Slide 1

Scan Me!
Its for attendance...
Or type this into a browser
https://forms.gle/9xrEw1ReHfbwSTa7

PM CERTIFIED
So fast it's past tense

1

Slide 2

Credits

This course is based on the
- PMBOK® Guide 6th edition.
- PMBOK® Guide 7th edition.
- PMI Agile Practice Guide.

- PM Certified LLC

Websites
- www.pmi.org
- www.pmcertified.net
- https://home.pearsonvue.com

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AGILE
PRACTICE GUIDE

PMBOK® GUIDE
SIXTH EDITION

Project Management Body of Knowledge

First Edition (1996)
Second Edition (2000)
Third Edition (2004)
Fourth Edition (2008)
Fifth Edition (2013)

2

Learning Objectives

3

- Create your PMBOK® to English decoder ring.
- Introduced to the 49 PMI project management processes
- Learn the PMBOK® Guide terminology.
- Understand the concepts behind all components of a project management plan.
- Understand how use all the tools and techniques discussed in the PMBOK® Guide.
- Learn how to use PMI® terms to defeat test questions.
- Understand how methodology can effect "good practice"

3

Course Administrative Notes

4

- This Course is 5 days in duration

- Meeting from 7:30 AM to 4:00 PM

- Lunch at 1200

- Breaks taken as needed

4

Course Agenda

Day 1: PMI's PMP credential and Initiating Process Groups
- PMI
- The PMP Exam
- Application and study methods
- Business application
- The Initiating Process Group

PMI's "good practice" in organizational project planning and how that is tested on the PMP exam

Day 2: Planning Process Group
PMI's "good practice" in project planning and how that is tested on the PMP exam

Day 3: Planning Process Group
PMI's "good practice" in project management and how that is tested on the PMP exam

Day 4: Execution, Monitor and Controlling Process Groups
PMI's PMP credential review and application information followed by a PMP exam simulation based off the current PMI testing program.

Knowledge Areas	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

Table 1-4 (Guide). Project Management Process Group and Knowledge Area Mapping
A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition. ©2017 Project Management Institute, Inc. All rights reserved.

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The PMP Credential

- It does not mean you are a good project manager.

- Signifies to the organization that you have years of project management experience.

- Tells others that you are fluent in the global language of project management as defined in the PMI lexicon.

- It indicates that you have studied the 40,000+ industry studies that have been used to create the "good practice" that makes up the PMBOK® Guide.

- It is also supposed to mean that you have studied a variety of project methodologies and know when to use one over another (for instance when to use Agile and when to use Waterfall).
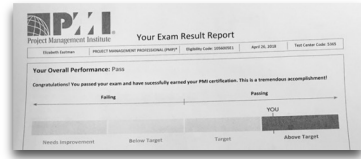
https://www.pmi.org/certifications/project-management-pmp/earn-the-pmp/why-the-pmp

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The PMP Exam

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- 180 questions randomly selected when you start the test
- You have 3 Hours and 50 min to complete the test.
- Questions are multiple-choice, diagrams, matching, etc.
- 5 of the questions are not graded (they are experimental).
- You only get points for correct answers.
- You can mark questions for review, and you can skip questions.
- You can go back and change any answer during the exam.
- You're not given a score at the end of the exam.

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The PMP Exam

8

- All test questions are scenario-based and comprised of three parts.
  - The background
  - The question
  - The answer block

- 180 total questions (5 are experimental)

Domain		Methodologies	
People	42%	Predictive	50%
Process	50%	Agile	25%
Business Environment	8%	Hybrid	25%

Read more *Project Management Professional (PMP)® Examination Content Outline*, June 2021

https://www.pmi.org/-/media/pmi/documents/public/pdf/certifications/pmp-examination-content-outline.pdf?v=0c0b33c1-dc44-4fa9-9111-a403abcb23f4&sc_lang_temp=en.

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The Application

- The PMP® application process is the largest barrier to achieving the credential.

- There are two prerequisites that you must meet in order to take the exam.
  - Formal Project Management Education 35 hrs
    - This course will give you the 35 hrs required
  - Months of Project Management Experience
    - 4-year degree or higher 36 months
    - No degree 60 months

- https://www.pmi.org/certifications/project-management-pmp/earn-the-pmp/how-to-apply

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If You Get Audited

-Most audits are cleared up within a few weeks, but the audit must be completed in 90 days. If you are selected for random audit, you must:

- Verify your education level
  -Does not need to be an official transcript

- Prove your PM education
  -You will be given a PDF certificate of completion for this course on the last day.

- Get signatures from each point of contact
  -This is what will take the longest depending on how many entries you had on the application.

- https://www.pmi.org/certifications/certification-resources/faq

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The PMBOK Guide

- PMI was founded in 1969 by a group of project managers focusing on best practice observed in the emerging aerospace industry.

- This First PMBOK® Guide was printed in 1996 after 15 years of development and industry study.

- The PMBOK® Guide has been updated every four to five years.

- The PMBOK® Guide is a collection of "good practice" grouped into processes.

- The knowledge that is retained in the PMBOK® has grown over time and will continue to grow as our industry changes.

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All Referenced Materials on the PMP Exam

1. *Agile Practice Guide*

2. *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)**

3. *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*

4. *Effective Project Management: Traditional, Agile, Extreme, Hybrid*

5. *Fundamentals of Technology Project Management, 2nd Edition*

6. *Project Managers Portable Handbook, 3rd Edition*

7. *Information Technology Project Management, 7thEdition*

8. *Essential Scrum: A Practical Guide to the Most Popular Agile Process*

9. *Project Management: The Managerial Process*

10. *The Project Management Tool Kit: 100 Tips and Techniques for Getting the Job Done Right*

https://www.pmi.org/certifications/project-management-pmp/earn-the-pmp/pmp-exam-preparation/pmp-reference-list

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Exam Concepts
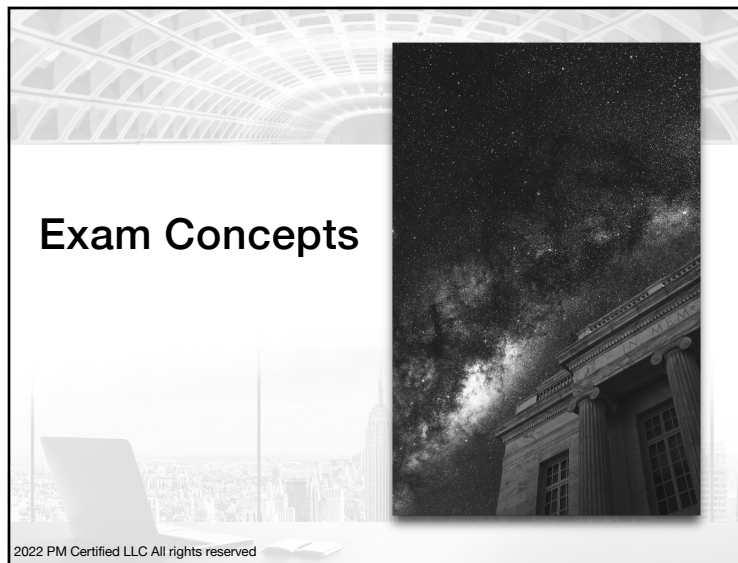
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Project, Program and Portfolio

- Project definition from PMBOK Guide®

"A project is a temporary endeavor undertaken to create a unique product, service, or result." (*PMBOK® 6th edition Guide, page 4*)

Projects are typically created to enhance operations or as a result of operations see *PMBOK® Guide, page 9*

Organization's Business Strategy
Portfolio
Program
Project
Phase
Deliverables
Work Package
Activities

14

15

What is a Phase

- Phases are used as divisions within a project or program and are usually named after terms common to the organization.

Feasibility → Design → Develop → Deploy

- Phase-to-Phase Relationships
  Sequential: a phase can only start once the previous phase has completed.
  Overlapping: a phase starts prior to the completion of the previous phase.

Phase 1 → Phase 2 → Phase 3 → Phase 4

Red
Amber
Yellow
Green

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Project Methodologies

- Remember the PMP is **NOT** a methodology!

- All planning methodologies were taken into consideration in the creation of the PMBOK®.

- "Tailoring" is used to take the "good practice" and to create your own or an organization's methodology.

- Examples of a few project management methods:

  o Waterfall
  o Stem and leaf
  o PERT
  o Critical Path Method
  o Rolling Wave
  o Agile
  o Scrum
  o Kanban
  o Extreme Programing
  o LEAN

  PMI has grouped all the different methodologies into five Project Life Cycle they are defined on page 19 but a better graphic can be see on page 666 to explain them.

  Key concept: The project methodology that is used for a project is largely determined by the environment the project exists in, no one project life cycle is better than another.

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Project Methodologies

- The 2022 PMP exam will force the student to understand at least two groups or buckets of Project Methodology.

- "Predictive" - all project methodologies that intentionally have one planning phase.

- "Agile" - all project methodologies where a firm grasp of all project requirements is not needed to start work. Work is used as a way of discovering requirements through a cyclical pattern of plan-work-validate in this each cycle has a mini "planning phase"

"About half of the examination will represent predictive project management approaches and the other half will represent agile or hybrid approaches."

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PMI PMP Examination Content Outline – January 2021

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Understanding Agile

- **Agile** is an umbrella term that covers a variety of methods. All of the methods are grouped into agile because they fulfill the Agile values.
  - Scrum
  - Crystal
  - Scrumban
  - Agile Unified Process AUP
  - Extreme Programing
  - Feature Driven Development FDD
  - Scaled Agile Framework SAFe

- Agile brings order to the chaos using structured process done in iteration; each iteration is referred to as a *sprint*. The length of the iterations can be uniform (Iteration-Based Agile) or varying in length (Flow-Based Agile). The use of product backlog is a typical tool in Agile to understand the work to be done in a sprint as requirements are defined. Work is added to the product backlog.

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Understanding Agile

- **Agile Alliance vs Scrum Alliance –** Two competing organizations that offer certificates in Agile methodology. PMI has partnered with the the Agile Alliance to write the *Agile Practice Guide*.

- **Agile Mindset –** "A way of thinking and behaving underpinned by the four values and 12 principles of the Agile manifesto".

- **Agile Manifesto –** Written in 2001 by 17 developers

  - **4 Paired Values**

    1) <u>Individuals and interactions</u> **over** processes and tools
    2) <u>Working software</u> **over** comprehensive documentation
    3) <u>Customer collaboration</u> **over** contract negotiation
    4) <u>Responding to change</u> **over** following a plan"

Project Management Institute, *Agile Practice Guide*, Project Management Institute Inc., 2017, Page 150. Copyright and all rights reserved.

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Understanding Agile

- **12 Agile Principles**

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.

2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.

3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.

4. Business people and developers must work together daily throughout the project.

5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.

6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.

Project Management Institute, *Agile Practice Guide*, Project Management Institute Inc., 2017, Page 9. Copyright and all rights reserved.

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Understanding Agile

- **12 Agile Principles**

7. Working software is the primary measure of progress.

8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.

9. Continuous attention to technical excellence and good design enhances agility.

10. Simplicity - the art of maximizing the amount of work not done – is essential.

11. The best architectures, requirements, and designs emerge from self-organizing teams.

12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Project Management Institute, *Agile Practice Guide*, Project Management Institute Inc., 2017, Page 150. Copyright and all rights reserved.

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Understanding Agile

Agile Project Team Positions

- Team Facilitator - Sometimes called a project manager, scrum master, project team lead, or team coach. Uses servant leadership, which focuses on understanding and addressing the needs of the team in order to enable high performance. Removes project impediments and paves the way for others' contribution

- Product Owner - Guides the direction of the product by prioritizing work based on its business value from the perspective of the end user.

- Team Member - Cross-functional teams can deliver finished work in the shortest possible time with higher quality and fewer external dependencies.

- Agile Coach - Focused on ensuring agile development and project life cycles are being done properly Coaches can be internal or external to the organization.
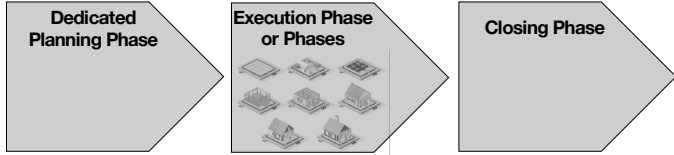
Project Management Institute, *Agile Practice Guide*, Project Management Institute Inc., 2017, Page 150. Copyright and all rights reserved.

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Agile vs Predictive

- Lets say we are going to use a "Predictive" project methodology to build a home.

- Planning – Usually a phase is dedicated to planning for the entire project this mitigates risk in the doing of project work.

Dedicated Planning Phase   **Execution Phase or Phases**   **Closing Phase**

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Agile vs Predictive

- Lets say we are going to use an "Agile" project methodology to build a home.

- Each phase or cycle of the agile project typically follows the same rhythm of event that are referred to as "Common Agile Practice or the "Scrum Ceremonies".

- Time Boxed events that occur once in a cycle

Backlog Preparation   The Sprint   Sprint Review   Sprint Retrospective

- Repeated or never ending events

The Daily Standup   Backlog Refinement

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Agile vs Predictive

- Now planning has been spread across the project as a portion of each phase or cycle. This allows the team to take advantage of Progressive Elaboration in order to maximize business value in the final product.

- As a result of this method risk in the doing of the work takes a back seat to the risks at the end of the project like customer satisfaction.
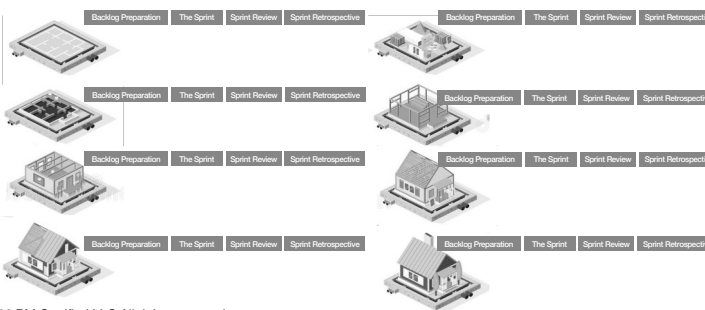
25

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Agile vs Predictive

- Lets say we are going to use a "Agile" project methodologies to build the same home.

26

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Agile vs Predictive

- An attempt to understand the difference was made on p. 19 of the Agile Practice Guide

Figure 3-1 , page 19, Project Management Institute, *Agile Practice Guide*, copyright 2017. Copyright and all rights reserved.

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The PMO
and How Organizations Effect Project Management

- The **PMO** is a segment of the organizations created with the intent of aiding the organization's project management efforts by:
  - Gathering and disseminating best practice
  - Coordinating resources between projects
  - Developing project managers
  - Providing governance to project management with policies, procedures, and templates
- The PMO can be structured in many ways. PMI has categorized all PMOs by power.
  - **Supportive**: Passive, almost no power
  - **Controlling**: Actively implements project governance
  - **Directive**: Directly manages the PMs
- How the organization is structured can also effect how a project management is conducted. PMI has attempted to group all organizations in to ten types on page 47, table 2-1.

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The Project Management Plan

- <u>The Project Management Plan</u> is the document created by the Project Manager detailing how the project will meet the project objectives and goals. Typically this is done with the use of three baselines
  - **Scope Baseline**
  - **Schedule Baseline**
  - **Cost Baseline**

- The Project Management Plan also details how the project will be controlled and reported as it moves through time to completion. To do this we usually use something called the **Performance Measurements Baseline**.

- The Project Management Plan can also include a variety of additional "plans" and "project documents" depending on the type of project. All can be seen on PMBOK® Guide page 89.

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What Is a Process?

- PMI has divided the "good practices" into 49 processes. These processes make up the PMBOK® Guide. Each Process is an attempt to create something; referred to as a process **output**. A process may have many outputs but will have at least one.
- To create this output, PMI has recognized several **tools and techniques** that could be used to make the outputs
- Depending on the tool and technique that is deemed best or appropriate, the process will require several **inputs**.
- For this reason PMI has broken down each process into Inputs, Tools and Techniques, and Outputs

Inputs	Tools and Techniques	Outputs
1.Bla bla bla 2.Bla bla bla 3.Bla bla bla	1.Bla bla bla 2.Bla bla bla	1.Bla bla bla

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The Tools and Techniques

- A tool and technique is a way of doing a process. This is how the project manager turns inputs into outputs.
- Not all tools and techniques discussed for a process are necessary in order to create the outputs. Usually the project manager will use one or a combination of the tools, but not all of them.
- Starting on page 685 PMI has grouped the tools and techniques into 7 groups. It is helpful to know the 7 types and each subtype for exam success.
  - Data Gathering
  - Data Analysis
  - Data Representation
  - Decision Making
  - Communication Skills
  - Interpersonal and Team Skills
  - Ungrouped tools

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Stakeholders

- A Stakeholder is any entity affected by the project.

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EEFs and OPAs

- **Organizational Process Assests** or OPAs: The things you use by preference to help you do a process.
Two subtypes:
  - Processes and Procedures
  - Organizational Knowledge Repositories

- **Enterprise Environmental Factors** or EEFs: Laws rules, regulations, and culture.
  - Internal to the organization
  - External to the organization

- Do not worry about the general difference between the two; it will be clearer in the context of a process.

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The Ten Knowledge Areas

- A Knowledge Area is a group of process that are similar in the type of experience or insight needed to do the process.

- PMI has grouped all the processes in the PMBOK® Guide by Knowledge Area so that the PMBOK® reads as follows:

  - (4.0) Project Integration Management
  - (5.0) Project Scope Management
  - (6.0) Project Time Management
  - (7.0) Project Cost Management
  - (8.0) Project Quality Management
  - (9.0) Project Human Resource Management
  - (10.0) Project Communications Management
  - (11.0) Project Risk Management
  - (12.0) Project Procurement Management
  - (13.0) Project Stakeholder Management

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The Five Process Groups

- A Process Group is a grouping of process by what they create, not necessarily a timeline in which they are done.

Good idea to making the project real

Monitoring & Controlling Process Group
(Make sure the project goes according to the plan)

Initiating → Planning → Executing → Closing

PM Plans for the project

The deliverables are accepted

The team does the plan
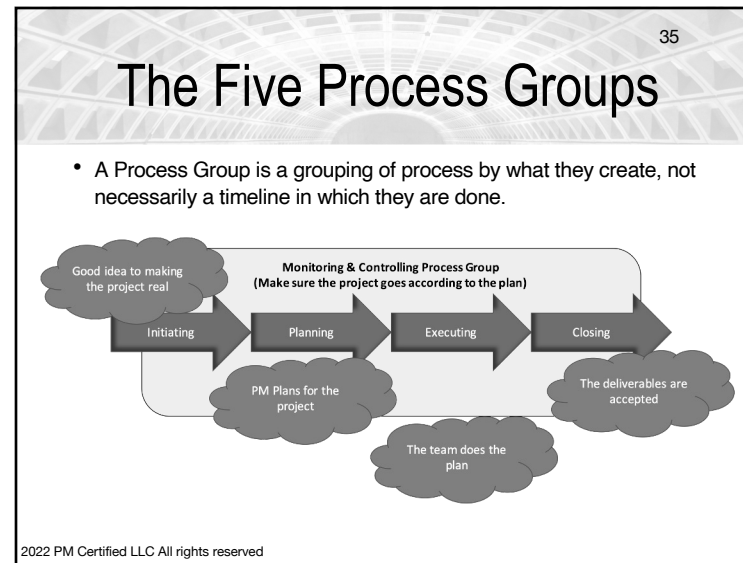
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Initiating Process Group

In this grouping of process, the organization works to make the project real. There are only two processes in this process group:

- 4.1 Develop Project Charter
- 13.1 Identify Stakeholders

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Integration Knowledge Area

This knowledge area is used to tie all the processes within process groups together into the big "so what."

- 4.1 Develop Project Charter
- 4.2 Develop Project Management Plan
- 4.3 Direct and Manage Project Work
- 4.4 Manage Project Knowledge
- 4.5 Monitor and Control Project Work
- 4.6 Perform Integrated Change Control
- 4.7 Close Project or Phase

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4.1 Develop Project Charter

<u>Key Concept</u>: This process formally authorizes the existence of a project and empowers the project manager with the l<u>imited</u> authority to insure project success.

Inputs	Tools and Techniques	Outputs
1. Business Documents - Business Case - Benefits Management Plan 2. Agreements 3. EEFs 4. OPAs	1. Expert Judgment 2. Data Gathering - Brainstorming - Focus Group - Interviews 3. Interpersonal and Team Skills - Conflict Management - Facilitation - Meeting Management 4. Meetings	1. Project Charter 2. Assumption Log

Figure 4-2 , page 75, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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4.1 Develop Project Charter

Inputs

1. **Business Documents**
- Business Case - This is a document that explains why this project was selected over competing efforts maybe because of a strategic opportunity or market conditions.
- Benefits Management Plan - This plan listed the tangible and intangible benefits expected from the project. It can also detail how these benefits align with other efforts within the organization contributing to business goals. More on Benefits Management can be read on p. 33.
2. **Agreements** - typically a contract, but not always; it could also be a MOU for example.
3. **EEFs**
4. **OPAs**

Figure 4-2 , page 75, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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4.1 Develop Project Charter

Tools and Techniques

1. **Expert Judgment** - One of the most common tools—it is just the utilization of an expert or SME, in this case maybe the project management office.
2. **Data Gathering**
- Brainstorming
- Focus Group
- Interviews
3. **Interpersonal and Team Skills**
- Conflict Management
- Facilitation
- Meeting Management
4. **Meetings**

Figure 4-2 , page 75, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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4.1 Develop Project Charter

Outputs

1. **Project Charter** - This is a document that defines the project at a high level, empowers the project manager, and controls the project manager. It should be approved by the Sponsor.
- **Defining the project**: typically this is from the SOW or contract that was used to create the project. This definition will include high-level requirements, details about the project deliverables and high-level risk events, as well as a strategic reason as to why this project was selected.
- **Empowering the PM**: The Charter should name the PM, as well as empower this person with control over resources in order to get the project done.
- **Controls the PM**: The Charter often uses different mechanisms to control project managers. Examples could be deadlines, milestones, reports, definition of done, success criteria.
2. **Assumption Log** - This is a list of items that are considered to be true, but will require clarification as the project moves forward.

Figure 4-2 , page 75, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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4.1 Develop Project Charter

New Terms from 2021 Exam Change

- **Project Overview Statement -** Communicates enterprise-wide the intent and the vision of the project

- **Definition of Done DoD -** Criteria that must be met so that the deliverable can be considered ready for customer use

- **Definition of Ready DoR -** A set of user centric requirements that will include all the information needed by the team in order to start working.

- **Project Governance -** The framework, and processes that guide project management activities in order to meet organizational, strategic, and operational goals.

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4.1 Develop Project Charter

ID #	Enabler	Primary Reference
1.2.1	Set a clear vision and mission	**4.1**
1.2.4	Determine an appropriate leadership style (e.g., directive, collaborative)	4.1, 9.1 and **9.5**
2.6.6	Coordinate with other projects and other operations	NEW **4.1** p 543 APG p 82 and 111
2.9.5	Determine critical information requirements	4.1, 5.2 and **4.5**
2.10.1	Anticipate and embrace the need for change (e.g., follow change management practices)	4.1, 4.2 and **4.6**
2.12.1	Determine the requirements (what, when, where, who etc.) for managing the Project artifacts	4.1, 4.2 and **5.2**
2.13.1	Assess project needs, complexity, and magnitude	4.1 and **4.2**
2.13.2	Recommend project execution strategy (e.g., contracting, finance)	4.1 and **4.2**
2.13.3	Recommend a project methodology/approach (i.e, predictive, agile, hybrid)	NEW **4.1**
2.14.1	Determine appropriate governance for a project (e.g., replicate organizational governance)	**4.1**
2.14.2	Define escalation paths and thresholds	4.1, 9.1 and **13.3**
2.16.3	Confirm approach for knowledge transfers	NEW 4.1 and **4.4**
2.17.1	Determine criteria to successfully close the project or phase	4.1, 5.2 and **4.2**
3.1.1	Confirm project compliance requirements (e.g., security, health and safety, regulatory compliance)	4.1, **5.2**, 8.1, 11.1, 11.2 and 13.1
3.2.1	Investigate that benefits are identified	**4.1**, 5.2, 8.1
3.2.2	Document agreements on ownership for ongoing benefits	NEW **4.1**, 8.1 and 4.4
3.3.1	Survey changes to external business environment (e.g., regulations, technology, geopolitical, market)	**4.1**
3.3.2	Assess and prioritize impact on project scope/backlog based on changes in external business environment	NEW 4.1 and **4.3**
3.3.3	Recommend options for scope/backlog changes (e.g. schedule, cost changes)	NEW 4.1 and **4.3**
3.3.4	Continually review external business environment for impacts on project scope/backlog	NEW 4.1 and **4.3**
3.4.1	Assess organizational culture	NEW **4.1**
3.4.3	Evaluate impact of the project to the organization and determine required actions	NEW 4.1 and **4.2**

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4.1 Develop Project Charter

ID #	Enabler	Primary Reference
1.2.1	Set a clear vision and mission	**4.1**
2.6.6	Coordinate with other projects and other operations	NEW **4.1**, 6.3, 6.6, p 543, APG p 82 and 111
2.13.3	Recommend a project methodology/approach (i.e, predictive, agile, hybrid)	NEW **4.1**
2.14.1	Determine appropriate governance for a project (e.g., replicate organizational governance)	**4.1**
3.3.1	Survey changes to external business environment (e.g., regulations, technology, geopolitical, market)	**4.1**
3.2.1	Investigate that benefits are identified	NEW **4.1**, 8.1 and 4.4
3.4.1	Assess organizational culture	NEW **4.1**

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Project Stakeholder Management

This knowledge area is used to understand who the project stakeholders are and how to manage their engagement.

