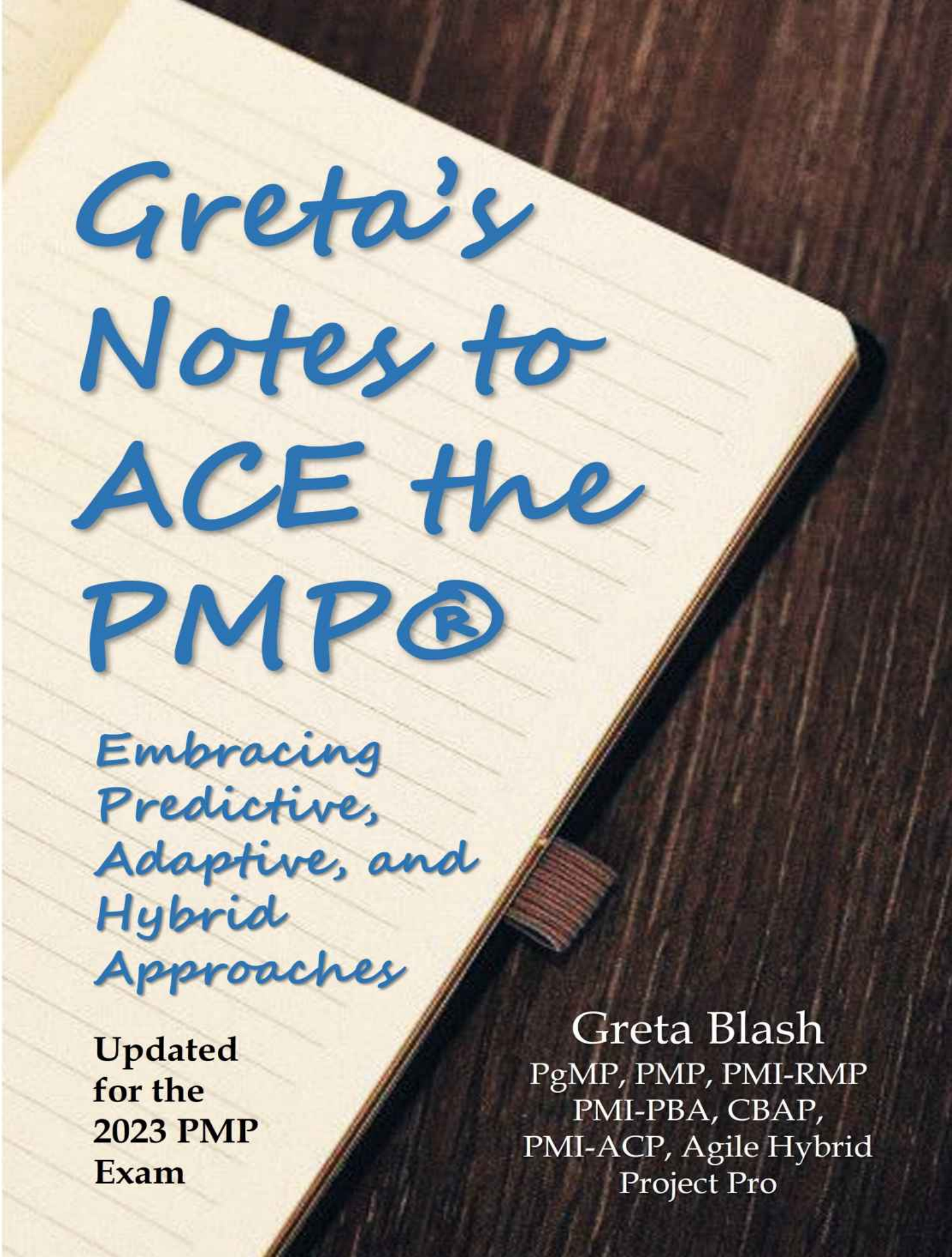

Greta's Notes to ACE the PMP®

Embracing Predictive, Adaptive, and Hybrid Approaches

Updated for the 2023 PMP Exam

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PMI-PBA, CBAP,
PMI-ACP, Agile Hybrid
Project Pro

GRETA'S NOTES
TO
ACE THE PMP®

EMBRACING PREDICTIVE, ADAPTIVE, AND HYBRID APPROACHES

By

Greta Blash, PMP, PgMP, PMI-RMP, PMI-ACP, DASSM, PMI-PBA, CBAP, Agile Hybrid Project Pro

Steve Blash, PMP, PMI-ACP, DASSM, Agile Hybrid Project Pro

Facilitated Methods (Division of Blash Enterprises, Inc.)

Dedication

We would like to dedicate this book to our wonderful family:
Georgia, Troy, Margi, and Nick
And
Owen, Ethan, Kristi, and Jared

Acknowledgments

We would like to thank all our students and class participants who encouraged us to assemble the notes I provide during training sessions to help them prepare for and pass the PMP® exam. Their continued suggestions and input have been invaluable.

A special thanks to our family, and especially my husband and partner for encouraging me to share my knowledge of various Approaches, Competencies and Experiences with others as they prepare to further their career in the project management discipline.

Foreword By Lee Lambert, PMP Founder

I had the honor of being one of the Founders of the Project Management Institute's (PMI)® Project Management Professional (PMP)®. Since its debut in 1984 more than one million professionals have earned this distinguished recognition.

In the ensuing years a plethora of books, tapes, videos, and live training programs have been created to help those seeking to become a PMP®. Some good, some not so good, but all claiming to help students prepare to sit for and pass this challenging exam.

As a Founder of the PMP® I am constantly asked for suggestions for materials that will help the prospective PMP candidate ace the exam. Up until now I have been reluctant to make recommendations of prep materials developed by those hoping to "cash in" on the stampede by others hoping to earn the prestigious PMP®.

Finally, someone has demonstrated concern for the PMP® wannabe! Greta Blash (PMP, PgMP, PMI-RMP, PMI-PBA, PMI-ACP, DASSM) has revised her best-selling book: ***Greta's Notes to ACE the PMP***® to reflect the changes being made to the new 2021 PMP® exam (effective January 2021). Her easy-to-use book will significantly increase the reader's probability of passing this new exam.

Greta's book does not remove the need for hands on knowledge gained through years of leading projects or tasks along with focused study and preparation, but it will become an invaluable supplement for improving your final push prior to sitting for the exam.

I am no longer reluctant to suggest to my network an aide in studying for the PMP exam. Greta's book! Without reservation I suggest to those professionals hoping to gain the coveted PMP® distinction – don't leave home without it!

Lee R Lambert, PMP Founder
PMI Fellow

Lee Lambert, PMP, is a project management industry thought leader with nearly 45 years of experience. He is known for his thought leadership in the establishment of education and practitioner measurement standards. Since embarking on his project management journey in 1966, he has implemented multiple enterprise project management processes and educated more than 40,000 professionals in 22 countries. Mr. Lambert was instrumental in the creation of PMI's Project Management Professional (PMP)® credential.

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About the Book

Book Content

This PMP® certification notes guide provides experienced project managers with the knowledge of concepts, terminology and techniques that are addressed on the PMP® exam from Project Management Institute Inc. (PMI)®. It helps in preparation for the Project Management Institute, Inc. (PMI)® Project Management Professional (PMP)® certification.

PMP® Certification

Certification Requirements

In addition to studying and your academic preparation, your project management experience is very important. The exam is not a test of your ability to read and memorize exam preparation materials. The questions are scenario-based and written by working PMPs.

The requirements to be approved to sit for the PMP® exam depend on your educational level:

- If you have a four-year degree, you will need to provide evidence of 36 months leading and being responsible for a project, as well as 35 hours of project management education/training.
- If you have a high school diploma or an associate degree (or a global equivalent), you will need to provide evidence of 60 months leading and being responsible for a project, as well as the 35 hours of project management education/training.

PMP® Certification Exam[1]

The PMP® certification continues to be a competency-based assessment of the integrated set of knowledge, skills and abilities as gained from both practical and learned experiences.

The PMP® exam questions are not written on any single text or singularly supported by any reference. A list of references is provided by PMI that identifies resources that are part of a larger set of educational resources and texts that might possibly be utilized for exam and study preparation. PMI® does not endorse specific review courses, resources, references, or other materials for certification preparation. The references listed on pmi.org are not inclusive of all resources that may be utilized and should not be interpreted as a guaranteed means of passing the exam.

The 2021 PMP® exam includes multiple approaches to span the value delivery spectrum, including predictive, agile and hybrid. Both the PMI® Talent Triangle and the PMP® Exam Content Outline are key references for the exam.

The Exam Content Outline (ECO) lists domains and tasks relevant to project management work.

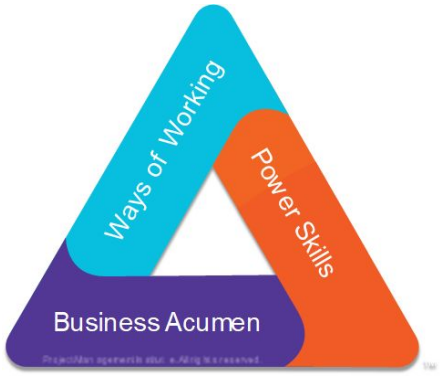
- Domains are defined as the high-level knowledge areas that are essential to the practice of project management.
- Tasks are the underlying responsibilities of the project manager within each domain area.
- All exam questions are mapped to tasks identified in the ECO.
- The exam content will follow the shape of the PMI® Talent Triangle and focus on:
  - People, or project leadership – 42%,
  - Process, or how to do the work – 50%,
  - Business environment/Business acumen, or how project managers and teams are leaders in an organization that supports strategic goals and business health – 8%.

The current version of the PMP® exam went live in January 2021.

- 230 minutes in length, including two 10-minute breaks. Once you have completed the first 60 questions you may take a break, but you cannot return to the previous 60 questions.
- 180 questions formats:
  - Matching,
  - Multiple choice,
  - Multiple response,
  - Hotspot,
  - Fill-in-the-blank.

PMI® Talent Triangle®

The PMI® Talent Triangle® is a practical representation of critical professional skills needed.



To help project professionals navigate this changing world of work and embrace smarter ways of working, the updated PMI® Talent Triangle® now focuses on:

Ways of Working – formerly Technical Project Management

These skills are those required to deliver the desired project results and are the skills that project managers initially acquired including understanding and delivering the critical success factors for the project, managing the project schedule, reporting the financial status of the project appropriately, and communicating the status of issues through an issue log.

Power Skills – formerly Leadership

Power skills go beyond the typical management to include– (formerly known as ‘soft skills’) – the critical interpersonal skills of professionals at every level that enable them to apply influence, inspire change, and build relationships. The common thread of all projects is people - and it is critical that project managers can deal

with people through their behaviors, being respectful and culturally sensitive.

Business Acumen – formerly Strategic and Business Management Skills

Business Acumen is the understanding of the business of an organization and thus make good judgments and quick decisions, while understanding influence factors across an organization or industry. It requires a working knowledge of business functions, key products or services provided, competitors.

The “Business Acumen” side of the Talent Triangle is most crucial to understand for project professionals to support the changing and competitive nature of organizations today.

Business Environment

Project management discipline continues to evolve and adapt due to changing environments and requirements.

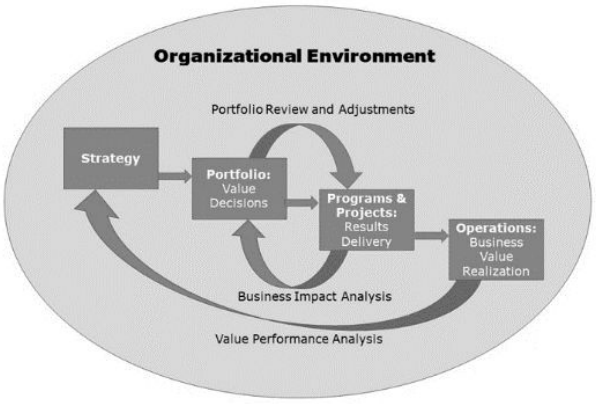
Understanding of basic project management terminology has been expanded to include new approaches and new ways of working.

Project management principles guide the behavior and actions of project managers, team members and stakeholders to provide intended outcomes.

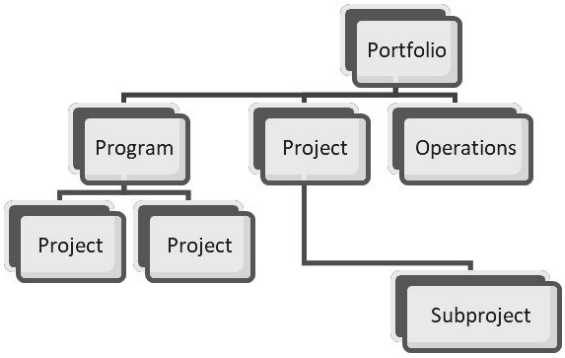
Foundation Concepts

Organizational Project Management (OPM)

The strategy execution framework coordinating portfolio, program, and project, and operations management and enables organizations to achieve strategic objectives.



Starts with the business strategy feeding portfolio management to authorize implementation of the strategic objectives through programs and/or projects.
Results are transitioned or delivered to organizations to realize the business benefits.



Portfolio
Projects, programs, component portfolios and operations managed as a group to achieve strategic objectives. Programs or projects in

the portfolio may not necessarily be interdependent or directly related.

Portfolio Management

Centralized management of one or more portfolios to achieve strategic objectives.

Program

Related projects, component programs and program activities that are managed in a coordinated way to obtain benefits not available from managing them individually.

Program Management

The application of knowledge, skills, and principles to a program to achieve the program objectives and to obtain benefits and control not available by managing program components individually.

Project

A temporary endeavor undertaken to create a unique product, service, or result.

Project Management

The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements accomplished through the appropriate application and integration of project management processes which are appropriately applied to each project.

Operations management

Concerned with management of the ongoing production of goods and/or services. Area that is outside the scope of formal project management however may intersect with projects and programs at some points.

Project Success

Project success often depends on the following:

- Maturity of organizational project management,
- Effectiveness of the project manager,
- Availability of funding and resources,
- Skill levels of the team members,
- Team and stakeholder engagement, communication, and collaboration,
- Understanding of the core problem, the impact of that, and the related needs.

Project management process group

Logical grouping of project management inputs, tools and techniques and outputs.

- Initiating,
- Planning,
- Executing,
- Monitoring and Controlling,
- Closing.

Project management knowledge areas

An identified area of project management defined by its knowledge requirements and described in terms of its component processes, practices, inputs, outputs, tools, and techniques.

- Integration,
- Scope,
- Schedule,
- Cost,
- Quality,
- Resource,
- Communications,
- Risk,
- Procurement,
- Stakeholders.

PMO

Several types of PMO (portfolio, program, or project management office) structures,

Vary in degree of control and influence on projects within the organization:

Supportive

- Consultative role,
- Provides best practices, methodologies, standards, and templates,
- Coach, mentor , and train project managers.

Controlling

- Provide support, implements controls and procedures,

- Monitor co mpliance with standards, policies, and procedures within the defined framework via project audits.

Directive

- High control , close to a functional organization,
- Directly manages shared resources (project managers and select team members),
- Coordinate communication across projects,

Note: This can also be referred to as a Center of Excellence or Agile Centers of Excellence (ACoE) or a Value Delivery Office (VDO).

Organization Structures

Functional (centralized):

All team members report to the functional manager,
Seldom a need for a PM as the business functional manager manages the projects.

Matrix (Weak, Balanced & Strong):

Weak – Matrix that more closely resembles a functional organization. Project manager acts as a coordinator or expeditor/facilitator for the functional manager,
Balanced – Shared project manager role but functional manager retains budget authority. Team members report to both functional/resource managers and PMs,
Strong – Matrix that more closely resembles a project-oriented organization. Project managers have authority, and control with functional manager, often sponsor.

Functional managers provide technical/domain knowledge and resources as needed.

Project-oriented:

- Project manager has full authority and control,
- Teams are usually full-time and co-located,
- Teams are organized based on project needs.

Hybrid/Composite:

A combination of two or more of the various types of structures where the PM authority and role varies by organization.

Relative Authority in Organizational Structures

Team member loyalty:

- Functional – to the functional department and manager,
- Matrix – conflicted loyalty between managers,
- Project-oriented – to the project and project manager.

Team member reporting:

- Functional – to the functional manager.
- Matrix – to both the functional manager and the project manager.
- Project-oriented – to the project manager.

Project manager role:

- Functional – seldom or loosely identified as someone other than the functional manager,
- Matrix – coordinator/expeditor to a full project manager,
- Project-oriented – full-time and responsible for project.

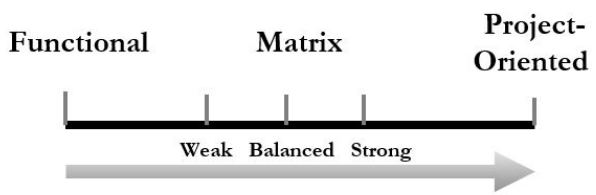
Team member role:

- Functional – part-time on project among functional responsibilities,
- Matrix – part-time or possibly full-time on individual projects,
- Project-oriented – full-time on project (preferred)

Control of project manager over team members:

- Functional – nonexistent (functional manager controls),
- Matrix – medium – shared with functional manager/sponsor,
- Project-oriented – high.

Note: Power of the project manager increases from Functional to Project-oriented structure.



Project Management Principles

Principles-based project management does not negate the conduct of applied project management practices regarding the management of schedule, cost, scope, risk, stakeholders, etc.,

Not prescriptive in nature but intended to guide the behavior of people involved in projects,

Aligned with the values identified in the PMI® Code of Ethics and Professional Conduct,

Twelve Project Management Principles include:

- Stewardship - Be a diligent, respectful, and caring steward,
- Team - Create a collaborative project team environment,
- Stakeholders – Effectively engage with stakeholders,
- Value – Focus on value,
- Systems Thinking – Recognize, evaluate, and respond to system interactions,
- Leadership – Demonstrate leadership behaviors,
- Tailoring – Tailor based on context,
- Quality – Building quality into processes and deliverables,
- Complexity – Navigate complexity,
- Risk – Optimize risk responses,
- Adaptability and Resiliency – Embrace adaptability and resiliency,
- Change – Enable change to achieve the envisioned future state.

Project Performance Domains

Eight performance domains are a group of related activities that are critical for the effective delivery of successful projects,

Operate as an interactive, interrelated, and integrated system, interdependent of the other performance domains,

Relate differently for each project, but present in every project.

Eight Project Performance Domains include:

- Stakeholders – groups and individuals associated with project activities and functions,
- Team – people who are responsible for producing project deliverables that realize business outcomes,
- Development Approach and Life Cycle – development approach, cadence, and life cycle phases of the project,

- Planning – initial, ongoing, and evolving organization and coordination necessary for delivering project deliverables and outcomes,
- Project work – established project processes, management of physical resources, and fostering a learning environment,
- Delivery – delivering the scope and quality that the project was undertaken to achieve,
- Measurement – assessing project performance and taking appropriate actions to maintain acceptable performance,
- Uncertainty – risk and uncertainty .

Agile Mindset

- " agile" has become more and more frequently referred to when speaking of projects today.
- Four values from the Agile Manifesto,
- Twelve principles,
- Adopted by more than 50 known different agile practices,
- Concepts comprising the agile mindset are appropriate to any project – not just software development,
- Adopt a flexible, change-friendly way of thinking and behaving,
- Understand the purpose of these practices,
- Select and implement appropriate practices based on context,
- Internalize agile values, mindset, and behavior,
- Continually communicate , collaborate and be transparent.

Manifesto for Agile Software Development[2]

Value exists in the items on the right, but more value in the items on the left:

Individuals and interactions	Over	Process and tools
Working software/results	Over	Comprehensive documentation
Customer collaboration	Over	Contract negotiation
Responding to	Over	Following a plan

change/feedback		

Agile Principles[3]

The manifesto was expanded to include 12 principles including:

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale,
- Businesspeople and developers must work together daily throughout the project ,
- Build projects around motivated individuals. Give them the environment and support they need and trust them to get the job done,
- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation (and enhanced at a white board),
- Working software is the primary measure of progress (measured by results),
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely,
- Continuous attention to technical excellence and good design enhances agility,
- Simplicity – the art of maximizing the amount of work not done – is essential. (Lean concept – eliminate anything that does not provide value,)
- The best architectures, requirements, and designs emerge from self-organizing teams,
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Tailoring to Context

The deliberate adaptation of the project management approach, governance, and processes to make them more suitable for the given environment and the work at hand.

