registers don't list categories of risk. Those are found in the initial project charter and identified iteratively throughout the project.

## Assessment exam answers (Chapter 5)

### Question 1

You and your team are meeting to discuss the customer's feedback on the deliverable you created in this iteration. What part of the Agile life cycle are you experiencing?

1. **Review**
2. Retrospective
3. Sprint planning
4. Daily standup meeting

The review is an informal meeting with the customer and other stakeholders to review the work that's been done in the Sprint/iteration. The customer will demo, test, ask questions, and add new items that they find valuable.

### Question 2

One of the team members is describing the work they did yesterday and their plans for today. What is the best time to discuss those areas of project work?

1. Review
2. Sprint planning
3. **Daily standup meeting**
4. Retrospective

The daily standup meeting allows the development team to discuss work in progress, work to be done, and any impediments to their progress. Typically, those meetings are 15 minutes long and informational only.

### Question 3

Kamilla is your project sponsor and is introducing you to Bob, the customer whose software you will be developing. Bob wants to know what to expect from the life cycle. You mention that you and your team practice Agile and use the Scrum framework. Bob looks confused and says, "Agile? Does that mean you aren't doing any planning at all?" How do you respond to your customer?

1. "Right, we don't do a lot of planning in Agile because we know things will change."
2. "We plan, but not the first iteration."
3. "**We plan at the last responsible moment, so we don't have to change plans whenever a new idea or deliverable is suggested.**"
4. "Correct, Agile teams don't plan at all; they go with the flow."

Agile teams plan, but they wait until they have enough information to understand the prioritization and what the result will be per iteration. Front-loaded substantial planning is not done, however.

### Question 4

Which of the following best describes Scrum?

1. A process
2. An Agile method
3. A waterfall method
4. **A framework**

Scrum was designed to be a lightweight framework that is easy to learn and has specific rules or life cycle components.

### Question 5

During your 15-minute stand-up meeting, two of your team members start discussing a solution to one of the issues that they ran into the day before. As the Scrum Master or Agile project manager, what should you do?

1. Extend the meeting and encourage your team to find a solution before going back to work.
2. **Make sure you help them resolve the issues after the meeting, not during the meeting.**
3. Invite other experts to the meeting to help create a solution.
4. Do nothing – a Scrum Master only listens during the stand-up meeting.

Daily standup meetings are for informational purposes only, and the development team is the only one to discuss what they have done, what they are doing, and what impediments are in their way. Any others attending the Scrum are silent observers. Other stakeholders can attend but don't participate in the discussion. No solutions are generated during the meeting, only information.

### Question 6

You are the Product Owner in your organization, and you have just started working with a new Agile team. One of the team members wants to know what your job entails. What do you tell them?

1. "My entire job function is to make sure the team has daily stand-up meetings and continues to embrace Agile."
2. "My job is to coach all of the managers on the different aspects of Agile project management."
3. "**My job is to own the product backlog and make sure that customer value is realized, no matter what.**"
4. "My job is to debate requirements only with key stakeholders to make sure we are building the product correctly."

The product owner's primary responsibility is to own the product backlog and communicate and redistribute the value as needed.

### Question 7

As an Agile project manager, you want your team to be which of the following?

1. **Self-organizing and self-managed**
2. Dependent on your project plans
3. Dependent on the product backlog
4. Self-organizing and servant leaders

Regardless of the specific framework, all Agile teams should be self-organized and self-managed.

### Question 8

You are an Agile project manager, and you are explaining to your new team why retrospectives are so valuable to the team and the organization. What will the team begin to understand about retrospectives once you have explained it to them?

1. **Retrospectives are a specific planned review and reflection point.**
2. Retrospectives are a primary function of all Agile methodologies.

3. Retrospectives are when the customer comes to our location and tests the increment.
4. Retrospectives are for helping the product owner to create the backlog.

Retrospectives allow the team to review what went well and what the challenges were during the Sprint. This reflection point allows for discussions to be had regarding continuous improvement for the next Sprint.

#### Question 9

As an Agile project manager, you explain to your team that, as their coach, you are there to provide for the team's needs and remove any roadblocks to their progress. This is also described as which of the following?

1. Project management
2. Agile leadership
3. Management and leadership
4. **Servant leadership**

Agile project managers are servants first to their team and practice leadership more so than management. Their job is to coach and support their team.

#### Question 10

Your customer is asking you to describe what you mean by self-organizing and self-managing teams. How would you describe them?

1. Your team is colocated, which helps with self-organization and self-management.
2. Your team is a group of experts who really don't need a manager.
3. Your team can make all project-related decisions.
4. **Your team can make decisions about how to produce the result of each iteration based on having shared knowledge of the work.**

The team is self-directed and self-managed so that they can make decisions about how they will go about creating the result. They communicate regularly to share knowledge.

#### Question 11

The basics of a standup meeting is to achieve which of the following?

1. Describe accomplishments for motivation.
2. Coordinate discussions on problems and work on solutions.
3. Identify opportunities for improvement.
4. **Identify issues and describe what has been accomplished since the last meeting.**

Three questions in each daily Scrum or stand-up meeting are, what did we do yesterday? What we will do today? What impediments are in our way?

#### Question 12

Who is responsible for the product backlog?

1. The Scrum Master
2. **The product owner**
3. Everyone
4. The sponsor

The product owner is fully responsible for the product backlog, but it is still transparent and open to the entire team. The team helps determine what items of value will be delivered during the next iteration/Sprint.

#### Question 13

Your team is looking forward to practicing the framework for Scrum and Agile. When asked how long the standup meetings will be, what will you say?

1. Standup meetings are done weekly for 1 hour.
2. Standup meetings are for waterfall projects.
3. **Standup meetings will require 15 minutes every day.**
4. Standup meetings will require 15 minutes every week.

The daily Scrum or stand-up meeting is time-boxed for 15 minutes every day. This keeps it short and to the point while updating the entire development team on what is occurring during the iteration/sprint.

#### Question 14

Colin has just joined your organization and is going to be part of your team. He has some familiarity with Scrum but is confused about the backlog and where it came from. How do you explain to Colin what a backlog is?

1. "It's an itemized list of things that the development team wants to accomplish on the Sprint."
2. "**It's all the requirements for features and functions prioritized by what is most valuable to do next.**"

3. "It's the list of value to be created, as well as the risk information for the project."
4. "It's the development team's "punch list," and it includes the theme of the Sprint."

The backlog represents the prioritized items the development team will work on during the project.

#### Question 15

Daily standup meetings or daily Scrums are designed to work through three questions: what did we work on yesterday? What will we work on today? Which of the following is the third question?

1. **What impediments are in our way?**
2. What solutions have we created?
3. What risk events have occurred?
4. What backlog items need to be accomplished?

The daily standup meetings or daily Scrums are designed to provide up-to-date information to the development team about work that's been completed or is in progress, as well as anything that is preventing them from being successful right now.

## Assessment exam answers (Chapter 6)

#### Question 1

Bill and Vanessa have a difference of opinion about how the schedule should be managed, and their squabble is making the team uncomfortable. You call a meeting with the entire team and begin to discuss the scheduling issues before asking the team to discuss a variety of solutions, analyze them, and decide on a course of action. What conflict resolution style was used here?

1. Negotiating
2. Compromise
3. Smoothing
4. **Collaborate**

The team is working through solutions for the problem, meaning they are solution-oriented and collaborating to work through the conflict.

### Question 2

Karen is a senior team member and has always completed her work on time. This week, her coworker, Frank, has managed to put Karen behind schedule because he missed a crucial step in the project and now needs to rework it. Karen comes to you and is frustrated because she is never behind schedule. As the project manager, you tell her that you understand, but that it isn't that big of a deal in the grand scheme of things and that you appreciate her diligence and hard work. What conflict management style did you use?

1. Compromise
2. **Smooth**
3. Force
4. Collaborate

Karen is still going to be behind schedule but you smoothed the situation by focusing on the good side of her work ethic, and then reassured her that you wouldn't think poorly of her based on someone else's mistake.

### Question 3

You are having a bad day. The situation with your customer has become tenuous due to the many scope changes and rework your team has had to do. You know the customer is always right, but you just don't have it in you to deal with them today, so you do not return their calls or emails and plan to deal with it tomorrow. What conflict resolution style are you using?

1. **Avoid**
2. Compromise
3. Smooth
4. Negotiate

You are avoiding interaction with your customer. This is considered a lose/lose strategy.

### Question 4

Your organization has just landed a large client in Asia and is assigning you and your team to manage the project. Your team has never worked on an international project before, so you call a meeting to discuss the culture, how communication can be most effective, and to answer any questions the team has about the country they will be working with. Which of the following standards in the Code of Ethics and Professional Conduct does this represent?

1. Honesty, mandatory
2. **Respect, aspirational**

3. Responsibility, mandatory
4. Fairness, aspirational

According to the Code of Ethics and Professional Conduct, this is a respect situation since the team is learning about a different culture. It is aspirational since it would be impossible to learn everything about another culture, especially in one meeting.

#### Question 5

You have been put in charge of hiring contractors to supplement your team. During one interview, you are very impressed by the qualifications of the potential hire, especially when they say they are PMP® certified. After the interview, you look them up on the PMI® website to make sure their PMP® number is on record, but you can't find them anywhere. You suspect that they may have lied during the interview. What do you do?

1. Report them to management.
2. Don't hire them.
3. **Report them to PMI®.**
4. Overlook it for now.

If anyone lies about their certification status, it needs to be reported to PMI® and they will deal with the individual. It's our responsibility to report them.

#### Question 6

You have just joined a new company as a junior project manager and due to the lack of project managers, your PMO has asked that you manage a large megaproject. This project will span years and millions of dollars. You have only ever managed small IT projects and know that you are not qualified to take on this project. What do you do?

1. **You explain to the PMO that you do not have the experience to manage such a large project and may not be the best resource.**
2. You explain to the PMO that you know you can do it but will need some guidance.
3. You explain to the PMO that it's a conflict of interest since you lack experience.
4. You explain to the PMO that you will need a team of experts to help you manage the project.

The Code of Ethics and Professional Conduct states that we be honest about our limitations and turn down work we know we are not qualified for. It is up to them to determine what your role would or would not be with new information.

### Question 7

Your company has recently hired an older gentleman to work as a contractor on your project. Many of the team members are in their early 30s and the new resource is 63. Your team has expressed concerns that their work habits don't match up with the way they do things and want you to replace them. What should you do in this situation?

1. Replace them.
2. **Explain to the team that would be age discrimination and you will not do that.**
3. Explain to the team that different work styles can benefit the project.
4. Explain to the team that you don't have any choice in the matter.

The Code of Ethics and Professional Conduct states this in the fairness category. It's a mandatory standard to not discriminate against others based on, but not limited to, gender, race, age, religion, disability, nationality, or sexual orientation.

### Question 8

You have been assigned to a large project and will need multiple contractors from external staffing agencies to supplement your team. One of your best friends recently lost their job and has asked that you bring them on, even though they don't have the skills necessary for the project work. What do you do?

1. Hire them and train them.
2. Explain that you can hire them but not to tell anyone they lack experience.
3. **Explain to them that even though you are friends, it would be a conflict of interest to bring them on, especially since they don't have the experience you need.**
4. Explain to them that hiring them would go against the organizational culture of using outside contractors from staffing agencies.

This would be a conflict of interest because your friend doesn't have the qualifications necessary.

### Question 9

Which of the following does not represent an aspect of servant leadership?

1. Listening
2. Transparent communication
3. Facilitation
4. **Management**

Management and leadership are different. All the other answers represent leadership characteristics.

#### Question 10

Which of the following is the top of Maslow's hierarchy of needs?

1. Safety
2. Esteem
3. Physiological
4. **Self-actualization**

The top of Maslow's hierarchy is self-actualization. The others are part of the hierarchy but are at lower levels.

#### Question 11

You are overseeing a junior project manager and helping to mentor and train them to be promoted. They are very hardworking and diligent and are constantly asking for feedback and the next steps. What kind of need is most prevalent in this employee?

1. Institutional
2. Personal
3. Affiliation
4. **Achievement**

This team member has achievement needs due to their need for feedback and training, rather than trying to get promoted or being a part of a team dynamic.

#### Question 12

Which of the following motivational theories is most focused on working at increasing employee loyalty to the company by providing a job for life?

1. Theory X
2. Theory Y
3. **Theory Z**
4. Theory of hygiene

Dr. William Ouchi's Theory Z encompasses the Japanese management style movement of the 1980s. Theory Z focuses on working at increasing employee loyalty to the company by providing a job for life. The main focus is on the wellbeing of the employee, both on and off the job.