- 13.1 Identify Stakeholders
- 13.2 Plan Stakeholder Engagement
- 13.3 Manage Stakeholder Engagement
- 13.4 Monitor Stakeholder Engagement

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13.1 Identify Stakeholders

Key Concept: Process of identifying all people or entities that are affected by the project and begins the documentation in order to understand how they are affected, and their project involvement levels.

Inputs	Tools and Techniques	Outputs
1. Project Charter	1. Expert Judgment	1. Stakeholder Register
2. Business Documents	2. Data Gathering	2. Change Requests
- Business Case	- Brainstorming	3. Project Management Plan Updates
- Benefits Management Plan	- Questionnaire and Surveys	- Requirements Management Plan
3. Project Management Plan	3. Data Analysis	- Communications Management Plan
- Communications Management Plan	- Stakeholder Analysis	- Risk Management Plan
- Stakeholder Engagement Plan	- Document Analysis	Stakeholder Engagement Plan
4. Project Documents	4. Data Representation	4. Project Documents Updates
- Change Log	- Stakeholder Mapping	- Assumption Log
- Requirements Documentation	5. Meetings	- Issue Log
5. Agreements		- Risk Register
6. EEFs		
7. OPAs		

Figure 13-2 , page 507, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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13.1 Identify Stakeholders

Inputs
1. Project Charter
2. Business Documents
- Business Case
- Benefits Management Plan
3. Project Management Plan
- Communications Management Plan
- Stakeholder Engagement Plan
4. Project Documents
- Change Log
- Issue Log
- Requirements Documentation
5. Agreements
6. EEFs
7. OPAs

Figure 13-2 , page 507, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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13.1 Identify Stakeholders

Tools and Techniques
1. Expert Judgment
2. Data Gathering
- Brainstorming
- Questionnaire and Surveys
3. Data Analysis
- Stakeholder Analysis
- Document Analysis - looking at historical project data
4. Data Representation
- **Stakeholder Mapping**
5. Meetings

Stakeholder Mapping - Is used to help the PM understand *who is who in the zoo* and display this understanding to key project team members.

Stakeholder Grid - Compares a group of stakeholders to two variables
Salience Model - Compares a stakeholder to three variables
Stakeholder Cube - Compares a stakeholder to three variables

Figure 13-2 , page 507, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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Slide 49 — 13.1 Identify Stakeholders

Tools and Techniques

Stakeholder Mapping
1. Stakeholder Grid

Compares all stakeholder to two variables, for example ranking the stakeholders by power and interest

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Slide 50 — 13.1 Identify Stakeholders

Tools and Techniques

Stakeholder Mapping
2. Salience Model Compares three variables using a Venn Diagram to create 8 types of stakeholder categories

Classification of Stakeholders: Salience model

1. Dormant Stakeholder
2. Discretionary Stakeholder
3. Demanding Stakeholder
4. Dominant Stakeholder
5. Dangerous Stakeholder
6. Dependent Stakeholder
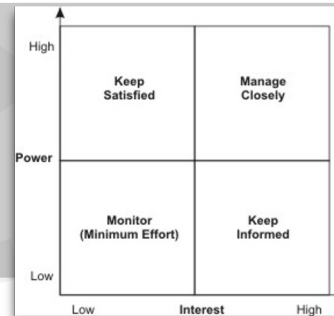7. Definitive Stakeholder
8. Non stakeholders

Figure 13-2 , page 507, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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13.1 Identify Stakeholders

Tools and Techniques

Stakeholder Mapping
3. Stakeholder Cube -
Compares a stakeholder to
three variables to create
typologies as a way of
categorizing stakeholders
Power: Active or Passive
Interest: Active or Passive
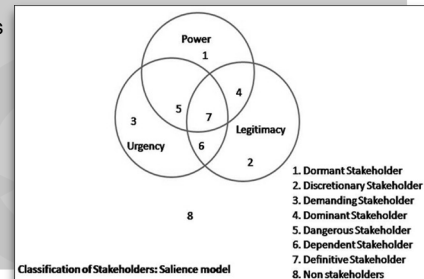Attitude: Backer or Blocker

Figure 13-2 , page 507, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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13.1 Identify Stakeholders

Outputs

1. **Stakeholder Register**
2. Change Requests
3. Project Management Plan Updates
- Requirements Management Plan
- Communications Management Plan
- Risk Management Plan
- Stakeholder Engagement Plan
4. Project Documents Updates
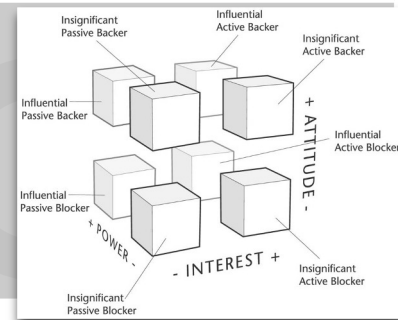- Assumption Log
- Issue Log
- Risk Register

Figure 13-2 , page 507, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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13.1 Identify Stakeholders

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Outputs

1. Stakeholder Register (EXAMPLE ONLY!!!!!)

STAKEHOLDER REGISTER								
Project Name:		<optional>						
Project Manager Name:		<required>						
ID	Name	Title	Organization	Contact Information	Location	Common Types	Rank In Project	Comments

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13.1 Identify Stakeholders

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ID #	Enabler	Primary Reference
1.2.6	Analyze team members and stakeholders' influence	**13.1**
1.9.2	Optimize alignment between stakeholder needs, expectations and project objectives	**13.1**
2.4.1	Analyze stakeholders (e.g., power interest grid, influence, impact)	**13.1**
2.4.2	Categorize stakeholders	**13.1**
3.1.1	Confirm project compliance requirements (e.g., security, health and safety, regulatory compliance)	4.1, 5.2, 8.1, 11.1, 11.2 and **13.1**

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Planning Process Group

- 4.2 Develop Project Management Plan
- 5.1 Plan Scope Management
- 5.2 Collect Requirements
- 5.3 Define Scope
- 5.4 Create WBS
- 6.1 Plan Schedule Management
- 6.2 Define Activities
- 6.3 Sequence Activities
- 6.4 Estimate Activity Durations
- 6.5 Develop Schedule
- 7.1 Plan Cost Management
- 7.2 Estimate Costs
- 7.3 Determine Budget

- 8.1 Plan Quality Management
- 9.1 Plan Resource Management
- 9.2 Estimate Activity Resources
- 10.1 Plan Communications Management
- 11.1 Plan Risk Management
- 11.2 Identify Risks
- 11.3 Perform Qualitative Risk Analysis
- 11.4 Perform Quantitative Risk Analysis
- 11.5 Plan Risk Responses
- 12.1 Plan Procurement Management
- 13.2 Plan Stakeholder Engagement

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Planning Process Group

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

Table 1-4 (Guide). Project Management Process Group and Knowledge Area Mapping

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4.2 Develop Project Management Plan

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Key Concept: Process synchronizing the planning process necessary to develop your project management plan. The plan will be approved when completed and usually revolves around Scope, Schedule, and Cost Baselines.

Inputs	Tools and Techniques	Outputs
1. Project Charter 2. Outputs From Other Processes 3. EEFs 4. OPAs	1. Expert Judgment 2. Data Gathering - Brainstorming - Checklists - Focus Groups - Interviews 3. Interpersonal and Team Skills - Conflict Management - Facilitation - Meeting Management 4. Meetings	1. Project Management Plan

Figure 4-4 , page 82, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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4.2 Develop Project Management Plan

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Inputs
1. Project Charter
2. **Outputs From Other Processes**
3. EEFs
4. OPAs

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4.2 Develop Project Management Plan

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Tools and Techniques

1. <u>Expert Judgment</u>
2. <u>Data Gathering</u>
- Brainstorming
- **Checklist**
- Focus Groups
- Interviews
3. <u>Interpersonal and Team Skills</u>
- Conflict Management
- Facilitation
- Meeting Management
4. <u>Meetings</u>

Figure 4-4 , page 82, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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4.2 Develop Project Management Plan

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Outputs

1. **<u>Project Management Plan</u>** - This is the combination of all necessary project plans and documents listed on page 89 of the PMBOK® Guide for that one project. It could be completed in one phase of a project of released in iterations depending on the methodology.

It is key for your exam success to know and understand all possible components of the project management plan. All 19 management plans as well as the 33 documents…

Figure 4-4 , page 82, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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Components of the Project Management Plan

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

Figure 4-1, page 89, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.
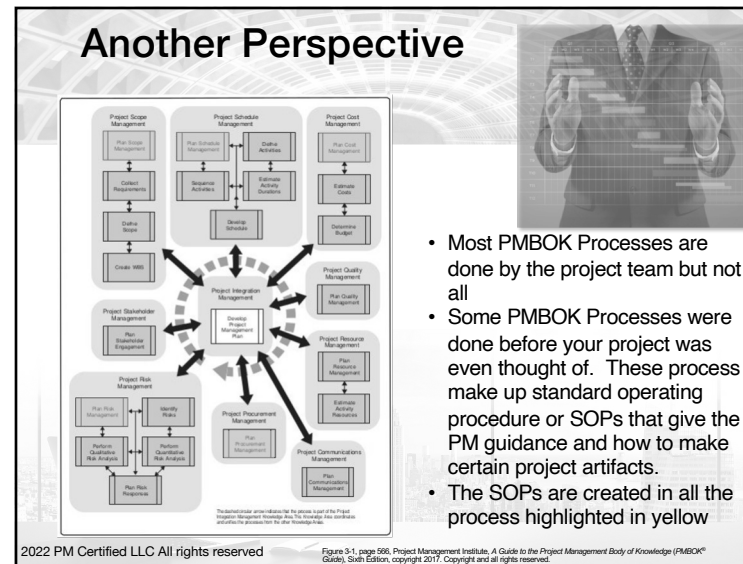
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Which Plans are Made in the Project and Which are Made by the Organization

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

Figure 4-1, page 89, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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Another Perspective

- Most PMBOK Processes are done by the project team but not all
- Some PMBOK Processes were done before your project was even thought of. These process make up standard operating procedure or SOPs that give the PM guidance and how to make certain project artifacts.
- The SOPs are created in all the process highlighted in yellow

Figure 3-1, page 566, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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4.2 Develop Project Management Plan

Additional Components NOT Made in a PMBOK Process:
- Change Management Plan - This plan describes any change control policies or systems that will be used in the project (could be OPA or EEF).
- Configuration Management Plan - This plan will discuss any other type of version control system in the project.
  - All configuration management systems
    - IDs each article
    - Reflects the current status of the article
    - Allows the user to audit the system
- Performance Measurement Baseline - This is a combination of Cost, Scope, and Schedule Baseline and is used to evaluate the project.
- Development Approach - This plan describes how the project management plan will be built and is dependent upon the planning methodology selected.
- Project Lifecycle Description – This is used to explain the overarching methodology the organization uses to complete projects.
- Management Review – A templet of normal audits/reviews and reports the organization will use to keep tabs on the project.

page 88, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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4.2 Develop Project Management Plan

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ID #	Enabler	Primary Reference
2.1.1	Assess opportunities to deliver value incrementally	NEW **4.2** p 23 APG
2.9.1	Consolidated the project/phase plans	**4.2**
2.10.2	Determine strategy to handle change	**4.2**
2.13.1	Assess project needs, complexity, and magnitude	4.1 and **4.2**
2.13.2	Recommend project execution strategy (e.g., contracting, finance)	4.1 and **4.2**
2.13.4	Use iterative, incremental practices throughout the project lifecycle (e.g., lessons learned, stakeholder engagement, risk)	NEW **4.2**
2.17.1	Determine criteria to successfully close the project or phase	4.1, 5.2 and **4.2**
3.4.3	Evaluate impact of the project to the organization and determine required actions	NEW 4.1 and **4.2**

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The SOP Processes

This Procsess are not seperated in any formal way by PMI, but through research we can see their simimlarities and importance to the project.

- 5.1 Plan Scope Management
- 6.1 Plan Schedule Management
- 7.1 Plan Cost Management
- 11.1 Plan Risk Management
- 12.1 Plan Procurment Management

Knowledge Areas	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

Table 1-4 (Guide). Project Management Process Group and Knowledge Area Mapping

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Slide 67

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5.1 Plan Scope Management

<u>Key Concept</u>: This process lays out the plan on how we will track and archive requirements in order to create the scope baseline and its supporting documents.

Inputs	Tools and Techniques	Outputs
1. Project Charter 2. Project Management Plan - Quality Management Plan - Project Life Cycle Description - Development Approach 2. EEFs 3. OPAs	1. Expert Judgment 2. Data Analysis - Alternative Analysis - Document Analysis 3. Meetings	1. Scope Management Plan 2. Requirements Management Plan

Figure 5-2 , page 134, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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Slide 68

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5.1 Plan Scope Management

Inputs

1. <u>Project Charter</u>
2. <u>Project Management Plan</u>
- **Quality Management Plan**: This plan could lay out additional requirements based on how testing is done or the training that must be done by the tester.
- **Project Life Cycle Description**
- **Development Approach**
2. <u>EEFs</u>
3. <u>OPAs</u>

Figure 5-2 , page 134, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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5.1 Plan Scope Management

Tools and Techniques

1. Expert Judgment
2. Data Analysis
- Alternative Analysis
- Document Analysis
3. Meetings

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5.1 Plan Scope Management

Outputs

1. **Scope Management Plan** - This plan discusses how the Scope baseline will be created, approved, or changed if needed and how it will be controlled/evaluated. It discusses how the three components of the baseline will be made.
- Scope Statement
- WBS
- WBS dictionary

2. **Requirements Management Plan** - This plan discusses the use of two project documents that are used to archive information and track the status of project requirements.
- Requirements Documentation
- Requirements Traceability Matrix

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5.1 Plan Scope Management

ID #	Enabler	Primary Reference
3.1.2	Classify compliance categories	NEW **5.1**, 8.1, 11.1

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6.1 Plan Schedule Management

<u>Key Concept:</u> This process lays out the plan of how we will create the project schedule baseline and its supporting documents. It will outline the scheduling systems as well as any scheduling policies for example how reporting is done or how estimating is done.

Inputs	Tools and Techniques	Outputs
1. Project Charter 2. Project Management Plan - Scope Management Plan - Development Approach 3. EEFs 4. OPAs	1. Expert Judgment 2. Data Analysis 3. Meetings	1. Schedule Management Plan

Figure 6-3, page 179, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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6.1 Plan Schedule Management

Inputs

1. Project Charter
2. Project Management Plan
- Scope Management Plan
- **Development Approach** - This input is not an output of any process; it is used to explain how deliverables are created and released using predictive, iterative, incremental, Agile, or highbred methods. If used it would be a driving factor in how scheduling is done.
3. EEFs
4. OPAs

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6.1 Plan Schedule Management

Tools and Techniques

1. Expert judgment
2. **Data Analysis** - looking at past projects to determine estimating techniques or to understand how accurate the schedule must be
3. Meetings

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6.1 Plan Schedule Management

Outputs

1. **Schedule Management Plan** - This plan tells us how to plan. It will be the how-to guide when it comes to filling out all scheduling documentation (see page 89). It will also lay out several key scheduling polices such as:
- When and how schedule reporting is done
- How estimating duration is done (also contingency reserve)
- Defines project duration and units of measure
- Explains the use of any project management information systems (PMIS)
- Explains how the Schedule Baseline is approved
- Explains how we change the Schedule Baseline when needed
- Explains who can update and how schedule updates are made

Figure 6-3, page 179, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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6.1 Plan Schedule Management

ID #	Enabler	Primary Reference
2.6.3	Prepare schedule based on methodology	**6.1** and 6.5
2.6.4	Measure ongoing progress based on methodology	6.1 and **6.6**

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Slide 77

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7.1 Plan Cost Management

Key Concept: This process lays out the plan of how we will create the project cost baseline and its supporting documents. It will outline the accounting systems as well as any accounting policies, such as how reporting is done or how estimating is done.

Inputs	Tools and Techniques	Outputs
1. Project Charter	1. Expert Judgment	1. Cost Management Plan
2. Project Management Plan	2. Data Analysis	
- Schedule Management Plan	3. Meetings	
- Risk Management Plan		
3. EEFs		
4. OPAs		

Figure 7-2, page 235, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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Slide 78

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7.1 Plan Cost Management

Inputs
1. Project Charter
2. Project Management Plan
- Schedule Management Plan
- Risk Management Plan
3. EEFs
4. OPAs

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7.1 Plan Cost Management

Tools and Techniques

1. Expert Judgment

2. Data Analysis

3. Meetings

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7.1 Plan Cost Management

Outputs

1. **Cost Management Plan** - This plan is the how-to for everything in cost; it tells us how we will create the cost baseline, who will approve it and how it is changed, if we need to change it. It will also discuss some important things moving forward such as what currency will be used for the project or assumed exchange rates. When we are estimating, the plan tells us what is considered an accurate estimate and how to set aside contingency reserves. It can also discuss reporting using earned value management and when it is done.

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7.1 Plan Cost Management

ID #	Enabler	Primary Reference
2.5.2	Anticipate future budget challenges	7.1, **7.3,** and 7.4
2.5.4	Plan and manage resources	7.1, 7.2, 7.3 and **7.4**

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11.1 Plan Risk Management

<u>Key Concept</u>: This process lays out the how to plan for handling risk during the project. It will also give guidance on using several important risk tools. Zero Risk Events in the Risk Management Plan.

Inputs	Tools and Techniques	Outputs
1. Project Charter 2. Project Management Plan - All Components 3. Project Documents - Stakeholder Register 3. EEFs 4. OPAs	1. Expert Judgment 2. Data Analysis - Stakeholder Analysis 3. Meetings	1. Risk Management Plan

Figure 11-2, page 401, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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11.1 Plan Risk Management

Inputs
1. Project Charter
2. Project Management Plan
- **All Components**
3. Project Documents
- Stakeholder Register
3. EEFs
4. OPAs

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11.1 Plan Risk Management

Tools and Techniques
1. Expert judgment
2. Data Analysis
- Stakeholder Analysis
3. Meetings

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11.1 Plan Risk Management

Outputs

1. **Risk Management Plan** - This plan will cover how risk will be tracked, evaluated, reported, and controlled during the project. Possible components of this plan:
   ‣ Risk Strategy
   ‣ Methodologies
   ‣ Roles & Responsibilities:
   ‣ Funding
   ‣ Timing
   ‣ Risk Categories
   ‣ Stakeholder Risk Appetite
   ‣ Definitions of Risk Probability & Impact
   ‣ Probability and Impact Matrix
   ‣ Reporting Formats
   ‣ Tracking

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11.1 Plan Risk Management

New Terms from 2021 Exam Change

- **Risk Tolerance** – A maximum amount of risk, and the potential impact of that risk occurring, that a project manager is allowed to handle.

- **Risk Appetite** – The degree of uncertainty an organization or key stakeholder is willing to accept in anticipation of a reward.

- **Risk Threshold** – The level of risk exposure above which risks are addressed and below which risks may be accepted (watch listed)

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11.1 Plan Risk Management

ID #	Enabler	Primary Reference
2.3.1	Determine risk management options	**11.1**
2.15.3	Collaborate with relevant stakeholders on the approach to resolve the issues	10.1, 11.1 and **13.2**
3.1.1	Confirm project compliance requirements (e.g., security, health and safety, regulatory compliance)	4.1, **5.2**, 8.1, 11.1, 11.2 and 13.1
3.1.2	Classify compliance categories	NEW 5.1, 8.1, **11.1**

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12.1 Plan Procurement Management

<u>Key Concept</u>: In this process, the how to guide for buying things is created for the project. Almost all EEFs

Inputs	Tools and Techniques	Outputs
1. Project Charter	1. Expert Judgment	1. Procurement Management Plan
2. Business Documents	2. Data Gathering	2. Procurement Strategy
- Business Case	- Market Research	3. Bid Documents
- Benefits Management Plan	3. Data Analysis	4. Procurement Statement of Work
3. Project Management Plan	- Make or Buy Analysis	5. Source Selection Criteria
- Scope Management Plan	4. Source Selection Analysis	6. Make-or-buy Decisions
- Quality Management Plan	5. Meetings	7. Independent Cost Estimates
- Resource Management Plan		8. Change Requests
- Scope Baseline		9. Project Documents Updates
4. Project Documents		- Lessons Learned Register
- Milestone List		- Milestone List
- Project Team Assignments		- Requirements Documentation
- Requirements Documentation		- Requirements Traceability Matrix
- Requirements Traceability Matrix		- Risk Register
- Resource Requirements		- Stakeholder Register
- Risk Register		10. OPA Updates
- Stakeholder Register		
5. EEFs		
6. OPAs		

Figure 12-1, page 460, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Sixth Edition*, copyright 2017. Copyright and all rights reserved.

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12.1 Plan Procurement Management

Inputs	
1. Project charter	4. Project Documents
2. Business documents	- Milestone List
- Business Case	- Project Team Assignments
- Benefits Management Plan	- Requirements Documentation
3. Project Management Plan	- Requirements Traceability Matrix
- Scope Management Plan	- Resource Requirements
- Quality Management Plan	- **Risk Register**
- Resource Management Plan	- Stakeholder Register
- Scope Baseline	5. EEFs
	6. OPAs

Figure 12-1, page 460, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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12.1 Plan Procurement Management

Tools and Techniques
1. Expert Judgment
2. Data Gathering
- **Market Research** - This would at least be the preferred vendors list.
3. Data Analysis
- Make or Buy Analysis
4. Source Selection Analysis
5. Meetings

Figure 12-1, page 460, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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12.1 Plan Procurement Management

Outputs

1. **Procurement Management Plan** - This plan is typically tiered by dollar amount and usually already exists in the organization.
2. **Procurement Strategy** - In the event that a decision has already been made to buy a specific item, this document would be a tailored version of the Procurement Management Plan for the life cycle of that procurement.
3. **Bid Documents** - This describes how we will use RFIs, RFQ, and RFPs
4. **Procurement Statement of Work** - This document creation would be described in the Procurement Management Plan. It should clarify quantity, quality levels, performance data, period of performance, work locations and detailed requirements
5. **Source Selection Criteria**
6. **Make-or-buy Decisions**
7. **Independent Cost Estimates**

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12.1 Plan Procurement Management

Outputs

8. Change Requests
9. Project Documents Updates
  - Lessons Learned Register
  - Milestone List
  - Requirements Documentation
  - Requirements Traceability Matrix
  - Risk Register
  - Stakeholder Register
10. OPA Updates

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12.1 Plan Procurement Management

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ID #	Enabler	Primary Reference
1.8.1	Analyze the bounds of the negotiations for agreement	**12.1**
1.8.5	Determine a negotiation strategy	**12.1**
2.11.1	Define resource requirements and needs	9.2 and **12.1**
2.11.2	Communicate resource requirements	5.2, 9.2, 12.1 and **12.2**
2.11.4	Plan and manage procurement strategy	12.1, 12.2 and **12.3**

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SOP Management Plans Summary

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Scope Management Plan - This plan discusses how the Scope baseline will be created, approved, or changed if needed and how it will be controlled/evaluated. It discusses how the three components of the baseline will be made.

Requirements Management Plan - This plan discusses the use of two project documents that are used to archive information and track the status of project requirements.

Schedule Management Plan - This plan tells us how to schedule. It tells the PM when and how schedule reporting is done / How estimating duration is done / Defines project units of measure / Explains the use of any PMIS / Explains how the Schedule Baseline is approved / Explains who can update the schedule / Also provides templets.

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SOP Management Plans [95] Summary

Cost Management Plan - **This plan is the how-to for everything in cost; it tells us how we will create the cost baseline, who will approve it and how it is changed, if we need to change it. This plan also covers reporting for cost management.**

Procurement Management Plan - This plan is typically explains purchasing rules that all PMs must follow usually the policies are tiered by dollar amount and usually already exists in the organization.

Risk Management Plan - This plan will cover how risk will be tracked, evaluated, reported, and controlled during the project.

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Project Scope Management

This knowledge area is used to make sure all project requirements are planned into the project and nothing more.

- 5.1 Plan Scope Management
- 5.2 Collect Requirements
- 5.3 Define Scope
- 5.4 Create WBS
- 5.5 Validate Scope
- 5.6 Control Scope

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5.2 Collect Requirements

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Key Concept: The process of finding and documenting all project requirements. This isn't only product requirements; it can also include stakeholder requirements.