- No two projects are the same,
- Unique context of the project must be understood,
- Various concepts and methods can be adapted and applied in the most appropriate way to produce the expected results,
- Often results in the need to apply a Hybrid approach, incorporating both predictive and adaptive methods for various portions of the project.

Strategic Alignment

Strategic Plan - A high-level business document that explains an organization's vision and mission plus the approach that will be adopted to achieve the vision and missions, including the specific goals and objectives to be achieved during the period covered by the document.

- Business strategy is the reason for the project,
- Needs are related to the strategy to achieve the business value,
- Important to understand how projects align with organizational strategy and global trends,
- Provides information to make informed decisions to meet or exceed the intended business value.

Strategic Management Elements

Strategic management includes the following elements:

- Vision: where the business wants to go (aspirational),
- Mission: pre-established objectives or purposes,
- Objectives: defining areas of pursuance,
- Strategies: resources needed to accomplish organizational purpose.
- Operational policies and procedures established to carry out the strategic elements,
- Includes the most appropriate organizational structures.

Organizational Influences

Two categories:

- Enterprise Environmental Factors (EEFs)
- Organizational Process Assets (OPAs)

Enterprise Environmental Factors (EEF)

Conditions, not under the immediate control of the team, that influence, constrain or direct the project, program, or portfolio. These originate from outside the project and often outside the organization .

External Business Environment Factors

Three most common frameworks to help understand the external business environment outside the organization:

- PESTLE: Political, Economic, Social, Technical, Legal and Environmental aspects,
- TECOP: Technical, Environmental, Commercial, Operational and Political factors,
- VUCA: Volatility, Uncertainty, Complexity and Ambiguity.
- Helps understand potential for risk,
- Part of the risk assessment activities,

Other areas include:

- Comparative advantage analysis
- Feasibility studies
    - SWOT analysis,
    - Assumption analysis,
    - Historical information analysis,
    - Risk alignment with organizational strategy.

Internal Business Environment Factors

- Within the organization requiring visibility into business plans, reorganizations, process changes and other activities,
- May require changes before or during the project,
- Often have a dramatic impact on the scope,

- May require new deliverables, or reprioritization of work, including removal of existing deliverables.

Organizational Process Assets (OPAs)

Plans, processes, policies, procedures, and knowledge bases specific to and used by the performing organization. These assets influence the management of the project.

- Specific to the organization and projects.
- Maintained by the PMO.
- Organizational knowledge bases are updated throughout the project with project information.

Processes, policies, procedures, and templates

- Organizational charts,
- Procurement rules,
- Hiring and onboarding procedures.

Organizational knowledge bases

- Engineering wikis,
- Libraries of archives,
- Lessons learned repositories.

Project Benefits and Value

"Projects do not simply produce outputs, but more importantly, enable those outputs to drive outcomes that ultimately deliver value to the organization and its stakeholders." [4]

- PMBOK® Guide – Seventh Edition represents a shift toward a systems view of value delivery,
- Perspective change from governing portfolios, programs, and projects to focusing on value chain,
- Enablement of organizational strategy, value, and business objectives.

Business Value

The net quantifiable benefit derived from a business endeavor. The benefit may be tangible, intangible, or both.

- Projects provide business value, realized through usage after results delivered.
- The goal is to cost-effectively improve outcomes and increase overall business value.
- Value may include :
  - Shareholder value or business growth,
  - Customer value,
  - Employee knowledge,
  - Channel or business partner value.

Needs Assessment[5]

Analysis of current business problems or opportunities to understand what is necessary to attain the desired future state.

- Usually performed by a business analyst, prior to the business case being developed,
- Helps to clarify the business goals, objectives, issues, and opportunities,
- Includes information regarding the current situation, its impact, and a recommended solution.

Benefits

- Benefits are defined in the business case and benefit management plan,

- Business documents, including the Benefits Management Plan and the Business Case provide objectives and justification for the project,
- Developed prior to the initiation of the project,
- Provide the "why" the project has been selected.

Benefits Management Plan

The documented explanation defines the processes for creating, maximizing, and sustaining the benefits provided by a project or program. It also describes how and when the benefits of a project will be derived and measured.

The Benefits Management Plan includes:

- Target tangible and intangible benefits,
- Strategic alignment with organizational business strategies,
- Timeframe for realization of benefits,
- Requirements for benefit owners to identify, monitor and report on realization of benefits, including metrics.

Business Case

A value proposition for a proposed project that may include financial and non-financial benefits.

- Business Case includes economic feasibility study for project decisions including:
- Current situation and impact,
- Purpose of the project,
- Options considered and recommended solution,
- Estimated cost of the recommended option,
- Benefits of the recommended options,
- How benefits will be measured.

Benefit Measurement Methods

Techniques used to justify the project based on projected value.

- Business-based measurements include:
- Payback Period – length of time for the investment to be recovered by revenue received,
- Opportunity Cost – cost of the option not chosen.
- Financial-based measurements include:

- Benefit Cost Analysis (BCR) – comparison of the benefits received to the cost of implementation for different projects,
- Present Value (PV) – current value of future money given a rate of return,
- Net Present Value (NPV) – difference between present value of cash outflows minus cash inflows calculates accurate value of the project,
- Internal Rate of Return (IRR) – discount/interest rate at which the project inflows and outflows are equal (NPV is zero),
- Return on Investment (ROI) – measure of net benefit to cost of investment (percentage),
- Net Benefit / Cost or (benefit – cost) / cost).

Note: It is very unlikely that you will have to calculate any of the methods above, but you should be familiar with their meaning and how they might be used to compare potential projects.

For the exam, when comparing potential projects:

- Payback Period - Shorter is best,
- Net Present Value - Bigger is better,
- Internal Rate of Return - Bigger is better,
- Return on Investment (ROI) - Bigger is better.

- Additional methods of determining potential value include:
  - Simulation – analysis of uncertainties to evaluate impact on objectives,
  - Discounted Cashflow Analysis (DCF) – values investment by discounting the estimated future cash flow,
  - Decision Tree Analysis – used to support selection of best of several options,
  - Net Promoter Score – measure of customer loyalty and referral,
  - A/B Testing – determination of user preferences between two options.

Additional terminology:

- Law of Diminishing Returns - “The more you put into it, the less you get out or the greater the likelihood that the return will not be as

expected,”

- Working capital - Amount of money available to invest, or the difference between current assets and current liabilities,
- Sunk cost - Amount of money previously spent on a project, or previous activity, that is not recoverable for a canceled project.

Incremental Value Delivery

- The Standish Group in 1998 published a report showing many projects fail because delivery of value took too long,
- Businesses need to deliver value to stakeholders to continue support and funding for the project,
- Key value of both adaptive and hybrid approaches is through an incremental value delivery approach,
- Smaller portions of work and value are delivered more frequently.
- Benefits include:
  - Value to be delivered sooner,
  - Higher customer value and increased market share for the organization to be attained,
  - Partial delivery (or previews) of functionality to customers,
  - Early feedback, allowing for adjustments to the directions, priorities, and quality of the product by the customer.

Organizational Culture and Change Management

Projects create and deliver change, and change is often the ca talyst for the authorization of a project.

Organizational Culture

- Culture can strongly influence a project's ability to meet its objectives,
- Changes are often met with some degree of resistance,
- Understanding the organization's style and culture helps support change including:
  - View of leadership, hierarchy, and authority,
  - Shared vision, beliefs, and expectations,
  - Diversity equity, and inclusion practices,
  - Regulations, policies, and procedures,
  - Code of conduct,
  - Operating environments,
  - Motivation and reward systems,
  - Risk tolerance.

Change Management

A comprehensive, cyclic, and structured approach for transitioning individuals, groups, and organizations from a current state to a future state in which they realize desired benefits.

- Change management helps support individuals as they embrace change,
- Projects support change to meet organizational objectives.
- Often impact individuals,
- Different from project change control, where changes to documents, deliverables, or baselines are identified, documented, and then approved or rejected,

- Prosci's ADKAR® model[6] includes five milestones needed to change successfully:
    A – Awareness of the need for change,
    D – Desire to support the change,
    K – Knowledge of how to change,
    A – Ability to demonstrate new skills and behaviors,
    R – Reinforcement to make the change stick.

Additional activities to support changes:

- Coaching co-workers to support the business with patience and compassionate mentoring,
- Enable an agile operating system where team members are coached to facilitate adopting a change-centered mindset,
- Keeping knowledge current by continuously improving both processes and knowledge,
- Roll out plan to address how the implementation of changes will be delivered,
- Specific training to support these changes based on stakeholder roles and responsibilities (including training artifacts – courseware, exercises, knowledge requirements, trainers),
- Demos of new functionality with early feedback to improve quality and incorporate changes[7].

Organizational Transformation for Project Practitioners

PMI's Brightline Initiative[8] was created to support executives who need to know how to bridge the gap between strategy and execution including five building blocks:

- A North Star statement to articulate the vision and strategic objectives of a transformation which needs to be crisp and concise with OKRs,
- Understand customer insights and global megatrends, customer-oriented understanding of impact to the business and driving change,
- Use a flat, adaptable cross-functional transformation operating system with rapid response teams and savvy project professionals

who can execute transformation strategy, empower the change, rather than through a hierarchical structure,

- Use volunteer champions from inside the organization to drive the transformation rather than external consultants who does not benefit the organization as much as employees who internalize and advocate for the change,
- Aim for Inside-Out Employee Transformation to transform mindsets and aspirations by changing culture through changing mindsets and empowering individuals.

Project Governance

“The governance system works alongside the value delivery system to enable smooth workflows, manage issues, and support decision making.”

Organizational Governance

- Governance refers to organization or structural arrangements at all levels of an organization,
- Decides and influences the behavior of the organization’s members .

Project Governance[9]

- Refers to the framework, functions and processes that guide project management activities to create a unique product, separate from organizational governance,
- Project’s governance is defined by and required to fit within the larger context of the program or organization sponsoring it,
- May require adjustments for an individual project, based on constraints and other project oversight requirements.

Governance Components

Common components that may be addressed by a project governance function include:

- Process to handle changes,
- Communication processes and procedures,
- Required project documentation,
- Processes for project decision-making,
- Process to align internal stakeholders with project process requirements,
- Process for review and approval of changes above the project manager's authority,
- Process to identify, escalate, and resolve issues,
- Process for stage gate or phase reviews,

- Guidelines for aligning project governance and organizational strategy,
- Project life cycle approach,
- Project organization chart with project roles,
- Project success and deliverable acceptance criteria,
- Relationship among project team, organizational groups, and external stakeholders.

Governance Board

- Also referred to as a Project Board or Steering Committee,
- May consist of separate or combined committees to supply support to the project manager,
- Members includes project sponsor, senior managers and PMO resources,
- Provides oversight to the project objectives, performance and adherence to project policies and procedures,
- Review key deliverables, especially defined by organization's methodology,
- Provides input for key decisions escalated to this body, including thresholds and tolerance.

Governance and Life Cycles

- Project's life cycle depends on organization's governance policies and tolerances for risk, change and other factors,
- Importance given to stakeholder or customer inputs,
- Type of work being performed.

Predictive life cycles

- Value is delivered as a product at the end of the life cycle.
- Deliverable or result is given to customers at the end,
- Benefits can often take a long time to be realized,
- Work is split into phases and governance board reviews at end of each phase,
- Better suited to large projects where the requirements are well understood and can be planned and managed with few changes,
- Phase gate refers to reviews where a decision is made to continue to the next phase, to continue with modification, or to end a project

or program,

- Phase gates are also referred to as ‘governance gate,’ ‘tollgate’ or ‘kill point,’
- At the beginning of each phase:
  - Risks should be analyzed, and reassessed,
  - Former assumptions should be verified and validated,
  - Clear and detailed explanation of the phase's deliverables should be understood,
  - Reviews ensure completeness and acceptance of key deliverables,
  - Phase or entire project may be ended if huge risks are found, deliverables are no longer needed, or requirements change.

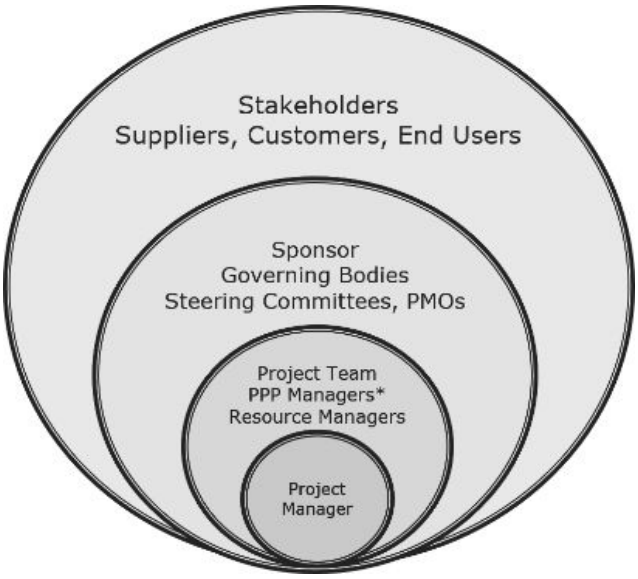
Adaptive life cycle

- Value delivery is embedded in life cycles,
- Customer participates in value creation and may receive benefit of the project incrementally, at the end of iterations,
- Work is split into releases,
- Better suited for a project in which the product and stakeholder requirements are complex and always changing,
- Reviews are held at the end of each iteration or sprint, (like a phase),
- The review process is guided by the customer’s acceptance criteria or some statement of expectation meeting the definition of done (DoD),
- Team gathers feedback from the review and uses it to improve the value of the result in the next iteration,
- Combination of individual iterations results in a unit of value that can be delivered to the customer,
- Could result in either a minimum viable product (MVP) or a minimum business increment (MBI).

Project Compliance

- Includes both internal and external standards that must be met,
- Additional Project Compliance Plan as a subsidiary plan to the Project Management Plan,
- Compliance requirements are often legal or regulatory constraints, with the consequence of non-compliance well understood,
- Requirements can be tracked through inclusion on the risk register, as well as continual review of work performance reports,
- Verification of requirements and validation of authorized stakeholders ensure that compliance is met,
- Identification of escalation procedures may be necessary if tolerance level is exceeded,
- Quality audits are also often used to verify compliance with compliance requirements.

Start the Project



- Activities performed when the project is initiated,
- Understanding “WHY” the project was selected and approved,
- Identifying key stakeholders.

Organizational Project Roles

- Project Manager – individual assigned to achieve the project objectives,
- Project Management Team
  - Project Coordinator,
  - Project Expeditor,
- Sponsor – Individual or group providing resources and support for the project, and accountable for success of project,
- Senior Manager – organizational managers with vested interest in the result of the project,
- Project Team – individuals who perform the activities required for the project,
- Functional/Resource Manager – managers to whom the project team members report within the organization,
- Project Management Team/Office (PMO) – management individuals directly or indirectly involved in project activities,
- Stakeholders – any individual or group that can be affected by or be affected by the project activities and results,
- Customers/End Users – ultimate recipient of the result of the project,
- Seller – individual or organization that provides resources to the project.

Identify and Engage Stakeholders

Stakeholders are individuals, groups or organizations who may impact the project, be impacted by the project, or perceive to be impacted by the project.

- Often grouped into categories.
- Identified in the Stakeholder Register.
- Continually updated throughout the project
- Important to identify, prioritize and engage all stakeholders as soon as possible.
- Stakeholder identification techniques include:

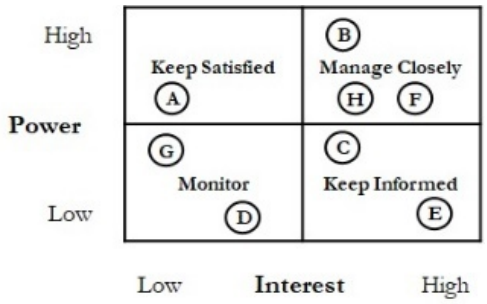
Data gathering

- Many techniques depend on context and requirements.

Data representation

- Directions of influence:
  - Upward to senior management,
  - Downward to team and SMEs,
  - Outward to stakeholders, and,
  - Sideward with other project managers,
- Prioritization – Useful for large numbers of stakeholders.

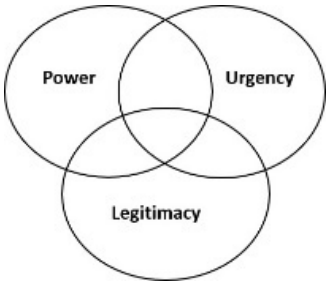
Power/Interest Grid



- Used to classify stakeholder representation:
  - Power/interest grid– authority to concern,
  - Power/influence grid – authority to involvement,

- Impact/influence grid – effect change to involvement.

Salience Model



- Power – level of authority or ability to influence outcomes,
- Urgency – need for immediate attention,
- Legitimacy – involvement is appropriate.

Stakeholder Register

A project document including the identification, assessment, and classification of project stakeholders.

- Two main sections include:
  - Profile – basic contact information,
  - Assessment – personal assessment of potential interest, expectations, influence, and potential engagement methods.

Plan Stakeholder Engagement

Development of approaches to involve project stakeholders, based on their needs, interests, and potential impact on project.

Stakeholder Engagement Plan

- Provides a plan to interact effectively with stakeholders,
- Develops approaches to appropriately engage with stakeholders throughout the project,
- Developed early in project life cycle, and reviewed and updated as stakeholder community changes:
  - Start of a new phase or project,
  - Changes to the organizational structure,

    - When stakeholders are added or are no longer involved,
    - Result of change, risk, or issue management activities.
- Recognizes diverse information needs of stakeholders.

Stakeholder Communications

- Important to analyze the communications needs and preferred methods for individuals and groups of stakeholders.
- Five (5) Cs of written communication including:
    - Correct grammar and spelling,
    - Concise expression and elimination of excess words,
    - Clear purpose and expression directed to the needs of the reader, including coherent and logical flow of ideas,
    - Coherent logical flow of ideas,
    - Controlling the flow of words and ideas.

- Dimensions - identifying different ways of communicating include:
    - Audience - including internal and external stakeholders,
    - Content and format – formal or informal,
    - Adjustment due to hierarchy – upward, downward, or horizontal,
    - Official or unofficial need – annual reports or governance related vs project team communication,
    - Written or verbal – including tone, inflection, and nonverbal gestures which may influence the understanding.

- Techniques include:
    - Choice of media - communications artifacts,
    - Sender-receiver models – incorporating feedback loops,
    - Writing style - active vs passive voice, sentence structure and word choice,
    - Meeting management,

    - Presentations – body language and visual aids,
    - Facilitation,
    - Active listening.

- Technologies include:
    - Verbal communications,
    - Digital or electronic media,
    - Physical media, including more formal in-person communications.

- Methods include:
    - Push – sent via pre-determined schedule by sender,
    - Pull – based on time the receiver wants to review,
    - Interactive communication – enables real- or near-real time communication between sender and receiver.

- Factors affecting choice:
    - Urgency of need for information,
    - Availability and reliability of technology,
    - Ease of use,
    - Project environment,
    - Sensitivity and confidentiality of information,
    - Social media policies.

Communications Management Plan

A component of the project, program, or portfolio management plan that describes how, when, and by whom information about the project will be administered and disseminated.

- Most organizations have templates with the following components:
- Information to be communicated, including language and terminology to be used,
- Reason for the communication,
- Time frame and frequency,

- Responsible person for content – especially when regards the release of confidential information,
- Receivers/Stakeholders of the communication,
- Methods or technologies of delivery,
- Time and budget allocation for creation of the communications,
- Additional information may include:
- Escalation process for issues that need visibility,
- Update method to be used for the plan,
- Glossary of common terminology,
- Flowcharts depicting flow of information, especially regarding approval of communications,
- Constraints due to regulation or policies - i.e., release of confidential information.