### Question 13

You have just been named in the project charter as the project manager for a large project. What form of power have you just attained?

1. Situational power
2. Referent power
3. **Positional power**
4. Expert power

Positional power is sometimes also called formal, authoritative, or legitimate. It's given by the organization.

### Question 14

You are analyzing your stakeholders in order to determine their level of need for communication and engagement at this point in the project. You are categorizing them based on their power or level of authority on the project, the urgency for immediate attention and their legitimacy, and whether their involvement is appropriate. Which of the following stakeholder assessment methods is being used?

1. Power/interest grid
2. Stakeholder cube
3. **Salience model**
4. Directions of influence

All answers reflect an aspect of stakeholder analysis, but the salience model focuses on power, urgency, and legitimacy.

## Assessment exam answers (Chapter 7)

### Question 1

You are the project manager for a large installation project. Your key stakeholders are discussing what is needed to be accomplished to set up their new data center, and they have some specific ideas about what they want. What is the best document to keep all their requirements organized and identify deliverables that affect other deliverables in order to effectively manage changes during execution?

1. Requirements list
2. WBS

**3. Requirements traceability matrix****4. Scope statement**

The requirements traceability matrix is a grid that connects product requirements from their origins to the deliverables they will become.

**Question 2**

Which of the following is the best description of a WBS?

- 1. Hierarchical decomposition of 100% scope of work**
2. Org chart for scope of work
3. What will and will not be included in the scope of work
4. An outline

That is the best definition of the WBS based on the answers provided.

**Question 3**

Juaquin is your sponsor, and he has come to you and asked for an overview of the deliverables you and your team have decomposed. He wants to make sure the customer fully understands the scope of work, and they are not well-versed in how a WBS works. What is the best document the customer can review to gain a better understanding of the requirements?

- 1. Scope statement**
2. WBS dictionary
3. WBS
4. Requirements traceability matrix

The scope statement defines what will and will not be included in the scope of work. The WBS dictionary also defines the work but as it is presented in the WBS, and it may contain other information outside the scope of work. The traceability matrix connects deliverables to the requirements. While all these answers are informative, the scope statement is the best choice.

**Question 4**

Which of the following is not part of the scope baseline?

1. Scope statement
2. WBS
- 3. Project charter**
4. WBS dictionary

The project charter is an output of the knowledge area of Integration. It is the formal authority to begin project work with high-level information on what success looks like.

#### Question 5

You and your team are doing some brainstorming and breaking down large deliverables into more manageable planning packages. What technique are you using to do that?

1. Scope planning
2. Requirement planning
3. **Decomposition**
4. WBS creation

Decomposition is the tool/technique for breaking large deliverables down to the work package level.

#### Question 6

You are working with your team to decompose the scope of work and your coordinator, Jim, suggests that you organize the WBS using a numbering system. What is this numbering system called?

1. The chart of accounts
2. Outline numbers
3. WBS dictionary
4. **The code of accounts**

The code of accounts is the formal numbering or outlining system used on the WBS.

#### Question 7

You have taken over in the middle of a large IT project after the previous project manager was pulled to work on something else. You are reviewing what they have accomplished so far and have determined that the requirements have been collected. What do you do next?

1. Double-check everything is properly documented.
2. Discuss with your team your plans to document scope of work.
3. **Create the scope statement.**
4. Explain to the team that you need to review the charter first before you can do anything.

As tempting as it is to choose to double-check the work, the correct answer is focused on the order of operations when planning for project scope. Remember that what you would do in the real world may not be the best answer.

#### Question 8

You are working on documentation for a project that involves installing data centers at multiple client sites with a very tight timeline. You have described the scope of work in a formal way but have also mentioned that your team would not be involved in testing the equipment. That would be left for operations. Which document would be best for this information?

1. WBS
2. Charter
3. WBS dictionary
4. **Scope statement**

The scope statement formally defines what the team will and will not do.

#### Question 9

All the following are the major differences between the scope statement and the WBS except for which one?

1. The scope statement describes what will and will not be done, while the WBS allows for a hierarchical version of the scope of work.
2. The scope statement describes what will and will not be done, while the WBS decomposes to a level you can estimate effectively.
3. The scope statement is very descriptive, while the WBS is more of an outline.
4. **The scope statement is very high level, while the WBS is very descriptive.**

The scope statement is very descriptive, while the WBS is higher level. That is why the WBS dictionary was created.

#### Question 10

What is the main goal or objective of the WBS from the project manager's perspective?

1. Helps create a schedule
2. Decomposes work to the activity level
3. Formally authorizes the project manager to begin project work
4. **Decomposes the scope of work to the work package level**

The WBS takes large deliverables and decomposes them to the work package level, not to the activity level, and is not part of schedule creation.

#### Question 11

Jamal is a key stakeholder on your current project and is also new to project management best practices. He has asked you to explain the difference between the project charter he signed and the scope statement he is about to sign, since they look similar to him. How would you answer Jamal's question?

1. The scope statement is just an updated project charter.
2. The project charter gives formal authorization to begin project work, while the scope statement breaks down scope of work for scheduling.
3. **The project charter gives formal authorization to begin project work, while the scope statement clearly describes what features will and will not be produced during the project.**
4. The project charter is just an overview to begin project work, while the scope statement is hierarchical.

The correct answer defines both documents and the way they are used in a project.

#### Question 12

You are working with your team to determine the structure of the WBS, and you have collected all the requirements and have a good understanding of the scope of work. Even though you know the scope could change, what is important to include in the WBS at this point?

1. High-level scope
2. Major deliverables and work packages
3. **100% scope of work as it is known today**
4. The business case

The WBS is progressively elaborated on, and we can only work with 100% of the scope of work as it is known at any point in the project.

#### Question 13

An agile charter differs from a project charter for which of the following reasons?

1. Offers less flexibility for the scope of work
2. Doesn't document how the project will be run

3. Offers more flexibility for the scope of work
4. Offers more information about software design

Since change is expected in an Agile project, the charter is formal and gives us the authorization to begin project work; however, it is much more high-level and may be updated repeatedly during the project at the beginning of each iteration.

#### Question 14

Which of the following could be considered a minimally marketable or viable increment on an Agile project?

1. A payroll system that is going to be used by the HR department
2. A corporate website with scrolling pages of content
3. **A cup holder on a beach chair**
4. A tracking website for your dogs

All the other answers are presenting finished products. The cup on the beach chair is just one result of a large project.

#### Question 15

Which of the following best describes what a WBS dictionary is?

1. A document that describes technical terms used for scope management
2. **A document that describes the details for each component in the WBS**
3. A document that translates essential WBS terms for global project teams
4. A document that helps translate functional requirements into technical requirements

The WBS dictionary is a companion document to the WBS and is used to clarify details of work packages and other components, as well as provide additional information, as needed.

#### Question 16

A project you have been working on has been canceled in the middle due to the customer going out of business. What must you do before you close out your project?

1. **Validate scope.**
2. Control scope.
3. Review using quality assurance.
4. Go through change control to reflect the project closure.

No matter how the project or phase closes, you must go through the validate scope process and gain acceptance on deliverables to date.

#### Question 17

Jimmy is one of your best team members, and you trust him to make the right decisions as he is working on the deliverables he was assigned to. You are collecting performance information in the form of work performance data and, after running variance analysis, you realize that Jimmy added something a bit extra to the cabling outside of the requirements. Which of the following answers is correct in this situation?

1. This is scope creep, but it isn't really affecting the results, so you leave it.
2. You ask Jimmy why he thought it was necessary and he explains in a way you understand, so you agree to leave it the way it is.
3. **This is scope creep, and a formal change needs to be made either to keep the change or remove the change.**
4. This is scope creep, but you don't have a formal change control system, so you ignore it. Jimmy knows what he is doing.

If scope creep occurs, you will need a formal change request to be processed to see how the change impacts the other constraints. Often, change requests are made after the fact due to scope creep and will need to be formally processed as a change request and the requisite updates made.

## Assessment exam answers (Chapter 8)

#### Question 1

Which of the following is the most common precedence relationship?

1. **Finish to start**
2. Start to start
3. Finish to finish
4. Start to finish

It is the most common because it gives the most pessimistic total duration of the activities and is what project management software uses by default.

### Question 2

You are working with your team and analyzing the current version of your precedence network diagram, as well as the durations that have been added to it. You are trying to figure out the critical path. Which of the following would be considered the near-critical path?

1. 20 days
2. **19 days**
3. 10 days
4. 5 days

The near-critical path is the second-longest in duration.

### Question 3

During the planning of a large install project, your essential resource lets you know that the first rollout will include tests of the system before the rest of the installs happen. He estimates that the automated tests will take about 5 hours to do, and that it isn't necessary for him to be there when the testing happens. Which of the following could the testing time be considered?

1. Lead time.
2. Total duration.
3. **Lag time.**
4. This isn't considered schedule time.

Lag time is the additional time that is necessary for the task but not necessary for a resource to be present.

### Question 4

Lisa is one of your primary go-to resources when estimating time because she tends to be right on schedule. You have asked her to estimate the time it will take for phase one of the project. Lisa lets you know that, based on other projects she has done that are similar, phase one should take about 2 months. What kind of estimate did Lisa give you?

1. **Analogous**
2. Parametric
3. Three-point
4. Reserve analysis

Analogous estimates are based on expert judgment and the history of similar activities.

### Question 5

Your customer tends to have an optimistic view of your schedule and doesn't consider risk if they don't see it happen. You are trying to convince the customer that you have some concerns about the total time an activity will take due to identified threat events, and your expert on the project has experienced the same on other projects. You have presented the customer with three different durations. What is the expected duration of the task using a three-point estimate?

Optimistic: 10 days

Pessimistic: 32 days

Most likely: 17 days

1. 17 days
2. 16.6 days
3. **18.3 days**
4. 32 days

You would use the PERT beta distribution formula of  $(O+4*ML+P)/6$  since your expert has done similar projects or activities in the past. If they had not, then you would use a triangular distribution of  $(O+ML+P)/3$ .

### Question 6

Which of the following schedule compression techniques involves performing tasks in parallel to speed up critical tasks?

1. **Fast tracking**
2. Crashing
3. Resource optimization
4. Monte Carlo technique

Fast tracking is performed by running activities in parallel instead of sequentially on the critical path to speed up the total duration. Crashing is adding money to the budget for additional resources.

### Question 7

Both Bill and Juan have come to you and pointed out that, on the schedule, they are over-allocated for several tasks and will not be able to meet their requests. They have asked if you could adjust the schedule. After reviewing the schedule, you have determined that Bill is working on critical tasks, and Juan is not. What adjustment would you have to make for Bill?

1. You would need to fast track.
2. You would need to crash.
3. **You would need to level.**
4. You would need to smooth.

Leveling your resources involves tasks on the critical path, but due to the overallocation, you would need to move the overallocated tasks Bill is working on out to the next available timeframe. This would result in extending the critical path.

### Question 8

You are reviewing your precedence network diagram and are attempting to determine float time for one activity after your assigned resource asked for a vacation day. You have determined that the early start of the activity is 30 and that the late start is 38. How much float time does the activity have?

1. **8.**
2. 10.
3. 5.
4. There is not enough information to answer this question.

To determine float, you subtract the early start from the late start, and the difference is how much float time there is on the activity. The formula is  $LS - ES$ . You can also use the finish, if stated in the question:  $LF - LS$ .

### Question 9

Your customer is working with you on your schedule creation, and they have made it very clear that they want this project completed by January 5th. By your calculations, it appears you will wrap up the project on January 15th. This is an example of which of the following?

1. Float
2. **Negative float**

3. Positive float
4. Total float

Negative float happens when a date constraint defies reason or the current schedule's duration. You will begin the project knowing you are already behind schedule, and may need to adjust your activities to meet the constraint.

#### Question 10

Based on the following network diagram, what is the critical path?

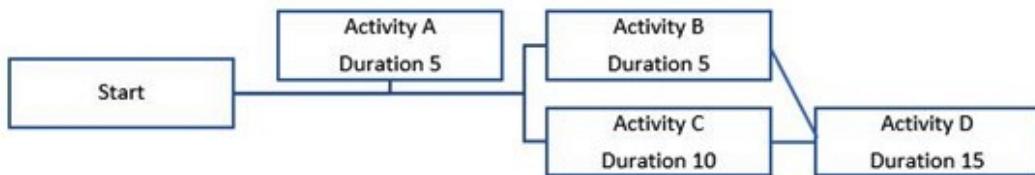


Figure 8.19 – Network diagram

1. ABD
2. **ACD**
3. ABCD
4. BD

The critical path is the longest total duration of connected activities in a network diagram. In this example, ACD = 30 and the non-critical path is ABD = 25.