Inputs	Tools and Techniques	Outputs

1. Project Charter
2. Project Management Plan
  - Scope Management Plan
  - Requirements Management Plan
  - Stakeholder Engagement Plan
3. Project Documents
  - Assumption Log
  - Lessons Learned Register
  - Stakeholder Register
4. Business Documents
  - Business Case
5. Agreements
6. EEFs
7. OPAs
	1. Expert Judgment
	2. Data Gathering
	  - Brainstorming
	  - Interviews
	  - Focus Groups
	  - Questionnaires and Surveys
	  - Benchmarking
	3. Data Analysis
	  - Document Analysis
	4. Decision Making
	  - Voting
	  - Multi-Criteria Decision Analysis
	5. Data Representation
	  - Affinity Diagrams
	  - Mind Mapping
	6. Interpersonal and Team Skills
	  - Nominal Group Technique
	  - Observation/conversation
	  - Facilitation
	7. Context Diagram
	8. Prototypes
		1. Requirements Documentation
		2. Requirements Traceability Matrix

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5.2 Collect Requirements

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Inputs	

1. Project Charter
2. Project Management Plan
  - Scope management plan
  - Requirements management plan
  - Stakeholder engagement plan
3. Project documents
  - Assumption log
  - Lessons learned register
  - Stakeholder register
	4. Business Documents
	  - Business Case
	5. Agreements
	6. EEFs
	7. OPAs

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5.2 Collect Requirements

Tools and Techniques

1. Expert Judgment
2. Data Gathering
   - **Brainstorming**
   - Interviews
   - Focus Groups
   - Questionnaires and Surveys
   - Benchmarking
3. Data Analysis
   - **Document Analysis**
4. Decision Making
   - **Voting** (Majority, Plurality, Unanimity, Autocratic)
   - Multi-criteria Decision Analysis

5. Data Representation
   - Affinity Diagrams
   - Mind-Mapping
6. Interpersonal and Team Skills
   - **Nominal Group Technique**
   - **Observation/conversation**
   - **Facilitation**
7. Context Diagram
8. Prototypes

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5.2 Collect Requirements

Outputs

1. **Requirements Documentation** - This is a document designed to capture all the data about one requirement.

2. **Requirements Traceability Matrix** - A list of all project requirements that will allow the project manager to sort through all the requirements quickly and help the project manager understand the status of any project requirement. (EXAMPLE ONLY!!)

REQUIREMENTS TRACEABILITY MATRIX

Project:	<optional>							
PM Name:	<required>							
ID	Type	Name	Description	Status	Owner	Expected Completion	Verification	Additional Comments
001								
002								
003								
004								
005								
006								

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5.2 Collect Requirements

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New Terms from 2021 Exam Change

- **De Facto Regulations - Regulations that are widely accepted but no official documentation exists.**

- **De Jure Regulations - Regulation mandated by written law or official policy**

- **XP Metaphor - Team members try to describe aspects of a solution in the same way a marketer might describe product features and benefits on a box**

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5.2 Collect Requirements

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ID #	Enabler	Primary Reference
1.10.2	Survey all necessary parties to reach consensus	**5.2**
2.8.1	Determine and prioritize requirements	**5.2**
2.12.1	Determine the requirements (what, when, where, who etc.) for managing the Project artifacts	4.1, 4.2 and **5.2**
3.1.1	Confirm project compliance requirements (e.g., security, health and safety, regulatory compliance)	4.1, **5.2**, 8.1, 11.1, 11.2 and 13.1

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5.3 Define Scope

Key Concept: This process creates the written definition of the project explaining how each requirement will be completed as well as discussing what is not in the project.

Inputs	Tools and Techniques	Outputs
1. Project Charter 2. Project Management Plan - Scope Management Plan 3. Project Documents - Assumption Log - Requirements Documentation - Risk Register 4. EEFs 5. OPAs	1. Expert Judgment 2. Data Analysis - Alternative Analysis - Decision Making - Multi-criteria Decision Analysis 4. Interpersonal and Team Skills - Facilitation 5. Product Analysis	1. Scope Statement 2. Project Document Updates - Assumption Log - Requirements Documentation - Requirements Traceability Matrix - Stakeholder Register

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5.3 Define Scope

Inputs
1. Project Charter 2. Project Management Plan - Scope Management Plan 3. Project Documents - Assumption Log - Requirements Documentation - Risk Register 4. EEFs 5. OPAs

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5.3 Define Scope

Tools and Techniques

1. Expert Judgment
2. Data Analysis
- **Alternative Analysis** - This tool is about looking at the requirements in a different way.
3. Decision Making
- Multi-criteria Decision Analysis
4. Interpersonal and Team Skills
- Facilitation
5. **Product Analysis** - For this process this tool is used to focuses on each product the project will create and uses that breakdown as a way of organizing the Scope Statement.

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5.3 Define Scope

Outputs

1. **Scope Statement** - This is a highly detailed document that defines everything that is considered within scope for the project. It can be written in many ways; some will organize it by product others by phase. The idea is you can hand it to someone, and that person will be able to understand what the project is and is not.

2. Project Document Updates
- Assumption Log
- Requirements Documentation
- Requirements Traceability Matrix
- Stakeholder Register

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5.3 Define Scope

New Terms from 2021 Exam Change

- **Product Roadmap -** An images that gives the team a big picture view of the product and the anticipated sequence of deliverables that over time, is progressively elaborated as more information is known, and vision is refined. Usually illustrated as a high-level gnat chart or use Kanban (Now, Next, Later).

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5.3 Define Scope

ID #	Enabler	Primary Reference
2.8.2	Break down scope (e.g., WBS, backlog)	**5.3** and 5.4

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5.4 Create WBS

<u>Key Concept</u>: The process of using a chart to display 100% of the work, called the WBS as well as making a dictionary of all the terms seen on the WBS. The combination of the WBS, WBS Dictionary, and Scope Statement is the creation of the Scope Baseline. This process covers its creation and its approval.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Scope management plan
2. Project documents
  - Project Scope Statement
  - Requirements Documentation
3. EEFs
4. OPAs
	1. Expert Judgment
	2. Decomposition
		1. Scope Baseline
		2. Project Document Updates
		  - Assumption Log
		  - Requirements Documentation

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5.4 Create WBS

Inputs

1. <u>Project Management Plan</u>
   - Scope management plan
2. <u>Project Documents</u>
   - Project Scope Statement
   - Requirements Documentation
3. <u>EEFs</u>
4. <u>OPAs</u>

Figure 5-10 , page 156, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

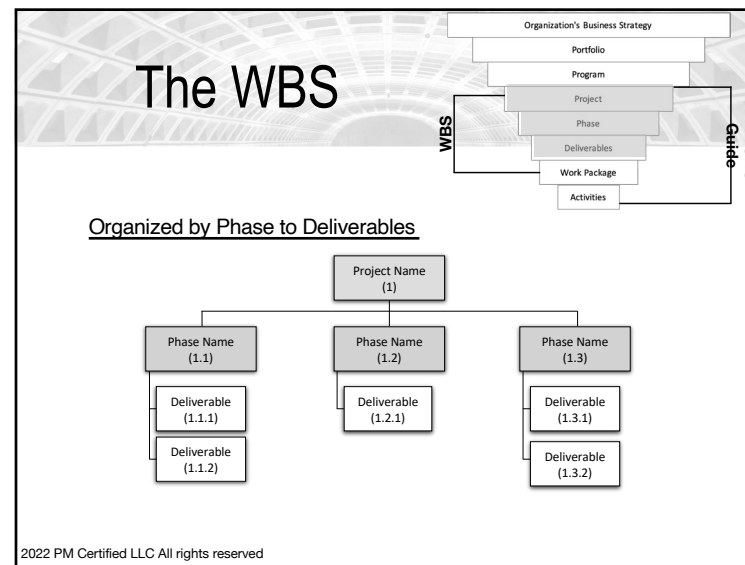**110**

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5.4 Create WBS

Tools and Techniques

1. Expert judgment
2. **Decomposition** - This tool is about breaking down the project to the lowest level we choose to control it. To control it we estimate for that piece of work in planning so that during execution we can compare what has occurred to what was planned.

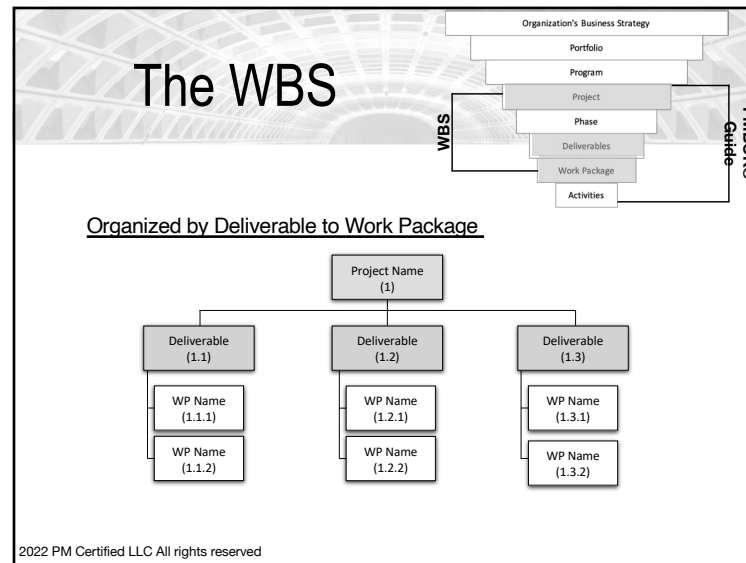*On the exam the lowest level of work on the WBS will be the Work Package*

WBS:
- Organization's Business Strategy
- Portfolio
- Program
- Project
- Phase
- Deliverables
- Work Package
- Activities

PMBOK® Guide

Figure 5-10 , page 156, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.
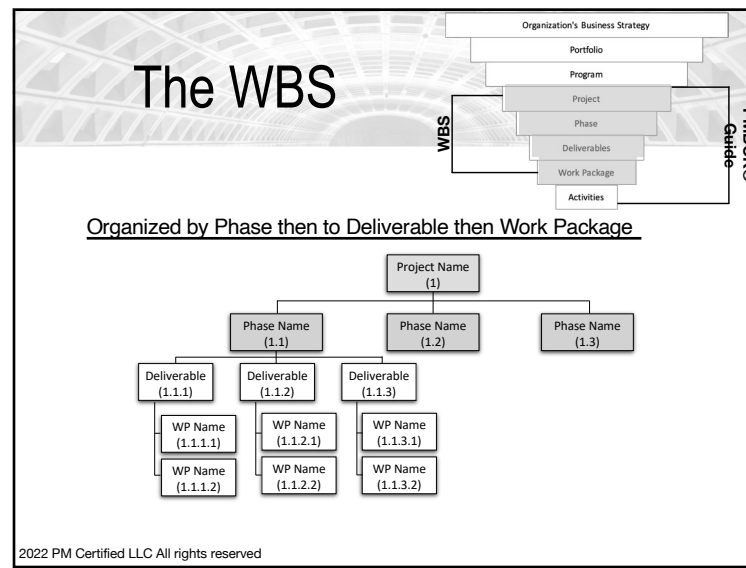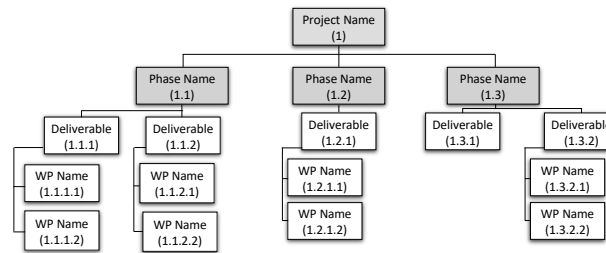
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The WBS

WBS:
- Organization's Business Strategy
- Portfolio
- Program
- Project
- Phase
- Deliverables
- Work Package
- Activities

PMBOK® Guide

Organized by Phase to Deliverables

```
                        Project Name
                           (1)
        ┌──────────────────┼──────────────────┐
   Phase Name          Phase Name          Phase Name
     (1.1)               (1.2)               (1.3)
        │                   │                   │
   Deliverable         Deliverable         Deliverable
    (1.1.1)             (1.2.1)             (1.3.1)
        │                                       │
   Deliverable                             Deliverable
    (1.1.2)                                 (1.3.2)
```

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The WBS

```
                        Project Name
                            (1)
        ┌───────────────────┼───────────────────┐
   Phase Name           Phase Name           Phase Name
     (1.1)                (1.2)                (1.3)
   ┌────┴────┐              │              ┌─────┴─────┐
Deliverable Deliverable  Deliverable   Deliverable  Deliverable
 (1.1.1)    (1.1.2)       (1.2.1)       (1.3.1)     (1.3.2)
   │          │             │                          │
 WP Name    WP Name      WP Name                    WP Name
(1.1.1.1)  (1.1.2.1)    (1.2.1.1)                  (1.3.2.1)
   │          │             │                          │
 WP Name    WP Name      WP Name                    WP Name
(1.1.1.2)  (1.1.2.2)    (1.2.1.2)                  (1.3.2.2)
```

WBS Terms to Know
Control Accounts- The level of work that we have chosen to control that part of the project
Code of Accounts- The count numbering system *(Comes from the Scope MP)*
Chart of Accounts- All of the account codes in the whole organization

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Product Backlog

Product Backlog						
Project Name						
PM Name		PM Certified Example				
Story ID	Story name	Status	Size	Sprint	Priority	Comments
1	Architecture	Done	3	2	1	
2	Get referrals	Ongoing	5	2	2	
3	Metrics	Ongoing	3	2	3	
4	Interface	Ongoing	8	3	4	
5	Design	Ongoing	5	3	5	

Product Backlog - This is a tool used in Agile to display the work as it relates to requirements as the requirements are being defined. This allows the scrum team to prioritize the work and determine what user stories will be completed within that sprint.
User Story- A piece of work that has been defined
Velocity - The number of user stories that the scrum team can complete in one sprint

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5.4 Create WBS

Outputs
1. **Scope Baseline** - This is the combination of the Scope Statement, the WBS and the WBS dictionary that is approved by the sponsor.

After its approval any additions to it will be called **scope creep**.
Exactly how we add scope creep should be outlined in the Scope Management Plan.

2. Project Document Updates
- Assumption Log
- Requirements Documentation

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5.4 Create WBS

ID #	Enabler	Primary Reference
2.1.2	Examine the business value throughout the project	5.4, **5.5** and APG
2.8.2	Break down scope (e.g., WBS, backlog)	**5.3** and 5.4

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Project Schedule Management

This knowledge area is used to create and control the schedule of project activities; the approved project schedule is referred to as the Schedule Baseline.

- 6.1 Plan Schedule Management
- 6.2 Define Activities
- 6.3 Sequence Activities
- 6.4 Estimate Activity Durations
- 6.5 Develop Schedule
- 6.6 Control Schedule

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6.2 Define Activities

Key Concept: This process breaks down the project to the lowest level and determines the names of each activity and starts the documenting of information about each activity in the project.

Inputs	Tools and Techniques	Outputs
1. Project Charter 2. Project Management Plan - Schedule Management Plan - Scope Baseline 3. EEFs 4 .OPAs	1. Expert Judgment 2. Decomposition 3. Rolling Wave 4. Meetings	1. Activity List 2. Activity Attributes 3. Milestone List 4. Change Requests 5. Project Management Plan Updates - Schedule Baseline - Cost Baseline

Figure 6-5, page 183, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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6.2 Define Activities

Inputs

1. Project Charter
2. Project Management Plan
- **Schedule Management Plan** - This tells us exactly how to fill out the activity documentation, milestone list, and activity list and where to archive.
- Scope baseline
3. EEFs
4. OPAs

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6.2 Define Activities

Tools and Techniques

1. Expert Judgment
2. Decomposition
3. Rolling Wave
4. Meetings

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6.2 Define Activities

Outputs

1. **Activity List** - This is a list of all project activities and is considered a project document on p 89. Image an Excel list covering every activity in the project.
2. **Activity Attributes** - This is a document that explains one activity and is the most granular project-scheduling document.
3. **Milestone List** - This is a separate list from the activity list. Milestones do not have durations but might be tied to activities.
4. Change Requests
5. Project Management Plan Updates
- Schedule Baseline
- Cost Baseline

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6.2 Define Activities

Activity Attributes

Activity Attributes		
Project:		**Date:**
Activity ID: This information comes from the project activity list.	**Activity:** This is the name of the activity from the project activity list.	**WBS No:** This identifies where this activity can be found in the WBS.
Activity Description: This information includes a detailed description of the work to be performed for this activity and should be consistent with what is provided in the project activity list.		
Activity Responsibility: This section lists who is responsible for executing the work associated with this activity.	**Resources and Skill Sets Required:** This section describes the resources needed to perform the work. For human resources this section should included necessary skill sets and skill levels required to complete the work.	
Activity Predecessors: This section lists other activities which must occur before this activity.	**Predecessor Scheduling:** This describes if the predecessor has a start-start, start-finish or other type of scheduling relationship.	**Predecessor Dependency:** This section describes any dependencies on predecessor activities like lead times, lag times or other requirements.
Activity Successors: This section lists other activities which must occur after this activity.	**Successor Scheduling:** This describes if the successor has a start-start, start-finish or other type of scheduling relationship.	**Successor Dependency:** This section describes any dependencies on successor activities such as lead times, lag times or other requirements.

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6.2 Define Activities

Activity List

Activity List											
Project Name											
PM Name		PM Certified EXAMPLE!!!!									
Activity ID	Activity Title	Start Date	End Date	Location	Owner	Risk Events	Duration	Cost	Contingency Reserves	Approved Changes	Stakeholder list

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6.2 Define Activities

New Terms from 2021 Exam Change

- **User Stories - A brief description of deliverable value from the perspective of the end user**

- **Feature – A piece of work typically comprised of several user stories**

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6.2 Define Activities

ID #	Enabler	Primary Reference
2.6.2	Utilize benchmarks and historical data	**6.2**

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6.3 Sequence Activities

<u>Key Concept</u>: This is the art of project management. In this process you sequence the activities so that the project is efficient with project resources and still flexible. The visual aid that is used to display this to others is the schedule network diagram.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Schedule Management Plan - Scope Baseline 2. Project Documents - Activity Attributes - Activity List - Assumption Log - Milestone List 3. EEFs 4. OPAs	1. Precedence Diagraming Method 2. Dependency Determination and Integration 3. Leads and Lags 4. Project Management Information System	1. Project Schedule Network Diagram 2. Project Document Updates - Activity Attributes - Activity List - Assumption Log - Milestone List

Figure 6-7, page 187, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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6.3 Sequence Activities

Inputs

1. <u>Project Management Plan</u>
- Schedule Management Plan
- Scope baseline
2. <u>Project Documents</u>
- Activity Attributes
- Activity List
- Assumption Log
- Milestone List
3. <u>EEFs</u>
4. <u>OPAs</u>

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6.3 Sequence Activities

Tools and Techniques

1. **Precedence Diagraming Method** - A technique that allows the PM to display the flow of activities across the Project, Phase, Deliverable, or Work Package. This comes from critical path project planning methodology, and in this process this is the tool that builds the schedule network diagram.
2. **Dependency Determination and Integration** - This the reason why an activity is sequenced the way it is on the schedule network diagram.
3. <u>Leads and Lags</u>
4. <u>Project Management Information System</u>

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6.3 Sequence Activities

Precedence Diagraming Method: This type of diagram can be used to show the four different kinds of relationships.

Finish to Start

| A 2 | → | B 7 |

Start to Start

| A 2 |
| B 7 |

Finish to Finish

| A 2 |
| B 7 |

Start to Finish

| A 2 |
| B 7 |

Dependency Determination and Integration: Explains why you sequenced the activities the way you did.

Mandatory (Hard logic)	Discretionary (soft logic)
Mandatory Internal	Discretionary Internal
Mandatory External	Discretionary External

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6.3 Sequence Activities

Outputs

1. **Project Schedule Network Diagram** - This diagram is the visual aid that allows others to understand the flow of activities throughout the project, phase, deliverable, or work package. The diagram does not explain "why" the activities are arraigned in a certain precedence; to understand why you would have to read that activity's activity attribute.
2. Project Document Updates
- **Activity Attributes** - This is where the "why" is recorded. It is called the *dependence determination*.
- Activity List
- Assumption Log
- Milestone List

| A | → | C |
| B | → | D |

C, D → E → F

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6.3 Sequence Activities

ID #	Enabler	Primary Reference
2.6.6	Coordinate with other projects and other operations	NEW PMBOK **4.1**, 6.3, 6.6, p 543 APG p 82 and 111

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6.4 Estimate Activities Duration

Key Concept: In this process we are attempting to determine the expected duration of a particular activity; once that is done, we will add to it contingency reserve. $tE + (x\sigma)$

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Schedule Management Plan - Scope Baseline 2. Project Documents - Activity Attributes - Activity List - Assumption Log - Milestone List - Project Team Assignments - Resource Breakdown Structure - Resource Calendars - Resource Requirements - Risk Register 3. EEFs 4. OPAs	1. Expert Judgment 2. Analogous Estimating 3. Parametric Estimating 4. Three-point Estimating 5. Bottom-up Estimating 6. Data Analysis - Alternative Analysis - Reserve Analysis 7. Decision-making 8. Meetings	1. Duration Estimates 2. Basis of Estimates 3. Project Document Updates - Activity Attributes - Assumption Log - Lessons Learned Register

Figure 6-12, page 195, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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6.4 Estimate Activities Duration

Terms:

Effort - The number of work hours to complete a task
Duration - Those work hours over the project calendar

ROM - Estimate considered to be accurate between -25% to +75%
Definitive - Estimate considered to be accurate between -5% to +10%

Contingency Reserve - Extra time or dollars the PM sets aside for risk
Management Reserve - Extra time or dollars the Sponsor sets aside for risk

Law of Diminishing Returns - When adding additional resource to an activity, you will not get the exact same return; it will be slightly less.

PERT - The Program Evaluation Review Technique developed for government program and project management in 1958 used critical path as well as Earned Value Management

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6.4 Estimate Activities Duration

Inputs
1. Project Management Plan
- Schedule Management Plan
- Scope baseline
2. Project Documents
- Activity Attributes
- Activity List
- Assumption Log
- Milestone List
- Project Team Assignments
- Resource Breakdown Structure
- Resource Calendars
- Resource Requirements
- Risk Register
3. EEFs
4. OPAs

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6.4 Estimate Activities Duration

Tools and Techniques

1. Expert Judgment
2. **Analogous estimating** - A method of estimating where the estimate comes from someone above you on the org chart.
3. **Parametric estimating** - A method of estimation that is based of one metric
4. **Three-point estimating** - A method of refining estimates by averaging them together
Two types of Three-point estimating
   - Triangular Distribution (simple average)
     [Estimate A + Estimate B + Estimate C] / 3 = *tE*
   - Beta Distribution (From PERT)
     [Optimistic + (4 x Most Likely) + Pessimistic] / 6 = *tE*
5. **Bottom-up estimating** - The most accurate estimating method. By asking those closest to the work for estimates.
6. Data analysis
   - Alternative analysis
   - **Reserve analysis** - Adding contingency reserve to an activity to account for risk.
7. Decision-making
8. Meetings

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Estimating with PERT

- The Program Evaluation and Review Technique was developed in 1958 by the US Navy. PERT is used to determine estimated duration and/or cost of a given activity by determining the expected outcome (in duration this is represented by *tE* in cost it is *cE*) from a population of estimates taking into consideration the entire range. $tE=[O+(4xM)+P]/6$.

- After finding the expected outcome (sometimes referred to a goal), PERT can also be used to determine the Standard Deviation (represented as σ) by subtracting the extremes of the range from one another and dividing the difference by six. $σ=(P-O)/6$.

PERT Formulas for the PMP Exam	
Duration Estimate	DE= *tE*+(xσ)
Time Expected / Goal Time	*tE*=[O+(4xM)+P]/6
Standard Deviation	σ=(P-O)/6
Range of Estimates	*ROE*=tE +/-(xσ)

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Estimating with PERT

- In this process the Duration Estimate = $tE + (x\sigma)$
- The x in the above equation is used to represent the required confidence level for that particular activity.
- Confidence can be explained as a % likelihood of hitting a target; in this process that target is an amount of time.
  - $1\sigma = 68.26\%$
  - $2\sigma = 95.46\%$
  - $3\sigma = 99.73\%$
  - $6\sigma = 99.9997\%$

Expected Duration or *te*

If the σ is known to be 10 min

Activity Duration

2 σ +/- 20 min   1 σ +/- 10 min

8:00 AM

With a 68% confidence the activity should be completed between 7:50 to 8:10 AM

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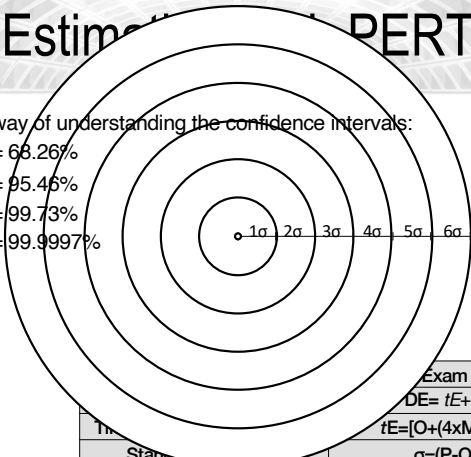
Estimating with PERT

- Another way of understanding the confidence intervals:
  - $1\sigma = 68.26\%$
  - $2\sigma = 95.46\%$
  - $3\sigma = 99.73\%$
  - $6\sigma = 99.9997\%$

1σ 2σ 3σ 4σ 5σ 6σ

Exam	
	DE= $tE+(x\sigma)$
	$tE=[O+(4xM)+P]/6$
Standard	$\sigma=(P-O)/6$
Range of Estimates	$ROE=tE +/-(x\sigma)$

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Estimating with PERT

- Imagine we had three estimates in hours (O=10, M=25, P =40) a 95% confidence is needed in your estimate

  - Expected Activity Duration or $tE = [O+(4xM)+ P]/6$

  - $(10+100+40)/6 =$ **25hr**

  - Activity Stand Deviation or $\sigma = (P-O)/6$

  - $(40-10)/6 =$ **5hr**

  - With a 95% confidence this activities Duration Estimate $= tE+(x\sigma)$

  25+(2x5) = 35hr this could also be expressed as a **range 25hr+/-10hr**

PERT Formulas for the PMP Exam	
Duration Estimate	DE= $tE+(x\sigma)$
Time Expected / Goal Time	$tE=[O+(4xM)+P]/6$
Standard Deviation	$\sigma=(P-O)/6$
Range of Estimates	$ROE=tE +/-(x\sigma)$

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6.4 Estimate Activities Duration

Outputs

1. **Duration Estimates** -This is a project document that explains the activities estimated duration (it includes the contingency reserve). Remember, effort and duration are different terms. We usually get the estimate in effort, and in this process we turn it into duration. Activity Duration Estimates = $tE + (x\sigma)$
2. **Basis of Estimates** - A project document that explains why you believe this activities estimate to be correct.
3. Project Document Updates
 - Activity Attributes
 - Assumption log
 - Lessons Learned Register

Figure 6-12, page 195, Project Management Institute, *A Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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6.4 Estimate Activities Duration

New Terms from 2021 Exam Change

- **Consensus Estimating Tools –** methods used to poll a team in order to gain information from the perspective of the worker.