Form the Team

Project Team members are individuals who perform the work to achieve project objectives, supported by the project manager.

- Can vary based on organization culture, location, project context,
- Includes individuals with knowledge or specific skills required by the project,
- Ensure skills required are either present in team members or leverage specialists to coach less-skilled team members,
- Predictive project teams consist of individuals with assigned roles and responsibilities,
- Adaptive project teams are empowered, self-organizing working collaboratively.

Project Team Composition

- Refers to the makeup of the team and how they are brought together,
- Varies based on the scope of the project, the organization's culture, and location, as well as the approach used to include :
  - The assignment of resources to the team,
  - The assignment of team members to project activities,
  - The determination of involvement by individual team members (full-time or part-time),
  - The knowledge and expertise needed by individual team members (generalists and specialists).

Project Team Roles

Roles on the project team can include:

- Project management staff members - may be supported by a PMO and often referred to as a project coordinator or expeditor.
- Project team members (work staff) - perform the work to create the project deliverables.
- Supporting experts – support and participate in development of the legal, logistics, engineering, and testing aspects project

management plan. Often referred to as Subject Matter Experts (SMEs).
- Business partners – individuals based on previous business partnerships established by the organization.

T-Shaped People and Self-Organizing Teams

- Specialized resources who are experts in a single area are often referred to as:
  - “I-shaped” individuals are specialized resources who are experts in a single area,
  - “T-shaped” individuals with additional knowledge providing value, versatility, and flexibility to both the project team, as well as the organization.

Diversity, Equity, and Inclusion

- Diversity, Equity, and Inclusion, or DEI, is an established human resource component or initiative in most global workplaces,
- DEI initiatives work towards establishing equitable and “psychologically safe” workplaces,
- Today’s teams are often made up of individuals from diverse cultural backgrounds,
- People come from different backgrounds of gender, language, ability or disability, and nationality, with diverse cultural backgrounds,
- It is important to create an environment that takes advantage of this diversity and builds a team climate of mutual trust,
- Improving team knowledge and skills to reduce cost and time and improve quality,
- Improving trust to raise team morale, reduce conflict, and improve teamwork,
- Creating a collaborative culture to improve individual and team performance and facilitate cross-training and mentoring ,
- Empowering the team to participate in decision-making and own the solutions they create.

Team Formation

Predictive

The activities required to form a team using a predictive approach include:

- Estimate internal and external team resources required to fill team roles,
- Acquire the actual team resources to fill the roles,
- Onboard the team resources,
- Continually monitor the team performance to determine where competencies can be improved and interactions among team members can be improved to create an effective teaming environment.

Adaptive

Self-organizing teams

A cross-functional team in which people fluidly assume leadership as needed to achieve the team's objectives.

Servant leadership

The practice of leading the team by focusing on understanding and addressing the needs and development of team members to enable the highest possible team performance.

Hybrid

- Project manager takes on responsibility of centralizing the coordination of the team members and accountable for completing the work.
- Team members self-organize to perform the work.

Team Norms

A document that enables the team to establish its values, agreements, and practices as it performs its work together.

- Shared set of mutually agreed upon rules to help teams handle challenges,
- Should be aligned with the PMI® Code of Ethics and Professional Conduct:[10]

- Responsibility
- Respect
- Fairness
- Honesty

Team charter

A document that records the team values, agreements, and operating guidelines as well as establishes clear expectations regarding acceptable behavior by project team members.

Ground rules

Expectations regarding acceptable behavior by project team members.

Team communication plan

- Internal: Team meeting times, shared calendars, working hours, etc.
- External: Stakeholder feedback, dependency management, alignment with goals or expectations.

Collocated vs Virtual Teams

Collocated teams

Team members work from the same location where interaction is easier and facilitates greater team bonding.

- Collaboration is a priority.
- Basic needs include:
  - Cohesion,
  - Shared goals,
  - Clear purpose,
  - Clarity on roles and expectations.

Virtual teams

A group of people with a shared goal who fulfill their roles with little or no time spent meeting face-to-face.

- Virtual team communication technology include:
  - Shared “task” boards to promote visibility,
  - Messaging and chat boards to enable effective communication,

- Shared access to calendars to promote visibility of team member and stakeholder availability,
- Document storage and access for shared artifacts,
- Knowledge repositories to store and provide access to historical artifacts,
- Video-conferencing tools to enable face-to-face communication, including both collocated and virtual team members.

Build Shared Understanding

- Ensure all team members and stakeholders have a common understanding of the importance, objectives, and strategic alignment of the project,
- Understanding of any agreements, (contracts or statements of work (SOW)) that initiated the project,
- Becomes the basis for the project and team charters.

Project Vision Statement

- Includes a description of the product or solution and alignment with organization's strategic goals,
- Becomes part of the approved project charter,
- Presented during project kickoff meetings and referred to throughout the project,
- May incorporate "collaborative game" techniques, including a "product box", to help understand and focus on the vision and value from a customer's point of view,
- eXtreme programming (XP) uses a metaphor to explain in simple , common, non-technical vocabulary and language.

Existing Agreements

- Agreements provide the initial understanding of objectives and expectations,
- These describe what is needed or wanted, schedule and budgetary requirements or constraints etc.
- Types of agreements:
    - Contracts - used for external customers,
    - Memorandums of understanding (MOUs) - often tied to an earlier contractual agreement,
    - Statement of Work (SOW) – including specifics on deliverables, roles, and responsibilities,
    - Service level agreements (SLA) – including service performance standards,

    - Letters of agreement or intent – less formal, usually tied to an earlier contractual agreement,
    - Email – written verification of agreement, usually tied to an earlier contractual agreement or SOW between key stakeholders,
    - Verbal agreements – often used when previous work was performed under a more formal agreement and a strong relationship exists between parties - not acceptable in all situations and organizations,
- Predictive project agreements identify each deliverable and objective acceptance criterion,
- Adaptive agreements provide resource and timing components, but actual deliverables are continually reprioritized.

Project Charter

Formal authorization of a project and provides the project manager with the authority to apply organizational resources to project activities.

- Shows organizational formal acceptance and commitment to the project,
- Provides direct link between project and strategic objectives often including defined start date and established boundaries,
- May include high-level information from business cases,
- Formally authorizes project,
- Authorized by senior management,
- Formally identifies project manager and project sponsor.

Kick-off Meeting

- Kickoff meetings may be held to explain and establish the context of the project.
- May include a meeting with the organization to announce the initiation of the effort,
- Often includes a separate meeting with the actual delivery team (depending on the approach being used):

- Predictive approach - information regarding initial planning efforts,
- Adaptive approach - product backlog development supporting the product roadmap,
- Hybrid approach - product roadmap is provided to enhance understanding of component delivery of the vision.

Determine Project Approach

- No two projects are the same,
- Important to understand the unique context of the project,
- Methods can be adapted and applied in the most appropriate way of working to produce the desired outcomes,
- Must be knowledgeable and competent in different life cycles and approaches that support the context of the project,
- Three main approaches include Predictive, Adaptive and Hybrid.

Project or Product?

Product

Artifact that is produced, is quantifiable, and can be either an end item or a component item. Additional words for products are materials or goods.

Product management

The integration of people, data, processes, and business systems to create, maintain, and evolve a product or service throughout its life cycle.

Product life cycle

A series of phases that represent the evolution of a product, from conception through delivery, growth, maturity, to retirement.

- These are often supported by versions or releases of the product.

Project life cycle

Project Life Cycle is a series of phases that a project passes through from its initiation to its closure.

- The phases may be sequential, iterative, or overlapping,
- Used to deliver new releases or versions of a product throughout the product life cycle.

Development Life Cycle Approaches

- Predictive – plan-driven (waterfall),
- Iterative – repeatable cycles,
- Incremental – small improvements,

- Adaptive – change-driven or agile methods,
- Hybrid – combination of predictive and adaptive.

Predictive/Plan-driven

The predictive lifecycle determines the project scope, time, and cost in the early phases of this lifecycle.

- The overall project is broken down into predefined phases, based on the organization's methodology,
- Scope baseline is the basis for formal acceptance and only changed through change control process.

Adaptive/Change-driven

An adaptive project life cycle is iterative or incremental, also referred to as change - driven or adaptive. It works well in environments with high levels of change and ongoing stakeholder involvement in a project.

- Scope is decomposed into requirements in a product backlog, prioritized and developed over a few iterations,
- Delivery of features and functions enables value to be provided sooner,
- Detailed scope is defined and approved at the beginning of each iteration.
- Life cycles approaches include:
  - Time-boxed,
  - Continuous flow,
  - Exploratory.

Hybrid

- Initial planning may be predictive,
- Development or delivery activities may employ adaptive.

Tailoring Projects

Tailoring is the deliberate adaptation of the project management approach, governance, and processes to make them more suitable for the given environment and the work at hand.

- Tailoring considers the development approach, processes, project life cycle, deliverables, and choice of people with whom to engage,
- Is an iterative, continuous process throughout the project,

- Determines what is most appropriate including:
  - Development life cycle components,
  - Ways of working,
  - Knowledge management,
  - Change management,
  - Governance,
  - Benefit management.

Development Approach Options

Questions to help determine the appropriate approach include:

- Will there be unplanned work?
- How does the team prefer to work?
- What cadence suits the type of work we do?
- What does the customer want?
- Does the customer want to receive the value incrementally?
- Is there a schedule constraint?
- Would the team benefit from a steadier, building approach or are we comfortable with a faster-paced one that might encounter more risks?
- What is the risk appetite and threshold of the sponsor, product manager , and stakeholders?
- Would small iterations or sprints be helpful?
- Will these smaller groups of work help increase the collaboration of external stakeholders?

Project Complexity

Complexity is often the result of uncertainty:[11]

- Governance complexity,
- Benefits understanding and delivery,
- Interdependency of components and systems,
- System behavior – interdependencies of components and systems,
- Human behavior – interplay between diverse individuals and groups,
- Ambiguity – uncertainty and lack of understanding or confusion,

- Contains multiple parts and multiple connections between parts,
- Exhibiting dynamic interactions between parts,
- Emergent behavior (not sum of parts).

Agile Approach Concepts

- Work is broken into sprints or iterations,
- Leadership role identified as Scrum Master,
- Key stakeholder is the Product Owner,
- Planning meetings prioritize and determine work to be done during iterations of sprints,
- Ceremonies include planning meetings, daily standups, demonstrations, and retrospectives,
- Changes to requirements are made “behind the scenes” by the Product Owner prior to the planning meeting with the team,
- Retrospectives are held at the end of an iteration, release, or the project to review the work and identify improvements,
- Like lessons learned but done continuously throughout the project, not only at the end.

Plan the Project

Planning Projects

- Assessment of the current organizational environment before planning,
- Determines how the work will be performed and managed,
- Should be reviewed and approved by the sponsor and key stakeholders,
- Initially done as soon as the project charter is completed,
- Readdressed continually throughout the project delivery to make "mid-course corrections".

Planning Concepts

Rolling Wave Planning

An iterative planning technique in which the work to be accomplished in the near term is planned in detail, while the work in the future is planned at a higher level.

Progressive Elaboration

The iterative process of increasing the level of detail in a project management plan as greater amounts of information and more accurate estimates become available.

- Utilized, regardless of the development approach utilized to deliver the project result,
- Rolling wave is thought of as planning "throughout",
- Progressive Elaboration is planning "downwards",
- Adds more detail as requirements are understood closer to when requirements are needed.

MVP or MBI?

Two ways to describe how work is organized and value is delivered incrementally to the customer.

MVP – Minimum Viable Product

The smallest collection of features that can be included in a product for customers to determine functionality ("bare bones" or "no frills" in Lean).

MBI – Minimum Business Increment

In Disciplined Agile, the smallest amount of value can be added to a product or service that benefits the business.

The advantages to either of these include:

- Enable the project team to deliver value sooner,
- Help the team validate improvements,
- Enables the team to incrementally build on success or pivot as needed.

Planning Across Life Cycles

The planning processes can be done differently depending on the life cycle being used.

Requirements specification – How much needs to be known about the desired outcome?

- Predictive – defined in specific terms before development,
- H ybrid – elaborated periodically during delivery,
- Adaptive – elaborated frequently during delivery,

Outcome(s) **–** When are these delivered to the customer?

- Predictive – delivered at the end of the project,
- Hybrid – can be divided into pieces (iteratively or incremental),
- Adaptive – delivered after each iteration according to the stakeholder desired value,

Change **–** How is change handled?

- Predictive – constrained as much as possible after baseline is agreed upon,
- Hybrid – incorporated at periodic intervals,
- Adaptive – incorporated real-time during delivery,

Stakeholders **–** What is the typical involvement?

- Predictive – involved in specific activities and milestones,
- Hybrid – involved regularly,
- Adaptive – involved continuously,

Risk and cost **–** How are these applied to different life cycles?

- Predictive – controlled by detailed planning and consideration of mostly known items,
- Hybrid – controlled by progressively elaborating plans with new information,
- Adaptive – controlled as requirements and constraints emerge.

Project Documents

Any documents that are prepared in support of a project – for example, requirements, specifications, contracts with vendors, design documents, test plans, and publications that will be delivered to the client along with the final product.

These are now referred to as “artifacts”.

Activity attributes	Activity list	Assumption log	Basis of estimates
*Burn-down chart	*Burn-up chart	Change log	Cost estimates
Cost forecasts	Duration estimates	Issue log	Lessons learned register
Milestone list	Physical resource assignments	*Product backlog	Project calendars
Project communications	*Project roadmap	Project schedule diagrams	Project scope statement
Project team assignments	Quality measurements	Quality metrics	Quality report
*Release plan	*Requirements backlog	Requirements documentation	Requirements traceability matrix
Resource breakdown structure	Resource calendars	Resource requirements	Risk register
Risk report	Schedule data	Schedule forecasts	*Sprint/Iteration plan
Stakeholder register	*Story Points	*Task board Kanban board	Team charter

Test and evaluation documents			

Scope

Scope refers to:

- Product scope – the features and functions that characterize a product, service, or result,
- Project scope – the work performed to deliver a product, service or result with the specified features or functions.

Scope Management Plan

A component of the project or program management plan that describes how the scope will be defined, developed, monitored, controlled, and validated.

- Provides guidance and direction on how scope will be managed throughout the project,
- Includes development and management of project scope statement, WBS, acceptance procedure of project deliverables and changes to project scope statement,
- Helps reduce the risk of scope creep and gold plating.

Scope Planning: Predictive

Predictive

- Facilitating or eliciting requirements,
- Identifying known requirements,
- Utilizing techniques including data gathering, data analysis, decision-making and data representation,
- Documenting the requirements including the textual scope statement and the work breakdown structure (WBS) (visual) with a supporting WBS dictionary,
- Develop the supporting schedule, budget, resource, and quality plans required to deliver those requirements.

The product owner:

- Creates many of the original user stories,
- Refines the release backlog to prepare for the Iteration Planning meeting,

- Explains each prioritized user story in detail to the team.

The team

- Estimates the effort and negotiates the final stories to be included in the iteration, creating the iteration baseline.
- Selection of the stories is also based on the expected velocity of the iteration.

Requirements

A condition or capability that is necessary to be present in a product, service, or result to satisfy a business need.

Requirements must be:

- Unambiguous (measurable and can be tested),
- Traceable,
- Complete fully defined and understood,
- Consistent,
- Acceptable to key stakeholders.

Requirements Management Plan

A component of the project or program management plan that describes how requirements will be analyzed, documented, and managed.

- Planning, tracking, and reporting information regarding requirements activity,
- Levels of authorization required to approve changes to requirements,
- Process and criteria used to prioritize requirements,
- Metrics and rationale for product requirements,
- Traceability structure, usage, and requirement attributes,
- Configuration management, including version control rules for requirements,
- Impact analysis activities as part of tracing, tracking, and reporting of requirement changes.

Types of Requirements

Business requirements

- Higher-level organizational needs,
- Identified in the business case or project charter,
- Aligned with business objectives.

Stakeholder requirements

- Requirements for individuals or groups of stakeholders,
- Especially for external stakeholder,
- Often reporting requirements.

Quality requirements

- Tied to product quality aspects,
- Include conditions or criteria needed to validate the successful completion of a project deliverable or fulfilment of other project requirements.

Project requirements

- Requirements to complete the project,
- Includes actions, processes, or other conditions the project needs to meet.,
- Usually specified in contracts or SOWs.

Product or Solution requirements

- Features and characteristics of the product, service, or result,
- Meets business and stakeholder requirements including:
- Functional requirements - identifying expected features and functions of the product or solution.

Transition or readiness requirements

- Temporary requirements to transition to desired future state,
- Ensures results can be used effectively by the customer.

Compliance requirements

- Aligned with legal or regulatory standards,
- Must be prioritized as mandatory.

Collect/Elicit Requirements

Elicits, analyzes, documents, stakeholder needs and requirements to meet project and product objectives.

- Determines stakeholder needs and requirements,
- Elicits or “draws out” information or knowledge,
- Provides basis for defining both the project and product scope,
- Directly affected by active stakeholder involvement,
- Final requirements need to be unambiguous (i.e., measurable, and testable), traceable, complete, and acceptable to key stakeholders,
- Specific and detailed enough to allow verification (testing) and validation (acceptance).

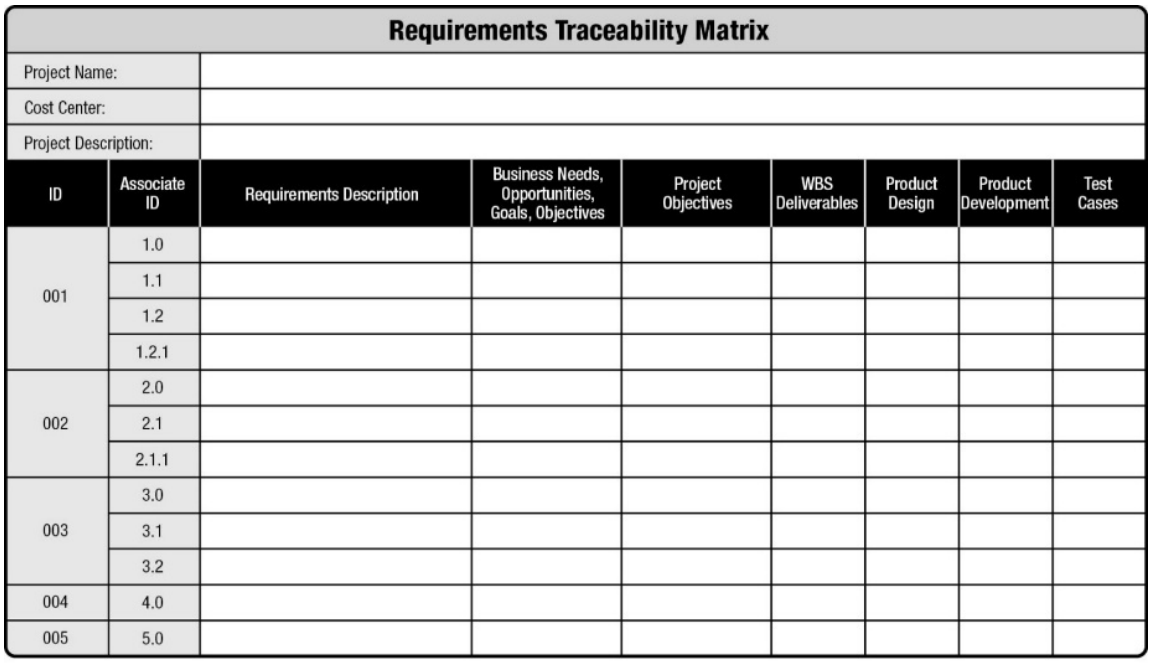
Data Gathering Techniques

Interviews	Checklists	Observation
Market research	Benchmarking	Focus groups
Questionnaires and surveys	Check sheets and checklists	Brainstorming and brain writing
Nominal group technique	Facilitation	Document analysis

Document Requirements

- Depends on the approach and any governance deliverables required by the organization,
- Simple format listing all requirements, categorized by stakeholder and priority.