#### Question 11

You are the project manager for a large development project and are discussing budgeting with your sponsor. The sponsor is asking for a definitive estimate from you to properly allocate funds for the project. Which of the following estimating techniques will give you a definitive estimate?

1. Analogous
2. Parametric
3. **Bottom-up**
4. Three-point

The most definitive estimate is based on a bottom-up estimate using the WBS and the current scope of work. Parametric is also more effective than analogous, but in this case, bottom-up is the best answer.

### Question 12

As a project manager, your responsibility is to put together a comprehensive budget that will be approved as a cost baseline. Therefore, you need to incorporate several considerations into the total number. All the following are included in your cost baselines except which one?

1. **Sunk costs**
2. Contingency reserves
3. Cost of quality
4. Scope of work

Sunk costs is money that has already been dumped or "sunk" into the project that typically will not be returned as a profit. Sunk costs are not a consideration when you wish to continue a troubled project.

### Question 13

You are the project manager for a large international project and are beginning to set up your schedule by determining sequence and durations. You know you will need to accommodate some of your overseas resources in the schedule. What is the best document to update and review to create the best possible schedule?

1. Project calendar
2. **Resource calendar**
3. Task calendar
4. Schedule calendar

While all calendars except the schedule calendar (a made-up term in this instance) are essential, the resource calendar is vital to keep track of your resources' holidays (especially internationally) and help create a realistic schedule based on human resources.

### Question 14

The near-critical path can best be described as what?

1. The longest path in duration.
2. **The second-longest path in duration.**
3. The third-longest path in duration.
4. There isn't a near-critical path.

The near-critical path is the second-longest path in the network diagram in duration and is typically managed as carefully as the critical path. If there is a risk or problem on the near-critical path, it could become the critical path when extended durations occur.

#### Question 15

Which of the following make up the cost baseline?

1. The budget and management reserves
2. The budget and risk reserves
3. The cost baseline and the contingency reserves
4. **The budget and the contingency reserves**

The budget and contingency reserves for risk make up the cost baseline and is ours to manage throughout the project. Management reserves, by management, and while it is considered part of the total amount the organization will or plans to spend, it isn't considered part of our baseline.

#### Question 16

You are the project manager for a large development project and are discussing budgeting with your sponsor. The sponsor is asking for an estimate based on past projects from you to properly allocate funds for the project. Which of the following estimating techniques will give you the best estimate?

1. **Analogous**
2. Parametric
3. Bottom Up
4. Three-point

Analogous estimates are based on lessons learned.

#### Question 17

As a project manager, your responsibility is to put together a comprehensive budget that will be approved as a cost baseline. Therefore, you need to incorporate several considerations into the total number. All the following are included in your cost baselines except which one?

1. **Funding limit reconciliation**
2. Contingency reserves
3. Cost of quality
4. Scope of work

A funding limit reconciliation is imposed on the project budget rather than being a part of the budget. The rest of the answers would be aspects of your inevitable cost baseline based on your budget. A funding limit reconciliation is where you control a significant outflow of money at one time. While it affects the budget and the baseline and its use across project work, it is not considered part of the cost baseline considerations. The cost of quality and the scope of work would drive the budget, and the contingency reserves for risk are considered part of the cost baseline as well.

#### Question 18

It's week 4 of a 30-week, 40,000 US dollar project, and you are collecting work performance data from your team to determine your cost and schedule performance. Your team reports that they are about 10% complete and have spent 15,000 dollars of the total budget. What can you tell about the cost performance of this project?

1. **The project is currently over budget.**
2. The project is currently under budget.
3. The project is right on budget.
4. There is not enough information to determine the budgetary performance.

Your team has currently done \$4,000 worth of work (EV) and spent \$15,000 (AC) on that work.  $EV - AC = CV$ .

#### Question 19

You have compiled your performance reports and are about to have a meeting with your sponsor. Your current performance information shows the following:

$EV = 30,000$

$PV = 32,000$

$AC = 28,000$

What will you be reporting to your sponsor about the project's schedule and budget?

1. Behind schedule and over budget
2. Ahead of schedule and under budget
3. Behind schedule and right on target for the budget
4. **Behind schedule and under budget**

$\$30,000 (EV) - \$32,000 (PV) = -\$2,000$  behind schedule.

$\$30,000 (EV) - \$28,000 AC = \$2,000$  under budget.

**Question 20**

One of your team members comes to you and states that their current CPI is 0.8 and that their SV is -12,000. How is this part of the project performing?

1. **Over budget and behind schedule**
2. Under budget and ahead of schedule
3. Over budget and ahead of schedule
4. Under budget and behind schedule

A CPI below 1.0 means that the project is over budget. You are spending more on less work being accomplished, and a negative schedule variance means being behind schedule by \$12,000.

**Question 21**

Which of the following is the correct formula for earned value (EV)?

1. EV – SV
2. BAC \* SPI
3. **BAC \* % complete**
4. EV/BAC

This is the correct formula for earned value.

**Question 22**

You have received approvals for your \$4,000 cost baseline and have scheduled the project work across 4 weeks. Which of the following could be considered the planned values of each week?

1. 2,000.
2. 4,000.
3. **1,000.**
4. There is not enough information to answer this question.

For the exam, assume an equal distribution of money across project work. In this case, the planned value is \$1,000 per week.

### Question 23

As a project manager, you are collecting work performance data from your team and need to process the data through variance analysis.

Your data includes the following:

EV = 42,000

PV = 41,200

AC = 42,200

What are your SPI and your CPI on this project, respectively?

1. **1.02 and 0.99**
2. 0.99 and 1.02
3. 800 and -200
4. -200 and 800

Always answer in the order asked in the question. The SPI is  $42,000/41,200 = 1.019$  rounded up to 1.02. The CPI is  $42,000/42,200 = 0.99$ . The easiest way to remember this is that if the earned value is less than the planned value, you are behind schedule. Less work is done than planned. If the earned value is less than the actual cost, this means less work was done and that you spent more on it than planned, so you are over budget.

## Assessment exam answers (Chapter 9)

### Question 1

You and your team are working on a crucial project for your best customer. They have asked you to create a cell phone for the elderly for mass production. The requirements state that the phone must have larger buttons and an amplifier for the earpiece, and that is it. They want a simple and usable design. Your team creates the phone, and all tests prove the phone functions the way it should. Which of the following best describes the phone?

1. High quality and high grade
2. Low quality and low grade
3. **High quality and low grade**
4. Low quality and high grade

Low grade means fewer features or functions. As long as it works, it is considered quality.

### Question 2

Which of the following is the best description of the cost of quality?

1. **Internal failure costs and external failure costs**
2. External failure costs and rework
3. Loss of business and internal failure costs
4. Internal costs and training costs

All these answers may be considered a result of poor quality, but the best answer is internal and external failure costs.

### Question 3

You are a new project manager entering a laptop battery manufacturing project halfway through. Your team is updating you of their process for sampling one out of every 1,000 laptop batteries that are created, as per the requirements. They tell you that each battery is being inspected for the time it takes to charge. The requirements state that each battery should be fully charged between 1 and 3 hours. The last sample took 4 hours to charge. What does this represent?

1. **An attribute**
2. A variable
3. A quality problem
4. An acceptable defect

An attribute shows that the results either meet or don't meet requirements. That represents a no-go decision.

### Question 4

Which of the following might represent a no/go decision?

1. The allowable range of correct results.
2. **The result is missing a key element.**
3. The person sampling has made a mistake.
4. The machinery needs to be repaired.

Attributes must be present in the result or it's a no/go decision, and rework would be necessary.

### Question 5

Your organization is working to create awareness and commitment to meeting quality requirements. This is due to the customer finding defects in their order. Which of the following answers best describes this organizational action on the five levels of increasingly effective quality management?

1. Incorporating quality in planning
2. Detect and correct
3. **Creating a culture**
4. Using manage quality

Organizational awareness and commitment to quality in a process and product is creating a culture of quality management. The others are increasingly better levels, but culture is the best answer.

### Question 6

Which of the following implemented the PDCA cycle in quality management?

1. Shewhart
2. **Deming**
3. Juran
4. Crosby

Even though Shewhart created the plan-do-check-act cycle, Deming incorporated it into quality management.

### Question 7

You have taken over in the middle of a large IT project after the previous project manager was pulled to work on something else. You are reviewing what they have accomplished so far and have determined that requirements have been collected for both scope and quality. What document is important to work on next that will provide the metrics for meeting quality?

1. Scope statement
2. **Quality management plan**
3. Cost-benefit analysis
4. Incorporate quality into planning

The quality management plan will contain the metrics needed to track quality.

### Question 8

As your team becomes more fluent in Agile best practices, the team would like to hold a meeting at the end of every iteration. Which of the following questions would not be asked at a retrospective?

1. What should we keep doing?
2. What should we stop doing?
3. What should we start doing?
4. **What should we focus on?**

Even though a discussion of where to place the team's focus is a good question, it typically isn't one of the questions that's asked in a basic retrospective meeting.

### Question 9

One of your organization's major competitors has been first to market with a new type of virtual reality machine. Your sponsor has called a meeting and is discussing the need to review the quality best practices of their organization in comparison to yours. Which of the following represents this practice?

1. Flowcharts
2. SIPOC
3. **Benchmarking**
4. Design of experiments

Benchmarking is the act of comparing your organization's quality process with that of another. It could be internal or external.

### Question 10

Which of the following best describes Kaizen?

1. Changes in quality
2. **Continuous improvements**
3. Agile approach
4. Tailoring approach

Kaizen is a philosophy of continuous improvement, and quality is the job of everyone. There isn't a step-by-step process for Kaizen but a focused approach to improving quality organizationally.

### Question 11

The quality management plan is important for all the following reasons except which one?

1. It describes the roles and responsibilities for quality management.
2. It describes the metrics that will be used to track quality.
3. It shows potential corrective actions.
4. **It documents the cost-benefit analysis for the cost of quality.**

Cost-benefit analysis may drive the roles, responsibilities, metrics, and potential corrective actions necessary, but it isn't the main reason why the quality management plan is important. It is more of a preemptive analysis to make sure the budget accommodates the cost of quality.

### Question 12

Your organization has a renewed focus on quality and has asked you to create or improve the process currently in use. You do a root cause analysis and realize the process is fine, but the team's execution of that process isn't precise. What might you do to help the team execute the process currently in place?

1. **Give them a checklist to follow.**
2. Create a quality management plan.
3. Discuss the metrics.
4. Hold a retrospective.

Checklists are job aids that outline the steps necessary to execute the quality process precisely.

### Question 13

The SIPOC model represents all the following except which one?

1. Suppliers
2. Inputs
3. **Organization**
4. Process

SIPOC stands for Suppliers, Inputs, Process, Outputs, Customer.

**Question 14**

The benefits of performing a cost-benefit analysis as it pertains to quality management planning are all the following except which one?

1. The primary benefit of meeting quality requirements is less rework.
2. The primary cost of meeting quality requirements is the expense associated with project quality management activities.
3. The primary benefit of meeting quality requirements is that you can determine the amount of money to put into the budget to meet quality requirements.
4. **The primary benefit of meeting quality requirements is that you can understand the cost of quality.**

The cost-benefit analysis is designed to add money to the budget to protect it against internal or external failure costs. It does drive the cost of quality, but the analysis pertains more to the other answers.

**Question 15**

Which of the following best describes the ISO definition of quality?

1. **The degree to which a set of inherent characteristics fulfill requirements**
2. The degree to which a set of inherent characteristics fulfill quality
3. The degree to which a set of characteristics fulfill requirements
4. The degree to which a set of characteristics fulfill metrics

"The degree to which a set of inherent characteristics fulfill requirements" is ISO's correct definition of quality.

**Question 16**

Ben and Kareem are experts in quality management and are putting together a list of process steps to help the rest of the team ensure they are executing the process correctly. Which of the following are they creating?

1. Check sheets
2. Quality management plan
3. **Checklists**
4. Quality control measurements

Checklists are job aids that document the process for execution to ensure high-quality results

#### Question 17

Jill is new to your team and was brought in as an expert of mechanical systems. You need her expertise since you will be working on a mass production project creating bicycle bells. She explains that you will need to perform statistical sampling on the population of bells, and she suggests that your team samples one out of every 1,000 bells and makes sure that it works. Your team is performing the sampling and determines that, in one of the samples, the bell mechanism doesn't work, so they stop the assembly line to determine the root cause. This represents which of the following?

1. A variable
2. **An attribute**
3. A defect
4. Performance review

An attribute represents go/no-go decisions. It could be also considered a defect, though in this case, stopping work due to a defect shows an attribute is missing, so root cause analysis would need to be done to determine why.