    Fist of Five -

    Roman Voting -

    Dot Voting -

    Planning Poker -

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6.4 Estimate Activities Duration

ID #	Enabler	Primary Reference
2.6.1	Estimate project tasks (milestones, dependencies, story points)	**6.4**

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6.5 Develop Schedule

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Key Concept: Now its time to put it all together and create the project schedule. The approved version of the project schedule is called the schedule baseline.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Schedule Management Plan
  - Scope Baseline
2. Project Documents
  - Activity Attributes
  - Activity List
  - Assumption Log
  - Basis of Estimates
  - Lessons Learned Register
  - Milestone List
  - Project Team Assignments
  - Resource Calendars
  - Resource Requirements
  - Risk Register
4. Agreements
3. EEFs
4. OPAs
	1. Schedule Network Analysis
	2. Critical Path Method
	3. Resource Optimization
	4. Data Analysis
	  - What-if Scenario Analysis
	  - Simulation
	5. Leads and Lags
	6. Schedule Compression
	7. Project Management Information System
	8. Agile Release Planning
		1. Schedule Baseline
		2. Project Schedule
		3. Schedule Data
		4. Project Calendars
		5. Change Requests
		6. Project Management Plan Updates
		  - Schedule Management Plan
		  - Cost Baseline
		7. Project Documents Updates
		  - Activity Attributes
		  - Assumption Log
		  - Duration Estimates
		  - Lessons Learned Register
		  - Resource Requirements
		  - Risk Register

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6.5 Develop Schedule

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Inputs

1. Project Management Plan
- Schedule Management Plan
- Scope Baseline
2. Project Documents
- Activity Attributes
- Activity List
- Assumption Log
- Basis of Estimates
- Lessons Learned Register
- Milestone List
- Project Team Assignments ?!?!?!?
- Resource Calendars
- Resource Requirements
- Risk Register
4. Agreements
3. EEFs
4. OPAs

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6.5 Develop Schedule

Tools and Techniques

1. **Schedule Network Analysis** - The combination of the below-listed tools in some way to generate the project schedule model
2. **Critical Path Method** - A scheduling methodology that enhances the schedule network diagram with the activity durations in order to represent the chain of activities that makes the critical path.
3. **Resource Optimization** - The moving around of the work between resources and/or the timeline. Two Teams Resources Leveling and Resource Smoothing
4. Data Analysis
   - What-if Scenario Analysis
   - Simulation
5. Leads and Lags
6. **Schedule Compression**
7. Project Management Information System
8. **Agile Release Planning**

Resource Optimization
Resource Leveling - Will affect the planned end date of the project
Resource Smoothing - does not affect the planned end date of the project

Schedule Compression
Fast Tracking - Increases Risk
Crashing - Increases Spending

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Critical Path Method

- This Tool enhances the schedule network diagram by adding start and end times to each task.
- By using the tool the PM can determine the path through the diagram that takes the longest called the critical path.
- The critical path method is broken into two steps:
  - Forward Pass - Solving each tasks Early Start then Early Finish times
  - Backward Pass - Solving each takes Late Finish then Late Start times

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Critical Path Method

- <u>Organize Chart</u>
  The chart should be organized and neat; in order to not make mistakes, try drawing lines to create tiers within the chart.
- <u>Forward Pass</u>
  A. Early Start   ES = The EF from the activity behind it +1
  B. Early Finish   EF= ES+D-1

- <u>Backward Pass</u>
  A. Late Finish   LF = LS of the next activity in line -1
  B. Late Start   LS = LF-D+1

- <u>Determine Float</u>
  A. Total Float
  B. Free Float
  C. Project Float

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Critical Path Method

Step One: Solve Along the Early Line using FORWARD PASS

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Critical Path Method

Earliest Start

ES=**EF**+1 the *EF* is bold in the equation to show that it is the largest value from the predecessor

Early Line

Start Line

ES		
	A	
	10	

Finish Line

Late Line

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Critical Path Method

Early Line

Start Line

1		EF
	A	
	10	

Finish Line

Late Line

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Critical Path Method

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	A	
	10	

	B	
	15	

	C	
	12	

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Critical Path Method

154

1		10
	A	
	10	

1		15
	B	
	15	

16		27
	C	
	12	

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Critical Path Method

Step Two: Solve Along the Late Line using BACKWARD PASS

Early Line

16		27
	C	
LS	12	LF

Late Line

Start Line — Finish Line

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Critical Path Method

Early Line

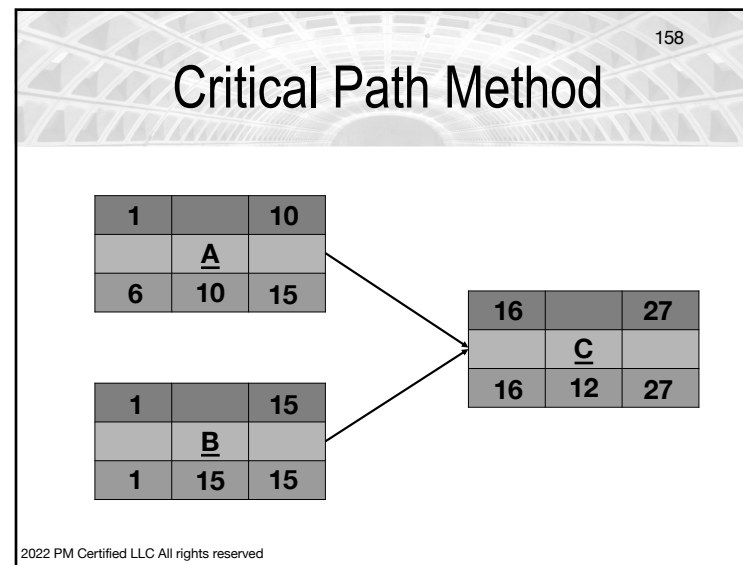| 16		27
	C	
	12	?

Late Line

Start Line — Finish Line

Late Finish
LF=LS-1 the *LS* is small in the equation to show that it is the smallest value from the successor relation ships

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Critical Path Method

Early Line

Start Line

16		27
	C	
16 =1+	12	27

Finish Line

Late Line

Late Start
LS=LF-D +1

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Critical Path Method

1		10
	A	
6	10	15

1		15
	B	
1	15	15

16		27
	C	
16	12	27

**158**

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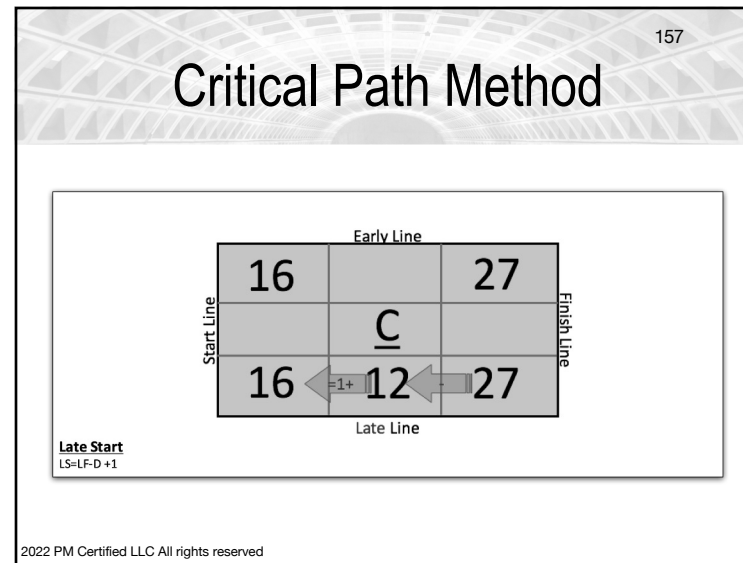
Critical Path Method

Three types of float:

Total Float aka slack or wiggle room: the amount of time that an activity can be delayed without delaying the expected end date of the project. **Activity vs Project Expected Duration**

Free Float: the amount of time that an activity can be delayed without delaying the next activity in line. **Activity vs the next Activity**
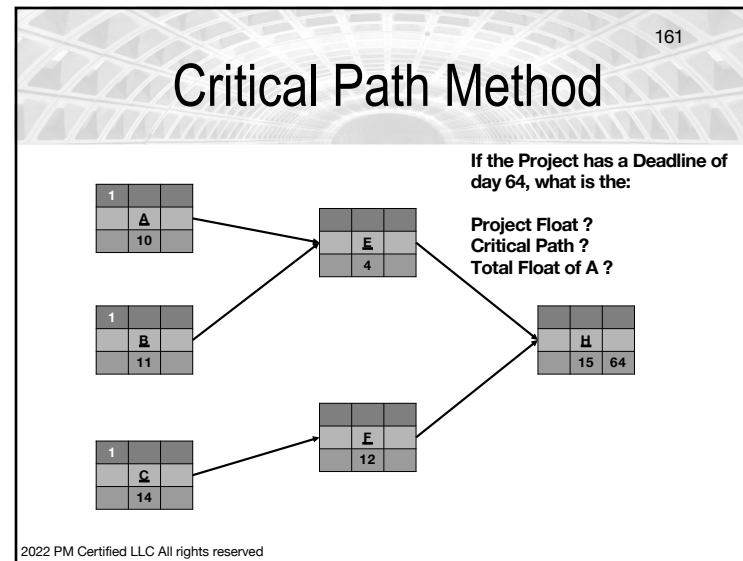
Project Float: the amount of time a project can be delayed, before it misses the project deadline set by the Sponsor. **Project Expected Duration vs Project Deadline**

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Critical Path Method

1	5	10
	A	
6	10	15

5

16	0	27
	C	
16	12	27

0

1	0	15
	B	
1	15	15

160
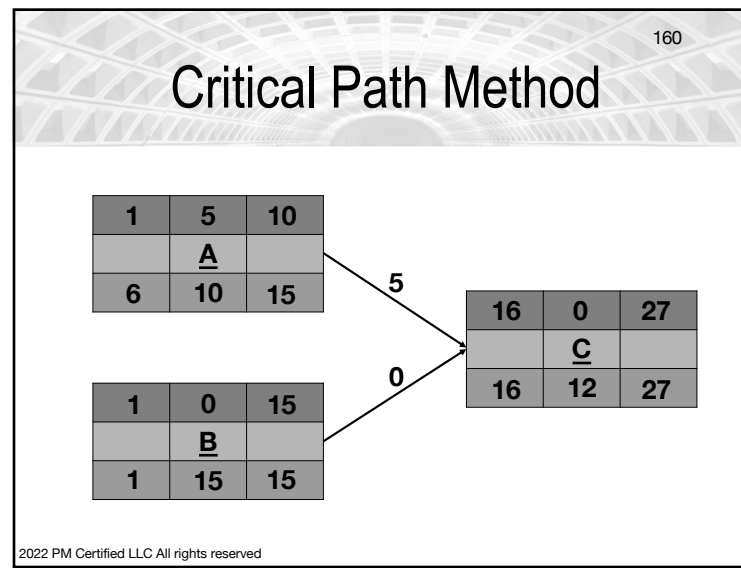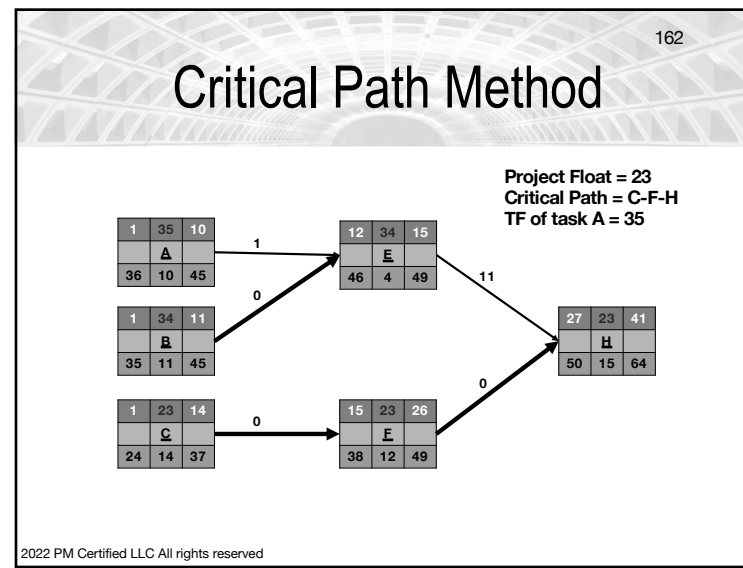
163

Critical Path Method

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Activity	Duration
A	10
B	11
C	14
D	5
E	4
F	12
G	8
H	15
I	7
J	8
K	17
L	12
THE DEADLINE IS DAY 84	

1) What is the Critical Path?
2) What is the PED or Project Estimated End Date?
3) What is the Project Float?
4) What is the Total Float of A?
5) What is the Free Float between E and H?

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Critical Path Method

Network diagram with activities: A (10), B (11), C (14), D (5), E (4), F (12), G (8), H (15), I (7), J (8), K (17), L (12, 84)

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Slide 165

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Critical Path Method

Project Float = 22
Critical Path = C-F-I-K-L

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Slide 166
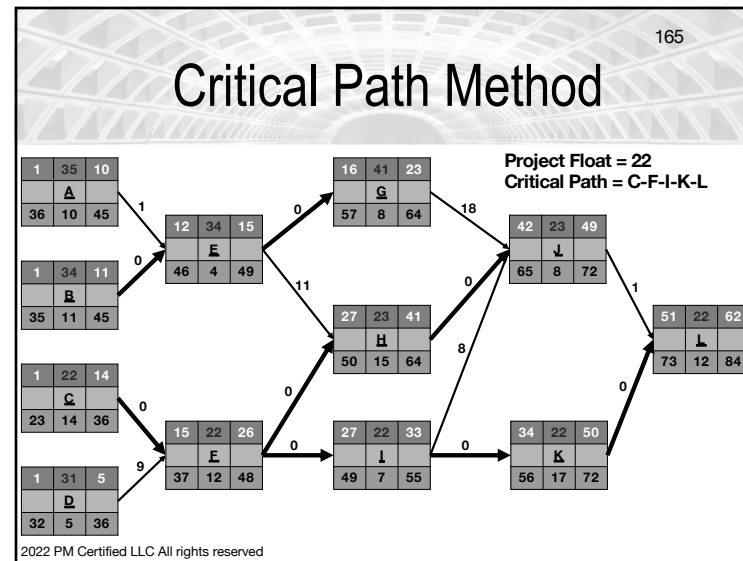
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6.5 Develop Schedule

Outputs

1. **Schedule Baseline** - The approved Project Schedule along with Schedule Data explaining it.
2. **Project Schedule** - Displays all activities planned for the project, usually in a Gantt Chart
3. **Schedule Data** - Explains the project milestone, funding, contingence reserves as it relates to the project schedule.
4. **Project Calendars** - This is a subset of the Project Schedule by time. The Phase 3 Calendar or the FY 2019 calendar. A project calendar displays all the activities planned in a window of time.
5. Change Requests
6. Project Management Plan Updates
- Schedule Management Plan
- Cost Baseline
7. Project Documents Updates
- Activity Attributes
- Assumption Log
- Duration Estimates
- Lessons Learned Register
- Resource Requirements
- Risk Register

Examples of a Gantt Chart, and Milestone Chart can be seen on p.218 PMBOK® Guide

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6.5 Develop Schedule

New Terms from 2021 Exam Change

- **On Demand Scheduling -** Based on the theory-of-constraints and pull-based scheduling concepts from lean manufacturing to limit a team's work in progress in order to balance demand against the team's delivery throughput

- **Iteration Backlog** - Items from the product backlog that can conceivably be completed within a given time period.

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6.5 Develop Schedule

ID #	Enabler	Primary Reference
2.6.3	Prepare schedule based on methodology	6.1 and **6.5**
2.6.5	Modify schedule, as needed, based on methodology	6.1, 6.5 and **6.7**

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Project Cost Management

This knowledge area is used to create and control the cost of the project. The aggregated cost of all project tasks is referred to as the Cost Baseline. These processes will create the cost baseline and control it.

- 7.1 Plan Cost Management
- 7.2 Estimate Cost
- 7.3 Determine Budget
- 7.4 Control Costs

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7.2 Estimate Costs

Key Concept: In this process we are attempting to determine the cost expected of a particular activity; once that is done, we will add the cost expected to the activity contingency reserve. $cE + (x\sigma)$ This creates the output Cost Estimates.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
- Cost Management Plan
- Quality Management Plan
- Scope Baseline
2. Project Documents
- Lessons Learned Register
- Project Schedule
- Resource Requirements
- Risk Register
3. EEFs
4. OPAs
	1. Expert Judgment
	2. Analogous Estimating
	3. Parametric Estimating
	4. Three-point Estimating
	5. Bottom-up Estimating
	6. Data Analysis
	  - Alternative Analysis
	  - Reserve Analysis
	  - Cost of Quality
	7. Project Management Information System
	8. Decision-Making
	  - Voting
		1. Cost Estimates
		2. Basis of Estimates
		3. Project Document Updates
		- Assumption Log
		- Lessons Learned Register
		- Risk Register

Figure 7-4, page 240, Project Management Institute, *A Guide to the Project Management Body of (Knowledge PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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7.2 Estimate Costs

Inputs

1. Project Management Plan
   - Cost Management Plan
   - **Quality Management Plan**
   - Scope Baseline
2. Project Documents
   - **Lessons Learned Register**
   - Project Schedule
   - **Resource Requirements**
   - **Risk Register**
3. EEFs
4. OPAs

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7.2 Estimate Costs

Tools and Techniques

1. Expert Judgment
2. Analogous Estimating
3. Parametric Estimating
4. Three-point Estimating
5. Bottom-up Estimating
6. Data Analysis
   - Alternative Analysis
   - Reserve Analysis
   - **Cost of Quality**
7. Project Management Information System
8. Decision-making
   - Voting

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7.2 Estimate Costs

Outputs

1. **Cost Estimates**
2. Basis of Estimates
3. Project Document Updates
- Assumption Log
- Lessons Learned Register
- Risk Register

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7.2 Estimate Costs

ID #	Enabler	Primary Reference
2.5.1	Estimate budgetary needs based on the scope of the project and lessons learned from historical projects	7.2 and **7.3**
2.5.4	Plan and manage resources	7.1, 7.2, 7.3 and **7.4**

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7.3 Determine Budget

Key Concept: Rolling up all the activity costs to the work package then to the phase to create the cost baseline. The cost baseline will be approved in this process.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Cost Management Plan - Resource Management Plan - Scope Baseline 2. Project Documents - Basis of Estimates - Cost Estimates - Project Schedule - Risk Register 4. Agreements 3. EEFs 4. OPAs	1. Expert Judgment 2. Cost Aggregation 3. Data Analysis - Reserve Analysis 4. Historical Information Review 5. Funding Limit Reconciliation 6. Financing	1. Cost Baseline 2. Project Funding Requirements 3. Project Documents Updates - Cost Estimates - Project Schedule - Risk Register

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7.3 Determine Budget

Inputs

1. Project Management Plan
   - Cost Management Plan
   - Resource Management Plan
   - Scope Baseline
2. Project Documents
   - Basis of Estimates
   - Cost Estimates
   - Project Schedule
   - Risk Register
4. Agreements
3. EEFs
4. OPAs

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7.3 Determine Budget

Tools and Techniques

1. Expert Judgment
2. **Cost Aggregation** - The rolling up of all project costs; see page 255 PMBOK® Guide
3. Data Analysis
-   Reserve Analysis
4. **Historical Information Review** - Using a past project as a historical reference for your future phases.
5. **Funding Limit Reconciliation** - Moving the work around the schedule depending on the available funds to do the work in the organization.
6. Financing

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7.3 Determine Budget

Outputs

1. **Cost Baseline** - This plan is the approved time-phase project budget excluding management reserves; it contains all other project costs.
2. Project Funding Requirements
3. Project Documents Updates
-   Cost Estimates
-   Project Schedule
-   Risk Register

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7.3 Determine Budget

ID #	Enabler	Primary Reference
2.5.1	Estimate budgetary needs based on the scope of the project and lessons learned from historical projects	7.1, **7.3,** and 7.4
2.5.2	Anticipate future budget challenges	7.1 and **7.3**
2.5.4	Plan and manage resources	7.1, 7.2, 7.3 and **7.4**

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Project Quality Management

The most confusing knowledge area in the course. This is about trying to understand what quality means for the deliverables in your project and making sure they will meet your sponsor expectations.

- 8.1 Plan Quality Management **Plan**
- 8.2 Manage Quality **Check**
- 8.3 Control Quality **Do**

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8.1 Plan Quality Management

Key Concept: Define what quality means to the project. This process also determines how, when, and by whom testing will be done and then documented.

Inputs	Tools and Techniques	Outputs

1. Project Charter
2. Project Management Plan
  - Requirements Management Plan
  - Risk Management Plan
  - Stakeholder Engagement Plan
  - Scope Baseline
3. Project Documents
  - Assumption Log
  - Requirements Documentation
  - Requirements Traceability Matrix
  - Risk Register
  - Stakeholder Register
4. EEF
5. OPA
	1. Expert Judgement
	2. Data Gathering
	  - Benchmarking
	  - Brainstorming
	  - Interviews
	3. Data Analysis
	  - Cost-benefit Analysis
	  - Cost of Quality
	4. Decision Making
	  Multi-criteria Decision Analysis
	5. Data Representation
	  - Flowcharts
	  - Logical Data Model
	  - Matrix Diagrams
	  - Mind Mapping
	6. Expert Judgement
	7. Test and Inspection Planning
	8. Meetings
		1. Quality Management plan
		2. Quality Metrics
		3. Project Management Plan Updates
		  - Risk Management Plan
		  - Scope Baseline
		4. Project Documents Updates
		  - Lessons Learned Register
		  - Requirements Traceability Matrix
		  - Risk Register
		  - Stakeholder Register

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8.1 Plan Quality Management

Inputs

1. Project Charter
2. Project Management Plan
   - Requirements Management Plan
   - Risk Management Plan
   - Stakeholder Engagement Plan
   - Scope Baseline
3. Project Documents
   - Assumption Log
   - Requirements Documentation
   - Requirements Traceability Matrix
   - Risk Register
   - Stakeholder Register
4. EEF
5. OPA

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8.1 Plan Quality Management

Quality Terms and Concepts

Quality vs Grade
Quality is the ability for an item to do its intended job.
Grade is the category of competing goods.

Zero Defects
A quality concept centered around striving for perfection through prevention and a conscious desire to do the job right the first time to achieve zero defects. This concept was written about first by Philip Crosby in *Absolutes of Quality Management*, 1979.

Six Sigma
The concept of achieving a certain number of defects. At 6σ you will have 3.4 defects per million.

Lean Six Sigma
Combines the concept of Six Sigma with the lean manufacturing concepts which is focused on the reduction of waste; the seven original are:
1. Transportation
2. Inventory
3. Motion
4. Waiting   *TIMWOOD*
5. Overproduction
6. Over Processing
7. Defects

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8.1 Plan Quality Management

Quality Terms and Concepts

KanBan
The use of a visual aid to display the status of the work with a board that is sectioned off into the categories of work and cards representing tasks.

Quality Function Deployment
Used to understand what quality means to the end user or customer then designs that understanding into our project deliverables.

Prevention preferred over inspection
This concept is suggesting that the PM should use the quality management plan as a way to pick up the data points in order to forecast and prevent issues from ever occurring.