Requirements traceability matrix



Requirements Traceability Matrix

Project Name:	
Cost Center:	
Project Description:	

ID	Associate ID	Requirements Description	Business Needs, Opportunities, Goals, Objectives	Project Objectives	WBS Deliverables	Product Design	Product Development	Test Cases
001	1.0							
	1.1							
	1.2							
	1.2.1							
002	2.0							
	2.1							
	2.1.1							
003	3.0							
	3.1							
	3.2							
004	4.0							
005	5.0							

Figure 5-6. Example of a Requirements Traceability Matrix

A grid that links product requirements from their origin to the deliverables that satisfy them.

- Used by business analysts to ensure that all requirements are completed,
- Detail is dependent on the project approach and criticality of individual requirements.

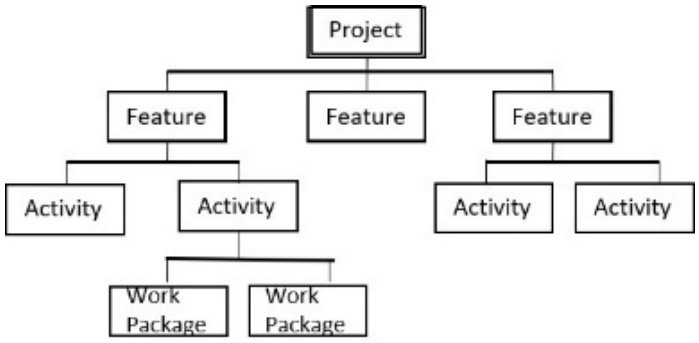
Scope Statement

Textual document that includes all the requirements as specified for the scope of the project.

- Describes both the project and product requirements and acceptance criteria,
- Defines what is included and excluded,
- Existing risks, assumptions, and constraints but continuously updated,
- Initial scope is defined in more detail as more information is available,
- In an iterative approach:
  - Detail will be determined one iteration at a time,

- Detailed planning for the next iteration is carried out as current iteration work is done.

Create WBS (Work Breakdown Structure)



A hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables.

- Divides up or partition all the project work or deliverables into manageable units of work,
- Provides a framework of what must be accomplished and delivered,
- Represents all project and product work (100% Rule),
- Provides a structured representation of approved project scope deliverables,
- Code of accounts assigned to each component,
- Provides detail through the WBS dictionary.

Additional WBS Components

Control Account

A management control point where scope, budget, actual cost, and schedule are integrated and compared to earned value for performance measurement.

Planning Package

A WBS component below the control account with known work content but without detailed schedule activities.

- A planning package may or may not be needed. depending on how monitoring will be conducted,

- A control account has two or more work packages,
- Each work package is part of a single control account.

WBS Dictionary

Provides detailed deliverable, activity, and scheduling information about each component in the WBS.

Additional information is added for a work package including :

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

Scope Baseline

Approved version of a scope statement, WBS, and its associated WBS dictionary, that can be changed using formal change control procedures and is used as a basis for comparison to actual results.

Includes:

- Project scope statement,
- WBS,
- Work packages – lowest level in WBS,
- Control account – identifies responsibility for payment of work (accounting charge back code),
- Planning package(s) – all work packages within a control account,
- WBS dictionary – provides work package detail.

Scope Planning: Adaptive

- May use an iterative or incremental approach,
- Continually reviewing agile user stories to the product backlog,
- Selecting user stories from the product backlog and incorporating them into a release backlog to support the identified features and function for the identified release,
- Utilize a story map to sequence and prioritize the user stories in the release backlog.

Release Planning

- Verifies release dates previously determined by organization or product management function,
- Agreement by team on number and length of iterations for release,
- Sets the cadence for individual iterations,
- Review features/user stories identified for the release,
- Develop a story map to identify sequence and priority of user stories.

Iteration/Sprint Planning

- Review the prioritized stories presented by the product owner based on the results of the backlog refinement effort,
- Clarify detail understanding of each user story,
- Determine the tasks required to complete each story,
- Estimate the effort to complete the tasks for the user story,
- Combine the estimate for identified stories to determine the final selection based on the comparison of the effort and the agreed upon velocity for the iteration.

Backlogs

Name, content, and detail contained in the various backlogs are highly dependent on the approach.

Product Backlog

A prioritized list of customer requirements and the first step of Scrum in which priority is based on the riskiness and business value of the user story.

Release Backlog

Stories from the product backlog pertaining to the functionality of the release.

Iteration/Sprint Backlog

A list of work items identified by the Scrum team to be completed during the Scrum sprint.

Adaptive Artifacts

These are often decomposed as additional information is discovered.

Features

A set of related requirements that allows the user to satisfy a business objective or need.

Epics

A large body of work that can be broken down into smaller pieces—features and user stories. Epics can take months to complete.

User stories

Short description of required functionality; told from role of the end-user's point of view. A brief description of deliverable value for a specific user.

Product roadmap

A high-level visual summary of the product or products of the project that includes goals, milestones, and potential deliverables.

Story map

Visual representation of the functionality of a release by grouping stories by sequence and priority.

Prioritization and Refinement of the Backlog

- Allows reprioritization or work to complete higher-priority work that delivers value first,
- Continual refinement and prioritization done by product owner/customer prior to iteration planning,
- Additional details added and large epics and stories decomposed,
- Additional refinement and understanding done by team and product owner during iteration planning.

Schedule

- Indicates how and when products, services or results will be delivered.
- Varies based on the development approach selected.

Predictive schedules

- Predictable with deadline or milestones for deliverables,
- Focus more on the importance of quality rather than quick delivery,
- Schedule and work focused on single delivery at the end,
- Change is constrained and controlled.

Adaptive schedules

- Focus on quick value delivery instead of complete product with highest quality,
- Frequent delivery of product, driven by cadence,
- Change incorporated in real time during the delivery.

Hybrid schedules

- Tailored plans combining consistency with flexibility in scheduling of work,
- Quality increased with incremental or short-term value delivery,
- Product delivery can be divided into pre-defined subsets (milestones, releases, cadence),
- Change incorporated at intervals based on the cadences,
- Change when needed.

Schedule Management Plan

A component of the project or program management plan that establishes the criteria and activities for developing, monitoring and controlling the schedule.

- Varies according to the project approach as well as the complexity of the project.
- Includes :
    - How the activities or tasks to deliver the project requirements will be defined and progressively elaborated,
    - The scheduling method and scheduling tool used,

    - The format used to report schedule information,
    - The criteria for monitoring and controlling the schedule,
    - How the status and progress will be reported during execution,
    - How schedule contingencies will be reported and assessed.
- Additional areas that may be included:
    - Project schedule model - The methodology and tool that will be used to develop the project schedule, including the maintenance and updates of the schedule, including status and progress reporting,
    - Release and iteration length for time-bound approaches,
    - Accuracy of estimates - Acceptable range used to determine realistic activity duration estimates, including a possible amount to cover risk contingency,
    - Units of measure – Individual resource staff hours, days, or weeks,
    - Organizational links – Processes to convert WBS and the work packages to the schedule to ensure consistency with the estimates and resulting schedules,
    - Control thresholds - Defined variance thresholds for monitoring schedule performance before action is taken, including when additional reviews and possible escalation is needed. These are often expressed as percentage deviations from the baseline plan. This may also include estimated standard deviations (plus or minus amounts), based on the organizational requirements,
    - Rules of Performance Measurement - Includes the rules that will be used for percent complete, Earned Value Management (EVM) techniques (baselines, fixed-formula, percent complete) and measurements (SV, SPI, CV, and CPI),
    - Reporting formats - Defined frequency, format, and content for schedule-related reports.

Note: When using a hybrid approach, management or the PMO may require schedule reporting and therefore should be identified as part of the schedule management plan.

Schedule Planning: Predictive

- Project vision and preliminary scope is known ahead of scheduling activities.
- Steps include:
  - Decompose a work package into required activities to complete the deliverable,
  - Determine dependencies and precedence relationships between activities,
- Estimate the duration of activities based on average resources,
- Determine the critical path(s),
- Resolve any resource over-allocations,
- Compress the schedule, if needed, to meet constraints.

Schedule Sequencing of Activities

Project activity

A distinct, scheduled portion of work performed during a project.

Activity list

A documented tabulation of schedule activities that shows the activity description, activity identifier, and a sufficiently detailed scope-of-work description so project team members understand what work is to be performed.

Sequence Activities

Identifies relationships among the project activities:

- Defines logical sequence of work to obtain greatest efficiency,
- Converts activity list to a network diagram,
- Connects activities with one or more predecessors and successors except for first and last activity,
- Considers given constraints,
- May need to modify to achieve a realistic project schedule,
- May be done manually or with project management software.

Activity Dependencies

A logical relationship between two project activities

Mandatory

- Must be scheduled in the specific sequence indicated,
- Referred to as hard logic or hard dependencies,
- May be contractually required or inherent in the nature of the work.

Discretionary

- May be done in a different sequence from best practices,
- Especially when the schedule needs to be condensed or resource modifications are required,
- Referred to as soft logic or soft dependencies.

External

- Represent relationships between project activities and non-project activities,
- Project manager often has little or no control,
- Must be closely monitored for potential impact to the project schedule.

Internal

- Relationship between project activities,
- Usually under the control of the project manager and team.

Precedence Relationships

Finish-to-Start (FS)

- Logical relationship in which a successor activity cannot start until a predecessor activity has finished.

Finish-to-Finish (FF)

- Logical relationship in which a successor activity cannot finish until a predecessor activity has finished.

Start-to-Start (SS)

- Logical relationship in which a successor activity cannot start until a predecessor activity has started.

Start-to-Finish (SF)

- A logical relationship in which a successor activity cannot finish until a predecessor has started.

Lags and Leads in Precedence Relationships

Leads and lags can be used to further modify the dependencies between two activities.

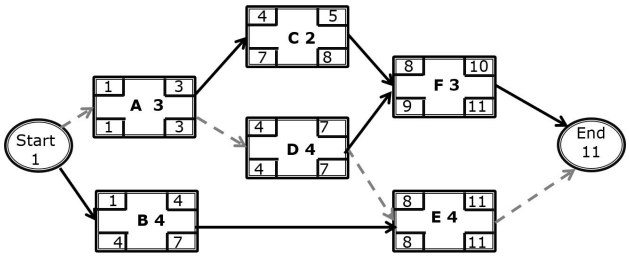
Lead

The amount of time whereby a successor activity can be advanced with respect to predecessor activity.

Lag

The amount of time whereby a successor activity will be delayed with respect to a preceding activity.

Precedence Diagramming Method (PDM)



A technique used to create the network diagram. It constructs a schedule model in which activities are represented by nodes and are graphically linked by one or more logical relationships to show the sequence in which the activities are to be performed.

- Precedence relationships consider appropriate logic while connecting these points to another activity,
- Precedence relationships are always assigned to activities based on the dependencies of each activity,
- Each activity has both a start and finish,
- Precedence indicates which of the two activities drives the relationship (the predecessor activity) and which is driven by it (the successor activity),
- In most situations, predecessors occur earlier in time than successors.

Activity Durations Estimate

Estimates the number of work periods needed to complete individual activities with estimated resources.

- Estimates amount of time each activity will take to complete,
- Dependent on resource types or skill level, resource quantities and resource calendars,
- Requires estimation of work effort required and number of resources available to complete the work,
- Factors that influence the duration:
  - Constraints imposed,
  - Effort involved,
  - Type of resources – fixed duration, fixed effort or work, fixed number of resources,
  - Schedule network analysis technique used.
- Modified as final resource is determined,
- Progressively elaborated as additional and better data is available.

Activity Estimation Terminology

Duration

Quantitative assessments of the likely number of time periods that are required to complete an activity.

- Includes only working time, and not non-working periods such as weekends or holidays,
- Is often the estimate shown on the project schedule,
- These do not include lags between activities.

Elapsed time

The actual calendar time required for an activity from start to finish.

- Actual calendar time required for an activity's completion,
- Includes non-working periods such as weekends or holidays.

Effort

The number of labor units required to complete a scheduled activity or WBS component.

- Often expressed in the unit of measure which will be used to manage the activity progress,

- The estimates of effort provide the basis for cost estimating and resource allocation.

Estimating Techniques

Note: Used for both estimating durations, as well as, estimating cost.

Analogous

- Uses historical data and expert judgment as a basis for current estimate.
- Top-down method not very accurate.

Parametric

- Uses a statistical relationship (parameter/quantitative factor) between historical data and other current variables,
- Top-down method used when parameters are applicable.

Three-point Estimating – Triangular

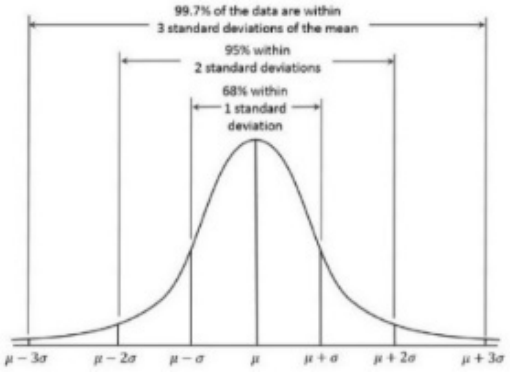
- Uses three estimates (Pessimistic, Optimistic, and Most Likely) to calculate an average to estimate uncertainty,
  Also known as a triangular distribution:
  (P + ML + O) / 3

Three-point Estimating – BETA/PERT

- Uses three estimates (Pessimistic, Optimistic, and Most Likely) to calculate a weighted average.
  Also known as a Beta or Pert distribution:
  (P + 4ML + O) / 6

Bottom-up

- Most accurate, but time-consuming method,



- Sums individual details up to a higher summary level.

Standard Deviation

SD = (P-O)/6

Remember:

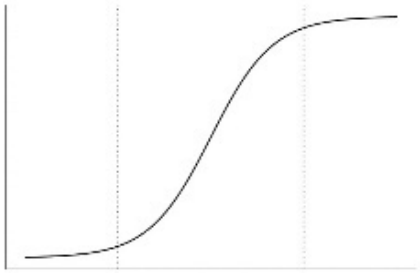
±1 standard deviation = 68%

±2 standard deviation = 95.5%

±3 standard deviation = 99.7%

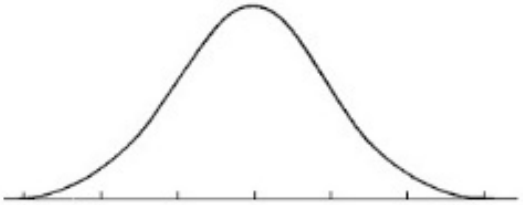
Cumulative distribution – (S-curve)

- Represents the probability of achieving any particular outcome or less,
- Used in earned value management to represent the Plan Value (PV) for the project.



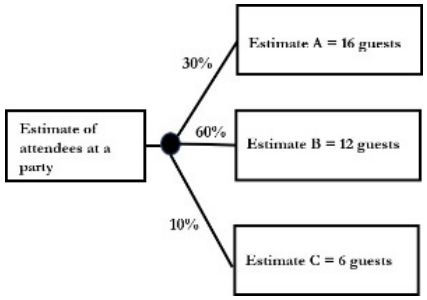
Continuous distribution – (Bell curve)

- Represents the expected distribution of random variables,
- Used in triangular, beta or pert estimations.



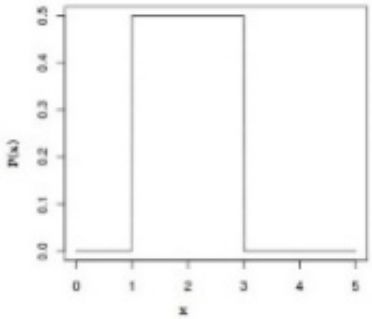
Discrete distribution – (Decision Tree)

- Represents several uncertain events with tests on an attribute with branches representing the test outcomes,



- Used in risk management to help determine Expected Monetary Value (EMV) of various potential results.

Uniform distribution – Rectangular



- Distribution where no one value is more likely between high and low bounds.

Critical Path Method

A technique of schedule analysis in which the schedule activities are evaluated to determine the float or slack for each activity and the overall schedule. To calculate critical path, use the forward and

backward pass along with float analysis to identify all network paths, including critical.

Critical path activity
Any activity on the critical path in a project schedule.

Network Diagram with Date and Dependencies

- Sequence and connect the activities based on predecessors or successors creating paths from Start to End,
- Identify the duration of each activity,
- For each path, sum the duration of each activity on the path,
- Identify the path(s) with the longest duration as the critical path(s),
- For each activity, determine the early start, early finish, late start, and late finish dates using a forward and backward pass. (If scheduling software is used, these dates will be automatically calculated).

Early start date (ES)
The earliest possible point in time when the uncompleted portions of a schedule activity can start is based on the schedule network logic, the data date, and any schedule constraints.

Early finish/end date (EF)
The earliest possible point in time when the uncompleted portions of a schedule activity can finish is based on the schedule network logic, the data date, and any schedule constraints.

Late start date (LS)
The latest possible point in time when the uncompleted portions of a schedule activity can start based on the schedule network logic, the project completion date, and any schedule constraints.

Late finish date (LF)
The latest possible point in time when the uncompleted portions of a schedule activity can finish based on the schedule network logic, the project completion date, and any schedule constraints.

Float/Slack

The difference between early and late dates for an activity or between activities.

Total float (or slack)
The amount of time that a schedule activity can be delayed or extended from its early start date without delaying the project finish date or violating a schedule constraint.

Free float (or slack)
The amount of time that a schedule activity can be delayed without delaying the early start date of any successor or violating a schedule constraint.

- Total float is within an activity,
- Free float is between two activities.

Project Schedule

Creates the project schedule model with activity sequences, durations, resource requirements and schedule constraints.

- Coordinates activities into a master plan to complete the project objectives on time,
- Sets dates for milestones,
- Used to track progress based on schedule performance,
- Conflicts and resource leveling must be resolved before approval and final baseline.

Schedule Presentation Formats

- Roadmap,
- Activity list,
- Milestone chart,

Significant points or events in a project, program, or portfolio on summary level of the project.

- Gantt Chart,

A bar chart of schedule information where activities are listed on the vertical axis, dates are shown on the horizontal axis, and the activity

durations are shown as horizontal bars placed according to start and finish dates.

- Project Schedule Network Diagram (PDM).

Resource Optimization

Resource Smoothing –
A resource optimization technique in which free and total float are used without affecting the critical path.

- Reallocates and adjusts resources to meet assignment limits.

Resource Levelling
A resource optimization technique in which adjustments are made to the project schedule to optimize the allocation of resources and which may affect the critical path.

- Expands duration of activities to accommodate overscheduling,
- Negatively impacts the final date of the project.

Schedule Compression Techniques

Used to shorten the schedule while not reducing the scope of the project.

Fast Tracking
Activities are done in parallel rather than sequentially to shorten the overall duration of the project.

- May be employed during initial planning to help meet the scheduled completion date.

Crashing
Additional resources are assigned to an activity to shorten the duration of the project.

- Not considered until the project schedule appears to be in jeopardy of not being completed on time.

Schedule Baseline

The approved version of a schedule model that can be changed using formal change control procedures and is used as the basis of comparison to actual results.

- It is one of the main project documents created before the project starts.

Schedule Planning: Adaptive

- Agile projects can either use a time-boxed approach or a continuous flow method.

Time-box approach*:*

Releases

- The time periods specified by the customer or business to deliver results, usually in 3-to-6-month intervals,
- The functionality and timeframes are usually shown on the product roadmap.

Story Map

- Allows stories for a release to be sequenced and prioritized.

Iterations

- Release timeframes are broken into small, time periods of equal length, defined by the team, usually 1-4 weeks in length,
- Prioritized user stories are developed.

Iteration Plan

- Prior to each iteration, the product owner provides the team members with the prioritized stories for the iteration,
- During the iteration planning meeting the team clarifies and identifies the tasks needed to support the prioritized user stories,
- The estimated story points of these stories and tasks are used to determine how many user stories can realistically be completed in the iteration,
- The total number of story points selected for an iteration is based upon the team's velocity, or capacity to complete the work.