#### Question 18

Your team is getting together at the end of an iteration and discussing ways that the product and their process can be improved immediately in the next iteration. The review has been done and the team has gathered a lot of great information, so they are ready to put the new best practices into place. Which of the following Agile events does this represent?

1. Iteration planning
2. Daily stand-up meeting
3. Review
4. **Retrospective**

A retrospective is a meeting the team has at the end of the iteration to discuss the results of the review, and to make plans for improvements in the next iteration.

### Question 19

You have been a project manager in software development for 10 years. Yesterday, you were pulled to work on a project that is building out a help desk for your organization. Software development is not necessary for this project. While executing the project work, you determine that you need to revisit the steps the team is taking due to quality results not being what they should be. Which will you be using?

1. Inspection
2. **Audit**
3. Manage quality
4. Defect repair

An audit is a review of the quality process and the steps that were taken to produce the defect. This takes place in the manage quality process.

### Question 20

During the control quality process, your team is determining whether two separate inputs are creating a single problem or whether there is a relationship between them. Which of the following charts or graphs will they use to do this?

1. Histogram
2. Pareto diagram
3. **Scatter diagram**
4. Control chart

A scatter diagram shows either a relationship or a lack thereof between two variables. If the two have a relationship, the team can work to determine the causes and implement a fix for the process. If there are two unique problems, the team would have to determine which to work on first.

### Question 21

During your statistical sampling process, you determine that four of your samples are falling outside the normal control limits. One result is below the lower control limit, while three results are above your upper control limits. What does this information show?

1. Your process is in control.
2. Your process is normal.
3. Your process has above 3.4 defects per million opportunities.
4. **Your process is out of control.**

Results on a control chart that are either over or under the control limits point to a problem with the process that is causing defects. This could be a human error or a process error. Either way, root cause analysis is needed to determine the reasons for this.

#### Question 22

You and your team are working on a project that will create a better dog harness that allows for a GPS chip to be installed, and you are also working on an app to track your dog's location faster. There are numerous problems during your project. First, the material for the harness blocks the signal in some areas and the app has too many bugs, but you know the team will work through the tech issues as you go forward, and the ability to adjust the harness is more difficult than anticipated. Which of the following charts or graphs can the team use to identify the biggest problem first and apply their time and effort to the biggest problem?

1. **Pareto diagram**
2. Scatter diagram
3. Control chart
4. Run chart

Pareto diagrams use the 80/20 rule to determine what the big 20% of problems are and work with the most impactful first.

#### Question 23

Root cause analysis of a quality process can best be assessed using which of the following?

1. Scatter diagram
2. Control chart
3. Run chart
4. **Ishikawa diagram**

Ishikawa diagrams, fishbone diagrams, and root cause analysis all represent the correct answers. The Ishikawa diagram is used to work through the root causes of major issues so that the right response to fix the problems can be applied.

#### Question 24

Which of the following control quality outputs is the most necessary to gain the validation of scope?

1. Quality control measurements
2. **Verified deliverables**

3. Work performance information
4. Control charts

Verified deliverables are necessary to show that the result is quality, so the validate scope process or formal acceptance can occur and the project or phase can be closed.

#### Question 25

Bill is running inspections on the bicycle project and has determined that four of the tires had defects, two of the handlebars were not based on requirements, and that 13 seats had problems with their stitching. Which document could Bill use to plot out all the defects to communicate that information to stakeholders, who can then make decisions about which is the most impactful to the quality of the overall project?

1. Checklists
2. **Check sheets**
3. Cause-and-effect diagram
4. Control charts

Check sheets allow a tally of results/defects to be collected to determine the most impactful. In this question, it was easy to identify that the seats contained the most defects, but is that the most impactful? The check sheets are used to keep track of, communicate, and review defects so that you can make the best decisions regarding where to apply the defect repairs.

#### Question 26

Finish this sentence: "If we find defects outside of normal limits or tolerance levels in our quality control inspections\_\_\_\_\_."

1. **The result points to a problem with the way we are executing the work, or our process is flawed**
2. The result points to a problem with the way we are executing the work, but our process is fine
3. The result doesn't point to a problem with the way we are executing the work, and our process is fine
4. The result doesn't point to a problem with the way we are executing the work, and our process is flawed

There is only one correct answer here. If the defects are outside our normal limits or tolerance levels, it shows that there is a problem with how we are executing the work. Typically, this is due to our process being flawed or out of control.

## Assessment exam answers (Chapter 10)

### Question 1

Which of the following is not an aspect of the 5 Cs for communication?

1. Correct grammar and spelling
2. Concise expression
3. **Controlled communications**
4. Coherent logical flow of ideas

The 5 Cs represent correct grammar and spelling, concise expression and elimination of excess words, clear purpose and expressions, coherent, logical flow of ideas and controlling the flow of ideas and words. In this case, controlled communications is not the correct answer as the other answers are more specific to the 5 Cs.

### Question 2

You have a team of five people and are planning to acquire another three team members. You also have a sponsor, a functional manager, and a procurement administrator as stakeholders as well. You are holding a meeting with all your stakeholders and are attempting to determine how many channels of communication you will have in that meeting. How many communication channels do you have if you are the communicator?

1. **66**
2. 55
3. 12
4. 15

There are 12 stakeholders, including yourself. The communication channels formula is  $N(N-1)/2$ . N represents how many stakeholders are involved.  $12(12-1)/2 = 66$ .

### Question 3

As a project manager for your team, you are very busy in the planning process. One of your team members comes to you with a concern about the order of the activities he is scheduled to perform. As he is explaining this to you, you are thinking about everything else you need to do that day. What is not being used in this interaction?

1. Emotional intelligence
2. Conflict resolution
3. Coaching for improved performance
4. **Active listening**

All the answers could be considered actions you could be taking; however, you are not listening to your team members actively if you are thinking about other things when they are having a discussion with you.

#### Question 4

Your team is meeting at the same place in the morning to discuss yesterday's work and today's work, as well as impediments they are experiencing. Jim is a team member who hears Karen's issues that she is experiencing and determines that if she does activity A before B, she can eliminate the threat of being behind schedule. Which of the following should you say as the project manager in this situation?

1. "Jim is correct, Karen; I think that is an excellent solution."
2. "**Jim, that is a great solution, but this is a stand-up meeting, and we can't have solutions discussed. Please wait until the meeting is over to work through solutions.**"
3. "Karen, please try not to involve problems in this meeting; it is informational only."
4. "That sounds good, Jim, what does the rest of the team think about the solution?"

The situation described is a daily stand-up meeting. This will not focus on solutions, only information about what the team member worked on yesterday, what they will work on today, and what impediments are in their way. The answer may sound harsh, but as a good Agile project manager, you would make sure everyone understood the meeting's purpose and would stop any solution-oriented discussions until after the meeting is over.

#### Question 5

After working all morning on the agenda for your kick-off meeting, you attach it to an email and send it out to those who will need to be in attendance. What kind of communication method is this?

1. Pull
2. **Push**
3. Email
4. Internal

If you are sending out an email, then you are pushing communications out to a specific set of receivers. You will know they got the information and may gain some feedback or questions, thus allowing the feedback cycle to begin. Pull communication is when the information can be accessed at any time without an understanding of whether the message was understood. Email and internal sounds correct, but in this case, the best answer is push communication.

### Question 6

You are the project manager for a large development project. You realize that you will need to plot out what resources are required and in what category compared to the WBS. Which of the following will you use to do this?

1. RACI chart
2. RAM
3. **RBS**
4. Team charter

The resource breakdown structure looks at the work that is needed to be done per the WBS and breaks it down by resource type.

### Question 7

You are a project manager for a large project spanning several departments, as well as your customer's organization. What would be the best document to help you get everything documented so that protocols are followed for the chain of command?

1. Project schedule
2. Project calendar
3. **Project organizational chart**
4. A RACI chart

A project organizational chart shows the chain of command for the departments and people specific to the project.

### Question 8

You and your team are plotting out what tasks need to be done by which resource. Charlie is a seasoned team member and wants to know what he will be responsible for on the project. How can you show Charlie and the rest of your team's tasks and the responsibilities of team members appropriately?

1. **RAM**
2. RBS
3. Calendar
4. Project organizational chart

A responsibility assignment matrix will show who is responsible, who is accountable, and who can be consulted and informed, and is an easy way to show the team their responsibilities.

### Question 9

One of your stakeholders is asking you to provide a RACI chart for them. What does RACI stand for?

1. Reasonable, approved, consult, inform
2. Responsible, accurate, consult, inform
3. Responsible, attainable, consult, inform
4. **Responsible, accountable, consult, inform**

RACI: Responsible, accountable, consult, inform. A RACI is a type of responsibility assignment matrix (RAM).

### Question 10

Your project team is discussing what type of life cycle would be appropriate for the new project they are working on. You mention that it is essential that the team focuses on continuously improving their execution to maintain quality and scope requirements. Which of the following resource management trends implies continuous improvements?

1. Kanban
2. JIT
3. **Kaizen**
4. TOC

All these answers represent trends in resource management; however, Kaizen is a focused approach to continuous improvement.

### Question 11

Which of the following does not reflect areas of emotional intelligence?

1. Empathy
2. Self-regulation
3. Self-awareness
4. **Active listening**

Active listening is an integral part of being a good manager; however, it is not under the category of emotional intelligence, while the other answers are.

### Question 12

A new stakeholder has joined the project from a functional department, and they notice that your team appears to be working without any delegation or specific scheduling. They ask you to explain why your team seems to be running the project, instead of the project manager dictating who does what and when. What is the best answer to their query?

1. "They are a high-performing team, so I don't need to dictate."
2. "They are all subject matter experts, so I don't have to dictate work to them."
3. "**They are a self-directed team and perform using Agile principles.**"
4. "They are only in the planning process, so I don't know everything yet to direct them."

If the team is self-directed and self-managed and will use an Agile approach to manage their work, it's typical on an Agile team that the team members determine what work they will do and when to meet the goals of the project deliverables.

### Question 13

Your team is working together to determine how decisions will be made and some rules of engagement for the project. Which of the following documents are they working on?

1. RAM
2. RACI
3. Resource management plan
4. **Team charter**

A team charter will document the team rules, how conflicts will be managed, how decisions will be made, rules for meetings, and so on.

### Question 14

You have been a project manager for years at your organization, so you have an internal understanding of how your organization works, as well as how other teams and their managers interrelate. What tool or technique defines that understanding?

1. Expert judgment
2. **Organizational theory**
3. Enterprise environmental factors
4. Organization understanding

Organizational theory is the understanding of how your organization and its departments function and work.

### Question 15

You are estimating your activity resources and are using your team's historical information and those confirmed estimates to determine how many resources you will need for each activity. Which of the following best describes the tool or technique you are using?

1. **Analogous estimating**
2. Parametric estimating
3. Bottom-up estimating
4. Expert judgment

Analogous estimating is using lessons learned or historical information to make estimates for how many resources are needed, as well as estimating durations and costs.

## Assessment exam answers (Chapter 11)

### Question 1

Your project team is in the process of beginning to identify risks, and you have set up a facilitated brainstorming session in which the team can focus on categories of risk. Which of the following tools may be helpful in this process?

1. Risk register
2. Qualitative risk analysis
3. Quantitative risk analysis
4. **SWOT analysis**

SWOT analysis is a structured brainstorming technique. The other answers are processes or outputs.

### Question 2

Jill is one of your best team members, and she is excellent at identifying and managing risk on your team. Jill is concerned that an identified threat may impact your budget more than your project can handle. What technique could you use to determine the price tag of the identified risk event?

1. Earned value
2. **Expected monetary value**
3. Cost variance
4. Cost performance index

The expected monetary value formula of Probability (%) \* Impact (\$) can help determine the price tag for risks at its currently assessed probability. The other answers are for cost and schedule control.

#### Question 3

Keenan and Abdul are in the conference room, discussing different strategies for overcoming a risk event. Keenan feels the best course of action is to change the project management plan through formal change control and adjust those items that are creating the potential risk event. What risk response is Kennan suggesting?

1. **Avoid**
2. Mitigate
3. Exploit
4. Transfer

Avoid is the response that uses formal change control to change the project management plan and stop a threat from occurring.

#### Question 4

Ben is a member of your team and is the risk owner for one of the big, impactful risk events on your project. When the risk occurred, he implemented the response but then quickly noticed that another risk had occurred elsewhere in the project due to the response he implemented. This is an example of which of the following?

1. Residual risk
2. Mitigation
3. **Secondary risk**
4. Contingent response strategy

A secondary risk event occurs when a response creates another risk that was unknown and may require a fallback plan.