Attribute Sampling - Pass Fail
Variable Sampling - A certain amount of failure is expected.
Tolerance - the amount of expected failure

Five Increasing levels of Quality management
1. Relies on customers to find defects
2. Defects are found and corrected before they are ever sent out.
3. Iterative updating or correcting quality processes
4. Incorporates quality into all aspects of planning.
5. Quality aware Culture

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8.1 Plan Quality Management

Quality Terms and Concepts

Precision
The ability to repeat the same action with a small standard deviation
Accuracy
The ability to hit the target

Organizations and Standards

ISO
International **S**tandards **O**rganization

CMMI
Five levels of maturity for software development. **C**apability **M**aturity **M**odel **I**ntegration
1. Initial
2. Managed
3. Defined
4. Quantitative Managed
5. Optimizing

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8.1 Plan Quality Management

Names to Know

Edward Deming
Most known for his paper 14 points of Total Quality and concept that *Quality is a management problem 85% of the time.*
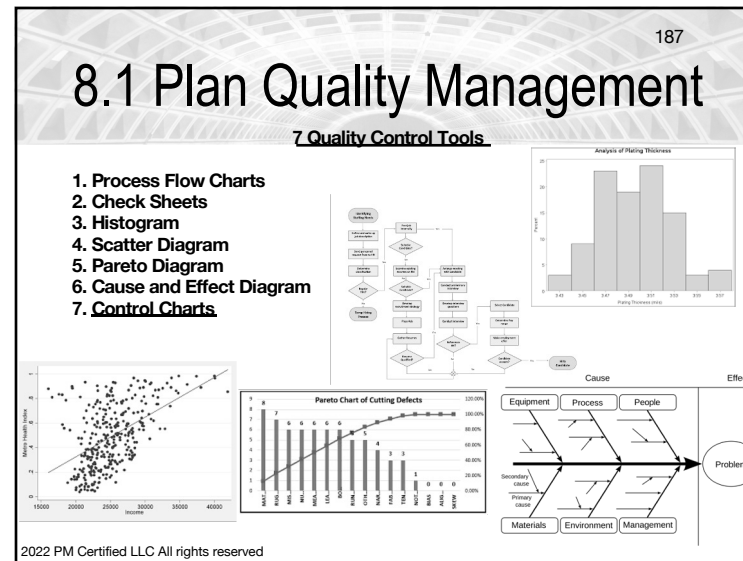
Philip Crosby
Published the methodology for Zero Defects also developed the Cost of Quality

Joseph Juran
Most of his work was about quality by design; he came up with "Fitness for Use." His worked focused around understanding what quality is and designing it into every step of production.
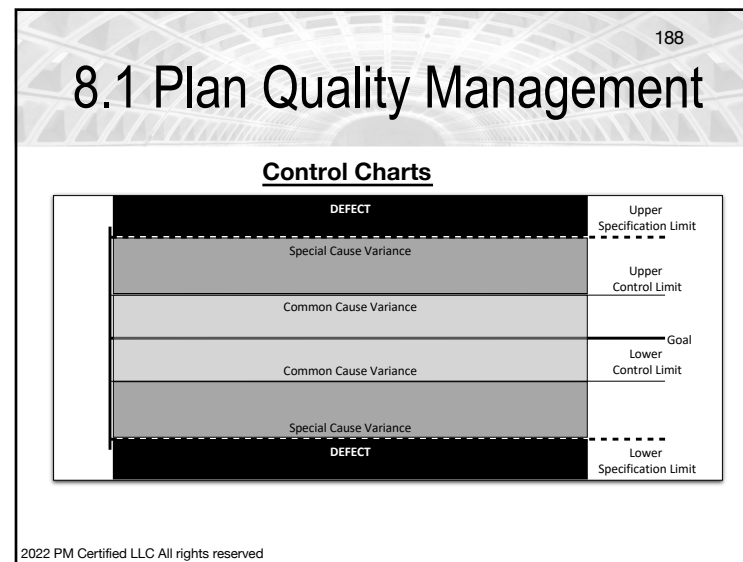
Kaoru Ishikawa
Worked with Deming and is credited for the cause and effect diagram also author of *What is Quality Control* in 1985, where he stressed a product life cycle approach to the Plan-Do-Check-Act model and turned the four step loop into six.

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8.1 Plan Quality Management

7 Quality Control Tools

1. Process Flow Charts
2. Check Sheets
3. Histogram
4. Scatter Diagram
5. Pareto Diagram
6. Cause and Effect Diagram
7. Control Charts

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8.1 Plan Quality Management

Control Charts

DEFECT	Upper Specification Limit
Special Cause Variance	Upper Control Limit
Common Cause Variance	
	Goal
Common Cause Variance	Lower Control Limit
Special Cause Variance	
DEFECT	Lower Specification Limit

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8.1 Plan Quality Management

Control Charts

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8.1 Plan Quality Management

Tools and Techniques

1. Expert Judgement
2. Data Gathering
   - Benchmarking
   - Brainstorming
   - Interviews
3. Data Analysis
   - **Cost-benefit Analysis** - understanding the cost threshold for quality in a portion of your project
   - **Cost of Quality** - understanding the you are going to pay for quality but you have the choice of when
4. Decision Making
   Multi-criteria Decision Analysis
5. Data Representation
   - Flowcharts (process flowcharts and SIPOC Model)
   - Logical Data Model
   - **Matrix Diagrams** - In this process L type Matrix diagrams could be used in quality function deployment to understand the relationship between customer requirements and technical requirements.
   - Mind mapping
6. Test and Inspection Planning
7. Meetings

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8.1 Plan Quality Management

Cost of Quality Terms

Cost of Conformance	**Cost of Nonconformance**
Prevention Costs	**Internal Failure Costs**
Training	Rework
Document processes	Scrap
Equipment	**External Failure Costs**
Time to do it right	Liabilities
Appraisal Costs	Warranty work
Testing	Lost business
Destructive testing loss	
Inspections	

Matrix Diagram

Project Name	Customer Requirements			
Deliverable	**Item 1**	**Item 2**	**Item 3**	**Item 4**
Item 1	*		**	*
Item 2	*	*	*	
Item 3			*	
Item 4		******		**

Technical Requirements (label for Items 1-4 rows)

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8.1 Plan Quality Management

Outputs

1. **Quality Management Plan** - This plan spells out exactly what quality means for each deliverable; it also details who will be conducting each quality activity and when it will occur. Often, quality or the results of quality are displayed to others using graphs, tables, or charts; this plan will discuss how they are populated and supply the template. One of the most important components of this plan is providing guidance on how to document and archive the results from testing; this document is called quality control measurements.

2. **Quality Metrics** - What is actually being measured. Example: the number of bugs per line of code.

3. Project Management Plan Updates
   - Risk Management Plan
   - Scope Baseline

4. Project Documents Updates
   - Lessons Learned Register
   - Requirements Traceability Matrix
   - Risk Register
   - Stakeholder Register

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8.1 Plan Quality Management

ID #	Enabler	Primary Reference
2.7.1	Determine quality standard required for project deliverables	**8.1**
3.1.1	Confirm project compliance requirements (e.g., security, health and safety, regulatory compliance)	4.1, **5.2**, 8.1, 11.1, 11.2 and 13.1
3.1.2	Classify compliance categories	NEW 5.1, **8.1**, 11.1
3.1.3	Determine potential threats to compliance	NEW 5.2, 8.1, **11.2**
3.1.5	Analyze the consequences of noncompliance	NEW 5.2, 8.1, **11.2**
3.1.6	Determine necessary approach and action to address compliance needs (e.g., risk, legal)	NEW 5.2, 8.1, **11.2**
3.2.1	Investigate that benefits are identified	**4.1**, 5.2, 8.1
3.2.2	Document agreements on ownership for ongoing benefits	NEW **4.1**, 8.1 and 4.4

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Project Resource Management

The estimating, obtaining and controlling of project resources. Both physical and human.

- 9.1 Plan Resource Management
- 9.2 Estimate Activity Resources
- 9.3 Acquire Resources
- 9.4 Develop Team
- 9.5 Manage Team
- 9.6 Control Resources

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9.1 Plan Resource Management

Key Concept: This process creates the plan that will lay out exactly how estimating and requesting for resources will work for this project. The plan will also discuss roles and responsibilities, training, evaluations, and how conflicts are resolved.

Inputs	Tools and Techniques	Outputs

1. Project Charter
2. Project Management Plan
  - Quality Management Plan
  - Scope Baseline
3. Project Documents
  - Project Schedule
  - Requirements Documentation
  - Risk Register
  - Stakeholder Register
4. OPAs
5. EEFS
	1. Expert Judgment
	2. Data Analysis
	  - Hierarchical Charts
	  - Responsibility Assignment Matrix
	  - Organizational Theory
	3. Meetings
		1. Resource Management Plan
		2. Team Charter
		3. Project Document Updates
		  - Assumption Log
		  - Risk Register

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9.1 Plan Resource Management

Inputs

1. Project Charter
2. Project Management Plan
  - Quality Management Plan
  - Scope Baseline
3. Project Documents
  - Project Schedule
  - Requirements Documentation
  - Risk Register
  - Stakeholder Register
4. OPAs
5. EEFS

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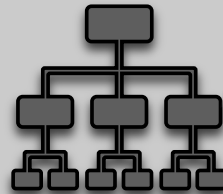
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9.1 Plan Resource Management

Tools and Techniques

1. Expert Judgment
2. **Data Analysis**
   - **Hierarchical Charts**
   - **Responsibility Assignment Matrix**
   - **Organizational Theory**
3. Meetings

Project Deliverable (or Activity) / Role	Project Leadership					Project Team Members				
	Executive Spon	Project Spons	Steering Comm	Advisory Comm	Role #5	Project Manag	Tech Lead	Functional Le	SME	Project Team Member
Initiate Phase Activities										
- Submit Project Request	A/C	R/A				R/A	A/C	A/C	C	
- Request Review by PMO						R				
- Research Solution	I	C				R/A	A/C	A/C	C	
- Develop Business Case	I	A/C	I	I		R/A	C	C	C	
Plan Phase Activities										
- Create Project Charter	C	C				R/A	C	C	C	
- Create Schedule	I	I	I	I		R/A	C	C	C	C
- Create Additional Plans as required	I	I	I	I		R/A				I
Execute Phase Activities										
- Build Deliverables	C/I	C/I	C/I	C/I			R/A	R/A	R/A	R/A
- Create Status Report	I	I	I	I		R/A	R/A	R/A	R/A	
Control Phase Activities										
- Perform Change Management		C	C	C		R	A	A	A	A
Close Phase Activities										
- Create Lessons Learned	C	C	C	C		R/A	C	C	C	C
- Create Project Closure Report	I	I	I	I		R/A	I	I	I	

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9.1 Plan Resource Management

Outputs

1. **Resource Management Plan** - This is one of the larger plans discussed in the PMBOK® Guide; make sure to know all components.
   - Team Development - Team building and evaluations
   - Training - team and collective
   - Project Organization Chart - Shows the team members reporting relationships
   - Resource Controls - Ensure adequate resources are available as needed
   - Recognition Plan - How rewards are given
   - Project Team Resource Management Plan - The human resource part of this
   - Roles and Responsibilities - Written to cover all human resources on the project
   - Acquiring Resources - How resources are requested
   - Identification of Resources - How estimating for resources will be done

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9.1 Plan Resource Management

Outputs

2. Team Charter - The goal of this document is to create an agile environment so that the team members can work together as a team. It achieves this by defining ground rules, group norms, team values, and working agreements.

3. Project Document Updates -
- Assumption Log
- Risk Register

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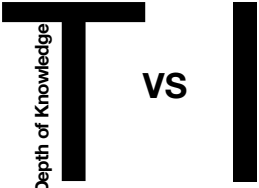
200

9.1 Plan Resource Management

New Terms from 2021 Exam Change

- **Team Skill Appraisal -** **Appraisals enable the team to holistically identify its strengths and weaknesses, assess opportunities for improvement, build trust, and establish communication mechanisms.**

- **T vs I Skills – Broad skills vs narrow. The Agile Practice Guide uses this concept to describe the optimal "Agile Team" being composed of team members with T skills over I skills.**

Width of Knowledge

Depth of Knowledge

T VS I

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9.1 Plan Resource Management

ID #	Enabler	Primary Reference
1.2.2	Support diversity and inclusion (e.g., behavior types, thought process)	**9.1**
1.2.7	Distinguish various options to lead various team members and stakeholders	**9.1**
1.4.1	Organize around team strengths	**9.1**
1.7.1	Determine critical impediments, obstacles, and blockers for the team	**9.1**, APG
1.13.1	Allocate time to mentoring	**9.1** and APG
2.1.3	Support the team to subdivide project tasks as necessary to find the Minimum Viable Product	NEW **9.1** p 33 APG

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9.1 Plan Resource Management

ID #	Enabler	Primary Reference
1.4.4	Determine and bestow level(s) of decision making authority	9.1 and **9.3**
1.5.2	Determine training options based on training needs	**9.1**, 9.2, 9.3
1.12.2	Establish an environment that fosters adherence to the ground rules	13.3 and **9.1**
2.14.2	Define escalation paths and thresholds	4.1, **9.1** and 13.2
2.16.1	Discuss project responsibilities within team	4.4 and **9.1**

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9.2 Estimate Activities Resources

Key Concept: In this process we are attempting to determine the number and type of resources to do a particular activity; resources include people, machinery, facilities, and materials.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Resource Management Plan
  - Scope Baseline
2. Project Documents
  - Activity Attributes
  - Activity List
  - Assumption Log
  - Cost Estimates
  - Resource Calendars
  - Risk Register
3. EEFs
4. OPAs
	1. Expert Judgment
	2. Bottom-up Estimating
	3. Analogous Estimating
	4. Parametric Estimating
	5. Data Analysis
	  - Alternative Analysis
	6. Project Management Information System
	7. Meetings
		1. Resource Requirements
		2. Basis of Estimates
		3. Resource Breakdown Structure
		4. Project Document Updates
		  - Activity Attributes
		  - Assumption Log
		  - Lessons Learned Register

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9.2 Estimate Activities Resources

Inputs

1. <u>Project Management Plan</u>
  - Resource Management Plan
  - Scope Baseline
2. <u>Project Documents</u>
  - Activity Attributes
  - Activity List
  - Assumption Log
  - Cost Estimates
  - Resource Calendars
  - Risk Register
3. <u>EEFs</u>
4. <u>OPAs</u>

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9.2 Estimate Activities Resources

Tools and Techniques

1. Expert Judgment
2. Bottom-up Estimating
3. Analogous Estimating
4. Parametric Estimating
5. Data Analysis
   - Alternative Analysis
6. Project Management Information System
7. Meetings

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9.2 Estimate Activities Resources

Outputs

1. **Resource Requirements** - This is the document that explains the number of resources and type of resources needed to do a particular activity
2. Basis of Estimates
3. **Resource Breakdown Structure**
4. Project Document Updates
   - Activity Attributes
   - Assumption Log
   - Lessons Learned Register

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9.2 Estimate Activities Resources

ID #	Enabler	Primary Reference
1.4.2	Support team task accountability	9.1, 9.2, **9.3** and 9.6
1.5.1	Determine required competencies and elements of training	9.1 and **9.2**
1.5.2	Determine training options based on training needs	9.1, 9.2, **9.3** and 9.6
1.5.3	Allocate resources for training	**9.2** and 9.6
1.6.2	Deduce project resource requirements	**9.2** and 9.6
1.11.1	Examine Virtual Team Member Needs (e.g., environment, geography, culture, global, etc.)	**9.2**
1.11.2	Investigate alternatives (.e.g, communication tools, co-location) for Virtual Team Member engagement	APG, 10.1 and **9.2**
2.11.1	Define resource requirements and needs	9.2 and **12.1**
2.16.2	Outline expectations for working environment	4.4 and **9.2**

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Project Communication Management

This knowledge area covers the planning of communication, the act of communicating, and making sure the team is following the plan when communicating.

- 10.1 Plan Communication Management
- 10.2 Manage Communications
- 10.3 Monitor Communications

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10.1 Plan Communication Management

Key Concept: This process takes into consideration the different platforms of communication in the organization and writes the plan for how the team will use the selected platforms and the appropriate use of those platforms.

Inputs	Tools and Techniques	Outputs

1. Project Charter
2. Project Management Plan
  - Resource Management Plan
  - Stakeholder Engagement Plan
3. Project Documents
  - Requirements Documentation
  - Stakeholder Register
4. OPAs
5. EEFS
	1. Expert Judgment
	2. Communication Requirements Analysis
	3. Communication Technology
	4. Communication Models
	5. Communication Methods
	6. Interpersonal and Team Skills
	  - Communication Styles Assessment
	  - Political Awareness
	  - Cultural Awareness
	7. Data Representation
	8. Meetings
		1. Communications Management Plan
		2. Project Management Plan Updates
		  - Stakeholder Engagement Plan
		3. Project Documents Updates
		  - Project Schedule
		  - Stakeholder Register

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10.1 Plan Communication Management

Inputs

1. Project Charter
2. Project Management Plan
   - Resource Management Plan
   - Stakeholder Engagement Plan
3. Project Documents
   - Requirements Documentation
   - Stakeholder Register
4. OPAs
5. EEFS

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10.1 Plan Communication Management

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Tools and Techniques

1. Expert Judgment
2. **Communication Requirements Analysis** - *n(n-1)/2 one to one formula*
3. **Communication Technology** ⟶ Factors that can affect the choice of communication technology
   ✓ Urgency of the need for information
   ✓ Availability and reliability of technology
   ✓ Ease of use
   ✓ Project environment
   ✓ Sensitivity of the information
4. Communication Models
5. **Communication Methods**
   - **Interactive**
   - **Push**
   - **Pull**
6. Interpersonal and Team Skills
   - Communication Styles Assessment
   - Political Awareness
   - Cultural Awareness
7. **Data Representation** - The use of stakeholder grid or a RACI chart
8. Meetings

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10.1 Plan Communication Management

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Outputs

1. **Communications Management Plan** - This is the plan that covers the approved types of project communications by type. It could be phase oriented or by groups of stakeholders, but it will cover how communication is created, archived, and destroyed.
2. Project Management Plan Updates
   - Stakeholder Engagement Plan
3. Project Documents Updates
   - Project Schedule
   - Stakeholder Register

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10.1 Plan Communication Management

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ID #	Enabler	Primary Reference
1.11.2	Investigate alternatives (.e.g, communication tools, co-location) for Virtual Team Member engagement	APG, 10.1 10.3, and **9.2**
2.2.1	Analyze communication needs of all stakeholders	13.1 and **10.1**
2.2.2	Determine communications methods, channels, frequency, and level of detail for all stakeholders	**10.1**
2.15.3	Collaborate with relevant stakeholders on the approach to resolve the issues	10.1, 11.1 and **13.2**

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Project Risk Management

This knowledge area covers policies for handling risk, identification of risk, planning for risk, and controlling risk in the project.

- 11.1 Plan Risk Management
- 11.2 Identify Risks
- 11.3 Perform Qualitative Risk Analysis
- 11.4 Perform Quantitative Risk Analysis
- 11.5 Plan Risk Responses
- 11.6 Implement Risk Responses
- 11.7 Monitor Risks

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Project Risk Management

Risk Approaches, Tools and Data Sources

- Risk Breakdown Structure
- Risk Register
- The Watch List
- Probability and Impact Matrix
- Prompt Lists
- Questionnaire
- Checklists

- Root-Cause Analysis
- Failure Modes and Effect Analysis
- Delphi Technique
- Assumptions and Constraint Analysis
- Brainstorming
- Cause and Effect Diagrams
- Nominal Group Technique

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Project Risk Management

Risk Approaches, Tools and Data Sources

- **Prompt Lists** - this is a set of risk categories that can be used to identify risk events during planning.

PESTLE	**TECOP**	**VUCA**	**SPECRUM**
Political	Technical	Volatility	Socio-cultural
Economic	Environmental	Uncertainty	Political
Social	Commercial	Complexity	Economic
Technological	Operational	Ambiguity	Competitive
Legal	Political		Technology
Environmental			Regulatory/legal
			Uncertainty/risk
			Market

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Project Risk Management

Risk Approaches, Tools and Data Sources

- RBS or Risk Breakdown Structure - This tool can be used to understand the different categories of risk in a project.

Project Number ###	RBS Level 1	RBS Level 2	
All Sources of Project Risk	Phase 1	1.1 Political 1.2 Economic 1.3 Social 1.4 Technological 1.5 Legal 1.6 Environmental	
	Phase 2	2.1 Political 2.2 Economic 2.3 Social 2.4 Technological 2.5 Legal 2.6 Environmental	
	Phase 3	3.1 Political 3.2 Economic 3.3 Social 3.4 Technological 3.5 Legal 3.6 Environmental	

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Project Risk Management

Risk Approaches, Tools and Data Sources

- The Probability and Impact Table - This tool can be used in combination with Risk Thresholds to understand risk within a project. It is one of the most effective tools a PM can use to rank risk across the project. It can also be used by the organization to give the PM guidance on how to handle a particular risk event.

		Threats					Opportunities				
Probability	0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05
	0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
	0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
	0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
	0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01
		0.05	0.10	0.20	0.40	0.80	0.80	0.40	0.20	0.10	0.05
						Impact					

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Project Risk Management

Risk Approaches, Tools and Data Sources

- The Risk Register is the preferred method to track and archive project risk.
- When used in Organizational Risk Management, the ID numbers can be used to build lessons learned, best practice, and refined strategies for a particular risk event.

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11.2 Identify Risk

Key Concept: This process is always going on. The PM is always looking to identify risk through the project, not just in planning.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Requirements Management Plan - Schedule Management Plan - Cost Management Plan - Quality Management Plan - Resource Management Plan - Risk Management Plan - Scope Baseline - Schedule Baseline - Cost Baseline 2. Project Documents - Assumption Log - Cost Estimates - Duration Estimates - Issue Log - Lessons Learned Register - Requirements Documentation - Resource Requirements - Stakeholder Register 3. Agreements 4. Procurement Documentation 5. EEFs 6. OPAs	1. Expert Judgment 2. Data Gathering - Brainstorming - Checklists - Interviews 3. Data Analysis - Root Cause Analysis - Assumption and Constraint Analysis - SWOT Analysis - Document Analysis 4. Interpersonal and Team Skills - Facilitation 5. Prompt Lists 6. Meetings	1. Risk Register 2. Risk Reports 3. Project Document Updates - Assumption Log - Issue Log - Lessons Learned Register

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11.2 Identify Risk

Inputs

1. Project Management Plan
   - Requirements Management Plan
   - Schedule Management Plan
   - Cost Management Plan
   - Quality Management Plan
   - Resource Management Plan
   - Risk Management Plan
   - Scope Baseline
   - Schedule Baseline
   - Cost Baseline

2. Project Documents
   - Assumption Log
   - Cost Estimates
   - Duration Estimates
   - Issue Log
   - Lessons Learned Register
   - Requirements Documentation
   - Resource Requirements
   - Stakeholder Register
3. Agreements
4. Procurement Documentation
5. EEFs
6. OPAs

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11.2 Identify Risk

Tools and Techniques

1. Expert Judgment
2. Data Gathering
   - Brainstorming
   - Checklists
   - Interviews
3. Data Analysis
   - Root Cause Analysis
   - Assumption and Constraint Analysis
   - SWOT Analysis
   - Document Analysis
4. Interpersonal and Team Skills
   - Facilitation
5. Prompt Lists
6. Meetings

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11.2 Identify Risk

Outputs

1. **Risk Register**
2. **Risk Reports** - A report on overall project, summarizing key risk events or categories of risk and risk drivers. When and how this is done would have been described in the Risk Management Plan.
3. Project Document Updates
  - Assumption Log
  - Issue Log
  - Lessons Learned Register

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11.2 Identify Risk

ID #	Enabler	Primary Reference
3.1.1	Confirm project compliance requirements (e.g., security, health and safety, regulatory compliance)	4.1, **5.2**, 8.1, 11.1, 11.2 and 13.1
3.1.3	Determine potential threats to compliance	NEW 5.2, 8.1, **11.2**
3.1.5	Analyze the consequences of noncompliance	NEW 5.2, 8.1, **11.2**, 11.3
3.1.6	Determine necessary approach and action to address compliance needs (e.g., risk, legal)	NEW 5.2, 8.1, **11.2**

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11.3 Perform Qualitative Risk Analysis

Key Concept: Comparing risk events to one another in order to distinguish high risk vs low risk.