Iteration Backlog

The work that is committed to be performed during a given iteration and is expected to burn down the duration. The work does not carry over to the next iteration.

- Selected user stories are presented by the product owner to the team members,

- User stories that are agreed upon to be delivered in the upcoming iteration or sprint become the iteration backlog,
- If a user story is not successfully completed at the end of the sprint it is moved to the release backlog for reprioritization and possible inclusion in the next or future iteration.

Sprint velocity

A descriptive metric used by agile and hybrid teams.

- Describes the volume of work that a team performs during a sprint,
- Initially the teams choose a number and then refine that metric at the end of the iteration based on discussions during the retrospective meeting,
- Teams use this metric to understand the rate of work during an average sprint, based on previous performance,
- It is based on the complexity of the project and the capabilities of the team members,
- It cannot be compared to other teams.

Continuous flow approach (on-demand)

- Prioritize individual incoming user stories,
- Place the user story in the appropriate queue to be worked on by the appropriate resource,
- When work on that portion of the story is completed, move the user story in the queue for the resource to do the next step,
- Continue moving the story through the columns until it is complete.

Estimate Effort, Not Time

Recommended usage of relative effort required rather than absolute time estimates .

Relative Sizing

- Compares effort required by multiple user stories and assigns a relative value, often using t-shirt sizes (S, M, L, XL) or other grouping .

Story Points

- Uses relative point values (numbers in the Fibonacci sequence).

- Not hours, days, or week, to estimate the difficulty of implementing a user story,
- An abstract measure of effort needed to implement work.

Planning Poker

- Iterative estimates by team members,
- Uses story points to determine the relative size or effort of user stories.

Definition of Ready and Definition of Done

Definition of Ready (DoR)

A team's checklist for a user-centric requirement that has all the information the team needs to be able to begin working on it.

- Identifies understanding provided to the delivery team during iteration planning,
- Helps ensure delivery of expected result.

Definition of Done (DoD)

A team's checklist of all the criteria required to be met so that a deliverable can be considered ready for customer use.

- Describes the target start or stakeholder's expectation,
- Like the acceptance criteria but may also include intermediate stages of "doneness,"
- Definition must be determined, understood, and accepted by all team members.

Hybrid Scheduling Model

- No agreed upon hybrid scheduling model,
- Usually combines predictive high-level planning with adaptive delivery of work,
- Regardless of approach, requirements continually refined, and prioritized to deliver highest value,
- Retrospectives help adjust the process and identify areas for improvement.

Special Intervals

Black-out times

- Prior to implementation with no added functionality added,
- Final testing conducted,
- Referred to as Iteration H (Hardening) with focus on refactoring and technical debt.

Go Live

- End of the project timeline specified by organizational procedures.

Iteration Zero

- Staging or preparation time before starting release work.

Resources

Resources refer to both team members and physical resources, including equipment and supplies.

Resource Management Plan

The project document identifies resources and how to acquire, allocate, monitor, and control them.

Includes:

- How to acquire needed resources,
- Controls for physical resources,
- Skills, competencies, and capacities required for individual resources,
- Project organization chart – with resource categories and reporting relationships,
- Roles, responsibilities, and authority levels of team members,
- Training strategies and requirements,
- Team development methods,
- Reward and recognition plan.

Resource Assignment: Predictive

- Team resources are identified and then are acquired and assigned to various activities by the project manager or team leads,
- The assignment includes specifying individual roles and responsibilities for work activities,
- Can be shown with a project organization chart or team directory,
- This creates a “resource-loaded” schedule with associated resource costs.

Resource Calendars

Identify working days, shifts, and when specific resources are made available to the project.

- Includes both identified team members and physical resource availability,
- Important for critical resources.

Pre-Assignment Tools

- Tools used to help assess potential team members:
  - Attitudinal surveys,
  - Specific assessments,
  - Structured interviews,
  - Ability tests,
  - Focus groups.

Responsibility Assignment

- Tailored based on team, needs and project approach,
- Includes consideration of both technical and “soft” skills:
  - Experience: Does the team member have the relevant experience to carry out the activity?
  - Knowledge: Does the team member have relevant information about the customer’s need, prior implementations, and the nuances of this project?
  - Skills: Does the team member have the relevant skills?
  - Attitude: Does the team member can collaborate with the other team members?
  - International factors: Consider team member location, time zone, and communications needs.
- Adaptive approaches utilize self-organization and self-assignment to work by the team members, and not by a project manager .

Responsibility Assignment Tools

Responsibility Assignment Matrix (RAM)

A grid that shows the project resources assigned to each work package or work activity.

- Only shows a check mark to indicate involvement.

RACI Chart

A common type of responsibility assignment matrix (RAM) where Responsible, Accountable, Consulted, and Informed statuses defines the involvement of stakeholders in project activities.

- Used to document the role and accountability of team members and stakeholders involved in activities.

	Product Owner	Project Manager	Business Analyst	Developer
Activity A	A	I		R
Activity B		R	A	
Activity C		A		R
Activity D		C	R	A
Activity E		R	A	

Responsible (R)

- Indicates the resource that is involved in doing the work on a task or activity to create a deliverable,
- At least one responsible person per task,
- Typically, a team member.

Accountable (A)

- Indicates the individual who delegates, ensures understanding of the expectations, and reviews the project work,
- Often also approves the result,
- There should be only one accountable person,
- Holds a leadership or management role within the project team.

Consulted (C)

- Stakeholder or expert that provides input and feedback on the project work,
- Not every task needs this role, but it should be reviewed carefully.

Informed (I)

- Usually a stakeholder, who needs to be aware of the work,
- Helps ensure no negative impacts to existing work,
- Not necessarily in a decision-making role.

Resource Assignment: Adaptive

- Teams are the focus, not individuals,
- Self-organize,
- Determine how work is distributed among team members,
- Combination of generalist and specialists.

Filling Resource Needs: Make or Buy

- Sometimes it is necessary to look beyond the team to get the needed people or equipment,
- The first step is to determine “make or buy”,
- If decision is to acquire from outside the project, procurement strategy should be identified:
  - Do we buy it? Or should we try to make it in house?
  - What is the impact on the schedule, budget, or quality metrics?
  - Is the skill or capability of the resource needed beyond the project?
  - Do these resources exist somewhere else in the organization?
  - How steep is the learning curve, both project requirements as well as the activities supported?
  - Would outsourcing to an external source allow the team to focus on other activities?

Budget

Budget Planning

- Includes the cost of activities and resources and value required for delivery,
- Very dependent on the approach and project life cycle.

Predictive

- Budget is set during planning,
- Changes only when a change request is approved.

Budget Planning: Predictive

Cost Management Plan

A component of a project or program management plan that describes how costs will be planned, structured, and controlled.

- Provides guidance and direction on how project costs will be managed,
- Defines the policies, procedures and documentation required to manage project costs.
- Includes:
  - Units of measure,
  - Precision and accuracy levels,
  - Organizational procedures links,
  - Control thresholds,
  - Rules of performance measurement (EVM techniques, control accounts, tracking methodologies),
  - Reporting formats,
  - Performance measurement guidelines (EVM and control accounts),
  - Additional details,
  - Description of strategic funding choices,
  - Currency exchange rate fluctuations,
  - Project cost reporting.

Estimate Activity Costs

Approximate monetary resources needed to complete project activities.

- Predictions based on information at a point in time,
- Reviewed and refined as more detail is available,
- May include:
  - Direct labor,
  - Materials,
  - Equipment,
  - Facilities,
  - Services,
  - Information technology,
  - Contingency reserves.
- As more information is known the estimate becomes more definitive.

Rough Order of Magnitude (ROM)

- Generally made early in the project,
- Developed without basis of detailed data and often based on high-level historical data, expert judgment, or a costing model,

  Accuracy: -25% to +75%.

Definitive estimate (or "control" or "detailed")

- Based on detailed information about the project work,
- Developed by estimating the cost for each work package in the WBS,

  Accuracy: –5% to +10%.

Phased estimate (or "rolling wave" or "moving window")

- Allows the use of a less-detailed estimate (perhaps ROM) for some later parts of the work, whereas work that must be done earlier in the project life cycle is estimated more accurately (perhaps at the definitive level).

Contingency Reserves

Time or money allocated in the schedule or cost baseline for known risks with active response strategies.

Project Budget

The sum of all budgets established to provide financial support for the work to be performed. (Budget at Completion).

- Aggregates:
  - Activity costs (plus contingency) – allocated to the time when the cost would be incurred,
  - Work package cost (plus contingency) – now referred to as work cost estimates,
  - Cost baselines (potentially with additional contingency).

Cost Baseline

The approved version of the time-phased project budget, excluding any management reserves, can be changed only through formal change control procedures, and is used as a basis for comparison to actual results.

- Used to measure and monitor cost performance, comparing actual costs to those budgeted,
- It does include the contingency reserve,
- But does not include the management reserves,
- Can only be changed through a formal change control process.

Budget Planning: Adaptive[12]

- Focus on short-term metrics,

- Budget usually done for individual releases,
- Based on the resources, and length of time of the project .

Burn rate

The rate at which the project consumes financial resources, representing negative cash flow. Burn rates are often used by agile projects to budget costs for planned iterations / sprints / increments.

- Budget is based on the number and cost of combined resources and time periods worked.

Risk

- Regardless of the development approach, additional areas to consider before the project baselines are developed and agreed upon include:
  - Risk assessment,
  - Quality requirements,
  - Procurement strategy.

Risk is Uncertainty

An uncertain event or condition, that, if it occurs, has a positive or negative effect on one or more project objectives.

Inherent Risk

- Individual projects must consider risk before any planning occurs,
- Agile projects include risks in user stories and continually review the backlog items,
- Risks are captured on a risk register and should be continually visible and reassessed.

Key Risk Terms:

Threat

A risk that would have a negative effect on one or more project objectives.

Opportunity

A risk that, if developed, would create a positive effect on one or more project objectives.

Trigger condition

An event or situation that indicates that a risk is about to occur.

Types of Risks: Predictive

- Three main types of risks:
  - Pure risk – which represent a threat or loss only,

- Business risks – which represent an opportunity at the organizational level for gain or loss,
- Project risks – which are identified, the impact determined and handled at the project level for both opportunities and threats.

Risk Strategy

Based on understanding of organization, stakeholders, and the project risk.

Risk appetite
The degree of uncertainty an organization or individual is willing to accept in anticipation of a reward.

Risk tolerance
The degree of uncertainty an organization or individual can withstand.

Risk threshold
The measure of acceptable variation that reflects the risk appetite of the organization and stakeholders.

Risk Management Approach/Plan

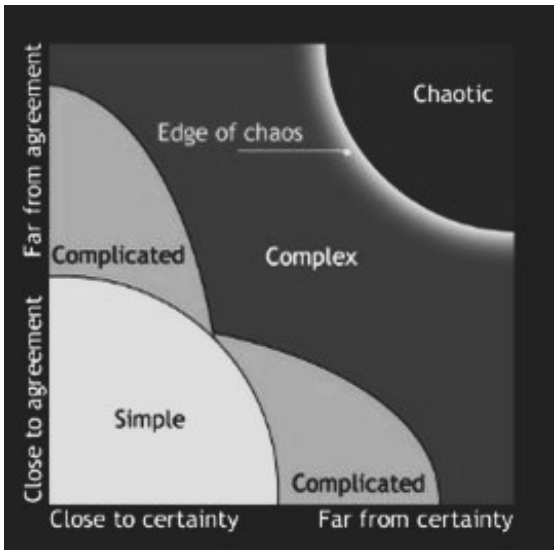
A component of the project, program, or portfolio management plan that describes how risk management activities will be structured and performed.

- Defines how risk management activities will be conducted,
- Should begin when project is conceived,
- Risk management processes and policies should be appropriate to overall importance of project and its risk,
- Includes:
  - Risk strategy,
  - Methodology,
  - Roles and responsibilities,
  - Funding,
  - Timing,
  - Risk identification techniques,
  - Risk categories,

- Stakeholder risk appetite,
- Definition of risk probability and impact,
- Probability and impact matrix,
- Analysis using both a subjective as well as an objective approach,
- Appropriate risk responses and plans,
- Reporting formats,
- Tracking documents including reassessment of risk.

Determining Project Approach

Stacey Diagram



- Often used to describe uncertainty helping determine the most appropriate project approach,
- X-axis refers to uncertainty,
- Y-axis refers to technology or platforms,
- A predictive approach works best when certainty and agreement are present,
- The structure of a predictive approach helps with chaos from lack of agreement and certainty,
- In projects that are complicated and complex, an adaptive approach is more appropriate.

Suitability Filter

- Assessment of organizational and project attributes to help determine development approach.
  - Culture – supportive environment for approach,
  - Team – having the necessary experience,
  - Project – high rates of change and criticality of the project,
  - Results plotted on a radar chart,
  - Center – good fit for agile,
  - Outside – predictive approach more suitable,
  - Middle – hybrid approach could work well.

Risk Identification

Identify individual project risks and their characteristics, as well as sources of overall project risks.

- Documents existing risks and their sources,
- All project personnel should be involved in identifying potential risks,
- Statement of risks should be able to be clearly understood,
- Stakeholders may provide additional input,
- Additional management plans provide potential risks,
- May be tracked at various levels of the WBS.

Risk Identification Techniques

Risk Breakdown Structure (RBS),

A hierarchical representation of potential sources of risk.

- Typical categories include technical, management, commercial, external.

Data gathering and analysis techniques,

- Brainstorming, nominal group technique, SWOT analysis, affinity diagram, assumption analysis, document review, Delphi technique, Monte Carlo simulation.

Prompt lists (PESTLE, VUCA, TCOP)

A checklist for a specific category of risk.

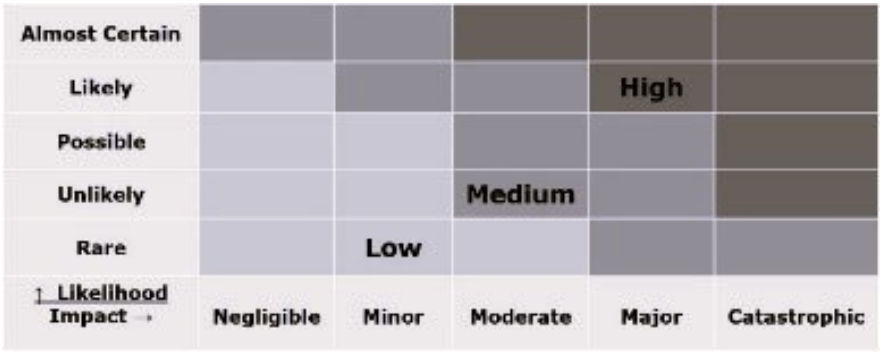
- A simple series of broad risks, rather than specific risks,

- Prompts the team to think and brainstorm the risks in groups and eventually prioritize.

Risk Probability and Impact Definitions

- Risks are analyzed based on the probability and impact if occurs,
- Based on the risk tolerance of the organization and key stakeholders,
- Helps determine the initial risk appetite of an organization or stakeholder to categorize risks as low, medium, or high,
- For low, medium, and high categories more specific percentages, time, cost, and quality values are specified,
- Initial analysis places each risk on a Probability Impact Matrix (PI Matrix).

Probability Impact Matrix



A grid for mapping the probability of occurrence of each risk and its impact on project objectives if that risk occurs.

- Initial assessment of risks based on organization's risk appetite.

Qualitative Assessment

Prioritization of individual project risks action by assessing their probability of occurrence and impact as well as other characteristics.

- Rapid method to prioritize risks for further analysis or action,
- **Focus** is on high-priority risks,
- Assess and combine probability of occurrence and impact,
- Must be aware of potential bias in this assessment,

- High risks will utilize a quantitative assessment for deeper understanding.

Risk Register: Predictive

A repository in which outputs of risk management processes are recorded.

- The central planning document for project risk analysis and control,
- Contains a list of the most important risks to the project's completion.
- For each individual risk includes (tailored to context):
  - Identified risks – categories and event description,
  - Probability, Impact, Risk Score/Exposure,
  - Trigger,
  - Planned Response,
- Additional information added as project work proceeds:
  - Roles – including the Risk Owner and Risk Action Owner,
  - Current risk status,
  - WBS reference,
  - Timing of potential occurrence,
  - When no longer relevant,
  - Deadline for acting.

Risk List: Adaptive

- List of risks with additional columns:
  - Owner - The person(s) who has/have taken responsibility for addressing the risk,
  - Status - Status of the risk, including - Identified, Accepted, In Progress, Resolved, or Issue (the risk has happened).
- Once a risk has occurred and become an issue, additional information is captured:
  - Date identified,
  - Date resolved,

- Days active,
- Resolution strategy.

Quantitative Risk Analysis

Analyze the combined, numerical effect of identified individual project risks and other sources of uncertainty on overall project objectives.

- Performed on risks that have been prioritized by Qualitative Risk Analysis,
- Depends on availability of high-quality data about individual risks and other sources of uncertainty,
- Requires specialized risk software and expertise in development and interpretation of risk models,
- Consumes additional time and costs,
- Appropriate for:
  - Large or complex projects,
  - Strategically important projects,
  - Projects with contractual requirements,
  - Required by key stakeholder.
- Only reliable method to assess overall project risk through evaluating aggregated effect of all project risks,
- Evaluates need for possible additional time and/or resources and identification of risk responses,
- Calculates overall project risk exposure.

Quantitative Risk Analysis: Techniques

Simulations

An analytical technique that models the combined effect of uncertainties to evaluate their potential impact on objectives.

- Calculates several possible outcomes by varying assumptions .

Monte Carlo

A risk management technique used to estimate the impacts of various risks on the project cost and project timeline.

- Run multiple times with different variables,
- Creates a calculated probability distribution,

- Used at various times during the project life cycle to get the idea on a range of probable outcomes during various scenarios .

Sensitivity Analysis

An analysis technique to determine which individual project risks or other sources of uncertainty have the most potential impact on project outcomes, by correlating variations in project outcomes with variations in elements of a quantitative risk analysis model.

- Shows prioritized threats and opportunities.
- One element is changed while other elements are held constant.

Tornado diagram

A horizontal bar chart comparing the relative importance of various opportunities and threats with the highest one shown on the top.

- Shows the results of sensitivity analysis,
- Displayed the highest opportunity and threat first.

Decision tree analysis

A diagramming and calculation technique for evaluating the implications of a chain of multiple options in the presence of uncertainty.

- Branches represent decisions or events, with associated costs and risks.
- Endpoints of each branch represent an outcome (negative or positive).

Influence diagrams

A graphical representation of situations showing causal influences, time ordering of events, and other relationships among variables and outcomes.

- Shows various elements and impact to each other,
- Used as a simplified version of the decision tree.

Expected monetary value (EMV)

A quantitative method of calculating the average outcome when the future is uncertain. The calculation of EMV is a component of decision tree analysis. Opportunities will have positive values and threats will have negative values.

- Calculated by multiplying the value of each possible outcome by the probability of the outcome, and then adding all the results

together.

Plan Risk Responses

Develops options, selects strategies, and agreement on actions to address overall project risk exposure.

- Identifies response for individual risks as well as over-all project risk,
- Identifies appropriate ways to handle project risks,
- Should be appropriate for significance of risk,
- Should be cost effective,
- Allocates resources and inserts activities into product documents and project management plan as needed,
- Assigned to a responsible person (risk owner),
- Contingency reserves often allocated to cover additional time or cost,
- Low priority risks are included on a watch list for periodic monitoring.

Additional Risk Terminology:

Secondary risk

A risk that arises as a direct result of implementing a risk response.

Residual risk

The risk that remains after risk responses have been implemented.

Contingency plan

A risk response strategy developed in advance before risks occur. It is meant to be used when identified risks become reality.

- Also known as a “fallback plan.”

Contingency reserve

Time or money allocated in the schedule or cost baseline for known risks with active response strategies.