#### Question 5

Two of your team members are discussing the best way to update the risk register to make it more effective, and you mention that adding categories of risk events may be helpful. Which of the following risk processes suggests categorization?

1. Identify risks
2. Quantitative risk analysis
3. **Qualitative risk analysis**
4. Response planning

Qualitative risk analysis includes probability and impact assessments, categories of risks, and prioritization.

#### Question 6

You and your team are in a meeting discussing risk, and Jamal is concerned that one of the risk events could impact the project financially. His estimate puts the impact at 35,000. The team discusses the identified risk and agrees on the impact, and they determine that the probability of that event occurring is around 20%. What is the expected monetary value?

1. **7,000**
2. 35,000
3. 35,020
4. 6,000

Expected monetary value is probability \* impact. In this case  $35,000 * 0.20 = 7,000$ .

#### Question 7

Francis and Tom are the risk owners for an identified technology risk. They have come to you to review a change request to make sure that all impacts have been assessed and gain the go-ahead to process a change request. You review the request and realize that the change would impact aspects of the program your project belongs to. Which of the following threat responses is the best option in this case?

1. Exploit
2. Transfer
3. Avoid
4. **Escalate**

Because the threat and the response would impact certain aspects of the program, the best answer is to escalate this to the program level.

#### Question 8

You and your team have used SWOT analysis to identify numerous threats to the project. According to the risk management process, what will the team do next?

1. Perform quantitative risk analysis.
2. Update the risk report.
3. **Perform qualitative risk analysis.**
4. Send out a risk report.

The team has identified risks and will now perform qualitative risk analysis. The question asks about processes, rather than outputs.

#### Question 9

Your team is running an Agile project to create a new payroll system for the HR department. You are currently in the middle of a 4-week iteration when James, one of your team members, identifies a risk to the increment. What risk process is the best answer in this situation?

1. Identify risks
2. **Monitor risks**
3. Implement risk responses
4. Qualitative risk analysis

The team is in the middle of execution rather than planning, so the best answer is to monitor risks.

#### Question 10

Your team is getting used to using a risk register and have faithfully been updating it as new threats and opportunities have been identified. During a risk meeting, you review the risk register and notice that someone added an entry that reflected an unknown/unknown occurrence from the previous week that didn't have much impact on the project, and that it was dealt with as soon as it occurred. What did the team member add and was it appropriate?

1. They added a risk, and yes, it is appropriate for the risk register.
2. They added a risk, and no, it was not appropriate for the risk register.
3. They added an issue, and yes, it is appropriate for the risk register.
4. **They added an issue, and no, it isn't appropriate for the risk register.**

The question is describing an issue, which is a risk that has been realized and then dealt with immediately. Issue logs are where issues should be documented.

#### Question 11

During a recent meeting with key stakeholders, you mention that a threat event occurred during the execution of a main deliverable. Your sponsor Rachel asks why they were not informed of the risk last week. What should the project manager have done to communicate to the stakeholders?

1. Distributed the risk register
2. Added the information to the work performance reports
3. **Updated the risk report and distributed it**
4. Added risk to the agenda of every meeting, so nothing is left out

While it is important to have risk on your agendas, the risk reports are designed to communicate all risk activity to the stakeholders.

#### Question 12

Which of the following risk processes is determining the probability and impact of identified risks, as well as their prioritization?

1. Identify risks
2. Quantitative risk analysis
3. **Qualitative risk analysis**
4. Monitor risks

The qualitative risk analysis process will result in probability and impact assessments, as well as categories and prioritization of risk being realized. Quantitative risk analysis uses those probability and impact assessments to gain further information statistically to make the best decisions as needed.

#### Question 13

You are the project manager for a large manufacturing project, which includes creating a microchip for the new cell phones your company is making for release in January. Your sponsor is looking through the information in your risk register, and they notice that there isn't any information about the odds of meeting your budget with the current reserves you have set aside. Which tool or technique could be used to identify the odds of meeting the current budget with the given reserves?

1. Expected monetary value
2. **Monte Carlo technique**
3. Sensitivity analysis
4. Audits

The Monte Carlo technique uses random number generation, is computer-generated, and is iterative in determining how risks will impact the budget and the odds of doing so. The expected monetary value calculates probability and impact, while sensitivity analysis uses tornado diagrams to plot out the most impactful risk items.

#### Question 14

What information will you have after performing quantitative risk analysis?

1. **A detailed probabilistic analysis of risk on your project**
2. A detailed risk report

3. A detailed list of probability and impact
4. A detailed overview of risk triggers

While you may have a detailed risk report, the best answer is a probabilistic analysis of the project.

#### Question 15

Your team is halfway through a year-long project and Will, a senior engineer on your team, determines that a threat event he recently identified is going to impact the program level of the organization. Which of the following responses should be implemented here?

1. Mitigate
2. Exploit
3. **Escalate**
4. Avoid

Since the risk will impact the program level, the best response is to escalate the risk to the program manager or PMO.

## Assessment exam answers (Chapter 12)

#### Question 1

You are working with your procurement administrator and determining what the best contract type should be for acquiring the equipment you need. You are concerned about your budget because you are working with a funding limit and need to keep the cost risks low. What is the best contract type to use in this situation?

1. **Fixed price**
2. Cost reimbursable
3. Time and materials
4. Service-level agreement

Fixed price keeps the cost risks low for the project budget, as long as the scope of work is well-known.

### Question 2

Your organization has used the ABC company for years to help with large installs of server upgrades in multiple locations, and Doug has been assigned as the resource to your projects. You and Doug have a good working relationship, and you trust him to get the job done. The ABC company has signed a fixed-price incentive fee contract and has stipulated that Doug will get his incentives when the customer validates scope. In the middle of the project, Doug comes to you and asks for his incentives early because he always gets his work done and he could use the money. What should your response be?

1. "Sure, let me process a change request to see if we can get you some of your incentives early."
2. "Sorry Doug, I can't make that decision, you're going to have to talk to Larry, my procurement administrator."
3. "**Sorry Doug, I know you'll get your work done and make your incentives easily, but that would be a breach of contract, and I can't pay you early. I'm really sorry about that!**"
4. "Sure Doug, let me write you a check for half of your incentives."

I know it's tempting to fall for the story and process a change request, but in this case, it would be a breach of contract and your job to engage your stakeholders. You would be the one to explain you can't pay them outside of the stipulations in the contract.

### Question 3

You and your team are trying to determine what you will need from outside sellers in the form of materials and equipment. During your discussions, you are attempting to figure out what can be done in-house and what can't be. This could be an example of which of the following?

1. Make or rent analysis
2. **Make or buy analysis**
3. Source selection criteria
4. Planning procurements

The best answer is make or buy analysis since you are discussing whether you can develop in-house or need outside assistance.

### Question 4

After a good, hard look at your procurement needs, you have put together a document that clearly states your needs for that particular type of seller, as well as the requirements for the product you are building. What document does this best represent?

1. RPF
2. RFQ

3. RFI
4. SOW

The statement of work describes the procurement needs for the project and is sent out with requests for responses to the SOW from the seller.

#### Question 5

The project you and your team are currently working on needs a very unique piece of equipment that only one vendor has. You will have to pay what they ask and can't confirm its quality until the part is delivered. What kind of seller are you working with?

1. Single source
2. **Sole source**
3. Vendor bid analysis
4. Selected seller

Sole source represents a vendor who is the only one who can provide what the project needs. A single source is when the organization only works with one seller.

#### Question 6

You work for a large organization with multiple locations and departments. You and another IT team from another building are working together on a project. Both departments feel it is necessary to outline each team's responsibilities and key performance indicators clearly, but a legal contract isn't necessary. Which of the following may work instead?

1. Letter of Intent
2. Fixed Price Contract
3. **Service Level Agreements (SLA)**
4. Purchase Order (PO)

SLA is the best answer based on the other answers given and is the only answer outside of a letter of intent that isn't a formal contract.

#### Question 7

You and your team are working through prospective procurement needs for the project during a make-or-buy analysis and have decided that your project would benefit from renting laptops, rather than spending part of your budget to buy them. Your team has determined that each laptop needs to have a long battery life since they travel so much, as well as a specific amount of RAM. You have determined that the rentals in total can be no more than \$1,000 a month. What are you and your team determining?

1. Make-or-buy decisions
2. **Source selection criteria**

3. Procurement management planning
4. Request for proposal information

Documenting specific needs from the procurement involves source selection criteria, since the question specifically states the expectations for the laptops in both performance and financially.

#### Question 8

You have a variety of procurement needs for a large manufacturing project. The main need is to find a supplier that can deliver quickly and meet the quality specifications of the components necessary to create the end result. You have received several bids from different sellers bidding on the same scope of work, and you and your team determine you'll need several categories to review them and make a decision. The weight and the scoring system have been designed by your PMO, and you have determined that to keep things fair you'll choose the seller with the highest score. Which of the following procurement tools or techniques are you using while performing this review?

1. **Weighting system**
2. Scoring system
3. Conduct procurements
4. Control procurements

A weighting system allows a weight to be added to each potential source selection criteria. Then, each criterion would be scored and multiplied against the weight. This allows scoring systems to be used to choose the best seller.

#### Question 9

A representative from your legal department has called a meeting to review the scope of work with sellers who can provide the specific scope of work needed. In the meeting, several of the prospective sellers have questions, so you provide them with the specifics of the scope of work so that they can put together a comprehensive proposal with all of the information necessary. What kind of meeting is this?

1. **Bidder's conference**
2. Audit meeting
3. Lessons learned meeting
4. Status meeting

Bidder's conferences are designed to get everyone responding to the same scope of work in one room where they can ask questions and get answers. Everyone hears the same information, so no favorites are selected.

### Question 10

Colleen and her marketing team have worked with your organization for years as a selected seller providing marketing campaigns for your company's newest products, and they have been very successful. You have reached the end of the approval phase for their newest campaign and their work is completed on the project. You have asked Colleen and her legal team to sign off on the payments they received for their work, and to also have your team sign off on the document stating they had done everything they were contractually bound to do. Which of the following procurement documents are you and Colleen signing?

1. Warranty
2. Service-level agreement
3. Memorandum of understanding
4. **Waiver**

Waivers protect both the buyer and seller from future costs or issues concerned with breach of agreement.

### Question 11

Before your team closes out the project and the final contract, you review the procurement process from beginning to end and determine that your selection process worked very well. You also determine that the sellers you selected met all the contractual obligations within the schedule and scope requirements. This allows you to put them on a short list of sellers for future projects based on their performance. What is this tool or technique called?

1. Inspection
2. Lessons learned
3. **Audit**
4. Supplier survey

Procurement audits review the entire procurement process, including what worked and what didn't, so use this for lessons learned and future procurements.

### Question 12

Your building project is nearing the end, and you and your team are doing a walkthrough of the building to make sure that everything on your punch list is completed within the requirements. You meet up with the foreman and let them know that everything looks to be in order, and that they can receive their final payments and incentives and the contract can be closed out successfully. What tool or technique are you executing in this situation?

1. Audit
2. Contract closure

3. Waivers
4. **Inspection**

An inspection is a physical review of work that's completed to determine whether it meets contractual obligations and terms and conditions before procurement closure occurs.

#### Question 13

While executing a contract with a seller you have worked with on many projects, you ask for a change to be made to the scope of work. The seller is irritated because, during negotiations, the contract administrator assured them that they would not have to perform the specifics of what you are asking for. The seller disagrees with the change request and refuses to execute the work. It has been determined that the claim cannot be resolved. Which of the following will occur due to this situation?

1. Claims administration
2. **Alternative dispute resolution**
3. Negotiation
4. Litigation

Alternative dispute resolution (ADR) occurs when a contented change can't be solved with negotiation through claims administration.

#### Question 14

As you plan out your scope of work for a large megaproject, you know that there are specific needs of the project. As you and your contract administrator start putting together the SOW and investigating possible sellers, you realize that there is only one seller who can provide you with the materials you need. While this makes the selection process easier, you are concerned that it may be difficult to track its quality, so you ask for specific terms and conditions to be added to the SOW before it gets sent out. Which of the following best describes this situation?

1. This is a single source situation.
2. This is due to not advertising effectively.
3. **This is due to a sole source situation.**
4. This is due to not having enough background info on specific seller types.

Sole source means there is only one seller that can provide what the project needs. Single source means your organization only works with one seller for a specific project need. They have been shortlisted.

### Question 15

You are in a room with the legal department, who is negotiating a cost-plus incentive fee contract. The selected seller states that they believe the entire costs would be \$150,000. You agree to the costs as they fit your cost estimates for the work. You have also agreed to a \$15,000 incentive fee if they meet the quality requirements on your project. As the negotiation continues, you mention that if the costs were to come in below the quoted amount, you would be willing to do a share ratio of 80/20 to help incentivize the seller to keep the costs low. When the contractual work is completed, the seller states that the final costs are \$135,000 and that they have met all the requirements for their incentives. How much will you pay out for this contract based on the situation given?