Inputs	Tools and Techniques	Outputs

1. Project Management Plans
  - Risk Management Plan
3. Project Documents
  - Assumption Log
  - Risk Register
  - Stakeholder Register
3. EEFs
4. OPAs
	1. Expert Judgment
	2. Data Gathering
	  - Interviews
	3. Data Analysis
	  - Risk Data Quality Assessment
	  - Risk Probability and Impact Assessment
	  - Assessment of Other risk Parameters
	4. Interpersonal and Team Skills
	  Facilitation
	5. Risk Categorization
	6. Data Representation
	  - Probability and Impact Matrix
	  - Hierarchical Charts
	7. Meetings
		1. Project Documents Updates
		  - Assumption Log
		  - Issue Log
		  - Risk Register
		  - Risk Report

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11.3 Perform Qualitative Risk Analysis

Inputs

1. Project Management Plan
 - Risk Management Plan
3. Project Documents
 - Assumption Log
 - Risk Register
 - Stakeholder Register
3. EEFs
4. OPAs

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11.3 Perform Qualitative Risk Analysis

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Tools and Techniques

1. Expert Judgment
2. Data Gathering
   - Interviews
3. Data Analysis
   - Risk Data Quality Assessment
   - **Risk Probability and Impact Assessment**
   - Assessment of Other Risk Parameters (PMBOK® Guide p 423-424)
4. Interpersonal and Team Skills Facilitation
5. Risk Categorization
6. **Data Representation**
   - **Probability and Impact Matrix**
   - **Hierarchical Charts**
7. **Meetings** - This is often called a *Risk workshop*

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11.3 Perform Qualitative Risk Analysis

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Outputs

1. Project documents updates
   - Assumption Log
   - Issue Log
   - **Risk Register**
   - **Risk Report**

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11.3 Perform Qualitative Risk Analysis

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The Bubble Chart

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11.3 Perform Qualitative Risk Analysis

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ID #	Enabler	Primary Reference
3.1.5	Analyze the consequences of noncompliance	NEW 5.2, 8.1, 11.2, **11.3**

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11.4 Perform Quantitative Risk Analysis

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Key Concept: This process allows us to quantify the potential risk impacts to the project, allowing the PM to assign contingence reserve for risk events that touch upon many areas of the project.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Risk Management Plan
  - Scope Baseline
  - Schedule Baseline
  - Cost Baseline
2. Project Documents
  - Assumption Log
  - Basis of Estimates
  - Cost Estimates
  - Cost Forecasts
  - Duration Estimates
  - Milestone List
  - Resource Requirements
  - Risk Register
  - Risk Report
  - Schedule Forecasts
3. EEFs
4. OPAs
	1. Expert Judgment
	2. Data Gathering
	  - Interviews
	3. Interpersonal and Team Skills
	  - Facilitation
	4. Representations of Uncertainty
	5. Data Analysis
	  - Simulations
	  - Sensitivity Analysis
	  - Decision Tree Analysis
	  - Influence Diagrams
		1. Project Documents Updates
		  - Risk Report

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11.4 Perform Quantitative Risk Analysis

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Inputs

1. <u>Project Management Plan</u>
  - Risk Management Plan
  - Scope Baseline
  - Schedule Baseline
  - Cost Baseline
2. <u>Project Documents</u>
  - Assumption Log
  - Basis of Estimates
  - Cost Estimates
  - Cost Forecasts
  - Duration Estimates
  - Milestone List
  - Resource Requirements
  - Risk Register
  - Risk Report
  - Schedule Forecasts
3. <u>EEFs</u>
4. <u>OPAs</u>

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11.4 Perform Quantitative Risk Analysis

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Tools and Techniques

1. Expert Judgment
2. Data Gathering
   - Interviews
3. Interpersonal and Team Skills
   - Facilitation
4. Representations of Uncertainty
5. Data Analysis
   - Simulations
   - **Sensitivity Analysis**
   - **Decision Tree Analysis** - Using Expected Monetary Value

EMV = Probability x Impact see PMBOK® Guide p. 435 for example
   - Influence Diagrams

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11.4 Perform Quantitative Risk Analysis

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Outputs

1. Project Documents Updates
   - **Risk Report**

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11.4 Perform Quantitative Risk Analysis

ID #	Enabler	Primary Reference
2.15.2	Attack the issue with the optimal action to achieve project success	11.4, 11.5 and **11.6**

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11.5 Plan Risk Responses

<u>Key Concept</u>: In this process strategies are assigned to individual risk events.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Resource Management Plan - Risk Management Plan - Cost Baseline 2. Project Documents - Schedule Forecasts - Lessons Learned Register - Project Schedule - Project Team Assignments - Resource Calendars - Risk Register - Risk Report - Stakeholder Register 3. EEFs 4. OPAs	1. Expert Judgment 2. Data Gathering - Interviews 3. Interpersonal and Team Skills - Facilitation 4. Strategies for Threats 5. Strategies for Opportunities 6. Contingent Response Strategies 7. Strategies for Overall Project Risk 8. Data Analysis - Simulations - Alternatives Analysis - Cost-Benefit Analysis 9. Decision Making - Multicriteria Decision Analysis	1. Change Requests 2. Project Management Plan Updates - Schedule Management Plan - Cost Management Plan - Quality Management Plan - Resource Management Plan - Procurement Management Plan - Scope Baseline - Schedule Baseline - Cost Baseline 3. Project Documents Updates - Assumption Log - Cost Forecasts - Lessons Learned Register - Project Schedule - Project Team Assignments - Risk Register - Risk Report

Figure 11-16, page 437, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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11.5 Plan Risk Responses

Inputs

1. Project Management Plan
   - Resource Management Plan
   - Risk Management Plan
   - Cost Baseline
2. Project Documents
   - Schedule Forecasts
   - Lessons Learned Register
   - Project Schedule
   - Project Team Assignments
   - Resource Calendars
   - Risk Register
   - Risk Report
   - Stakeholder Register
3. EEFs
4. OPAs

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11.5 Plan Risk Responses

Tools and Techniques

1. Expert Judgment
2. Data Gathering
   - Interviews
3. Interpersonal and Team Skills
   - Facilitation
4. **Strategies for Threats**
5. **Strategies for Opportunities**
6. **Contingent Response Strategies**
7. Strategies for Overall Project Risk
8. Data Analysis
   - Simulations
   - Alternatives Analysis
   - Cost-Benefit Analysis
9. Decision Making
   - Multicriteria Decision Analysis

Strategies for Threats

Escalate:
Avoid:
Transfer:
Mitigate:
Accept:

Strategies for Opportunities

Escalate:
Exploit:
Share:
Enhance:
Accept:

Figure 11-11, page 428, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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11.5 Plan Risk Responses

Outputs

1. **Change Requests**
2. **Project Management Plan Updates**
   - Schedule Management Plan
   - Cost Management Plan
   - Quality Management Plan
   - Resource Management Plan
   - Procurement Management Plan
   - Scope Baseline
   - Schedule Baseline
   - Cost Baseline
3. **Project Documents Updates**
   - Assumption Log
   - Cost Forecasts
   - Lessons Learned Register
   - Project Schedule
   - Project Team Assignments
   - **Risk Register**
   - Risk Report

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11.5 Plan Risk Responses

ID #	Enabler	Primary Reference
2.15.3	Collaborate with relevant stakeholders on the approach to resolve the issues	10.1, 11.1, 11.5 and **13.2**

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Project Procurement Management

This knowledge is used to buy things for the project. In this knowledge area, the PM will act as the sponsor for a mini-project.

- 12.1 Plan Procurement Management
- 12.2 Conduct Procurements
- 12.3 Control Procurements

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Contract Terms

<u>Centralized Purchasing</u>: A dedicated portion of the company handles the majority of the procurement work

<u>Decentralized Purchasing</u>: The PM leads the procurement process.

<u>Sole Source</u>: Choosing a seller because it is the only source of the required product or service

<u>Tender</u>: Used interchangeably with bid

<u>Privity</u>: A contractual relationship between two entities

<u>Force Majeure</u>: A contract vehicle that allows for non-performance when unforeseeable and uncontrollable events occur (natural disasters, riots, etc.)

<u>Service Level Agreements</u>: A contract between a service provider (internal or external) and the end user that describes the level of service expected from the service provider.

Figure 12-1, page 460, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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Contract Types

Contract Types- Are used to shift risk in different ways.

Fixed Price Contracts
Firm Fixed Price (FFP)
Fixed Price Plus Incentive Fee (FPIF)
Fixed Price with Economic Price Adjustment (FP-EPA)

Cost-Reimbursable Contracts
Cost Plus Fixed Fee (CPFF)
Cost Plus Incentive Fee (CPIF)
Cost Plus Award Fee (CPAF)

Time & Materials Contracts
Often contain "not to exceed" clause

Risk graph: 100% to 0% on y-axis, with PM and Contractor lines. X-axis: CPFF, CPIF, CPAF, T&M, FP-EPA, FPIF, FFP

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13.2 Plan Stakeholder Engagement

<u>Key Concept</u>: Tailored plan focused on getting a stakeholder (or group) to the desired level of engagement during the project.

Inputs	Tools and Techniques	Outputs
1. Project Charter 2. Project Management Plan - Resource Management plan - Communication Management Plan - Risk Management Plan 3. Project Documents - Assumption Log - Change Log - Issue Log - Project Schedule - Risk Register - Stakeholder Register 4. Agreements 5. EEFs 6. OPAs	1. Expert Judgment 2. Data Gathering - Benchmarking 3. Data Analysis - Assumption and Constraint Analysis - Root Cause Analysis 4. Decision Making - Prioritization 5. Data Representation - Mind Mapping - Stakeholder Engagement Assessment Matrix 6. Meetings	1. Stakeholder Engagement Plan

Figure 13-4, page 516, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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13.2 Plan Stakeholder Engagement

Inputs

1. Project Charter
2. Project Management Plan
   - Resource Management plan
   - Communication Management Plan
   - Risk Management Plan
3. Project Documents
   - Assumption Log
   - Change Log
   - Issue Log
   - Project Schedule
   - Risk Register
   - Stakeholder Register
4. Agreements
5. EEFs
6. OPAs

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13.2 Plan Stakeholder Engagement

Tools and Techniques

1. Expert Judgment
2. Data Gathering
   - Benchmarking
3. Data Analysis
   - Assumption and Constraint Analysis
   - Root Cause Analysis
4. Decision Making
   - Prioritization
5. Data Representation
   - Mind Mapping
   - **Stakeholder Engagement Assessment Matrix**
6. Meetings

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13.2 Plan Stakeholder Engagement

Outputs

1. **Stakeholder Engagement Plan** - This plan details the desired level of engagement for a particular stakeholder or group of stakeholders for the entire project or by phase. This plan will also describe the strategy you plan to get that stakeholder to that desired level and maintain it during your project, using the communication platforms discussed in the communications management plan.

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13.2 Plan Stakeholder Engagement

ID #	Enabler	Primary Reference
1.9.1	Evaluate engagement needs for stakeholders	13.1 and **13.2**
1.14.2	Analyze personality indicators and adjust to the emotional needs of key project stakeholders	NEW **13.2**
2.4.4	Develop, execute, and validate a strategy for stakeholder engagement	**13.2**
2.15.3	Collaborate with relevant stakeholders on the approach to resolve the issues	10.1, 11.1, 11.5 and **13.2**

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Executing Process Group

- 4.3 Direct and Manage Project Work
- 4.4 Manage Project Knowledge
- 8.2 Manage Quality
- 9.3 Acquire Resources
- 9.4 Develop Team
- 9.5 Manage Team
- 10.2 Manage Communications
- 11.6 Implement Risk Responses
- 12.2 Conduct Procurements
- 13.3 Manage Stakeholder Engagement

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4.3 Direct and Manage Project Work

<u>Key Concept</u>: Doing the planned work and creating deliverables

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Any Component 2. Project Documents - Change Log - Lessons Learned Register - Milestone List - Project Communication - Project Schedule - Requirements Traceability Matrix - Risk Register - Risk Report - Stakeholder Register 3. Approved Change Requests 4. EEFs 5. OPAs	1. Expert Judgment 2. Project Management Information Systems 3. Meetings	1. Deliverables 2. Work Performance Data 3. Issue Log 4. Change Requests 5. Project Management Plan Updates - Any Component 6. Project Documents Updates - Activity List - Assumption Log - Cost Forecasts - Lessons Learned Register - Requirements Documentation - Risk Register - Stakeholder Register 7. OPA Updates

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4.3 Direct and Manage Project Work

Inputs

1. Project Management Plan
   - Any Component
2. Project Documents
   - **Change Log** - A list of all project change requests.
   - Lessons Learned Register
   - Milestone List
   - Project Communication
   - Project Schedule
   - Requirements Traceability Matrix
   - Risk Register
   - Risk Report
   - Stakeholder Register
3. **Approved Change Requests**
4. EEFs
5. OPAs

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Fixing the project with change requests

Change Requests are submitted throughout the project. In 4.6 Integrated Change Control change request could be accepted.

Defect - any deliverable that does not meet the project requirements
Corrective Action - Any fix after a defect has occurred
Preventive Action - Any fix before the defect has occurred

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4.3 Direct and Manage Project Work

Tools and Techniques

1. Expert Judgment
2. Project Management Information Systems
3. Meetings

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4.3 Direct and Manage Project Work

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Outputs

1. **Deliverables** - Once checked in Control Quality it will be called a *Verified Deliverable* once checked by the sponsor or customer; it will become an *Accepted Deliverable*.
2. **Work Performance Data -** Data is created as a result of doing the project work. Linked data is called work performance information, and it is this information that can be rolled up into a work performance report.
3. Issue Log
4. Change Requests
5. Project Management Plan Updates
   - Any Component
6. Project Documents Updates
   - Activity List
   - Assumption Log
   - Cost Forecasts
   - Lessons Learned Register
   - Requirements Documentation
   - Risk Register
   - Stakeholder Register
7. OPA Updates

Work Performance Summary

4.3 – Work Performance Data

M&C – Work Performance Information

4.5 Work Performance Reports

Reports
Information
Data

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4.3 Direct and Manage Project Work

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ID #	Enabler	Primary Reference
2.9.3	Analyze the data collected	4.3, **4.4** and all M/C
2.9.4	Collect and analyze data to make informed project decisions	4.3, **4.6** and all M/C
2.9.5	Determine critical information requirements	4.1, 4.3, 5.2 and **4.5**
2.10.1	Anticipate and embrace the need for change (e.g., follow change management practices)	4.1, 4.2, 4.3 and **4.6**
2.10.3	Execute change management strategy according to the methodology	4.3, **4.6**
2.10.4	Determine a change response to move the project forward	4.6 and **4.3**
2.12.2	Validate that the project information is kept up to date (i.e., version control) and accessible to all Stakeholders	4.4, 4.3 and **4.5**
2.13.4	Use iterative, incremental practices throughout the project lifecycle (e.g., lessons learned, stakeholder engagement, risk)	NEW **4.2**, 4.3
2.16.1	Discuss project responsibilities within team	4.3, 4.4 and **9.1**
3.1.4	Use methods to support compliance	NEW 4.3, 8.3, **11.6**
3.2.3	Verify measurement system is in place to track benefits	NEW **4.3** and 8.2
3.3.2	Assess and prioritize impact on project scope/backlog based on changes in external business environment	NEW 4.1 and **4.3**
3.3.3	Recommend options for scope/backlog changes (e.g. schedule, cost changes)	NEW 4.1 and **4.3**
3.3.4	Continually review external business environment for impacts on project scope/backlog	NEW 4.1 and **4.3**

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4.4 Manage Project Knowledge

Key Concept: Actively gathering lessons learned through the project and at project or phase closing, rolling up the lessons learned into the lessons learned repository.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Any Component
2. Project Documents
  - Lessons Learned Register
  - Project Team Assignments
  - Resource Breakdown Structure
  - Source Selection Criteria
  - Stakeholder Register
3. Deliverables
4. EEFs
5. OPAs
	1. Expert Judgment
	2. Knowledge Management
	3. Information Management
	4. Interpersonal and Team Skills
	  - Active listening
	  - Facilitation
	  - Leadership
	  - Networking
	  - Political awareness
		1. Lessons Learned Register
		2. Project Management Plan Updates
		  - Any Component
		3. OPA Updates

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4.4 Manage Project Knowledge

Inputs

1. Project Management Plan
  - Any Component
2. Project Documents
  - Lessons Learned Register
  - Project Team Assignments
  - Resource Breakdown Structure
  - Source Selection Criteria
  - Stakeholder Register
3. Deliverables
4. EEFs
5. OPAs

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4.4 Manage Project Knowledge

Tools and Techniques

1. Expert Judgment
2. Knowledge Management
3. Information Management
4. Interpersonal and Team Skills
   - Active listening
   - Facilitation
   - Leadership
   - Networking
   - Political awareness

Knowledge

Knowledge is split in to two areas Explicit and Tacit.

Explicit Knowledge- Knowledge that can be quantified or measured. Example: our estimate was of by 30% because ....
Tacit Knowledge - Knowledge that cannot be measured with numbers. Example: the boss prefers text messages for all communication after 4 PM.

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4.4 Manage Project Knowledge

Outputs

1. **Lessons Learned Register** - A list of best practice and lessons learned gathered as the project moves forward in time. Typically the use of this document is disclosed in the Benefits Management Plan as a way of feeding the PMO with information to disseminate to other PMs.
2. Project Management Plan Updates
   - Any Component
3. OPA Updates

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4.4 Manage Project Knowledge

ID #	Enabler	Primary Reference
1.6.4	Maintain team and knowledge transfer	NEW **4.4**
2.1.1	Assess opportunities to deliver value incrementally	NEW **4.2** p 23 APG
2.9.3	Analyze the data collected	4.3, **4.4** and all M/C
2.12.2	Validate that the project information is kept up to date (i.e., version control) and accessible to all Stakeholders	4.4, 4.3 and **4.5**
2.12.3	Continually assess the effectiveness of the management of the Project artifacts	4.4 and **4.5**
2.16.1	Discuss project responsibilities within team	4.3, 4.4 and **9.1**
2.16.2	Outline expectations for working environment	4.4 and **9.2**
2.16.3	Confirm approach for knowledge transfers	NEW 4.1 and **4.4**
2.17.3	Conclude activities to close out project or phase (e.g., final lessons learned, retrospective, procurement, financials, resources)	4.4, 12.3, **4.7** and APG
3.2.2	Document agreements on ownership for ongoing benefits	NEW **4.1**, 8.1 and 4.4

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8.2 Manage Quality

<u>Key Concept</u>: Checks the quality management plan and the PM's understanding of the project requirements. Can also be done in execution to make sure the plan is actually being followed.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Quality Management Plan
2. Project Documents
  - Lessons Learned Register
  - Quality Control Measurements
  - Quality Metrics
  - Risk Reports
3. OPAs
	1. Data Gathering
	2. Data Analysis
	  - Alternatives Analysis
	  - Document Analysis
	  - Process Analysis
	  - Root Cause Analysis
	3. Decision Making
	  Multi-criteria Decision Analysis
	4. Data Representation
	  - Affinity Diagrams
	  - Cause and Effect Diagrams
	  - Flowcharts
	  - Matrix Diagrams
	  - Scatter Diagrams
	5. Audits
	6. Design for X
	7. Problem Solving
	8. Quality Improvement Methods
		1. Quality Reports
		2. Testing Evaluation Documents
		3. Change Requests
		4. Project Management Plan Updates
		  - Quality Management Plan
		  - Scope Baseline
		  - Schedule Baseline
		  - Cost Baseline
		5. Project Documents Updates
		  - Issue Log
		  - Lessons Learned Register
		  - Risk Register

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8.2 Manage Quality

Inputs

1. <u>Project management plan</u>
   - Quality management plan
2. <u>Project documents</u>
   - Lessons Learned Register
   - **Quality Metrics**
   - **Quality Control Measurements**
   - Risk reports
3. <u>OPAs</u>

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8.2 Manage Quality

Tools and Techniques

1. <u>Data Gathering</u>
2. <u>Data Analysis</u>
   - Alternatives Analysis
   - Document Analysis
   - Process Analysis
   - Root cause Analysis
3. <u>Decision Making</u>
   - Multicriteria Decision Analysis

4. <u>Data Representation</u>
   - Affinity Diagrams
   - Cause and Effect Diagrams
   - Flowcharts
   - Matrix Diagrams
   - Scatter Diagrams
5. **<u>Audits</u>**
6. **<u>Design for X</u>**
7. <u>Problem Solving</u>
8. **<u>Quality Improvement Methods</u>**

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8.2 Manage Quality

Outputs

1. **Quality Reports**
2. **Testing Evaluation Documents**
3. Change Requests
4. Project Management Plan Updates
   - Quality Management Plan
   - Scope Baseline
   - Schedule Baseline
   - Cost Baseline
5. Project Documents Updates
   - Issue Log
   - Lessons Learned Register
   - Risk Register

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8.2 Manage Quality

ID #	Enabler	Primary Reference
2.7.2	Recommend options for improvement based on quality gaps	**8.2**
3.1.7	Measure the extent to which the project is in compliance	NEW 4.5, 8.2, **11.6**
3.2.3	Verify measurement system is in place to track benefits	NEW **4.3** and 8.2

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9.3 Acquire Resources

Key Concept: In this process the PM receives, commandeers, and obtains the resources to do the project work.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Resource Management Plan
  - Procurement Management Plan
  - Cost Baseline
2. Project Documents
  - Project Schedule
  - Resource Calendars
  - Resource Requirements
  - Stakeholder Register
3. EEFs
4. OPAs
	1. Decision Making
	2. Interpersonal and Team Skills
	  - Multicriteria Decision Analysis
	3. Pre- Assignment
	  - Negotiation
	4. Virtual Teams
		1. Physical Resource Assignments
		2. Project Team Assignments
		3. Resource Calendars
		4. Change Requests
		5. Project Management Plan Updates
		  - Resource Management Plan
		  - Cost Baseline
		6. Project Documents Updates
		  - Lessons Learned Register
		  - Project Schedule
		  - Resource Breakdown Structure
		  - Resource Requirements
		  - Risk Register
		  - Stakeholder Register
		7. EEF Updates
		8. OPA Updates

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9.3 Acquire Resources

Inputs

1. Project Management Plan
- Resource Management Plan
- Procurement Management Plan
- Cost Baseline
2. Project Documents
- Project Schedule
- Resource Calendars
- Resource Requirements
- Stakeholder Register
3. EEFs
4. OPAs

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9.3 Acquire Resources

Tools and Techniques

1. Decision Making
2. Interpersonal and Team Skills
 - Multicriteria Decision Analysis
3. Pre-Assignment
 - **Negotiation**
4. **Virtual Teams**

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9.3 Acquire Resources

Outputs

1. **Physical Resource Assignments**
2. **Project Team assignments**
3. Resource calendars
4. Change Requests
5. Project Management Plan Updates
 - Resource Management Plan
 - Cost Baseline

6. Project Documents Updates
 - Lessons Learned Register
 - Project Schedule
 - Resource Breakdown Structure
 - Resource Requirements
 - Risk Register
 - Stakeholder Register
7. EEF Updates
8. OPA Updates

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9.3 Acquire Resources

New Terms from 2021 Exam Change

- **Personality Profile Assessments - A tool used to determine a person's personality traits or type. Most widely used Myers-Briggs Type Indicator**

- **Pairing - The concept of pairing team members together in order to increase work production. Usually pairing senior team members with newer team members.**

- **Virtual Pairing - Same as above but in the virtual environment we must also consider time zone and work culture.**

- **Fishbowl Window - A semipermanent video conference link between two locations.**

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9.3 Acquire Resources

ID #	Enabler	Primary Reference
1.4.2	Support team task accountability	9.1, 9.2, **9.3,** and 9.6
1.4.4	Determine and bestow level(s) of decision making authority	9.1 and **9.3**
1.5.2	Determine training options based on training needs	9.1, 9.2, 9.3 **and 9.6**
1.12.1	Communicate organizational principles with team and external stakeholders	13.3 and **9.3**
1.14.1	Assess behavior through the use of personality indicators	NEW 9.1, **9.3** and 9.5

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9.4 Develop Team

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Key Concept: This process focuses on collective training and evaluation of the team in order to create a team culture that can accomplish the planned project goals.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Resource Management Plan
2. Project Documents
  - Lessons Learned Register
  - Project Schedule
  - Project Team Assignments
  - Resource Calendars
  - Team Charter
3. EEFs
4. OPAs
	1. Colocation
	2. Virtual Team
	3. Communication Technology
	4. Interpersonal and Team Skills
	  - Conflict Management
	  - Motivation
	  - Negotiation
	  - Team Building
	5. Recognition and Rewards
	6. Training
	7. Individual and Teams Assessments
	8. Meetings
		1. Team Performance Assessments
		2. Change Requests
		3. Project Management Plan Updates
		  - Resource Management Plan
		4. Project Documents Updates
		  - Lessons Learned Register
		  - Project Schedule
		  - Project Team Assignments
		  - Resource Calendars
		  - Team Charter
		5. EEF Updates
		6. OPA Updates

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9.4 Develop Team

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Inputs

1. Project Management Plan
  - Resource Management Plan
2. Project Documents
  - Lessons Learned Register
  - Project Schedule
  - Project Team Assignments
  - Resource Calendars
  - Team Charter
3. EEFs
4. OPAs

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9.4 Develop Team

Tools and Techniques

1. **Colocation**
2. Virtual Team
3. Communication Technology
4. **Interpersonal and Team Skills**
   - **Conflict Management**
   - **Motivation**
   - Negotiation
   - **Team Building**
5. **Recognition and Rewards**
6. Training
7. Individual and Teams Assessments
8. Meetings

The Tuckman Ladder

Forming-

Storming-

Norming-

Performing-

Adjourning-

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9.4 Develop Team

Outputs

1. **Team Performance Assessments**
2. Change Requests
3. Project Management Plan Updates
   - Resource Management Plan
4. Project Documents Updates
   - Lessons Learned Register
   - Project Schedule
   - Project Team Assignments
   - Resource Calendars
   - Team Charter
5. EEF Updates
6. OPA Updates

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9.4 Develop Team

New Terms from 2021 Exam Change

- **Emotional Intelligence** - The intangible component of a leader that allows the leader to know exactly what to say, when to say it and how to say it.