Risk Response Strategies

Strategies for threats:

Escalate	Outside of project scope and escalated

	above project level
Avoid	Eliminate threat or protect from its impact
Transfer	Shift ownership to a third party
Mitigate	Reduce the probability and impact
Accept	Acknowledgement but no proactive action is identified

Strategies for opportunities:

Escalate	Outside of project scope and escalated above project level
Exploit	Ensure that the opportunity happens
Share	Share opportunity with a third party
Enhance	Increase the probability and impact
Accept	Acknowledgement but no proactive action is identified

- Contingent response strategies - only if some predefined conditions exist and sufficient warning to implement the plan,
- Strategies for overall project risk same as for threats and opportunities, except escalate strategy.

Quality

The degree to which a set of inherent characteristics fulfill requirements.

- Quality aspects apply to both project processes as well as the product/deliverables,
- Quality measures and techniques are specific to the type of deliverables produced.
- Includes:
  - Stakeholder expectations and end-user satisfaction,
  - Compliance with standards and regulations,
  - Continuous improvement.

Cost of Quality (CoQ)

All costs incurred over the life of the product by investment in preventing nonconformance to requirements, appraisal of the product or service for conformance to requirements, and failure to meet requirements.

- Based on Philip Cosby's initial book – Quality is Free,
- Separated into the categories of Cost of Conformance and Cost of Non-conformance.

Cost of Conformance

- Money spent during the project to avoid failure including:
  - Preventative costs (training, documentation, etc.),
  - Appraisal costs (assessments, testing, inspections, etc.).

Cost of Non-conformance

- Cost incurred both during and after the project because of poor quality.
  - Internal Failure Costs (found during the project, rework, scrap, etc.),
  - External Failure *Costs (escaped defects found by customer).*

Stakeholder and Customer Expectation of Quality: Predictive

- Product/deliverables – quality requirements.
- Processes – conformance to a quality policy.

Quality Management Plan

A component of the project or program management plan that describes how applicable policies, procedures, and guidelines will be implemented to achieve the quality objectives.

- Provides guidance and direction on how quality will be managed and verified,
- How quality policies and standards are to be met and implemented,
- Style and detail determined by project requirements,
- Provides focus on value of project,
- Closely related to project scope, requirements, and risks,
- Activities and resources to achieve quality objectives,
- Supports cost reduction and schedule delays due to rework,
- Reviewed early and continuously throughout the project.

Note: If the organization does not have a quality plan, the project manager is expected to create one for the project. If one exists, the quality management plan identifies how the organization's quality policies, procedures and guidelines will be implemented.

Compliance Requirements

- Quality processes ensure that compliance requirements are met.
- Activities to ensure compliance:
  - Classify compliance requirements into categories,
  - Determine any potential threats to compliance,
  - Identify these as special risks on the risk register,
  - Analyze the consequences of noncompliance,
  - Determine necessary approaches and actions to address compliance needs, like risk responses.

Quality Standards and Regulations

Standards

A document established by an authority, custom, or general consent as a model.

Regulations

Requirements imposed by a governmental body.

De facto standards or regulations

Widely accepted or adopted through use, but not officially endorsed.

De jure standards and regulations ("from the bench")

Result of a legal decision and mandated by law.

- Additional international institutes devoted to quality:
  - American Society for Quality (ASQ),
  - ISSO 9000 series – implemented global standard of quality,
  - The Chartered Quality Institute (CQI).

Quality Metrics, Checklists, and Processes

- Metrics measure quality attributes,
- Include a tolerance level for acceptance,
- Additional quality techniques include:
  - Checklists,
  - Templates,
  - Quality artifacts.
- Adaptive teams use retrospectives and small batch cycles to ensure quality.

Quality Methods for Continuous Improvement

Six Sigma (Lean Six Sigma)

- Focuses on removing waste,
- DMAIC framework (Define, Measure, Analyze, Improve, Control),

Kaizen

- Japanese word for "good change" or "change for better/improve",
- Continual improvement of functions and processes to standardize,

- Involves all employees,

Agile Methods

- Agile methods are based on lean concepts.
- Most frequently used frameworks include Scrum, Kanban, Crystal Methods.

Procurement

Plan the Procurement Strategy

Prerequisite OPAs

- Organizational procurement strategy identifying collaboration with the organization's finance or procurement departments.

Acquisition method

- Processes required to obtain external resources,
- Often based on pre-defined purchase limits,
- May require defined bidding processes and templates. pre-approved vendors, and approved contract types.

Contract types

- Definition and usage of types of contracts named by the organization to meet diverse needs,
- Procurement phases,
- Processes from requesting an external need, to find and selecting a seller under a contract,
- Ensuring contract terms and conditions are met,
- Requirements to close the contract.

Procurement Management Plan

A component of the project or program management plan that describes how a project team will acquire goods and services from outside of the performing organization.

- Usually tied to the organization's procurement function,
- Organizational requirements (internal EEFs):
  - Types of contracts that will be used,
  - Activities included in procurement process,
  - Describes the process for obtaining and evaluating bids,
  - Identifies sources and availability of funding if financed externally,
  - Mandates standardized procurement documents,
  - Legal jurisdiction and payment currency.

Project requirements:

- Coordination with other project elements (scheduling or performance reporting),
- Metrics, assumptions, constraints, and risks,
- Additional stakeholders and their roles,
- Independent estimates or prequalified sellers,
- Describes how providers and contracts will be managed.

Procurement Documents:

Documents used in bid and proposal activities.

Request for quotation (RFQ)

- Request for the amount that will be charged to provide the result,
- Often with no additional detail as to how the amount was determined,
- Also called a bid, tender or quote,
- Does not constitute an agreement but allow the buyer to determine which response will best meet the requested need.

Invitation for Bid (IFB)

- Usually part of a more formal procurement process.
- Sent or published to a wide range of potential sellers to determine those that might specifically be interested in the next step of the procurement process.

Request for information (RFI)

- Request for information,
- Can be sent to gather additional information if the seller or their products or services are not well known to the organization,
- Can be used to pare down the list of potential sellers.

Expression of Interest (EOI)

- A non-binding formal offer made by one party to another,
- Used to ensure awareness of level of interest in collaborating to achieve a common goal or provide a product,
- Used more often before a formal request has been distributed .

Request for Proposal (RFP)

A type of procurement document used to request proposals from prospective sellers of products or services. In some application areas, it may have a narrower or more specific meaning.

- Usually a very formal, and time-consuming document to develop,
- Usually reserved for critical or high-price items,
- Specifically defines what is being requested,
- Often includes questions regarding:
  - Result,
  - Delivery method,
  - Management philosophy,
  - Types of resources proposed (including certifications required),
  - The seller organization in general,
  - References.
- Answers to these questions are part of the seller's proposal,
- Proposed cost submitted separately,
- Allows an initial decision based on the merits of the seller and the way they would deliver the results, separate from the final cost being proposed.

Bidders Conferences

The meetings with prospective sellers prior to the preparation of a bid or proposal to ensure all prospective vendors have a clear and common understanding of the procurement. Also called vendor conferences, pre-bid conferences, or contractor conferences.

- Provides all prospective sellers with a clear, common understanding of technical and contract requirements,
- Responses may be incorporated into procurement documents as amendments,
- Must ensure that there is no conflict of interest.

Source Selection Criteria

A set of attributes, desired by the buyer, which a seller is required to meet or exceed to be selected for a contract.

- Developed simultaneously with the RFP,

- Basis of choice should be disclosed as part of evaluation criteria,
- Analysis may be based on:
  - Least cost – standard or routine nature,
  - Qualifications only,
  - Quality-based/highest technical proposal score,
  - Quality and cost-based,
  - Sole source,
  - Fixed budget – disclosed to sellers.
- May include determination of seller's:
  - Understanding of requirements,
  - Capabilities identified in the RFP,
  - Method of management oversight,
  - Technical approach to be used,
  - Overall or life cycle cost,
  - Understanding of need,
  - Technical capability,
  - Management approach,
  - Warranty of product or service,
  - Financial capacity,
  - Production capacity and interest,
- Business size and type:
  - Past performance of sellers,
  - References,
  - Intellectual property rights,
  - Proprietary rights.

Qualified Vendors

- Organizational list of pre-qualified vendors,
- Review based on past performance,
- Additional information may be found in the lessons learned repository from previous project,

Procurement SOW

Describes the procurement item in sufficient detail to allow prospective sellers to determine if they can provide the products, services, or results.

- Developed from project scope statement,
- Describes product or services to be supplied by the seller,
- Information may include:
  - Specifications,
  - Deliverables and quality desired,
  - Quality levels,
  - Performance data and period of performance,
  - Work location,
  - Roles and responsibilities.
- Additionally, may include Terms of Reference (TOR)
  - Tasks to be worked on,
  - Applicable standards,
  - Approval data to be submitted.

Contracts

A contract is a mutually binding, and often legal, agreement that obligates the seller to provide the specified project or service or result and obligates the buyer to pay for it.

- Because of legal aspects additional oversight is needed,
- Description of work including both deliverables and the scope,
- Any delivery dates and schedule information associated with the work,
- Identification of authority, where appropriate, especially regarding the authority to sign or administer the contract,
- How changes to the contract are to be handled,
- Roles and responsibilities of both parties,
- Management of both technical and business aspects, including reporting requirements,
- Price and payment terms, related to the “obligation” aspect referring to the seller providing and the buyer “paying” for the

specific product, service, or result,
- Provisions for termination, including premature closure obligations,
- Applicable guarantees and warranties,
- Intellectual property,
- Security, confidentiality, data privacy.

Predictive Contracts

- Three basic types: fixed price, cost-reimbursable, and time and material.

Fixed Price Contracts

- Sets a fixed total price for a defined product, service, or result,
- Used when requirements are well defined,
- No significant scope changes are expected.

Firm Fixed Price contracts (FFPS)

- The fixed price is set at the beginning with no changes or adjustments included,
- Most common type of contract and the one most preferred by organizations as the price is set at the outset and not subject to change unless the scope of the work changes .

Fixed price with an incentive fee (FPIF)

- Can include an additional amount or percentage that can be earned by the seller if a specified incentive is met,
- Often used when additional effort may result in an early delivery, or when higher quality is achieved beyond that which is specified in the contract,
- Performance targets are established at the outset and the final contract price is determined after completion of all work, based on the performance of the seller,
- A ceiling price is set, and the seller is obligated to complete the work and then assume all costs above the ceiling (known as the point of total assumption).

Fixed price with economic price adjustments (FPEPA)

- Used on multi-year projects to handle the impact of inflation on a fixed price made at the beginning of the contract,

- Related to a reliable financial index to precisely adjust the final price.

Cost-reimbursable Contracts

Contracts used for projects with expected, significant scope changes.

- Often used for project work where not as much known at the beginning of the contract or where significant scope changes are expected,
- The seller is reimbursed for all legitimate, actual costs,
- Also includes an amount to cover the profit margin for the seller,
- Must be an open relationship between the buyer and the seller that allows the seller's "books" to be examined if requested .

Cost-plus fixed fee (CPFF)

- Reimbursement for all allowable costs and receives an additional fixed fee amount calculated as a percentage of the initial estimated project costs.

Cost-plus incentive fee (CPIF)

- Includes an additional amount above the reimbursement for the actual cost is determined based on some identified incentive .

Cost-plus award fee (CPAF)

- Includes an award fee to cover the seller's profit with the majority of earned fee earned is based upon the satisfaction of certain, broad-based, subjective performance criteria that was specified at the time of the contract.

Time and Material (T&M)

- Used when the buyer reimburses the seller for the time spent working on the contact activities as well as any expenses incurred,
- Often used for staff augmentation,
- Not to exceed limits on schedule and costs are needed to prevent open-ended and unknown total costs being involved.

Agile Contract Types

- Don't include identification of deliverables to be created,
- Emphasize working agreements and collaboration between the parties.

Multi-tiered structure

- Achieves flexibility by including different content related to the contract in different documents,
- Could include e a master service agreement for fixed items.
- Variable items could be identified in a schedule of services or possibly a work order,
- A SOW could also be attached to provide additional specific project information.

Emphasized value delivered

- Incremental value delivery in milestones or phase gates,
- Milestones and payment terms are based on the value delivered at the milestone,
- Encourages feedback during product development.

Fixed price increments

- Breaks the scope into smaller pieces, and micro-deliverables,
- Provide more control over the cost and budget,
- Limits the supplier's financial risk.

Not-to-exceed time and materials

- Like the traditional time and material contract with additional limits on potential risk,
- Budget is limited to a fixed amount,
- Allowing the customer to add or remove items.

Graduated time and materials

- Time and material contract with shared financial risk,
- Connects quality and timely delivery of work to the financial award,
- Utilizes the DoD and provides a reward for early delivery, or reduction for late delivery.

Early cancellation option

- Focuses on value delivery rather than scope,
- Enables flexible delivery of scope, including early completion with the same as a cancellation fee paid.,
- Often referred to as "payment for nothing, change is free."

Dynamic scope option

- Contracts with fixed budget enabling innovation while limiting risk,

- Provides option to vary scope and fund innovation at specific points, including adjusting features, while still limiting risk to supplier.

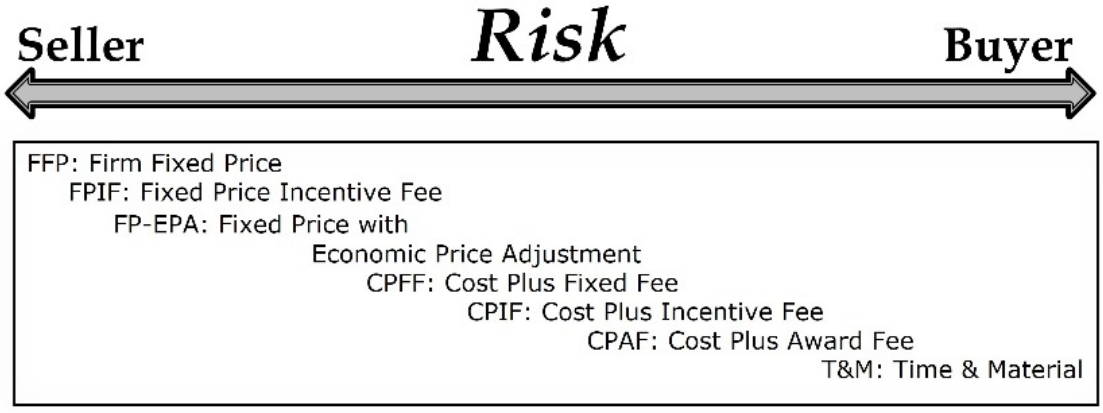
Team augmentation

- Like a traditional staff augmentation contract with a focus on collaboration,
- Enables flexible scope by embedding the supplier resource directly into the customer organization,
- Funding is based on the team resource(s) rather than the scope.

NOTE: Not all these agile contract types are required to be memorized for the exam – but the basic concepts supporting adaptability in deliverables, fixed time frames and similarity to staff augmentation agreements are common to all.

Contract Risk

- Fixed Price – Risk is to the seller to determine price and still make a profit. The buyer knows what it will cost,
- Time and Material – Risk is to the buyer as not guarantee of the final cost. The seller is reimbursed for time and expenses,
- Cost-reimbursable – Risk is shared equally between the buyer and the seller.



Integrate Plans

- Individual project subsidiary plans must be integrated into a full Project Management Plan,
- These plans are continually reviewed throughout the project,
- Even though individual plans may be developed separately, the impact on other plans needs to be analyzed,
- Focusing on integrated views of all plans help:
  - Identify and correct gaps or discrepancies,
  - Align efforts and understand how the various activities depend on each other,
  - Help the assessment and coordination of project work throughout the life cycle.

Plan for Complexity and Change

- Complexity in the project arises from the organization's system, human behavior, uncertainty, or ambiguity,
- Ways to work with systems-based complexity include:
  - System-based methods - decomposition and simulations,
  - Reframing the problem – diversity and balance,
  - Process-based – iterate, engage, and fail safe.

Fail Fast and Self-Correct

- It is important to start with a plan,
- Remain open to tailoring, adapting and resilience,
- "Fail fast" allows focus on critical parts first.

Integrated Plans

Predictive

- All plans are combined at the end of planning,
- Includes subsidiary plans and project baselines,
- Plans, other than the baselines, will be adjusted as actual results are obtained and compared to initial estimates.

Adaptive

- Plans are done more frequently and cover a smaller scope,
- “Ceremonies” provide support for continuous review and improvement.

Hybrid

- Teams determine “way of working” and apply the appropriate planning detail and frequency.

Project Management Plan

A project management plan establishes needed guardrails for hybrid and adaptive projects, so teams can tailor their way of working and act quickly and flexibly while maintaining control.

- All projects, regardless of the context, industry, life cycle or development approach need a plan,
- Emphasis is on the “management” of required work,
- Defines basis of all project work and how the work will be performed,
- Central document that guides project’s execution and control,
- Needs of the project determine which components of the project management plan and project documents are necessary,
- Non-baselined portions can be progressively elaborated and updated as needed throughout the project execution,
- Baselined portions are updated when approved through integrated change control process,
- Includes:
  - Subsidiary plans,
  - Baselines,
  - Performance measurement baseline (PMB),
  - Change and configuration management plans,
  - Project life cycle description and development approach,
  - Key management reviews.

Subsidiary plans

- Several subsidiary plans compose the overall project management plan,

- Identifies how various aspects of the project will be planned, executed, monitored, and controlled including:
  - Scope management plan,
  - Requirements management plan,
  - Schedule management plan,
  - Cost management plan,
  - Quality management plan,
  - Resource management plan,
  - Communications management plan,
  - Risk management plan,
  - Stakeholder engagement plan,
  - Procurement management plan.

Project Baselines

- Identified baselines include:
  - Scope baseline,
  - Schedule baseline,
  - Cost baseline,
- Baseline detail and documentation may require tailoring based on the organization's EEFs, OPAs and governance,
- Changes to these baselines will be managed based on the Change Management Plan,
- Change authority levels are identified in the Project Management Plan.

Additional components

- Performance measurement baseline,
- Project life cycle,
- Project governance,
- Development approach,
- Management reviews,
- Compliance management plan,
- Process improvement plan,
- Benefit transition plan,
- Rollout-implementation plan,
- Change and configuration management plans.

Change Management Plan

A component of the project management plan that establishes the Change Control Board, documents the extent of its authority, and describes how the change control system will be implemented.

- Used in predictive approaches to handle how changes will be addressed,
- Determine a process and assigned roles for handling requested changes.

Change request

Request for change sent to upper management or the Change Control Board (CCB) for its evaluation and approval.

- In addition to the process, often provided as an OPA, specific ways that the project will handle changes should be identified including:
  - Who can propose a change? The roles are assigned for this authority,
  - What exactly constitutes a change? A change is usually a proposed or real event that may impact or change one or more of the project baselines or measures,
  - What is the impact of the change on project objectives? Recommend an evaluation or impact assessment method,
  - What are the steps to evaluate a change request before approving or rejecting it? Document the required steps per the change control system and quality policy,
  - Who has the authority to approve various types and levels of change? Change control board or other designated approvers,
  - When a change request is approved, what project documents will record the next steps (actions)? The change control log, records not only the next steps but also tracks the status of all change requests received,
  - How will actions to confirm completion and quality be monitored? Reviewing identified quality metrics, monitoring of RAM/RACI charts, and information radiators.

Note: Except for the baselines, these are "plans" and as a result will need to be monitored and possibly changed as actual project results are reviewed. The baselines, if changed, will need to go through the defined Change Control System.

Lead the Team

The focus is on the leadership skills of a Project Manager. Corresponds to the “People” domain of the ECO and the “Power Skills” leg of the PMI® Talent Triangle.

Power Skills

- Power skills help maintain influence with stakeholders to deliver change,
- Interpersonal “power” skills are required to lead teams including:
  - Collaborative leadership,
  - Communication,
  - Innovative mindset,
  - Understanding of purpose,
  - Empathy.

Leadership

- Leadership is a trait required of everyone on the project team,
- Teams are made up of individuals with different skill sets, backgrounds, experiences, and attitudes,
- Teams need to be cohesive and work collaboratively together to be productive and effective.