1. **\$153,000.**
2. \$150,000.
3. \$162,000.
4. There is not enough information to answer this question.

In this case, you will pay out all the actual costs, which equals \$135,000, plus their original incentives of \$15,000 and 20% of the savings of \$15,000.

Original: \$150,000

Actual: \$135,000

Difference: \$15,000

Incentive paid: \$15,000

Share ratio: 80 (us) 20 (them)

\$135,000 contract costs + \$15,000 incentive fee + 20 percent of the savings or  
\$3,000 = \$153,000.

## Assessment exam answers (Chapter 13)

### Question 1

You are working with your stakeholders to determine what information needs to be updated weekly. One of your key stakeholders, Joan, asked to be kept up to date on any surprises that occur on the project that result in a negative impact. Which of the following documents is Joan asking to see weekly?

1. Stakeholder register
2. Risk management plan

3. Issue log
4. Assumption log

The issue log documents any unknown/unknown events that can cause problems on the project. It is a large part of good communication with your stakeholders who may be affected by issues or need to manage them.

#### Question 2

Which of the following documents can help you plan for stakeholder engagement on the seller side of the project?

1. **Agreements**
2. SOW
3. RFP
4. Procurement plan

All of these are seemingly good answers, but until the sellers become contractually bound to the project, they are not actual stakeholders.

#### Question 3

Power structures, politics, and how communication flows in your organization are influenced by which of the following?

1. Enterprise environmental factors
2. The industry
3. The organizational setup
4. **Organizational process assets**

Power structures and hierarchical politics, how communication will occur, and utilizing lessons learned or empirical knowledge from similar past projects. Corporate policies and procedures for social media, ethics, and cybersecurity, all the way to the software you use and your organizational communications requirements, are all considered organizational process assets.

#### Question 4

You are a project manager working on a large construction project and have the help of a project coordinator. During the project, several stakeholders are expressing concerns about the updates they are getting and a lack of communication. You review everything with your coordinator, and it appears they have done everything according to the engagement plan as have you. Which tool or technique would be helpful in this situation?

1. Stakeholder engagement assessment
2. Expert judgment
3. **Root cause analysis**
4. Benchmarking

To determine the real reason behind your stakeholders' concerns, you would need to figure out the real reason or root cause of the problem so that the actual problem is determined before you change your strategy.

#### Question 5

Claudia is a functional manager in your organization that you typically borrow resources from. Your new project is developing an app that tracks calories, and it needs a good developer. Claudia has just the right person. You have jotted down on your calendar that you must review the project's needs with her next week. At this point, what kind of stakeholder engagement category is Claudia currently in?

1. Neutral
2. Supportive
3. Leading
4. **Unaware**

Even though Claudia may suspect that you will use her as a resource in future projects, she is currently unaware of this. Once she is brought into the project, you will need to get her desired performance to be as supportive or leading as needed.

#### Question 6

Joaquin is a new member of your team and has recently arrived from Spain to work on your development project. Some of your team members are concerned that he won't be able to keep up due to language differences and cultural differences. What is the best thing to do in this situation?

1. **Call a meeting to introduce Joaquin to the team formally and ask him to put together some information on his country and culture.**
2. Call a meeting and tell the team they will need to work closely with Joaquin until he knows the way the team works together.
3. Send out an email introducing Joaquin to the team and send a short video about Spain to the team.
4. Tell the team that they need to be more culturally sensitive.

Part of cultural sensitivity in global teams is making sure that everyone understands a member's culture to avoid any problems in the future. In this case, the best answer is to have Joaquin explain his culture and answer any questions or address concerns anyone may have. The PM would need to facilitate the discussion and remain aware of any future issues and address them immediately. Cultural sensitivity is a must in global teams and stakeholder engagement.

#### Question 7

You have a team of seven people and three key stakeholders. During a meeting, one of the key stakeholders suggests that everyone be on time for meetings and that no cell phones should be allowed so that time isn't wasted. The rest of the team agrees that this is a good idea. What has the team just done during this discussion?

1. Set ground rules
2. Kept the peace
3. Used negotiation
4. Deferred to a key stakeholder

Ground rules are important to be set for the team, as well as stakeholders, so that conflict doesn't take the place of good interactions. Setting meeting rules is typical for this.

#### Question 8

Which of the following is NOT an output of managing stakeholder engagement?

1. Change requests
2. Issue log updates
3. **Stakeholder engagement assessment matrix**
4. Project management plan updates

This is an output of planning stakeholder engagement.

#### Question 9

Jill has been a stakeholder on many of your projects and is always very supportive of your initiatives. Lately, Jill seems less interested and vocal with her support. What is the best thing to do in this instance?

1. Review the stakeholder engagement plan and update it to help engage Jill.
2. **Talk to Jill and find out why she is less supportive and craft a new approach.**
3. Review the stakeholder engagement plan and decide how best to move forward.

4. Start updating Jill more often with the project information so she can see how well the project is running.

In this case, you would want to talk to Jill first to find out what, if anything, is causing her lack of support or interest. Then, you would update your engagement plan with the information you've learned. Good communication is integral to stakeholder engagement.

#### Question 10

You are in the breakroom and overhear two stakeholders discussing how they were not invited to meetings they were supposed to be invited to, and that they are not being updated regularly on project performance. What is the first thing you should do?

1. **Review the stakeholder engagement and communications management plan to determine whether they are supposed to be updated, and then update the plans to include them as needed.**
2. Review the stakeholder engagement and communications management plan and update them so that it includes the stakeholders.
3. Hold a meeting to discuss what information they need.
4. Hold a meeting with the team to find out why they aren't being updated or being invited to meetings.

In this question, it seems like talking to them is the best way to find out what's going on, but in this case, you'll want to review your strategies and communication plan to determine whether they are actually supposed to be updated or invited to meetings and if so, adjust your strategy. Asking them will give you the same answer as overhearing the conversation. You would need to go through formal change control to update any management plans and gain approvals first.

## Assessment exam answers (Chapter 14)

#### Question 1

Which of the following would not be considered a subsidiary plan of the project management plan?

1. Risk management plan
2. **Scope baseline**
3. Cost management plan
4. Quality management plan

The scope baseline is part of the project management plan; however, it isn't a subsidiary plan.

### Question 2

You and your team have put together a comprehensive project management plan and you feel it will be executed effectively. What do you need to do before you can begin executing project work?

1. Hold a kick-off meeting.
2. Acquire your resources.
3. **Gain formal approvals.**
4. Communicate the plan to your customer.

In this case, there may be several things you will do, including carrying out a kick-off meeting and explaining the plan to your customer. The project management plan needs to be formally bought into and accepted before you can begin execution.

### Question 3

What is the main output of direct and manage project work?

1. Issue log
2. Change requests
3. Work performance data
4. **Deliverables**

All of the answers are outputs to this process, but the main output is the creation of deliverables.

### Question 4

Your team is in the process of executing project work and gathering information that allows you to make decisions about project changes to be made, and it gives the team the ability to communicate to stakeholders in the form of work performance reports. What process is this describing?

1. **Manage project knowledge**
2. Direct and manage project work
3. Perform integrated change control
4. Monitor and control project work

Each process is part of the integration knowledge area. However, manage project knowledge is the best answer since information is being coordinated in an integrated manner based on the entire project's performance.

### Question 5

Your customer has come to ask you to add a bell to the bicycle project you are working on. You have determined that adding the bell will cost \$2,000 and will add another week to the schedule. What do you do next?

1. Assess the impact.
2. **Create solutions.**
3. Get internal approvals.
4. Get customer approvals.

In this case, you have already determined the impact on the schedule and the budget due to a scope change. The next step would be to create solutions for implementation.

### Question 6

A key stakeholder has come to you to gain an understanding of the current state of the entire project. They are asking you to present that information in the next status meeting. Which of the following processes would you be using to do this?

1. Direct and manage project work
2. Develop the project management plan
3. **Monitor and control project work**
4. Integrated change control

The process of monitoring and controlling project work reviews the project's current status and works to understand the reasons for any variances or deviations from the plan. Meetings are a tool or technique of this process as well.

### Question 7

Kevin is a core team member who you have worked with on many projects. He has come to you to discuss a situation that involves a critical activity. He is concerned that the activities prior to this are behind schedule and he will be going on vacation when they are anticipated to finish. He mentioned that another team member has the skills and the float time and will step in as needed. Which of the following best describes what Kevin is suggesting?

1. Corrective action
2. **Preventative action**
3. Scope change
4. Schedule change

Kevin is suggesting preventative action based on a schedule risk. He will be gone when the work is finished, thus creating a schedule risk, and he has already determined a workaround to the situation. It may result in a resource change rather than a schedule change. Anyone can suggest preventative actions.

#### Question 8

Frank is a software developer on a large project that you are managing. The software you are developing will protect your organization from future hacking and is a cybersecurity preventative measure. Frank explains to you that he has made some slight changes to the scope of work based on his own expert judgment. The problem is that he didn't inform anyone prior to making the change resulting in scope creep. After explaining everything, you agree the change is good for the project. What do you do next?

1. Communicate the change to the rest of the team.
2. Communicate the change to the organization.
3. Update your plans and lessons learned.
4. **Go through integrated change control for formal approvals.**

In this case, Frank made a decision that wasn't approved in advance. Even though it turned out to be a good idea, you would still need to formally process a change request and gain approvals, even if this is done after the fact. Then, you would communicate the result and update your documentation.

#### Question 9

The project you have been working on isn't going well and, after speaking with your sponsor, a decision is made to close out the project. What must be done before formal closure can occur?

1. **Validation of scope with formal signatures from the customer.**
2. Close out the contracts.
3. Release the team.
4. Communicate the decision to other stakeholders.

All these answers may be legitimate, but before any formal closure can occur, the customer needs to validate scope formally, even if the project is canceled in the middle. Then, you would communicate this to the stakeholders, close out contracts, and release the team.

#### Question 10

All of the following are part of formal project or phase closure except for which one?

1. Confirming that the customer has formally accepted the deliverables and confirming the delivery of those deliverables

2. Ensuring that all costs are charged
3. Closing project accounts
4. **Performing root cause analysis for project issues**

All these answers are correct except for performing root cause analysis. This would have already been done during monitoring and controlling.

#### Question 11

Your team is getting ready to wrap up the project and is excited that the project went well. They are waiting for approvals from the customer so that the scope of work is validated, and then the project can be closed out. The customer is taking a long time to sign off, so a team member suggests you just release the team so that they can go work on other projects. How do you respond to their request?

1. "No problem, I know this is taking a long time, so I'll release the borrowed team members now."
2. "Sure, go ahead and let your functional managers know you are ready to return to their department."
3. "I'm sorry, I can't release the team until all contracts are closed out."
4. **"I'm sorry, I can't release the team until the scope of work is formally accepted."**

In this case, you wouldn't release the team until the validate scope process is completed. If you release the team and the customer decides they aren't going to accept the deliverables, the team is now gone and would be tough to get back. Contracts also need to be closed out, but that happens iteratively throughout the project, and there wasn't any mention of contracts in the question.

#### Question 12

Which of the following is a formal group that decides what changes can and can't be made to project work?

1. Change control department
2. Directive PMO
3. Controlling PMO
4. **Change Control Board**

The Change Control Board is typically internal and makes decisions about changes to the project.

### Question 13

Which of the following is best described as "Any action taken to bring performance back in line with the plan"?

1. **Corrective action**
2. Preventative action
3. Formal change control
4. Defect repair

Corrective action is making changes to bring performance back in line with the project management plan and subsequent baselines.

### Question 14

Which of the following integration processes allows for go-no-go decisions?

1. Develop project charter
2. Plan project work
3. Integrated change control
4. **Close project or phase**

Typically, in phase-oriented projects, go-no-go decisions are made during the closure of a phase to determine whether the next phase can proceed.

### Question 15

Which of the following inputs is absolutely necessary to close a project or phase?

1. Enterprise environmental factors
2. Organizational process assets
3. **Accepted deliverables**
4. Closed procurements

Accepted deliverables are needed to close out a project or phase and are an input to the process.



Packt .com

Subscribe to our online digital library for full access to over 7,000 books and videos, as well as industry leading tools to help you plan your personal development and advance your career. For more information, please visit our website.