Personal Skill
- **Self-Awareness** -
- **Self-Regulation** -
- **Motivation** -

Interpersonal Skills
- **Social Skills** -
- **Empathy** -

- **Active Listening** – A tool used to communicate with others to show the speaker that their views are important and being understood.

Reflective -
Attentive -
Following -

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9.4 Develop Team

ID #	Enabler	Primary Reference
1.3.4	Verify performance improvements	**9.4**, and 9.6
1.4.3	Evaluate demonstration of task accountability	9.4 and **9.5**
1.5.4	Measure training outcomes	NEW 9.1, **9.4** and 9.6
1.6.1	Appraise stakeholder skills	**9.4**
1.6.3	Continuously assess and refresh team skills to meet project needs	**9.4**
1.7.2	Prioritize critical impediments, obstacles, and blockers for the team	9.1, **9.4** and APG
1.7.3	Use network to implement solutions to remove impediments, obstacles, and blockers for the team	9.1, **9.4** and APG
1.7.4	Re-assess continually to ensure impediments, obstacles, and blockers for the team are being addressed	**9.4** and APG
1.12.3	Manage and rectify ground rule violations	9.4 and **9.5**

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9.5 Manage Team

Key Concept: This process focuses on individual team member training and managing issues among team members when needed.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Resource Management Plan 2. Project Documents - Issue Log - Lessons Learned Register - Project Team Assignments - Team Charter 3. Work Performance Reports 4. Team Performance Assessments 5. EEFs 6. OPAs	1. Interpersonal and Team Skills - Conflict Management - Decision Making - Emotional Intelligence - Influence - Leadership 2. Project Management Information Systems	1. Change Requests 2. Project Management Plan Updates - Resource Management Plan - Schedule Baseline - Cost Baseline 3. Project Documents Updates - Issue Log - Lessons learned register - Project Team Assignments 4. EEF Updates

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9.5 Manage Team

Inputs
1. Project Management Plan - Resource Management Plan 2. Project Documents - Issue Log - Lessons Learned Register - Project Team Assignments - Team Charter 3. Work Performance Reports 4. Team Performance Assessments 5. EEFs 6. OPAs

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9.5 Manage Team

Tools and Techniques

1. Interpersonal and Team Skills
   - **Conflict Management**
   - Decision Making
   - **Emotional Intelligence**
   - **Influence**
   - **Leadership**

Techniques for Resolving Conflicts

Withdraw/Avoid: (lose-lose)

Smooth/Accommodate: (lose-lose)

Force/Direct: (win-lose)

Compromise/Reconcile: (win-win / lose-lose)

Collaborate/Problem Solve: (win-win)

2. Project Management Information Systems

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Motivational Theories

Expectancy Theories - This attempts to understand motivation as a transaction between the follower and the leader.

Theory of Needs: This the work **McClelland** adds to Expectancy Theories, categories of competing needs of the follower.

Hierarchy of Needs: **Maslow** builds up McClelland's work and adds a hierarchy to the needs, and uses different names for the categories.

Hygiene Theory: **Herzberg** discusses the environment as the most important need for motivation. Later disproves himself.

Theory Z: **Ouchi's** employment for life theory to increases loyalty via a career track.

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Motivational Theories

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Hierarchy of Needs:

Self-
actualisation

Esteem

Social

Safety

Physiological

Wi-Fi

Battery

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9.5 Manage Team

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Outputs
1. Change Requests
2. Project Management Plan Updates
-Resource Management Plan
-Schedule Baseline
-Cost Baseline
3. Project Documents Updates
-**Issue Log**
-Lessons learned register
-Project Team Assignments
4.**EEF Updates**

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9.5 Manage Team

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ID #	Enabler	Primary Reference
1.1.1	Interpret the source and stage of the conflict	**9.5**
1.1.2	Analyze the context for the conflict	**9.5**
1.1.3	Evaluate / recommend / reconcile the appropriate conflict resolution solution	**9.5**
1.2.4	Determine an appropriate leadership style (e.g., directive, collaborative)	4.1, 9.1 and **9.5**
1.2.5	Inspire, motivate, and influence team members/stakeholders (e.g., team contract, social contract, reward system)	**9.5**
1.3.1	Appraise Team Member Performance against Key Performance Indicators	**9.5**
1.3.2	Support and recognize team member growth and development	**9.5**
1.3.3	Determine appropriate feedback approach	**9.5**
1.4.3	Evaluate demonstration of task accountability	9.4 and **9.5**
1.10.1	Breakdown situation to identify the root cause of a misunderstanding	13.3 **9.5** and 9.6
1.10.3	Support outcome of parties' agreement	9.5 and **13.3**
1.10.4	Investigate potential misunderstandings	**9.5**
1.12.3	Manage and rectify ground rule violations	9.4 and **9.5**
1.13.2	Recognize and act on mentoring opportunities	**9.5** and APG
1.14.1	Assess behavior through the use of personality indicators	NEW 9.1, **9.3** and 9.5

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10.2 Manage Communications

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<u>Key Concept</u>: Pretty simple, in this process the team communicates. Making sure the plan works is a different process.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Resource Management Plan
  - Communication Management Plan
  - Stakeholder Engagement Plan
3. Project Documents
  - Change Log
  - Issue Log
  - Lessons Learned Register
  - Quality Reports
  - Risk Reports
  - Stakeholder Register
4. OPAs
5. EEFS
	1. Communication Technology
	2. Communication Methods
	3. Communication Skills
	  - Communication Competence
	  - Feedback
	  - Nonverbal
	  - Presentation
	4. Project Management Information System
	5. Project Reporting
	6. Interpersonal and Team Skills
	  - Active Listening
	  - Political Awareness
	  - Cultural Awareness
	  - Meeting Management
	  - Networking
	7. Meetings
		1. Project Communications
		2. Project Management Plan Updates
		  - Communications Management Plan
		  - Stakeholder Engagement Plan
		3. Project Documents Updates
		  - Issue Log
		  - Lessons Learned Register
		  - Project Schedule
		  - Risk Register
		  - Stakeholder Register
		4. OPA Updates

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10.2 Manage Communications

Inputs

1. <u>Project Management Plan</u>
   - Resource Management Plan
   - Communication Management Plan
   - Stakeholder Engagement Plan
3. <u>Project Documents</u>
   - Change Log
   - Issue Log
   - Lessons Learned Register
   - Quality Reports
   - Risk Reports
   - Stakeholder Register
4. <u>OPAs</u>
5. <u>EEFS</u>

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10.2 Manage Communications

Tools and Techniques

1. <u>Communication Technology</u>
2. <u>Communication Methods</u>
3. **<u>Communication Skills</u>** - PMBOK® Guide p. 384
   - Communication Competence
   - Feedback
   - Nonverbal
   - Presentation
4. <u>Project Management Information System</u>
5. **<u>Project Reporting</u>**
6. <u>Interpersonal and Team Skills</u>
   - Active Listening
   - Political Awareness
   - Cultural Awareness
   - Meeting Management
   - Networking
7. <u>Meetings</u>

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10.2 Manage Communications

Outputs

1. **Project Communications**
2. Project Management Plan Updates
   - Communications Management Plan
   - Stakeholder Engagement Plan
3. Project Documents Updates
   - Issue Log
   - Lessons Learned Register
   - Project Schedule
   - Risk Register
   - Stakeholder Register
4. OPA Updates

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10.2 Manage Communications

ID #	Enabler	Primary Reference
1.11.3	Implement options for Virtual Team Member engagement	10.2, **13.3**
2.2.3	Communicate project information & updates effectively	**10.2**
2.2.4	Confirm communication is understood and feedback is received	**10.2**
2.15.3	Collaborate with relevant stakeholders on the approach to resolve the issues	10.1, 10.2, 11.1 and **13.2**

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11.6 Implement Risk Responses

Key Concept: Once the trigger event has occurred the contingency plan is started; if the contingency plan fails, the fallback plan will be initiated. The role of the risk owner and the PM should have been defined in the risk management plan, but the specifics for one risk event will be in the risk register.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Risk Management Plan
2. Project Documents
  - Lessons Learned Register
  - Risk Register
  - Risk Report
3. OPAs
	1. Expert Judgment
	2. Interpersonal and Team Skills
	  - Influencing
	3. Project Management Information System
		1. Change Requests
		2. Project Documents Updates
		  - Issue Log
		  - Lessons Learned Register
		  - Project Team Assignments
		  - Risk Register
		  - Risk Report

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11.6 Implement Risk Responses

Inputs

1. Project Management Plan
   - **Risk Management Plan**
2. Project Documents
   - Lessons Learned Register
   - **Risk Register**
   - Risk Report
3. OPAs

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11.6 Implement Risk Responses

Tools and Techniques

1. Expert Judgment
2. Interpersonal and Team Skills
   - **Influencing** - at times the risk response strategy could be owned by someone outside the project team.
3. Project Management Information System

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11.6 Implement Risk Responses

Outputs

1. **Change Requests**
2. Project Documents Updates
   - Issue Log
   - Lessons Learned Register
   - Project Team Assignments
   - Risk Register
   - Risk Report

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11.6 Implement Risk Responses

ID #	Enabler	Primary Reference
2.15.1	Recognize when a risk becomes an issue	**11.6**
2.15.2	Attack the issue with the optimal action to achieve project success	11.4, 11.5 and **11.6**
3.1.4	Use methods to support compliance	NEW 4.3, 8.3, **11.6**
3.1.7	Measure the extent to which the project is in compliance	NEW 4.5, 8.2, **11.6**

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12.2 Conduct Procurement

<u>Key Concept</u>: Three distinct parts: collect proposals, select a vendor, and award the contract. In a centralized procurement office, the PM will not lead any of this.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Scope Management Plan - Requirements Management Plan - Communications Management Plan - Risk Management Plan - Procurement Management Plan - Configuration Management Plan - Cost Baseline 2. Project Documents - Lessons Learned Register - Project Schedule - Requirements Documentation - Risk Register - Stakeholder Register 3. Procurement Documentation 4. Seller Proposals 5. EEFs 6. OPAs	1. Expert Judgment 2. Advertising 3. Bidder Conferences 4. Data Analysis - Influencing - Proposal Evaluation Techniques 5. Interpersonal and Team Skills - Negotiation	1. Selected Sellers 2. Agreements 3. Change Requests 4. Project Management Plan Updates - Requirements Management Plan - Quality Management Plan - Communications Management Plan - Risk Management Plan - Procurement Management Plan - Scope Baseline - Schedule Baseline - Cost Baseline 5. Project Documents Updates - Lessons Learned Register - Requirements Documentation - Requirements Traceability Matrix - Resource Calendar - Risk Register - Stakeholder Register 6. OPA Update

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12.2 Conduct Procurement

Inputs	
1. Project Management Plan	3. Project Documents
- Scope Management Plan	- Lessons Learned Register
- Requirements Management Plan	- Project Schedule
- Communications Management Plan	- Requirements Documentation
- Risk Management Plan	- Risk Register
- Procurement Management Plan	- Stakeholder Register
- Configuration Management Plan	4. Procurement Documentation
- Cost Baseline	5. Seller Proposals
	6. EEFs
	7. OPAs

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12.2 Conduct Procurement

Tools and Techniques

1. Expert Judgment
2. Advertising
3. Bidder Conferences
4. Data Analysis
 - Influencing
 - **Proposal Evaluation Techniques**
5. Interpersonal and Team Skills
 - **Negotiation** - Usually lead by someone from the procurement office unless the organization uses a decentralized procurement strategy.

Effective Vendor Management
- The use of a SOW to define scope
- Use reports and milestone to control the vendor
- Mange the Quality of the deliverables with inspections and audits
- Relationship management is key for future procurements.
  So basically the PM acts like a Sponsor

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12.2 Conduct Procurement

Outputs	

1. Selected Sellers
 2. Agreements
 3. Change Requests
 4. Project Management Plan Updates
   - Requirements Management Plan
   - Quality Management Plan
   - Communications Management Plan
   - Risk Management Plan
   - Procurement Management Plan
   - Scope Baseline
   - Schedule Baseline
   - Cost Baseline
	5. Project Documents Updates
	   - Lessons Learned Register
	   - Requirements Documentation
	   - Requirements Traceability Matrix
	   - Resource Calendar
	   - **Risk Register**
	   - Stakeholder Register
	 6. OPA Update

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12.2 Conduct Procurement

ID #	Enabler	Primary Reference
1.8.2	Assess priorities and determine ultimate objective(s)	**12.2**
1.8.4	Participate in agreement negotiations	**12.2**
2.11.2	Communicate resource requirements	5.2, 9.2, 12.1 and **12.2**
2.11.4	Plan and manage procurement strategy	12.1, 12.2 and **12.3**
2.11.5	Develop a delivery solution	**12.2**

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13.3 Manage Stakeholder Engagement

Key Concept: Doing your stakeholder engagement plan.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Communication Management Plan
  - Risk Management Plan
  - Stakeholder Engagement Plan
2. Project Documents
  - Assumption Log
  - Change Log
  - Issue Log
  - Lessons Learned
  - Stakeholder register
3. EEFs
4. OPAs
	1. Expert Judgment
	2. Communication Skills
	  - Feedback
	3. Interpersonal Skills
	  - Conflict Management
	  - Cultural Awareness
	  - Negotiation
	  - Observation / Conversation
	  - Political Awareness
	4. Ground Rules
	5. Meetings
		1. Change Requests
		2. Project Management Plan Updates
		  - Communications Management Plan
		  - Stakeholder Engagement Plan
		3. Project Documents Updates
		  - Change Log
		  - Issue Log
		  - Lessons Learned Register
		  - Stakeholder Register

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13.3 Manage Stakeholder Engagement

Inputs

1. Project Management Plan
   - Communication Management Plan
   - Risk Management Plan
   - Stakeholder Engagement Plan
2. Project Documents
   - Assumption Log
   - **Change Log**
   - Issue Log
   - Lessons Learned
   - Stakeholder register
3. EEFs
4. OPAs

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13.3 Manage Stakeholder Engagement

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Tools and Techniques

1. Expert Judgment
2. Communication Skills
   - Feedback
3. Interpersonal Skills
   - Conflict Management
   - Cultural Awareness
   - Negotiation
   - Observation / Conversation
   - Political Awareness
4. Ground Rules
5. Meetings

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13.3 Manage Stakeholder Engagement

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Outputs

1. Change requests
2. Project management plan updates
   - Communications management plan
   - Stakeholder engagement plan
3. Project documents updates
   - Change log
   - Issue log
   - Lessons learned register
   - Stakeholder register

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13.3 Manage Stakeholder Engagement

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ID #	Enabler	Primary Reference
3.1.1	Confirm project compliance requirements (e.g., security, health and safety, regulatory compliance)	4.1, 5.2, 8.1, 11.1, 11.2, 13.1, **13.3**

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Monitor and Controlling Process Group

- 4.5 Monitor and Control Project Work
- 4.6 Perform Integrated Change Control
- 5.5 Validate Scope
- 5.6 Control Scope
- 6.6 Control Schedule
- 7.4 Control Costs
- 8.3 Control Quality
- 9.6 Control Resources
- 10.3 Monitor Communications
- 11.7 Monitor Risks
- 12.3 Control Procurements
- 13.4 Monitor Stakeholder Engagement

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4.5 Monitor and Control Project Work

Key Concept: This is the process where all reports are made, except Quality Reports, Risk Reports, and Closing Reports.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Any Component 2. Project Documents - Assumption Log - Basis of Estimates - Cost Forecasts - Issue Log - Lessons Learned Register - Milestone List - Quality Reports - Risk Register - Risk Report - Schedule Forecasts 3. Work Performance Information 4. Agreements 5. EEFs 6. OPAs	1. Expert Judgment 2. Data Analysis - Alternatives Analysis - Cost-benefit Analysis - Earned Value Analysis - Root Cause Analysis - Trend Analysis - Variance analysis 3. Decision-Making 4. Meetings	1. Work Performance Reports 2. Change Requests 3. Project Management Plan Updates - Any Component 4. Project Documents Updates - Cost Forecasts - Issue Log - Lessons Learned Register - Risk Register - Schedule Forecast

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4.5 Monitor and Control Project Work

Inputs

1. Project Management Plan
- Any Component
2. Project Documents
- Assumption Log
- Basis of Estimates
- **Cost Forecasts**
- Issue Log
- Lessons Learned Register
- Milestone List
- Quality Reports
- Risk Register
- Risk Report
- **Schedule Forecasts**
3. **Work Performance Information**
4. Agreements
5. EEFs
6. OPAs

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4.5 Monitor and Control Project Work

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Tools and Techniques

1. Expert Judgment
2. Data Analysis
   - Alternatives Analysis
   - Cost-benefit Analysis
   - **Earned Value Analysis**
   - **Root Cause Analysis**
   - **Trend Analysis**
   - **Variance analysis**
3. Decision-making
4. Meetings

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4.5 Monitor and Control Project Work

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Outputs

1. **Work Performance Reports**
2. Change Requests
3. Project Management Plan Updates
   - Any Component
4. Project Documents Updates
   - Cost Forecasts
   - Issue Log
   - Lessons Learned Register
   - Risk Register
   - Schedule Forecast

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4.5 Monitor and Control Project Work

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ID #	Enabler	Primary Reference
2.9.2	Assess consolidated project plans for dependencies, gaps, and continued business value	4.2, 4.4, **4.5** and APG
2.9.5	Determine critical information requirements	4.1, 4.3, 5.2 and **4.5**
2.12.2	Validate that the project information is kept up to date (i.e., version control) and accessible to all Stakeholders	4.4, 4.3 and **4.5**
2.12.3	Continually assess the effectiveness of the management of the Project artifacts	4.4 and **4.5**
3.1.7	Measure the extent to which the project is in compliance	NEW 4.5, 8.2, **11.6**
3.2.4	Evaluate delivery options to demonstrate value	NEW 4.2, **4.5** and 5.5

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4.6 Perform Integrated Change Control

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Key Concept: This is the only process that approves changes to the project.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Change Management Plan - Configuration Management Plan - Scope Baseline - Schedule Baseline - Cost Baseline 2. Project Documents - Basis of Estimates - Requirements Traceability Matrix - Risk Report 3. Work Performance Reports 4. Change Requests 5. EEFs 6. OPAs	1. Expert Judgment 2. Change Control Tools 3. Data analysis - Alternatives Analysis - Cost-benefit Analysis 4. Decision-Making - Voting - Autocratic Decision Making - Multicriteria Decision Making 5. Meetings	1. Approved Change Requests 2. Project Management Plan Updates - Any Component 3. Project Documents Updates - Change Log

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4.6 Perform Integrated Change Control

Inputs	

1. Project Management Plan
  - **Change Management Plan**
  - Configuration Management Plan
  - Scope Baseline
  - Schedule Baseline
  - Cost Baseline
2. Project Documents
  - Basis of Estimates
  - **Requirements Traceability Matrix**
  - Risk Report
	3. Work Performance Reports
	4. Change Requests
	5. EEFs
	6. OPAs

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4.6 Perform Integrated Change Control

Tools and Techniques	

1. Expert Judgment
2. Change Control Tools
3. Data analysis
  - Alternatives Analysis
  - Cost-benefit Analysis
4. Decision-Making
  - Voting
  - Autocratic Decision Making
  - Multicriteria Decision Making
5. Meetings - A change control board (CCB) is a type of meeting. On the exam assume you have a change control board unless the question states otherwise.
	Flow of Change Management Activates
	
	1. Create Change Control tools and plan
	2. Identify the need for a Change
	3. Document the Change
	4. Approve, Defer, or Reject the Change
	5. Update all Effected Plans and Documents
	6. Buy in or Feedback From Stakeholders
	7. Track the Change

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4.6 Perform Integrated Change Control

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Outputs

1. **Approved Change Requests**
2. Project Management Plan Updates
   - Any Component
3. Project Documents Updates
   - **Change Log**

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4.6 Perform Integrated Change Control

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New Terms from 2021 Exam Change

• **Change Management Theory:**

McKinsey 7-S Model - Tool that analyzes firm's organizational design by looking at **7** key internal elements: strategy, structure, systems, shared values, style, staff and skills, in order to identify if they are effectively aligned and allow organization to achieve its objectives.

Kotter's Model - A tool created by John Kotter after his study showed organizational change has a 30% chance of success his.

1. Create a sense of urgency
2. Create a guiding coalition
3. Create a vision for change
4. Communicate the vision
5. Remove obstacles
6. Create short-term wins
7. Consolidate improvements
8. Anchor the changes

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4.6 Perform Integrated Change Control

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ID #	Enabler	Primary Reference
2.9.4	Collect and analyze data to make informed project decisions	4.3, **4.6** and all M/C
2.10.1	Anticipate and embrace the need for change (e.g., follow change management practices)	4.1, 4.2, 4.3 and **4.6**
2.10.3	Execute change management strategy according to the methodology	4.3, **4.6**
2.10.4	Determine a change response to move the project forward	4.6 and **4.3**
3.4.2	Evaluate impact of organizational change to project and determine required actions	NEW 4.3 and **4.6**

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5.5 Validate Scope

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Key Concept: The process turning verified deliverables into accepted deliverables.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Scope Management Plan - Requirements Management Plan - Scope Baseline 2. Project Documents - Lessons Learned Register - Quality Reports - Requirements Documentation - Requirements Traceability Matrix 3. Verified Deliverables 4. Work Performance Data	1. Inspections 2. Decision Making - Voting	1. Accepted Deliverables 2. Work Performance Information 3. Change Requests 4. Project Document Updates - Lessons Learned Register - Requirements Documentation - Requirements Traceability Matrix

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5.5 Validate Scope

Inputs

1. Project Management Plan
   - Scope Management Plan
   - Requirements Management Plan
   - Scope Baseline
2. Project Documents
   - Lessons Learned Register
   - **Quality Reports**
   - **Requirements Documentation**
   - **Requirements Traceability Matrix**
3. **Verified Deliverables -** **This is an output from control quality, and now we can see the flow of deliverables. Direct and Manage Project Work creates Deliverables, Control Quality Checks them and makes Verified Deliverables. This process turns them into Validated Deliverables**
4. Work Performance Data

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5.5 Validate Scope

Tools and Techniques

1. **Inspections** - Best case, the person who will sign off on the deliverables does this inspection.
2. Decision Making
   - Voting

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5.5 Validate Scope

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Outputs

1. **Accepted Deliverables**
2. **Work Performance Information**
3. **Change Requests**
4. Project Document Updates
 - Lessons Learned Register
 - Requirements
 - Documentation
 - Requirements Traceability Matrix

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5.5 Validate Scope

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ID #	Enabler	Primary Reference
2.1.2	Examine the business value throughout the project	5.4, **5.5** and APG
2.8.3	Monitor and validate scope	5.5 and **5.6**
2.17.2	Validate readiness for transition (e.g., to operations team or next phase)	8.3, 5.5 and **4.7**
3.1.7	Measure the extent to which the project is in compliance	NEW 4.5, 8.2, 5.5, **11.6**

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5.6 Control Scope

Key Concept: Understanding how scope creep is entering the project also eliminating unapproved scope creep (gold plating)

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Scope Management Plan - Requirements Management Plan - Change Management Plan - Configuration Management Plan - Scope Baseline - Performance Measurement Baseline 2. Project Documents - Lessons Learned Register - Requirements Documentation - Requirements Traceability Matrix 3. Work Performance Data 4. OPAs	1. Data Analysis - Variance Analysis - Trend Analysis	1. Work Performance Information 2. Change Requests 3. Project Management Plan Updates - Scope Management Plan - Scope Baseline - Schedule Baseline - Cost Baseline - Performance Management Plan 4. Project Document Updates - Lessons Learned Register - Requirements Documentation - Requirements Traceability Matrix

Figure 5-17 , page 167, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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5.6 Control Scope

Inputs

1. <u>Project Management Plan</u>
   - Scope Management Plan
   - Requirements Management Plan
   - Change Management Plan
   - Configuration Management Plan
   - **Scope Baseline**
   - Performance Measurement Baseline
2. <u>Project Documents</u>
   - Lessons Learned Register
   - Requirements Documentation
   - Requirements Traceability Matrix
3. <u>Work Performance Data</u>
4. <u>OPAs</u>

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5.6 Control Scope

Tools and Techniques

1. Data Analysis
   - Variance Analysis
   - Trend Analysis

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5.6 Control Scope

Outputs

1. **Work Performance Information**
2. Change Requests
3. Project Management Plan Updates
   - Scope Management Plan
   - Scope Baseline
   - Schedule Baseline
   - Cost Baseline
   - Performance Management Plan
4. Project Document Updates
   - Lessons Learned Register
   - Requirements
   - Documentation
   - Requirements Traceability Matrix

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5.6 Control Scope

ID #	Enabler	Primary Reference
2.8.3	Monitor and validate scope	5.5 and **5.6**

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6.6 Control Schedule

<u>Key Concept:</u> Most common process in project management, looking at the plan and comparing it to how much work has been completed to stay ahead or behind schedule.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Schedule Management Plan - Schedule Baseline - Scope Baseline - Performance Measurement Baseline 2. Project Documents - Lessons Learned Register - Project Calendars - Project Schedule - Resource Calendars - Schedule Data 3. Work Performance Data 4. OPAs	1. Data Analysis - Earned Value Analysis - Iteration Burndown Chart - Performance Reviews - Variance Analysis - Trend Analysis - What-if Scenario Analysis 2. Critical Path Method 3. Project Management Information System 4. Resource Optimization techniques 5. Leads and Lags 6. Schedule Compression	1. Work Performance Information 2. Schedule Forecasts 3. Change Requests 4. Project Management Plan Updates - Schedule Management Plan - Schedule Baseline - Cost Baseline - Performance Management Plan 5. Project Document Updates - Assumptions Log - Basis of Estimates - Lessons Learned Register - Project Schedule - Resource Calendars - Risk Register - Scheduling Data

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6.6 Control Schedule

Inputs

1. Project Management Plan
   - Schedule Management Plan
   - Schedule Baseline
   - Scope Baseline
   - Performance Measurement Baseline

2. Project Documents
   - Lessons Learned Register
   - Project Calendars
   - Project Schedule
   - Resource Calendars
   - Schedule Data
3. Work Performance Data
4. OPAs

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6.6 Control Schedule

Tools and Techniques

1. Data Analysis
   - **Earned Value Analysis**
   - **Iteration Burndown Chart**
   - Performance Review
   - Variance Analysis
   - Trend Analysis
   - What-if Scenario Analysis
2. Critical Path Method
3. Project Management Information System
4. Resource Optimization techniques
5. Leads and Lags
6. Schedule Compression

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6.6 Control Schedule

Outputs

1. **Work Performance Information** - This is usually represented as SV or SPI.
2. **Schedule Forecasts** - Based of what is known in the project now and the rate of work achieved so far the PM can create a forecast as to when the project should end.