Leadership Skills and Competencies

- Leadership skills help guide your project team to accomplishing the vision and enable a good working environment for the team,
- Requires a balance of ethical, interpersonal, and conceptual skills to analyze situations and interact appropriately,
- Leadership styles depend on the project environment and may require adapting to the situation,
- These skills and competencies may include:
  - Communication,
  - Conflict management,
  - Critical thinking,
  - Decision-making,
  - Emotional Intelligence (EQ or EI),
  - Ethical approaching (including the PMI® Code of Ethics and Professional Conduct,
  - Expert judgment,
  - Facilitation,
  - Meeting management,
  - Negotiation,
  - Networking,
  - Team building.

Developing Leadership Competencies

- Tailoring your leadership style to the project,
- Using emotional intelligence and interpersonal skills,

- Being mindful of individual and team objectives and working relationships,
- Understanding individual motivations and working styles,
- Maintaining transparency and openness,
- Building trust and collaboration within a psychologically safe environment,
- Encouraging team members to feel empowered and free to contribute and learn from others,
- Including external resources that support project needs.

Leadership Styles

- Direct – Hierarchical, with project manager making all decisions,
- Consultative – Leader factors in opinions but makes the final decision,
- Servant leadership – Leader models desired behaviors supporting the team,
- Consensus/Collaborative – Team operates autonomously, (agile style),
- Situational – Style changes to fit context and maturity/experience of team,
- Additional styles include:
    - Laissez-faire – letting things take their own course without interfering,
    - Avoiding – refusing to act, get involved or make decisions,
    - Transactional – (managerial) focus on supervision, organization or performance goals and accomplishments,
    - Transformational – empowerment through idealized attributes and behaviors through encouragement of individual innovation and creativity,
    - Charismatic – ability to inspire through high energy, enthusiasm, self-confidence, and strong convictions,
    - Interactional – combination of transactional, transformation and charismatic styles.

Leadership vs Management

Leadership	Management
Guide, influence and collaborate using relational power	Direct using positional power
Develop	Maintain
Innovate	Administrate
Focus on relationships with people	Focus on systems and structure
Inspire trust	Rely on control
Focus on long-term vision	Focus on near-term goals
Ask what and why	Ask how and when
Focus on horizon	Focus on bottom-line
Challenge the status quo	Accept the status quo
Do the right thing	Do things right
Focus on vision, alignment, motivation, and inspiration	Focus on operational issues and problem solving

Servant Leadership

The practice of leading the team by focusing on understanding and addressing the needs and development of team members to enable the highest possible team performance.

- Leading by supporting the team and addressing their needs.
- The leader serves and puts other people first,
- Concentrates on relationships, community, and collaboration,
- Understanding the team's needs,
- Taking action to enable the team to perform and deliver,
- Leadership becomes secondary,
- Only emerges after service has been provided,
- Help teams develop and grow as a group and as individuals,

- Every team member, and not just the project manager, should strive to be a servant leader, and support other team members,
- Facilitate the team's work by:
  - Providing coaching and training,
  - Remove blocks that impede work progress, (either from people or processes),
  - Focus on team accomplishments rather than team failures.

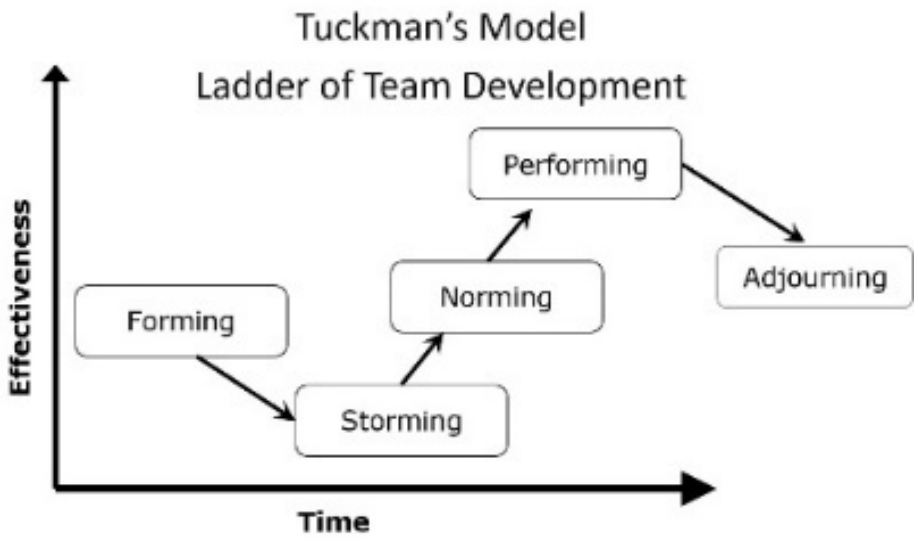
Adopt a Growth Mindset

The belief that a person's capacities and talents can be improved over time.

- Important to apply past experiences to understand situations,
- Should not try to dictate new ways based solely on the past,
- Consider new ideas and perspectives,
- Challenge the status quo,
- Consider the circumstances and the result of change,
- Encourage discussion to break complacency and blind acceptance,
- Continuously focus on ways to improve and innovate,
- Use elicitation methods to "draw" out new ideas.

Team Building

- Facilitates collaboration of team members to work toward a shared goal rather than focusing on the individual,
- Team building activities can be:
  - Formal or informal,
  - Brief or over an extended period,
  - Facilitated by the project manager or a professional facilitator.



Tuckman's Ladder of Team Development

- Addresses team dynamics,
- Likely when new team members join or leave, or change roles,
- Addressed in agile methods by recommending full-time team members.

Forming –team forms and team members meet and act as individuals,
Storming – Team members begin to assert themselves, working independently and individually, often at odds with each other,
Norming – Team members start to work together productively, adjusting their behavior to support the team rather than personal acceptance or control issues,
Performing – Team is well-organized, and members work together collaboratively and at optimum productivity levels. Collaborating easily, communicating freely, and solving disagreements,
Adjourning – Team members complete their work and move on to another assignment.

Virtual Team Member Engagement

- Continued engagement requires persistence, focus on good team dynamics, transparency, accountability, and active attention to effective communications,

- Use and configuration of videoconferencing tools is essential to ensure the desired results,
- Usage of tools such as task or Kanban boards, enable visibility to work status and other artifacts.

Virtual Team Best Practices

- Pros and cons for virtual teams to support a project.
- Best practices to considered during the performance of the project work, include:
  - Manage the inherent risk of virtual team members “feeling isolated”,
  - Focus on shared commitments and team goals vs. individual accomplishments,
  - Instill a sense of shared commitments in the team:
    - Start with the team charter or ground rules and continually reassess and refine those to support current situations,
    - Adopt and encourage behaviors to reinforce collaboration and transparency,
    - Encourage teams to be accountable for deliverables, rather than individuals,
    - Enable teams to self-organize where possible,
    - Use appropriate tools such as shared calendars to plan meetings and coordinate feedback,
    - Provide tools to improve visibility to goals and activity status.

Collaborative Project Team Environment

- Review best practices to ensure work can happen smoothly,
- Create a structure for physical and virtual working.

Team Work Space

Colocation - An organizational placement strategy in which the project team members are physically located close to one another to improve communication, working relationships, and productivity.

- Co-locating in a shared workspace fosters more informal and immediate collaboration and exchange of information,
- These could be physically shared spaces or virtual environments,
- Improves the team's ability to work faster, more collaboratively, and more unified,
- Passive information, referred to as “osmotic communication” is absorbed from the surroundings including:
  - Ad hoc discussions,
  - Side conversations,
  - Whiteboard drawings,
  - Physical body language.
- In agile projects, meaningful interaction is a core tenet,
- Workspaces must encourage frequent, free flowing interaction.

Transparency is one of the three pillars of empirical process (transparency, inspection, and adaptability) that promotes real-time, accurate progress on every aspect of the project.

- Ensure private spaces for those who need to work in solitude, including the use of “caves and commons,”
- Content of the team charter, or ground rules needs to be continually reviewed, and adapted where necessary.

Project Information Management Systems - PMIS

An information system consisting of the tools and techniques used to gather, integrate, and disseminate the outputs of project management processes.

- It is not a single “tool” but rather the combination of tools and techniques,
- Helps ensure consistency in the collection and reporting of project information,
- May be enhanced to support management of project artifacts through a sharing platform to enable both the storage and maintenance of project artifacts.

Project Artifacts

Any document that is prepared in support of a project – for example, requirements, specifications, contracts with vendors, design documents, test plans, and publications that will be delivered to the client along with the final product.

These are now referred to as “artifacts.”

- Project teams create and maintain many artifacts during the life of the project,
- Become a historical repository showing work that was done and information for future projects,
- Help reconstruct the history of the project or product, especially including changes,
- Maintained according to the Configuration Management (specified and included in the Project Management Plan) and archived once the project is complete,
- Format and distribution of artifacts is usually part of the OPAs but must be tailored to meet the needs of the project,
- Good practices for storage and distribution of artifacts include:
    - Store artifacts in an easily accessible location for users,
    - Utilize information radiators to make work visible and transparent,
    - Use a story and distribution system that matches the project needs,
    - Provide storage and access for virtual team members.

Standardized Artifacts

- Many organizations and PMOs have created standard systems for working with project artifacts,
- Often are part of the OPAs including:
  - A simple way to produce and control documents,
  - Standardized formats and templates,
  - A structured process for the review and approval of documents,
  - Built-in version control,
  - Document checkout and check-in capability to maintain the integrity of the document when undergoing changes,
  - Automatic alerts when documents are added or changed, often via email,
  - User-based document security,
  - Capability to support timely distribution of documents.
- Appropriate artifacts are selected and used, but often require tailoring to unique need of the project.

Predictive Artifacts

- Project Management Plan,
- Project Charter,
- Change Requests and Change Logs,
- Lessons Learned,
- Requirements Traceability Matrix,
- Scope Baseline (including the scope statement, WBS, and WBS dictionary),
- Schedule Baseline,
- Cost Baseline.

Adaptive Artifacts

- Product Roadmap,
- Product Vision Statement,
- Product, Release, and Iteration/Sprint Backlogs,
- Release and Iteration Plans,
- Task Board/Kanban Board,
- Burndown/Burnup Charts,

- Experiments (sometimes referred to as Spikes).

Hybrid Artifacts (in addition to those from predictive and adaptive)

- Agreements,
- Acceptance Criteria,
- Assumptions and Constraints,
- Business Case and Benefit Management Plan,
- Minutes of status meetings,
- Presentations and Slide decks,
- Project communications.

Information Storage and Distribution

- Important to have a place to both store and have access to artifacts for team members and others requiring information,
- Good practices for storage and distribution of artifacts include:
  - Store artifacts in an easily accessible location for users,
  - Utilize information radiators to make appropriate work visible and transparent,
  - Use a storage and distribution system that matches the complexity of the project,
  - Use cloud-based document storage and retrieval systems for larger projects or where team members are virtual and/or geographically distributed.

Artifacts Configuration Management

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

- Describes which project artifacts are subject to configuration control through the Configuration Management System.

Configuration Management System

A collection of procedures used to track project artifacts and monitor and control changes to these artifacts.

Version Control

A system that records changes to an artifact, in a way that allows retrieval of previous changes made to it.

- A subset of configuration management that relates to documents and digital records and the changes that have been made,
- Should be applied to all important artifacts identified by the organization and the project,
- Includes subsidiary project management plans and baselines (upon approval via the change control system),
- Changes to specified artifacts should show updates to provide a digital "paper trail" of the document's history including:
    - Possibly a new version number, depending on the organizational or project rules for how version numbers are determined and applied to changes,
    - A date/time stamp as to when the change was made,
    - Name of the user who made the change,
    - Rationale for why the change was made.

Note for exam terminology:

- Plans identify how activities and concepts are to be applied to the project,
- Systems (including configuration and change control) are the actual *processes to follow.*

Empower the Team

- A key concept of the agile mindset,
- Empowered team members help make decisions and contribute ideas based on their expert judgment,
- Enables team members to collaborate and work together and continuously improve to deliver the expected value,
- Requires a psychological safe environment where individual team members feel “safe” in providing their ideas and opinions,
- Given the opportunity through empowerment, an individual’s capacities and talents can continuously improve and innovate over time,
- The project manager becomes more of a servant leader, utilizing emotional intelligence approaches and enabling effective communication among team members.

Empowerment, Unity, Autonomy

- The goal is for the team to recognize the power and influence they possess,
- As an empowered, cohesive unit, the team depends on each other to make decisions and solve problems to quickly deliver the expected value,
- People contribute their best when they feel proud of their work and are empowered by being given shared responsibility,
- Empowered teams can act with a greater sense of responsibility when challenges arise during the project,
- Interference with the team is disruptive and can reduce team members’ motivation to work,
- Teams with a healthy culture of working autonomy:
    - Show trust in the individual,
    - Inspires collaboration and innovation,
    - Boosts the productivity of the entire team.

Create Psychological Safety and Embrace Diversity

Psychological safety is being able to show and employ oneself without fear of negative consequences of status, career, or self-worth —we should be comfortable being ourselves in our work setting.[13]

- Psychological safety is a psychosocial condition,
- Team members should be comfortable being themselves in their work setting, even though remembering that they are part of a team,
- Embracing diversity, trust, and mutual respect for all team members.

Motivational Theories/Approaches

Motivational theory from the mid-20th century is still relevant to project professionals today. [14]

Maslow's Hierarchy of Needs

- Groups human needs into five categories which humans fulfill progressively, from bottom to top,
- Motivation of a team requires facilitating or encouraging accordingly to strive to reach the fifth level of self-actualization,
- Underlying needs must be fulfilled before the ones above are attempted,
- Levels of the hierarchy, from most basic to self-actualization include:
  - Physiological Needs - the basic elements the human body needs to survive. These are food, water, and sleep,
  - Safety Needs - the items a person needs to feel safe from physical or economic harm,
  - Social Needs - the desire to give and receive affection and to be part of a group,
  - Esteem Needs - the recognition received from others as well as with self-esteem,

- Self-Actualization Needs - the desires an individual has for self-fulfillment and developing to their full potential.

Herzberg's Motivation-Hygiene Theory

- Success in the workplace is based upon those two elements:

Hygiene factors –

- Include company policies, supervision, salary, interpersonal relations and working conditions, -issues related to the employee's environment,
- Cannot motivate employees but can minimize dissatisfaction.

Motivating factors –

- Create satisfaction by fulfilling an individual's needs for meaning and personal growth,
- Relate to feelings of achievement, recognition, work itself, responsibility, and career advancement,
- Once the hygiene areas are addressed, the motivators will promote job satisfaction and encourage production.

McGregor's Theory X and Theory Y

- Refers to two styles of management – authoritarian (Theory X) and participative (Theory Y),
- Can be used to categorize people in the workforce.

Theory X - Authoritarian

- Theory X presumes that team members are only *interested* in their own goals and are unmotivated, dislike work and must be forced to be productive,
- These team members will require an authoritative management style and constant supervision to achieve the results required for the project,
- Theory X managers assume that team members are naturally unmotivated and dislike work and require "micromanagement."

Theory Y - Participative

- Theory Y assumes that people are naturally ambitious, self-motivated to do good work and exercise self-control,

- They need very little external motivation, will seek responsibility, and can be trusted to work on their own,
- Most often applies to team members working in a more agile, or adaptive environment, where the team is expected to be self-organizing, and self-starters,
- “Command and control” leadership style is replaced by servant leadership,
- Problem arises when there is a conflict between these styles:
  - Theory X manager, who manages a Theory Y person,
  - Theory Y manager is responsible for directing Theory X individuals.

McClelland’s Achievement Motivation Theory

- Individual’s needs are shaped by life experiences, largely depending on culture and life experiences,
- Three needs with one dominant in our personalities based on life experiences,
- Understanding can help with influencing goal setting, feedback and the use of motivation and reward systems.

Achievement

- Has a strong need to set and accomplish challenging goals,
- Takes calculated risks to achieve their goals,
- Likes to receive regular feedback on their progress and achievements,
- Often likes to work alone.

Affiliation

- Wants to belong to the group,
- Wants to be liked and will often go along with whatever the rest of the group wants to do,
- Favors collaboration over competition,
- Does not like considerable risk or uncertainty .

Power

- Wants to control and influence others,
- Likes to win arguments,
- Enjoys competition and winning,

- Enjoys status and recognition.

Motivation Theory Summary

Hierarchy of Needs	Maslow	Human needs: Psychological, Security, Social, Self-esteem, Self-actualization
Motivation-Hygiene Theory	Herzberg	Success based on two factors: Hygiene factors and Motivating factors
Theory X and Theory Y	MacGregor	Two styles of management - Theory X (authoritarian) and Theory Y (participative)
Achievement Motivation Theory	McClelland	Based on life experiences - Achievement, Affiliation and Power

Team Charter and Ground Rules

- Team charter and ground rules can and should be reviewed and updated as needed on a periodic basis,
- Should always have the ground rules close at hand and visibly displayed,
- If a ground rule has been violated, the team needs to ensure the appropriate response helps coach that team member back into alignment.

Rewards and Recognition

- Purpose is to motivate the team to perform well and deliver a specific outcome,
- Reward and recognition plans formalize reinforcement of performance or behavior,
- Generally standardized throughout an organization and approved through corporate channels,
- An individual can be recognized without giving them a reward,
- Be transparent and fair when using both rewards and recognition,
- Tailor the rewards and recognition,

- Both individual and team rewards and recognition can be used as part of a motivation strategy for the team.

Decision-Making Empowerment

Consensus is a group decision technique in which the group agrees to support an outcome even if the individuals do not agree with the decision.

- Decision-making is a core function of all teams,
- Teams need to make decisions about activities, risks, estimates and many other challenges,
- How teams will make decisions are included in the team charter or ground rules,
- Also includes how the team will handle and resolve conflict when disagreements arise,
- The team should always try and reach consensus on these areas.

Decision-Making Techniques

Decision-making techniques are used by a group to reach a decision. This technique is an assessment process that can have multiple alternatives and can lead to many outcomes.

- Decisions include activities, risks, estimates and other challenges,
- The team establishes their own norms, or Ways of Working (WoW), and captures those in the team charter or ground rules.

Predictive methods:

Prioritization/ranking

- Agile technique used to determine the most important requirement (user story),
- Often utilizes MoSCoW (Must, Should, Could, Wish/Won't) technique.

Multicriteria decision analysis

- Uses a decision matrix to evaluate and rank criteria used to make selection.
- Commonly used to accept proposals resulting from an RFP.

Autocratic decision making

- One individual takes responsibility for making the decision for the group.
- Used in straightforward decisions or when the team is unable to decide, causing a delay moving forward.

Voting methods

- Collective decision-making technique and process to assess multiple alternatives with an expected outcome to help determine future actions:
  - Unanimity – all members agree,
  - Majority – more than half agree,
  - Plurality – largest portion of the group agrees, even if the majority is not achieved.

Adaptive methods:

- Less structured and more informal,
- The entire team participates.

Thumbs up/down/sideways (Roman voting)

- Indicating agreement, disagreement or unsure.

Fist of Five

- Shows the range of agreement from a fist showing no support or agreement to all five fingers showing full support or agreement, and everything in between.

Planning poker

- Used mainly to determine agreement on the effort required to deliver a user story,
- Often uses Fibonacci sequence numbers indicating the perceived degree of difficulty.

Dot voting

- Everyone is given several “dots” to use to indicate their preference from several options.

Polling

- Number of responses to previously identified options, often to determine preferences by a group.

Display Task Accountability

Important to keep work and progress visible to support transparency and demonstration of work completed.

Predictive

- Tasks assigned and team members become accountable for completing specific work,
- The WBS dictionary and work package descriptions supply more information about the work to be done,
- The assignments can be shown by either a RAM or RACI chart.

Adaptive and Hybrid

- Kanban or task boards visually show progress on user stories or requirements, (Part of an Information Radiator),
- All team members should see overall progress of teamwork, but also update their individual progress,
- Key is that the information is up-to-date based on the frequency decided by the team .

Support Team Member Performance

Manage and Lead

Management by Objectives

- Support the team by setting challenging, but attainable objectives collaboratively with the team to encourage aspiration,
- Objective setting is commonly done continually throughout the project life cycle .