## Why subscribe?

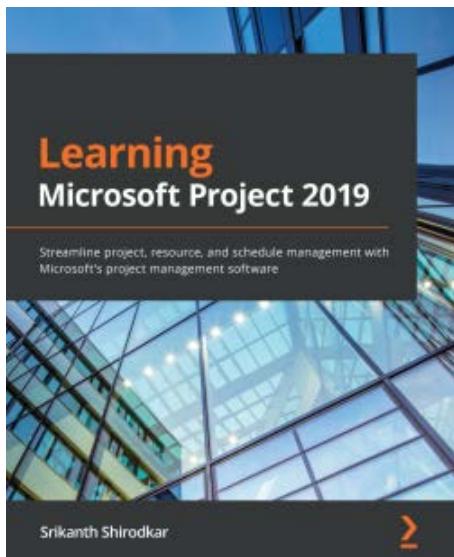
- Spend less time learning and more time coding with practical eBooks and Videos from over 4,000 industry professionals
- Improve your learning with Skill Plans built especially for you
- Get a free eBook or video every month
- Fully searchable for easy access to vital information
- Copy and paste, print, and bookmark content

Did you know that Packt offers eBook versions of every book published, with PDF and ePub files available? You can upgrade to the eBook version at [packt.com](http://packt.com) and as a print book customer, you are entitled to a discount on the eBook copy. Get in touch with us at [customercare@packtpub.com](mailto:customercare@packtpub.com) for more details.

At [www.packt.com](http://www.packt.com), you can also read a collection of free technical articles, sign up for a range of free newsletters, and receive exclusive discounts and offers on Packt books and eBooks.

# Other Books You May Enjoy

If you enjoyed this book, you may be interested in these other books by Packt:



## **Learning Microsoft Project 2019**

Srikanth Shirodkar

ISBN: 978-1-83898-872-2

- Create efficient project plans using Microsoft Project 2019
- Get to grips with resolving complex issues related to time, budget, and resource allocation
- Understand how to create automated dynamic reports
- Identify and protect the critical path in your project and mitigate project risks
- Become well-versed with executing Agile projects using MS Project

## Packt is searching for authors like you

If you're interested in becoming an author for Packt, please visit [authors.packtpub.com](http://authors.packtpub.com) and apply today. We have worked with thousands of developers and tech professionals, just like you, to help them share their insight with the global tech community. You can make a general application, apply for a specific hot topic that we are recruiting an author for, or submit your own idea.

## Leave a review - let other readers know what you think

Please share your thoughts on this book with others by leaving a review on the site that you bought it from. If you purchased the book from Amazon, please leave us an honest review on this book's Amazon page. This is vital so that other potential readers can see and use your unbiased opinion to make purchasing decisions, we can understand what our customers think about our products, and our authors can see your feedback on the title that they have worked with Packt to create. It will only take a few minutes of your time, but is valuable to other potential customers, our authors, and Packt. Thank you!



# Index

## Symbols

49 processes 56, 57

## A

Abilene's Paradox 555

accuracy

versus precision 347

acquiring resources process 398-400

Activity Attributes 554

Activity List 287, 554

activity on node (AON) 290

activity or task calendars 298

activity resources

estimating 394-397

key phrases 397

actual costs (AC) 327

adaptive project management 11, 87, 88

adjourning 229

Agile

about 10

considerations 254

history 177-180

versus predictive project

management 189-191

Agile Alliance 181

Agile approaches

benefits 191

Agile life cycle 200

Agile life cycle, Scrum events

about 200

Daily Scrum meeting 201

retrospective meeting 202

Sprint 201

Sprint planning 200

Sprint reviews 202

stand-up meetings 201

Agile Manifesto

about 181-183

history 181

Agile Manifesto, principles

Colocated Teams 186

Constant/Sustainable Pace 187

Continuous Attention 187

Customer Satisfaction 185

Face-Face Contact 186

Frequent Delivery 185

Motivated Individuals 186

Regular Reflection 187

Self-Organization 187

Simplicity 187

Welcome Changes 185

Working Software 186  
Agile mindset 192, 193  
Agile Practice Guide® 11  
Agile principles  
    key phrases 184  
Agile project charters  
    about 151  
    typical heading 151, 152  
Agile project management 87, 88, 151  
Agile scope 276  
Agile, team roles  
    about 195  
    Agile project manager 199  
    development team 199  
    product owner 196-198  
    Scrum coach 199  
    Scrum master 199  
alternative dispute resolution (ADR) 497  
ambiguity risks 431  
analogous estimates 300  
attributes 288  
attribute sampling 349  
authoritarian managers 234

## B

backward pass 307  
balanced matrix  
    about 118  
    key aspects 118  
benefit-cost ratio (BCR) 555  
budget  
    controlling 321  
Budget at Completion (BAC) 322

## C

Certified Associate in Project  
Management (CAPM®) 157

Change Control Board (CCB) 68, 158, 527  
closed procurements 495  
code of accounts 267  
Code of Ethics & Professional Conduct  
    about 219  
    reference link 218  
Code of Ethics & Professional  
    Conduct, categories  
fairness, aspirational standards 221  
fairness, mandatory standards 222  
honesty, aspirational standards 222  
honesty, mandatory standards 222  
respect, aspirational standards 221  
respect, mandatory standards 221  
responsibility, aspirational standards 220  
responsibility, mandatory standards 220  
communications  
    considerations 417  
    managing 421, 422  
    monitoring 422, 423  
communications management  
    Agile considerations 416  
    emerging best practices 413  
    key concepts 410-412  
    stand-up meetings 414  
    tailoring 415  
    trends 413  
communications management planning  
    about 418  
    key phrases 420  
    tools and techniques 419  
conduct procurements process  
    about 487, 488  
    bidder conferences 488  
    proposal evaluation 489  
Configuration Management  
    Knowledge Base 553

conflict, resolution strategies  
 about 212  
 collaborate and problem-solve 213  
 compromise/reconcile 213  
 force/direct 214  
 negotiation 215  
 smooth/accommodate 214  
 withdraw/avoid 214  
 conformance 348  
 context, of conflict  
 analyzing 211, 212  
 contract types, procurement management  
 about 475, 476  
 cost-reimbursable 477  
 fixed price 476  
 time and material contracts 479  
 control diagrams 373  
 control procurements process  
 about 493, 494  
 claims administration 494  
 data analysis 495  
 inspections and audits 495  
 seller surveys 495, 496  
 waivers 496, 497  
 warranty 496  
 Control Quality process 364-366  
 Control Scope process 275, 276  
 cost of poor quality (CoPQ) 348  
 cost of quality (COQ) 348  
 cost performance index (CPI) 328-331  
 cost reimbursable contracts  
 about 477  
 cost-plus-award-fee (CPAF) 477  
 cost-plus-fixed-fee (CPFF) 477  
 cost-plus-incentive-fee (CPIF) 478  
 cost/schedule performance  
 reporting 321  
 tracking 321

## D

Daily Scrum meeting 201  
 dashboards 365  
 data analysis 162  
 data representation  
 about 163  
 directions of influence 164  
 impact/influence grid 163  
 power/influence grid 163  
 power/interest grid 163  
 prioritization 165  
 salience model 164  
 stakeholder cube 164  
 David McClelland's theory, of needs  
 about 236  
 need for achievement 237  
 need for affiliation 238  
 need for power 237  
 decision models  
 about 96  
 cost-benefit analysis 97  
 payback period 98  
 scoring models 97  
 decomposition 266  
 define activities process  
 about 287, 288  
 progressive elaboration 288  
 rolling wave planning 288  
 definition of done 226  
 development life cycles 89  
 development team 199  
 direct costs 318  
 Disciplined Agile (DA) 10, 193  
 diversity and inclusion  
 supporting 218, 223  
 documents and plans 65  
 Douglas McGregor's Theory X  
 about 233

X managers 233  
Douglas McGregor's Theory Y  
about 233  
Y managers 234  
Drucker, Peter 405  
Dr. William Ouchi's Theory Z 234  
duration estimation  
about 297  
factors, affecting project schedule 297-299  
durations  
estimating 297

## E

earned schedule theory 327  
earned value management (EMV)  
about 315, 322  
Budget at Completion (BAC) 322, 323  
cost performance index (CPI) 328-330  
cost variance (CV) 327, 328  
earned schedule (ES) 327  
earned value (EV) 323, 324  
forecasting 331, 332  
planned value (PV) 324, 325  
schedule performance index (SPI) 326, 327  
schedule variance (SV) 325, 326  
To-Complete Performance  
Index (TCPI) 333, 334  
economic models  
about 99  
discounted cash flow analysis 99  
internal rates of return (IRR) 100, 101  
net present value (NPV) 100  
effective servant leader  
characteristics 224  
empirical process control 188  
Enterprise Environmental Factors  
(EEFs) 61, 62, 548  
estimate at completion (EAC) 331, 495  
estimate to complete (ETC) 331

expert judgement 144  
eXtreme Programming (XP) 195

## F

factors, affecting project schedule  
dates 297  
duration 299  
effort 298  
fast-tracking 292  
firm-fixed-price (FFP) 476  
fishbone diagram 369  
fixed price contracts  
about 476  
fixed-price-incentive-fee (FPIF) 476  
fixed-price-with-economic-price-  
adjustment (FPEPA) 476  
fixed-price-incentive-fee (FPIF) 476  
fixed-price-with-economic-price-  
adjustment (FPEPA) 476  
flowcharts 356  
formal authorization 146  
formal change control processes 321  
Frederick Herzberg's theory of  
hygiene 235, 236  
free float 309  
functional managers 159, 160  
functional organizations  
about 116  
key aspects 116, 117  
funding limit reconciliation 320  
future value (FV) 555

## G

Gantt charts 365  
grade  
about 346  
versus quality 346

## H

hard logic 289  
 high-level requirements  
   documenting 144  
 highly disciplined process 367  
 histograms 366, 367

## I

identify risks process  
   about 439, 440  
   prompt lists 444  
   risk register, creating 445  
   risk report 445  
   root cause analysis 441  
   SWOT analysis 442, 443  
 indirect costs 318  
 Inputs, Tools and Techniques, and  
   Outputs (ITTOs) 58-61, 438  
 institutional power 237  
 integrated change control  
   inputs 527  
   outputs 528  
   performing 527-530  
   tools and techniques 528  
 Internal Rate of Return (IRR) 105, 555  
 International Organization for Standardization  
   (ISO 9000 series) 346  
 Ishikawa diagram 368

## J

Just-in-Time (JIT) 386

## K

Kaizen 359, 386  
 key performance indicators (KPIs) 365  
 key phrases 83

key project stakeholders  
   about 106  
   change control board (CCB) 109  
   customers/end users 112  
   functional manager 111  
   key phrases 112  
   PMOs 107, 108  
   procurement administrator/vendors 111  
   sponsor 109, 110  
 knowledge areas  
   overview 52-56  
   project communications management 54  
   project cost management 54  
   project integration management 53  
   project procurement management 55  
   project quality management 54  
   project resource management 54  
   project risk management 55  
   project schedule management 53  
   project scope management 53  
   project stakeholder management 55  
   scope of work 54  
 knowledge management systems 365

## L

lag time 295  
 leadership 132  
   versus management 134  
 leadership styles  
   about 134, 135  
   charismatic 135  
   interactional 135  
   laissez-faire 135  
   servant leadership 135  
   transactional 135  
   transformational 135  
 lead time 296  
 lean management 386

learning styles  
about 36-38  
aural (auditory-musical) 38, 39  
logical (mathematical) 38, 39  
physical (kinesthetic) 38-40  
social (interpersonal) 38-40  
solitary (intrapersonal) 38  
verbal (linguistic) 38  
visual (spatial) 38  
logical data model 357  
lower control limits (LCL) 373

## M

make-or-buy analysis 474  
management  
versus leadership 134  
Management by Objective (MBO) 405  
Manage Quality process 362-364  
Maslow's hierarchy of needs  
about 231  
esteem needs 232  
physiological needs 231  
safety needs 232  
self-actualization 233  
social needs 232  
master service-level agreement  
(MSLA) 160, 492  
matrix diagrams 357  
matrix organizations  
about 117  
balanced matrix 118  
key aspects 118  
strong matrix 118  
weak matrix 117  
memorandum of understanding (MOU) 152  
milestones  
about 287, 288  
discretionary 288

mandatory 288  
mind mapping 357

## N

negative float 310  
net present value (NPV) 105, 555  
non-conformance 348  
non-event risks 431

## O

Object-Oriented Programming,  
Systems, Languages, and  
Applications (OOPSLA) 193  
opportunity responses  
about 454  
accept 455  
enhance 455  
escalate 455  
exploit 455  
share 455  
Organizational Process Assets  
(OPAs) 61-64, 548  
organizational structures  
about 112-116  
elements 114, 116  
functional organizations 116  
matrix organizations 117  
project-based organizations 119, 120  
organizational structure types 552  
Organization Project Management (OPM) 550