3. Change Requests
4. Project Management Plan Updates
   - Schedule Management Plan
   - Schedule Baseline
   - Cost Baseline
   - Performance Management Plan
5. Project Document Updates
   - Assumptions Log
   - Basis of Estimates
   - Lessons Learned Register
   - Project Schedule
   - Resource Calendars
   - Risk Register
   - Scheduling Data

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6.6 Control Schedule

ID #	Enabler	Primary Reference
2.6.4	Measure ongoing progress based on methodology	**6.1** and 6.6
2.6.5	Modify schedule, as needed, based on methodology	6.1, 6.5 and **6.6**
2.6.6	Coordinate with other projects and other operations	NEW PMBOK **4.1,** 6.3, **6.6** p 543 APG p 82 and 111

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7.4 Control Costs

Key Concept: In the process the PM compares all of the project spending to the planned spending to stay over or under budget, and from this the PM can create cost forecast.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Cost Management Plan
  - Cost Baseline
  - Performance Measurement Baseline
2. Project Documents
  - Lessons Learned Register
3. Project Funding Requirements
4. Work Performance Data
5. OPAs
	1. Expert Judgement
	2. Data Analysis
	  - Earned Value Analysis
	  - Variance Analysis
	  - Trend Analysis
	  - Reserve Analysis
	3. To Completion Performance Index
	4. Project Management Information System
		1. Work Performance Information
		2. Cost Forecasts
		3. Change Requests
		4. Project Management Plan Updates
		  - Cost Management Plan
		  - Cost Baseline
		  - Performance Management Plan
		5. Project Document Updates
		  - Assumptions Log
		  - Basis of Estimates
		  - Cost Estimates
		  - Lessons Learned Register
		  - Risk Register

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7.4 Control Costs

Inputs

1. Project Management Plan
   - Cost Management Plan
   - Cost Baseline
   - Performance Measurement Baseline
2. Project Documents
   - Lessons Learned Register
3. Project Funding Requirements
4. Work Performance Data
5. OPAs

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7.4 Control Costs

Tools and Techniques

1. Expert Judgement
2. Data Analysis
   - **Earned Value Analysis**
   - Variance Analysis
   - Trend Analysis
   - Reserve Analysis
3. To Completion Performance Index
4. Project Management Information System

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Earned Value

This method of determining project health and forecasting can be very difficult and is considered the hardest area on the exam. To make this easy on yourself when reading test questions, turn time into dollars, then work into dollars. Or just click C…

	Term	Definition	PG
BAC	Budget at Completion	Value of all the work	Planning
PV	Planned Value	Budgeted value of work created from estimates	Planning
EV	Earned Value	Value of work actually completed	Execution
AC	Actual Cost (total)	How much was actually spent to get the work done	Execution
CV	Cost Variance	Explains how many dollars we are off by	M&C
SV	Schedule Variance	Explains ahead or behind schedule	M&C
CPI	Cost Performance Index	The rate of spending vs work completed	M&C
SPI	Schedule Performance Index	The speed work is getting completed vs the plan	M&C
EAC	Estimate at Completion	Updated total cost forecast (based on progress)	M&C
ETC	Estimate to Complete	Expected costs remaining (now until end)	M&C
VAC	Variance at Completion	Expected Variance over/under budget	M&C
TCPI	To Completion performance Index	The optimal CPI need for the remainder of the project	M&C

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Earned Value

4 Basic Values		
Term		**Explanation**
BAC	Budget at Completion	Work x total units of work
PV	Planned Value	# of units that should have been done x the value of each unit
EV	Earned Value	# of units complete right now x the value of each unit
AC	Actual Cost (total)	Actual cost of work completed

	Term	**Formulas**	**Explanation**
CV	Cost Variance	CV = EV - AC	- Over Budget, + Under Budget
SV	Schedule Variance	SV = EV - PV	- Behind Schedule, + Ahead of Schedule
CPI	Cost Performance Index	CPI = EV / AC	Less than1 Over, greater than1 Under
SPI	Schedule Performance Index	SPI = EV / PV	Less than 1 Behind, greater than 1 Ahead
EAC	Estimate at Completion	Four types	Forecasted ending dollar amount
ETC	Estimate to Complete	ETC = EAC - AC	How many more dollars until we hit EAC
VAC	Variance at Completion	VAC = BAC - EAC	How far off we are from the BAC
TCPI	To Completion performance Index	Two Types	At this CPI we can fix the project

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Earned Value

	Term	**Formulas**	**Explanation**
EAC	Estimate at Complete	BAC / Cumulative CPI **Or** BAC / CPI	When you believe that what has happened so far will continue to happen. Used when variances are expected to continue.
		AC + (BAC-EV)	Ignores the past and uses the planned rate. This is used for anomalies.
		AC + Bottom-up ETC	Used to re-baseline the project
		$AC + \left[\dfrac{(BAC-EV)}{(CPI * SPI)} \right]$	Assumes both poor cost and poor schedule performance will continue
TCPI	To Completion performance Index	$\dfrac{(BAC - EV)}{(BAC - AC)}$	Used to fix the problem and hit the BAC at the end of the project
		$\dfrac{(BAC - EV)}{(EAC - AC)}$	When original budget is not possible and you have re-baselined the project now you will try to hit the new EAC

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7.4 Control Costs

You are managing the development of a neighborhood comprised of 12 homes of equal value estimated at $200,000 each. This project was estimated to take 24 months, currently you are 12 months into the project. According to your plan you should have completed a home every two months. Unfortunately you have experienced labor shortages and because of this you are currently 2 homes behind schedule. You have spent $1,000,000 to complete the 4 homes, your variances are expected to continue. What is your TCPI?

BAC=	CV=	EAC =
PV =	SV =	ETC =
EV =	CPI =	VAC =
AC =	SPI =	TCPI =

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7.4 Control Costs

Outputs

1. Work Performance Information
2. Cost Forecasts
3. Change Requests
4. Project Management Plan Updates
   - Cost Management Plan
   - Cost Baseline
   - Performance Management Plan
5. Project Document Updates
   - Assumptions Log
   - Basis of Estimates
   - Cost Estimates
   - Lessons Learned Register
   - Risk Register

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7.4 Control Costs

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ID #	Enabler	Primary Reference
2.5.2	Anticipate future budget challenges	7.1, **7.3,** and 7.4
2.5.3	Monitor budget variations and work with governance process to adjust as necessary	**7.4**
2.5.4	Plan and manage resources	7.1, 7.2, 7.3 and **7.4**

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8.3 Control Quality

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Key Concept: This process checks deliverables to determine if they are defective or meet the requirements. This process also creates the documents that proves this check actually happened.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Quality Management Plan 2. Project Documents - Lessons Learned Register - Quality Metrics - Test and Evaluation Documents 3. Approved Change Requests 4. Deliverables 5. Work Performance Data 6. EEFs 7. OPAs	1. Data Gathering - Checklists - Check Sheets - Statistical Sampling - Questions and Surveys 2. Data Analysis - Performance Reviews - Root Cause Analysis 3. Inspections 4. Testing/Product Evaluation 5. Date Representation - Cause-and-Effect Diagrams - Control Charts - Histograms - Scatter Diagrams 6. Meetings	1. Quality Control Measurements 2. Verified Deliverables 3. Work Performance Information 4. Change Requests 5. Project Management Plan Updates - Quality Management Plan 6. Project Document Updates - Issue Log - Lessons Learned Register - Test and Evaluation Documents

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8.3 Control Quality

Inputs

1. **Project Management Plan** - Tells the person doing the check exactly what to do and how to do it.
   - Quality Management Plan
2. Project Documents
   - Lessons Learned Register
   - **Quality Metrics**
   - Test and Evaluation Documents
3. **Deliverables**
4. Approved Change Requests
5. Work Performance Data
6. EEFs
7. OPAs

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8.3 Control Quality

Tools and Techniques

1. Data Gathering
   - Checklists
   - Check Sheets
   - Statistical Sampling
   - Questions and Surveys
2. Data Analysis
   - Performance Reviews
   - Root Cause Analysis

3. Inspections
   - Cause-and-Effect Diagrams
   - Control Charts
   - Histograms
   - Scatter Diagrams
4. Testing/Product Evaluation
5. Date Representation
6. Meetings

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8.3 Control Quality

Outputs

1. **Quality Control Measurements** - This is the document that is filled out every time a check is done on a deliverable; they should all be filled out and archived according to your Quality Management Plan.
2. **Verified Deliverables**
3. Work Performance Information
4. Change Requests
5. Project Management Plan Updates
- Quality Management Plan
6. Project Document Updates
- Issue Log
- Lessons Learned Register
- Test and Evaluation Documents

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8.3 Control Quality

ID #	Enabler	Primary Reference
2.7.3	Continually survey project deliverables quality	**8.3**
3.1.1	Confirm project compliance requirements (e.g., security, health and safety, regulatory compliance)	4.1, **5.2**, 8.1, 8.2, 8.3, 11.1, 11.2 and 13.1
3.1.4	Use methods to support compliance	NEW 4.3, 8.3, **11.6**

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9.6 Control Resources

Key Concept: This process checks to ensure that resources assigned to the project are available to the project as well as making sure that those resources are returned to the organization according to the plan.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Resource Management Plan
2. Project Documents
  - Lessons Learned Register
  - Physical Resource Assignments
  - Project Schedule
  - Resource Breakdown Structure
  - Resource Requirements
  - Risk Register
3. Work Performance Data
4. Agreements
5. OPAs
	1. Data Analysis
	  - Performance Reviews
	  - Alternatives Analysis
	  - Cost-benefit Analysis
	  - Performance Reviews
	  - Trend Analysis
	2. Problem Solving
	3. Interpersonal and Team Skills
	  - Negotiation
	  - Influencing
	4. Project Management Information System
		1. Work Performance Information
		2. Change Requests
		3. Project Management Plan Updates
		  - Resource Management Plan
		  - Schedule Baseline
		  - Cost Baseline
		4. Project Document Updates
		  - Assumptions Log
		  - Issue Log
		  - Lessons Learned Register
		  - Physical Resource Assignments
		  - Resource Breakdown Structure
		  - Risk Register

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9.6 Control Resources

Inputs

1. Project Management Plan
   - Resource Management Plan
2. Project Documents
   - Lessons Learned Register
   - Physical Resource Assignments
   - Project Schedule
   - Resource Breakdown Structure
   - Resource Requirements
   - Risk Register
3. Work Performance Data
4. Agreements
5. OPAs

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9.6 Control Resources

Tools and Techniques

1. Data Analysis
   - Performance Reviews
   - Alternatives Analysis
   - Cost-benefit Analysis
   - Performance Reviews
   - Trend Analysis
2. **Problem Solving**
3. Interpersonal and Team Skills
   - **Negotiation**
   - Influencing
4. Project Management Information System

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9.6 Control Resources

Outputs

1. Work Performance Information
2. Change Requests
3. Project Management Plan Updates
   - Resource Management Plan
   - Schedule Baseline
   - Cost Baseline
4. Project Document Updates
   - Assumptions Log
   - Issue Log
   - Lessons Learned Register
   - Physical Resource Assignments
   - Resource Breakdown Structure
   - Risk Register

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9.6 Control Resources

ID #	Enabler	Primary Reference
1.3.4	Verify performance improvements	**9.4,** and 9.6
1.4.2	Support team task accountability	9.1, 9.2, **9.3,** and 9.6
1.4.3	Evaluate demonstration of task accountability	9.4 **9.5,** and 9.6
1.5.2	Determine training options based on training needs	9.1, 9.2, **9.3,** and 9.6
1.5.3	Allocate resources for training	**9.2,** and 9.6
1.5.4	Measure training outcomes	NEW 9.1, **9.4,** and 9.6
1.6.2	Deduce project resource requirements	**9.2,** and 9.6

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10.3 Monitor Communications

Key Concept: Making sure that the plan you created is working, and the information needs of the stakeholders is being met, if it isn't, this process is used to change the plan.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Resource Management Plan - Communications Management Plan - Stakeholder Engagement Plan 2. Project Documents - Issue Log - Lessons Learned Register - Project Communication 3. Work Performance Data 4. EEFs 5. OPAs	1. Expert Jugement 2. Project Management Information System 3. Data Analysis - Stakeholder Engagement Assessment Matrix 4. Interpersonal and Team Skills - Observation and Conversation 5. Meetings	1. Work Performance Information 2. Change Requests 3. Project Management Plan Updates - Communications Management Plan - Stakeholder Engagement Plan 4. Project Document Updates - Issue Log - Lessons Learned Register - Stakeholder Register

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10.3 Monitor Communications

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Inputs

1. Project Management Plan
  - Resource Management Plan
  - Communications Management Plan
  - Stakeholder Engagement Plan
2. Project Documents
  - Issue Log
  - Lessons Learned Register
  - Project Communication
3. Work Performance Data
4. EEFs
5. OPAs

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10.3 Monitor Communications

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Tools and Techniques

1. Expert Jugement
2. Project Management Information System
3. Data Analysis
  - **Stakeholder Engagement Assessment Matrix**
4. Interpersonal and Team Skills
  - **Observation and Conversation**
5. Meetings

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10.3 Monitor Communications

Outputs
1. Work Performance Information
2. Change Requests
3. Project Management Plan Updates
-Communications Management Plan
-Stakeholder Engagement Plan
4. Project Document Updates
-Issue Log
-Lessons Learned Register
-Stakeholder Register

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10.3 Monitor Communications

ID #	Enabler	Primary Reference
1.11.2	Investigate alternatives (.e.g, communication tools, co-location) for Virtual Team Member engagement	APG, 10.1, 10.3, and **9.2**
1.11.4	Continually evaluate effectiveness of Virtual Team Member engagement	**10.3**

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11.7 Monitor Risk

Key Concept: Re-evaluating risks, changing the strategies for risks if needed, as well as determining if a risk response was a success or a failure.

Inputs	Tools and Techniques	Outputs

1. Project Management Plan
  - Risk Management Plan
2. Project Documents
  - Issue Log
  - Lessons Learned Register
  - Risk Register
  - Risk Reports
3. Work Performance Data
4. Work Performance Reports
	1. Data Analysis
	  - Technical Performance Analysis
	  - Reserve Analysis
	2. Audits
	3. Meetings
		1. Work Performance Information
		2. Change Requests
		3. Project Management Plan Updates
		  - Any Component
		4. Project Document Updates
		  - Assumptions Log
		  - Issue Log
		  - Lessons Learned Register
		  - Risk Register
		  - Risk Reports
		5. OPA Updates

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11.7 Monitor Risk

Inputs

1. Project Management Plan
- Risk Management Plan
2. Project Documents
- Issue Log
- Lessons Learned Register
- **Risk Register**
- Risk Reports
3. Work Performance Data
4. Work Performance Reports

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11.7 Monitor Risk

Tools and Techniques

1. Data Analysis
   - **Technical Performance Analysis** - Compares what was planned to occur and what actually happened.
   - **Reserve Analysis**
2. **Audits** - The Risk Audit is performed by someone who is not a risk owner.
3. Meetings

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11.7 Monitor Risk

Outputs

1. Work Performance Information
2. Change Requests
3. Project Management Plan Updates
   - **Any Component**
4. Project Document Updates
   - Assumptions Log
   - Issue Log
   - Lessons Learned Register
   - Risk Register
   - Risk Reports
5. OPA Updates

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11.7 Monitor Risk

ID #	Enabler	Primary Reference
2.3.2	Iteratively assess and prioritize risks	**11.7**

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12.3 Control Procurements

Key Concept: In this process the PM monitors the contractors performance against the contract and SOW.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Requirements Management Plan - Risk Management Plan - Procurement Management Plan - Change Management Plan - Schedule Baseline 2. Project Documents - Assumption Log - Lessons Learned Register - Milestone List - Quality Reports - Requirements Documentation - Requirements Traceability Matrix - Risk Register - Stakeholder Register 3. Agreements 4. Procurement Documents 5. Approved Change Requests 6. Work Performance Data 7. EEFs 8. OPAs	1. Expert Judgment 2. Claims Administration 3. Data Analysis - Technical Performance Analysis - Reserve Analysis 4. Inspections 5. Audits	1. Closed Procurement 2. Work Performance Information 3. Procurement Documentation Updates 4. Change Requests 5. Project Management Plan Updates - Risk Management Plan - Procurement Management Plan - Schedule Baseline - Cost Baseline 6. Project Document Updates - Lessons Learned Register - Resource Requirements - Requirements Traceability Matrix - Risk Register - Stakeholder Register 7. OPA Updates

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12.3 Control Procurements

Inputs

1. Project Management Plan
   - Requirements Management Plan
   - Risk Management Plan
   - Procurement Management Plan
   - Change Management Plan
   - Schedule Baseline
2. Project Documents
   - Assumption Log
   - Lessons Learned Register
   - Milestone List
   - Quality Reports
   - Requirements Documentation
   - Requirements Traceability Matrix
   - Risk Register
   - Stakeholder Register
3. Agreements
4. Procurement Documents
5. Approved Change Requests
6. Work Performance Data
7. EEFs
8. OPAs

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12.3 Control Procurements

Tools and Techniques

1. Expert Judgment
2. **Claims Administration**
3. Data Analysis
   - Technical Performance Analysis
   - Reserve Analysis
4. **Inspections**
5. **Audits**

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12.3 Control Procurements

Outputs

1. **Closed Procurement**
2. Work Performance Information
3. Procurement Documentation Updates
4. **Change Requests**
5. Project Management Plan Updates
 - Risk Management Plan
 - Procurement Management Plan
 - Schedule Baseline
 - Cost Baseline
6. Project Document Updates
 - Lessons Learned Register
 - Resource Requirements
 - Requirements Traceability Matrix
 - Risk Register
 - Stakeholder Register
7. OPA Updates

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12.3 Control Procurements

ID #	Enabler	Primary Reference
1.8.3	Verify objectives of the project agreement are met	**12.3**
2.11.3	Manage suppliers/contracts	**12.3**
2.11.4	Plan and manage procurement strategy	12.1, 12.2 and **12.3**

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13.4 Monitor Stakeholder Engagement

Key Concept: Ensuring the strategies to get a stakeholder engaged in the project are working.

Inputs	Tools and Techniques	Outputs
1. Project Management Plan - Resource Management Plan - Communications Management Plan - Stakeholder Engagement Plan 2. Project Documents - Issue Log - Lessons Learned Register - Project Communications - Risk Register - Stakeholder Register 3. Work Performance Data 4. EEFs 5. OPAs	1. Data Analysis - Technical Performance Analysis - Reserve Analysis 2. Decision Making - Multicriteria Decision Analysis - Voting 3. Data Representation - Stakeholder Engagement Assessment Matrix 4. Communication Skills - Feedback - Presentations 5. Interpersonal and Team Skills - Active listening - Cultural awareness - Leadership - Networking - Political awareness 6. Meetings	1. Work Performance Information 2. Change Requests 3. Project Management Plan Updates - Resource Management Plan - Communication Management Plan - Stakeholder Engagement Plan 4. Project Document Updates - Issue Log - Lessons Learned Register - Risk Register - Stakeholder Register

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13.4 Monitor Stakeholder Engagement

Inputs

1. Project Management Plan
- Resource Management Plan
- Communications Management Plan
- Stakeholder Engagement Plan
2. Project Documents
- Issue Log
- Lessons Learned Register
- Project Communications
- Risk Register
- Stakeholder Register
3. Work Performance Data
4. EEFs
5. OPAs

Figure 13-9, page 530, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Sixth Edition, copyright 2017.* Copyright and all rights reserved.

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13.4 Monitor Stakeholder Engagement

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Tools and Techniques

1. Data Analysis
   - Technical Performance Analysis
   - Reserve Analysis
2. Decision Making
   - Multicriteria Decision Analysis
   - Voting
3. Data Representation
   - Stakeholder Engagement Assessment Matrix
4. Communication Skills
   - Feedback
   - Presentations

5. Interpersonal and Team Skills
   - Active listening
   - Cultural awareness
   - Leadership
   - Networking
   - Political awareness
6. Meetings

Figure 13-9, page 530, Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Sixth Edition, copyright 2017. Copyright and all rights reserved.

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13.4 Monitor Stakeholder Engagement

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Outputs

1. Work Performance Information
2. Change Requests
3. Project Management Plan Updates
   - Resource Management Plan
   - Communication Management Plan
   - Stakeholder Engagement Plan
4. Project Document Updates
   - Issue Log
   - Lessons Learned Register
   - Risk Register
   - **Stakeholder Register**

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13.4 Monitor Stakeholder Engagement

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ID #	Enabler	Primary Reference
1.2.6	Analyze team members and stakeholders' influence	**13.1**, and 13.4
1.9.1	Evaluate engagement needs for stakeholders	13.1 **13.2**, and 13.4
1.9.2	Optimize alignment between stakeholder needs, expectations and project objectives	**13.1**, and 13.4
2.2.1	Analyze communication needs of all stakeholders	13.1, 13.4, and **10.1**
2.4.1	Analyze stakeholders (e.g., power interest grid, influence, impact)	**13.1**, 13.4
3.2.5	Appraise stakeholders of value gain progress	**13.3**, 13.4, 4.5, 4.7, and APG

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Closing Process Group

- 4.7 Close Project or Phase

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4.7 Close Project or Phase

Key Concept: The formal closing of a project or **PHASE**.

Inputs	Tools and Techniques	Outputs

1. Project Charter
2. Project Management Plan
  - All components
3. Project Documents
  - Assumption Log
  - Basis of Estimates
  - Change Log
  - Issue Log
  - Lessons Learned Register
  - Milestone List
  - Project Communications
  - Quality Control Measurements
  - Quality Reports
  - Requirements Documentation
  - Risk Register
  - Risk Report
4. Accepted Deliverables
5. Business Documents
  - Business Case
  - Benefits Management Plan
6. Agreements
7. Procurement Documents
8. OPAs
	1. Expert Judgment
	2. Data Analysis
	  - Document Analysis
	  - Regression Analysis
	  - Variance Analysis
	3. Meetings
		1. Project Document Updates
		  - Lessons Learned Register
		2. Final Product, Service, or Result Transition
		3. Final Report
		4. OPA Updates

Figure 4-14, page 121, Project Management Institute, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, Sixth Edition, copyright 2017. Copyright and all rights reserved.

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4.7 Close Project or Phase

Inputs

1. Project Charter
2. Project Management Plan
  - All components
3. Project Documents
  - Assumption Log
  - Basis of Estimates
  - Change Log
  - Issue Log
  - Lessons Learned Register
  - Milestone List
  - Project Communications
	- Quality Control Measurements
	  - Quality Reports
	  - Requirements Documentation
	  - Risk Register
	  - Risk Report
	4. Accepted Deliverables
	5. Business Documents
	  - Business Case
	  - Benefits Management Plan
	6. Agreements
	7. Procurement Documents
	8. OPAs

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4.7 Close Project or Phase

Tools and Techniques

1. Expert Judgment
2. Data Analysis
   - Document Analysis
   - **Regression Analysis**
   - Variance Analysis
3. Meetings

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4.7 Close Project or Phase

Outputs

1. Project Document Updates
   - Lessons Learned Register
2. Final Product, Service, or Result Transition
3. **Final Report**
4. OPA Updates

Closing Activities PMBOK Guide p. 123

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4.7 Close Project or Phase

ID #	Enabler	Primary Reference
2.17.2	Validate readiness for transition (e.g., to operations team or next phase)	8.3, 5.5 and **4.7**
2.17.3	Conclude activities to close out project or phase (e.g., final lessons learned, retrospective, procurement, financials, resources)	4.4, 12.3, **4.7** and APG
3.2.5	Appraise stakeholders of value gain progress	**13.3**, 13.4, 4.5, 4.7 and APG

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