## P

parametric estimates 300  
Pareto diagram 369, 370  
Pareto Principle 369  
partner-centric procurement documents  
about 490

- breach of contract 491
- cease and desist letter 492
- letter of intent 491
- Memorandum of Understanding (MOU) 491
- nondisclosure agreement (NDA) 492
- Purchase Order (PO) 492
- Service Level Agreements (SLA) 492
- performance measurement tools 365
- phase gates 91
- Plan-Do-Check-Act 355, 359
- planned values (PV) 324, 325
- planning, for quality management
  - about 355, 356
  - data representation 356, 357
  - quality checklists 358, 359
  - quality management plan 357, 358
  - quality metrics 358
- PMBOK® Guide 9
- PMI exam
  - about 545, 546
  - changes 545
  - formulas 556
  - question types 560
  - study tips 547, 548
- PMI exam, information
  - searching 543
- PMI exam, objectives
  - reviewing 543
- PMI exam, project
  - about 548
  - need for 549, 550
- politics 132
- portfolio
  - about 83
  - versus program 550
  - versus project 550
- positive float 310
- power 132
- precedence network diagram 297
- precision
  - versus accuracy 346, 347
- predecessor and successor 309
- predictive project management
  - about 87
  - versus Agile 189-191
- predictive project management (PMP®) 10
- predictive scope 275
- present value (PV) 555
- process flow diagram 366
- process groups 50, 51
- procurement management
  - considerations, for Agile/Adaptive environments 473, 474
  - contract types 475
  - key concepts 472, 486
  - planning 474, 475
  - roles 479
  - roles, project manager 480
  - trends and emerging best practices 473
- procurement management, roles
  - procurement documents, reviewing 481, 482
- Procurement SOW (PSOW) 480
- single source 482
- sole source 482-486
- source selection criteria 480, 481
- procurement managers 161, 162
- procurement statement of work (PSOW) 161
- product owner 196-198
- program 82
- Program Evaluation and Review Technique (PERT) 301
- progressive elaboration 80, 144
- project
  - defining 78, 79

- temporary 79
- unique 80, 81
- project-based organizations
  - about 119, 120
  - key aspects 119
- project calendars 297
- project charter
  - criteria 146, 147
  - goals 139-144
  - inputs 152, 153
  - objectives 139-144
  - tools and techniques 153
  - typical heading 148-150
- project communications management 54
- project coordinators 157
- project cost management
  - about 54
  - bottom-up estimates 317
  - budget, determining 319, 320
  - considerations, for Agile and
    - adaptive environments 315
  - costs, estimating 316-318
  - key concepts 314
  - plan 316
  - tailoring considerations 315
  - trends and emerging best practices 315
- project documents
  - about 67-69
  - rules 69
- project integration
  - about 137
  - cognitive level 138
  - context level 138
  - process level 138
- project integration management 53
- project knowledge
  - inputs 522
  - managing 522-524
- outputs 523
- tools and techniques 523
- project life cycles 89
- project management
  - about 84, 85
  - data 554, 555
  - fundamental rules, for inputs and outputs 69
  - information 554, 555
  - types 86, 87
- project management, certification
  - application 543
  - application, audit 544
  - application, updates 544
  - hours, calculating for application 544
  - need for 542
- project management, data and information
  - about 93
  - key phrases 94
  - work performance data 93
  - work performance information 93
  - work performance reports 93
- project management, documents
  - about 551
  - Business Case 551
  - Project Benefits Management Plan 551
  - Project Charter 551
  - Project Management Plan 551
- project management education 17
- Project Management Information System (PMIS) 93, 144, 258, 445, 521, 549, 553
- Project Management Institute (PMI)<sup>®</sup> 9, 157
- Project Management Offices (PMOs)
  - about 63, 107, 108, 118, 158, 553
  - controlling PMO 107
  - directive PMO 107
  - supportive PMO 107
- project management plan
  - about 67-69

- developing 518, 520
- inputs 518
- outputs 518
- rules 70
- tools and techniques 518
- Project Management Professional Certification (PMP®)
  - about 157
  - need for 4, 5
- Project Management Professional (PMP)® exam
  - about 11-16
  - applying 18-25
  - study tips 34, 35
- project management rules
  - sequencing 70
- project management rules, for handling
  - tools and techniques
    - about 71
    - communication skills 71
    - data analysis 71
    - data gathering 71
    - data representation 71
    - decision-making 71
    - interpersonal and team skills 71
- project managers
  - about 132, 137
  - personality traits 136, 137
  - powers 133, 134
  - role 123, 124
  - roles 215
  - skills 551, 552
  - vision and mission, setting for 215
- project manager, soft skills
  - about 216
  - active listening 218
  - communication 217
  - leadership 216
- team-building 217
- project/phase
  - about 90
  - attributes 90
  - closing 530-533
  - inputs 530, 531
  - outputs 532
  - tools and techniques 531
- project procurement management 55
- project quality management 54
- project resource management 54
- project risk management 55
- projects 132
- project schedule
  - developing 304, 305
- project schedule development techniques
  - critical chain 310
  - critical path 305-310
  - Monte Carlo technique 311
  - resource optimization 313
  - schedule compression 311
- project schedule management 53
- project scheduler 157
- project scope management 53
- project selection techniques
  - about 94, 95
  - business case 104, 105
  - business case, creating 95, 96
  - constrained optimization 101, 102
  - decision models 96
  - economic models 99
  - expert judgment 102
  - feasibility analysis 103
  - key phrases 105, 106
- project sponsor 146
- project stakeholder management 55
- Project Statement of Work (SOW) 554
- project team 158

project work  
controlling 524-526  
directing 520-522  
inputs 520, 524, 525  
managing 520-522  
monitoring 524-526  
outputs 521, 526  
tools and techniques 521, 525  
proposal evaluation, conduct procurements  
contract administrator/agreement  
coordinator/procurement team 489, 490  
screening system 489  
weighting system 489

## Q

qualitative risk analysis  
expected monetary value (EMV) 448-452  
performing 445-448  
phrases 447  
quality  
about 346  
versus grade 346  
quality assurance 355  
quality checklists 358  
quality management  
agile/adaptive environments 352  
emerging practices 350  
key concepts 346  
key phrases 362  
retrospectives 352-354  
tailoring considerations 351  
trends 350  
quality management, gurus  
about 359  
Crosby, Phillip 361  
Deming, W. Edwards 359  
Juran, Joseph 360  
Pareto, Vilfredo 360

Shewhart, Walter A 359  
Smith, Bill 360  
Taguchi, Genichi 361  
quality management plan 357, 358  
quality management planning, considerations  
about 347  
attribute sampling 349  
prevention over inspection 348  
tolerance levels 349  
quality metrics 358

## R

RACI chart 389, 390  
registered education providers (REPs) 17  
relationships  
about 290  
finish to finish relationships 293  
finish to start relationships 291  
start to finish relationships 294  
start to start relationships 292  
requirements  
collecting 257-260  
requirements management plan  
developing 255-257  
Requirement Traceability Matrix (RTM) 554  
resource breakdown structure  
(RBS) 396, 437, 554  
resource calendars 298  
resource management  
emerging practices 386  
key concepts 384, 385  
trends 386  
resource management plan  
overview 241  
resource management planning  
about 387-391  
headers 391, 392  
inputs 392

key phrases 394  
 outputs 393  
 tools and techniques 393  
**resources**  
 controlling 408-410  
**Responsibility Assignment Matrix (RAM)** 388, 554  
 resume producing event (RPE) 318  
 retrospective meeting 202  
 return on investment (ROI) 95, 105, 466  
 reward and recognize 238-241  
**Risk Breakdown Structure (RBS)** 437, 554  
**risk management**  
 considerations, for Agile and Adaptive environment 434  
 considerations, tailoring 433  
 key concepts 430  
 non-event risks 431-433  
 plan 434-438  
 trends and emerging best practices 430  
**risk responses**  
 creating, for threats 452  
 implementing 459  
 issue logs 457, 458  
 opportunity responses 454  
 planning 452  
 risk owners 456, 457  
 risk triggers 456  
 strategies, for overall project risk 456  
 risk responses, creating for threats  
 about 452  
 accept category 453  
 avoid category 453  
 contingent response strategy 454  
 escalate category 452  
 mitigate category 453  
 transfer category 453  
 risk responses implementation  
 about 459

ITTOs 460  
 residual risk events 461  
 secondary risks 461  
**risks**  
 monitoring 461-463  
**risks, categories**  
 opportunities 319  
 threats 319  
**role delineation study (RDS)** 88  
**rolling-wave planning** 268  
**run charts** 371  
**S**  
**scatter diagrams** 372  
**schedule**  
 controlling 321  
**schedule baseline** 313, 314  
**schedule compression, ways**  
 crashing 312  
 fast tracking 312  
**schedule management**  
 considerations, for Agile and adaptive environments 285  
 key concepts 284  
**schedule management plan**  
 considerations 286, 287  
 developing 286  
**scheduling**  
 tailoring considerations 285  
 trends and emerging best practices 284  
**scope**  
 controlling 273, 274  
 defining 261-264  
 monitoring 273, 274  
**scope creep** 268, 274  
**scope management plan**  
 developing 255-257  
**scope management trends** 252, 253

- scope of work 54
- scope statement
  - defining 261-264
- Scrum
  - about 188
  - overview 193
- Scrum Alliance®
  - URL 353
- Scrum master 199
- Scrum, pillars
  - adaptation 194
  - inspection 194
  - transparency 194
- self-organizing and cross-functional 199
- sellers 160
- sequencing activities
  - about 289
  - dependencies 289
  - goal 289
- sequencing activities, dependencies
  - discretionary 289
  - external 290
  - internal 290
  - mandatory 289
- service-level agreement (SLA) 152, 160, 473
- Sigma variables 368
- Six Sigma 367
- SMART
  - about 405
  - attainable 406
  - measurable 406
  - realistic 407
  - specific 406
  - time-based 407
- soft costs 387
- soft logic 289
- source, of conflict
  - interpreting 210, 211
- sponsor 109, 110, 158
- spot check
  - about 188
  - solution 189
- Sprint
  - about 201
  - reviews 202
- Sprint planning 200
- stage, of conflict
  - interpreting 210, 211
- stakeholder analysis 162
- stakeholder engagement, managing
  - about 510, 511
  - outputs 510
  - tools and techniques 510
- stakeholder engagement, monitoring
  - about 511, 512
  - tools and techniques 511, 512
- stakeholder engagement, planning
  - about 506-509
  - categories 509
  - inputs 507
  - tools and techniques 508
- stakeholder management 154, 155
- stakeholder register 165-167
- stakeholders
  - about 156
  - change control board (CCB) 158
  - functional managers 159, 160
  - process, identifying 156
  - procurement managers 161, 162
  - project coordinators 157
  - Project Management Office (PMO) 158
  - project scheduler 157
  - project team 158
  - sellers 160
  - suppliers 160
  - vendors 160

standard deviation 303  
 stand-up meeting 201  
 statement of work (SOW) 145  
 status reporting 365  
 strategic avoidance 214  
 strong matrix 118  
**Supplier, Inputs, Process, Output, Customer (SIPOC) model** 356  
 suppliers 160

## T

tailoring  
 considerations 253  
 team  
 developing 401-403  
 managing 403, 404  
 team charter  
 influencing 226-229  
 inspiring 226-229  
 motivating 226-229  
 potential headers 240  
 team management  
 considerations 239, 240  
 team members' influence  
 analyzing 242  
 team performance  
 supporting 405  
 team stakeholders' influence  
 analyzing 242  
 techniques, for fixing overallocation  
 leveling 313  
 smoothing 313  
 theories 230  
 Theory of Constraints (TOC) 386  
 three-point estimates 300-304  
 time and material (T&M contracts) 479

To-Complete Performance Index (TCPI) 333, 334  
 top-down estimate 141  
 total float 309  
 Total Productive Maintenance (TPM) 386  
 triangular distribution 302, 303  
 Tuckman-Jensen model 229  
 two-factor theory 235

## U

upper control limits (UCL) 373

## V

Validate Scope process 274  
 value servant leadership  
 about 223, 224  
 characteristics 225  
 variability risks 431  
 vendors 160  
 Volatility, Uncertainty, Complexity, and Ambiguity (VUCA) 444

## W

waterfall project management 10, 87  
 WBS dictionary  
 about 270  
 information 271-273  
 weak matrix  
 about 117  
 key aspects 117  
 weighted average duration estimate 302  
 work authorization system (WAS) 553  
 work breakdown structure  
 (WBS) 197, 264-269, 287, 437, 554  
 work package 268