Servant Leadership

- Leadership when using more of a servant leadership approach includes:
- Defining the vision for the team,
- Continually aligning the team to the vision,
- Motivating team members to pursue and achieve the vision.

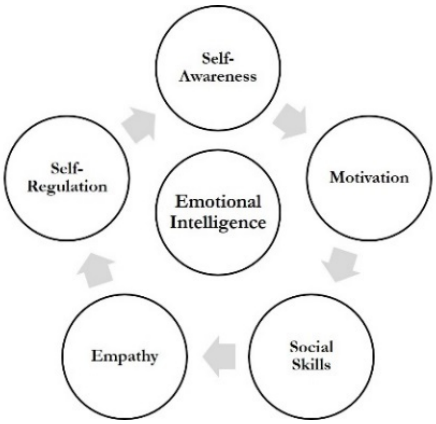
Assess Team Member Performance

- Performance assessments can be carried out for team members and monitored throughout the project,
- Can utilize either formal or informal methods, often recommended by the organization,
- Identify strengths, weaknesses, aspirations, and preferences,
- Discover opportunities for improvement,
- Use performance assessments to reviews and evaluate work on the project, including:
    - Comparison of performance to goals,
    - Reclarification and performance in assigned roles and responsibilities,
    - Ability to deliver and receive positive as well as negative feedback,
    - Discovery and support of unknown or unresolved issues,
    - Creation and monitoring of individual training plans,
    - Establishment of future goals.
    - Personality Indicators

- Personality assessments attempt to measure human psychology,
- Often provide insight into individual personalities to help shape motivation options as well as improvement of interactions and communications with other team members, as well as stakeholders,
- Clearly explain the usage and permission is received,
- Ensure personal information captured is not shared with others without the individual's permission,
- Results are heavily based on how the individual responds to the questions,
- Don't make fixed assumptions or judgments based on the results,
- Psychological metrics, or psychometrics, can also be useful in analyzing personality indicators,
- Allows the project manager to adjust within the team to support emotional and other needs of team members and key project stakeholders,
- Psychological team roles are useful for understanding types of roles or tasks they may best be suited for or conversely, not readily suited for including:
    - Results-oriented—product testing,
    - Relationship-focused—communication leader, meeting facilitator,
    - Innovative and disruptive thinkers—agile software developer/team member,
    - Process and rule-followers—transcriber in meetings, prototype builder,
    - Pragmatic—archive project documents.

- Commonly used tools:
    - Big Fiver Personality Model (OCEAN),
    - Myers-Briggs Type Indicator,
    - DISC,
    - As well as many others.

Emotional Intelligence



- Emotional Intelligence helps with the understanding of personal emotions and those of others to help minimize conflict,
- Benefits include improved teamwork, enhanced interpersonal skills and competencies, motivated employee, reduced attrition, and improved overall project performance,
- Assess behavior using personality indicators,
- Analyze personality indicators and adjust to the emotional needs of key project stakeholders,
- Factors include:
  - Self-awareness,
  - Self-regulation,
  - Empathy,
  - Social skills,
  - Motivation.

Self-awareness

- Being able to read the emotions and feelings of oneself as well as others,
- Recognizing the effect of emotions and behaviors, positively or negatively.

Self-regulation

- Understanding triggers and learning how to react when situations arise.

Empathy

Empathy is a critical emotional intelligence skill that profoundly affects the ability to relate to and establish a rapport with others. It

expands vision and decision-making beyond the immediate circumstance and individual priorities.

- U nderstand others by observing emotional cues and listening carefully,
- Incorporate a service orientation to recognize needs and matching them to results,
- Establish an empathetic culture to help develop others, leverage diversity, and remain politically aware.

Social Skills

- Builds strong relationships with people to affect change in the organization including :
  - Communicating,
  - Building bonds,
  - Collaboration and cooperation,
  - Catalyzing change,
  - Managing conflict,
  - Influencing,
  - Leadership.

Motivation

- Associated with an individual's personal, internal abilities and raising ambition to attain peak performance,
- Leads people towards having a desired social skill set,
- Help teams achieve high performance and meet project objectives,
- Important to understand how to nurture and grow these factors personally as well as for the team.

Communicate with Stakeholders

- Everything depends on effective and successful communication,
- Project leadership means establishing meaningful and collaborative relationships with all stakeholders .

Communications:

- Both personal and strategic,
- Need to manage volumes of informal and formal conversations, emails, documents and so on,
- Essential to ensure the right information is getting to the right stakeholder so timely decisions can be made, issues addressed, and expectations met.

Manage Project Communications

Creating, collecting, distributing, storing, retrieving and ultimate disposition of project information in accordance with the communications management plan.

- Identification of communication requirements continues throughout the project, not just initially when the Communication Management Plan was developed,
- Identifies all aspects of effective communication including actual communications distributed to the appropriate stakeholders,
- Allows for flexibility and adjustments to meet changing needs of stakeholders and the project,
- Ensures information being communicated to stakeholders is received and understood,
- Provides stakeholders opportunities to make requests for further information, clarification, and discussion,
- A communications matrix is a shorter version and helps organize communication information,
- The matrix often uses a spreadsheet, whiteboard or other media tailored to the team’s needs.

Predictive communications:

- Information to be communicated, including language, format, content, and level of detail,

- Reason for communication,
- Time frame and frequency,
- Receipt of acknowledgement, or response, if required,
- Sender of the communication,
- Authorizing person, in case of confidential information
- Receivers – including their needs, requirements, and expectations,
- Methods or technologies used for communications –email, press release, social media.

Two Way Communications

Critical communication techniques that every project team member should practice.

Active listening

Active listing is a communication technique that involves acknowledging what is heard and clarifying the message to confirm that what was heard matches the message that the sender intended. (From glossary) – (An interpersonal skill that requires listening closely and participating actively while communicating.)

- The listener must focus attention on the message to the end, rather than trying to formulate the response prematurely,
- The receiver should confirm receipt and understanding of the message, often by re-stating or paraphrasing the message, or using body language, head nodding, etc.

Feedback

- Provides confirmation that the message sent was understood. That can be done through feedback including:
  - Clear, specific, and offered in a timely way,
  - Objective and critical,
  - Positive or effective – if received and understood objectively,
  - Negative – if misunderstood or clouded by a lack of trust and psychological safety,
- Implicit acceptance of the message by the receiver id assumed if no response is received,
- Non-participation can lead to misunderstanding, or the need to spend more time explaining situations that were previously

discussed,

- If key stakeholders are not participating as expected, the reason will need to be uncovered, and may require escalation to help resolve the situation, or provide a replacement.

Formal Communication

- Overlaps exist between communications being distributed and stakeholders receiving them,
- The stakeholder register, engagement plan, as well as the communications management plan should include required reports, including any formal communications,
- Predictive approaches utilize formal reporting at appropriate milestones to support approval of milestones or governance checkpoints,
- These are often used to obtain “sign-off” or approval of work.

Information Radiators

- Information radiator is the generic term for visual displays placed in a visible location so everyone can quickly see the latest information, (in agile practice, also known as “Big Visible Chart”),
- Several ways information can be openly shared using either electronic or physical methods, or a combination of both,
- Open communications and transparency are some of the pillars of agile,
- May take time to develop trust and become comfortable displaying project information openly,
- The team should establish clear ground rules of respect,
- Ensure that the team members stay respectful, but open to speaking up and offer helpful opinions.

Meetings

- Always try to make the most of meeting times,
- Consider meetings with only one topic to ensure the right participants are included in the meeting, and topics discussed are of interest and concern to them,
- Be organized and clear about the purpose of holding the meeting and the desired objective,

- Timebox meetings: Start and end the meeting on time, including creating timings for discussion content,
- Practice active listening and feedback techniques during the meeting,
- Facilitate collaboration: Be open to and encourage ideation or problem resolution during meetings.

Collaboration

- Optimizes alignment between stakeholder needs, expectations, and project objectives,
- Builds trust and influence stakeholders to accomplish project objectives,
- Establishes healthy, collaborative working relationships both within the team and with stakeholders,
- Frequency of engagement is based on mutual needs and expectations,
- The stakeholder engagement assessment matrix is especially helpful in evaluating the current and desired engagement level by individual stakeholders at different times during the project,
- Regular collaboration between core team members can be supported by daily stand-up meetings and collocating teams near each other for more face-to-face communications,
- Infrequent collaboration can be supported by scheduled sessions such as milestone reviews, backlog refinement sessions, and project update meetings.

Monitor Stakeholders Engagement

Monitors overall project stakeholder relationships and adjusts strategies and plans for engaging stakeholders.

- Continually evaluate engagement needs of stakeholders,
- Increases efficiency and effectiveness of stakeholder activities,
- Can be enhanced by using effective collaboration tools, including shared whiteboards, wikis, and shared file structures,
- Tailor strategies and plans initially identified in the Stakeholder Management Plan,

- Involvement and engagement in the project may fluctuate or remain constant depending on the focus of the project at that time,
- Level of engagement needs to be evaluated and re-evaluated throughout the project,
- Track changes, including when, and why changes were made.

Stakeholder Engagement Assessment Matrix (SEAM)

A matrix that compares current and desired stakeholder engagement levels.

- Reviewed and modified continuously through the project as interests and concerns may change for different areas of the project,
- Important to understand the current level of engagement and then work with them to help achieve the desired level,
- Especially challenging for those that are resistant, as it requires understanding their resistance and what will be necessary to move them to at least a neutral position,
- Key labels used for this matrix include:
    - Unaware – These stakeholders don't realize they are stakeholders or are unaware of the focus of the project currently,
    - Resistant – Against the project or the current focus,
    - Neutral – Are knowledgeable, but have no strong opinion on the project,
    - Supportive – In favor of the project and/or current focus helpful in promoting,
    - Leading – aka "Champions" – advocates for the project or current focus.

Knowledge-Sharing Culture

- Knowledge sharing that support projects, as well as the organization, often includes training, coaching, and mentoring,
- Consistent learning and teaching occur as part of projects, including as part of an individual's professional development path,
- Team members can both learn and teach others and should always avail themselves of training, coaching, and mentoring opportunities,
- In agile projects, agile coaches or scrum masters help teams to develop their agile practice and foster more effective and cohesive teams.

An agile coach is often a process role on a project team that helps organizations achieve true agility by coaching teams across the enterprise on how to apply agile practices and choose their best way of working. See also "scrum master."[15]

Acquiring Required Competencies

- Gap analysis helps compare current competencies to those desired,
- Based on the combined needs of the project team, training and coaching offerings can be arranged ,
- Improving skills and knowledge for team members, and stakeholders increases the team's ability to increase the quality, output, and value of the project effort.

Training

- Training requirements may include support for technical skills, interpersonal or soft skills, or be included as part of team building activities,
- Can be formal or informal, on almost any topic from "soft" to technical skills,
- Usually provides "upskilling" based on identifying gaps in knowledge,

- Provides understanding of why and how but requires applying what was learned to actual work activities,
- The schedule is dependent on the timing of the need of the project and the availability of training opportunities,
- May be provided by key stakeholders to team members to the team with the customer's business, culture, desired outcomes, and project vision and context,
- Training to help a team member understand how to perform an activity should occur just prior to utilizing that skill,
- Training for customers to utilize the product or service should occur shortly before implementation and is part of the transition planning activities,
- Training can be provided in multiple ways including:
    - Instructor-led, classroom – physically present or co located,
    - Virtual classroom, instructor led,
    - Self-paced eLearning – scalable including rich media video, simulated lab exercises, etc.,
    - Document review,
    - Interactive simulations – including hands-on labs or test simulators to provide support when studying for an exam,
    - On-the-job training and coaching,
- Post-training performance assessments can be used to evaluate improvements resulting from the training.
- Either done with formal exams or observations of knowledge or skill improvements,
- If the desired outcomes of the training are not achieved, record this in the lessons learned and try to find out why as part of a retrospective session.

Coaching

- In agile teams, coaching is more common than training or mentoring,
- Team members are coached on individual skill areas, with the aim of getting the work done and professional improvement,

- Preferred when an experienced team member can work directly with other team members in specific areas,
- Coaching can be provided individually or to a group,
- Group coaching is often the result of working together to complete a task, rather than assigning the responsibility to a single individual .

Informal coaching

- Delegate tasks, observe and then provide feedback,
- Encouraging others to take the lead on activities,
- Collaborating on project planning and management activities.

Formal coaching

- Practice taking on new roles,
- Facilitating meetings and sessions,
- Transferring skills by pairing individuals,
- Modeling and observing behaviors,
- The two roles that are often utilized for coaching on agile projects include:
    - Agile coach - process role on a project team that helps organizations achieve true agility by coaching teams across the enterprise on how to apply agile practices and choose their best way of working,
    - Scrum master - coach of the development team and process owner in the Scrum framework. Removes obstacles, facilitates productive events, and protects the team from disruption.

Mentoring

- Mentorships complement training and coaching efforts,
- Mentorships are longer-term partnerships that are formed and provide tremendous value for professional growth,
- Aims to transfer skill sets and knowledge from the more experienced party to the less experienced party,
- Often individual decisions which establish a long term “mentorship” relationship with another individual, especially for increased knowledge in personal development, beyond the project context.

Self-Organizing Teams Collaborate and Learn

- Self-organizing teams coach and mentor each other every day in their work,
- Often results in the sharing of tacit knowledge that is difficult to articulate and share,
- Goes beyond knowledge acquired in traditional methods (explicit knowledge), including training, research, and discovery,
- Job shadowing and coaching often follow formal training sessions to ensure the transfer of knowledge and skills from the team to the organization during the transition of the solution.

Manage Conflict

- Extremely important to recognize and handle potential team members or stakeholder disagreements and the conflicts,
- Managing conflict is the responsibility of all stakeholders,
- Important to utilize interpersonal and team skills to ensure positive results when handling conflict,
- Servant leader removes obstacles or impediments for the team often reducing potential sources of conflict.
- How conflict is to be handled should be documented in the team charter or ground rules,
- Provide a psychologically safe team environment where exchanges and disagreements are encouraged and welcomed,
- Important to recognize the benefits of encouraging disagreements among the team members to arrive at the best solutions,
- Interpret the source and stage of the conflict,
- Analyze the context for the conflict,
- Evaluate/recommend/reconcile the appropriate conflict resolution solution,
- Focus on the issues and not individuals.

Causes of Conflict

- Competition,
- Differences in objectives, values, and perceptions,
- Disagreements about roles, activities, and individual approaches,
- Communication breakdowns,
- Utilize expert judgment and root-cause analysis to determine core issue or root of the conflict.

Handling Conflict

- How to address conflict should be specified in the team charter/ground rules,
- Need to be continually reviewed and updated, as necessary,
- This especially applies to decisions regarding the need for escalation, rather than coming to an agreement within the team,

- Agile teams often consider conflict management strategies when determining and tailoring their way of working (WoW),
- Team members need to work in a safe environment where they are empowered and able to exchange ideas and points of view,
- Key tools used to address personal aspects of the conflict include:
  - Interpersonal skills,
  - Emotional intelligence,
- Conflict that involves an actual problem or situation utilizes root cause analysis techniques to help to move from the situation or symptom to discovering the actual root cause,
- Traditional projects often utilize cause-and-effect diagrams (also known as fishbone or Isikawa diagrams),
- Agile approaches have adopted the lean technique, 5 Whys method,
- Important to understand when a disagreement moves beyond just being a disagreement and becomes a conflict.

Levels of Conflict

- The conflict model by Speed B. Leas is widely used to manage project teams,
- Helps understand the context of a disagreement, when it is possible to intervene, and how and when to escalate,
- Describes how conflict emerges and evolves from a task orientation with possible resolutions to intractable solutions which are nearly impossible to resolve:
  - Level 1 - Problem to solve: Differences are identified, then shared and discussed among members. This level is a problem or task-oriented conflict, not a person or relationship-oriented conflict,
  - Level 2 - Disagreement: Personalities and issues mix; therefore, problems cannot be named. At this stage, people begin to distrust one another and make problems personal,
  - Level 3 - Contest: Win/lose dynamic appears, followed by taking sides, distorted communication, personal attacks,

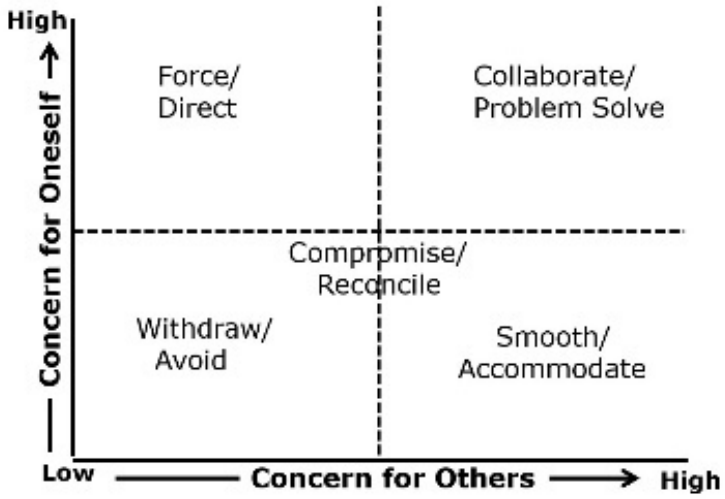
Conflict aims shift from focus on self-protection to winning the argument, People feel threatened or invigorated and ready to fight,

- Level 4 - Fight/Flight: Conflict participants may shift from winning to now trying to hurt or get rid of their opponents, Intervention is needed,
- Level *5* - Intractable situation/War: People are now incapable of having a clear understanding of issues. Efforts to destroy others' reputation, positions, or well-being are common. This eventually ruins the relationship.

Use Interpersonal Skills to Manage Conflict

- Interpersonal skills are possible for Levels 1-4,
- Play a major role in ensuring the results of a disagreement or conflict are positive rather than negative:
  - Emotional Intelligence – utilizing empathy to understand the situation and help diffuse,
  - Influencing – persuading all parties to reconsider or modify their tone, approach, or mindset,
  - Leadership – move beyond influencing and steer the discussion in a more positive direction,
  - Decision-Making – if a decision can't be reached by the parties, then offer a solution to move the situation forward,
  - Active Listening – continue to listen for language, especially as it becomes personalized or accusing, with a bitter or caustic tone. It may also be accompanied by defensive or aggressive physical postures.

Conflict Management Approaches



- The approach to managing conflict will depend on:
  - The intensity and importance of the conflict,
  - The time given to resolve the conflict,
  - The positions of the conflicting parties,
  - The motivation to resolve conflicts on a short-term or long-term basis.
- Approaches include:
  - Withdraw/Avoid - remove oneself from conflict (used when conflict doesn't impact project objectives or not related to a legal, safety or ethical issue),
  - Smooth/Accommodate – neutralize feeling by focusing on common ground (used when emotions prevent resolution),
  - Force/Direct – one person forces a solution (used when legal, safety or ethical issues are involved)
  - Compromise/Reconcile – temporary or partial resolution through some degree of satisfaction to all parties,
  - Collaborate/Problem Solve – incorporate multiple viewpoints to enable cooperative attitudes to reach consensus and commitment.
- An additional approach – Arbitration and Mediation (ADR) is used for contract disputes and involves escalating to an outside panel, rather than pursuing legal resolution.

Conflict Stages and Outcomes[16]

- Not only is it important to understand the levels of a conflict, but also the outcomes that will occur as a result,
- The outcomes can be positive in levels 1 to 3. After that, parties may become embittered.

Level 1 - Problem to solve – often task-oriented where differences are identified and discussed,
Outcome – collaborate to solve the problem by moving parties toward an acceptable agreement.

Level 2 – Disagreement – issue becomes obscured as it becomes personalized with distrust starting to set in,
Outcome – collaborative solution can be attempted or negotiating an acceptable agreement.

Level 3 – Contest – Win/lose environment emerges with communications becoming distorted and aggressive,
Outcome – third party decision-making, compromise or mediation may be required for a resolution.

Level 4 – Fight/flight – Efforts move from winning the argument to inflicting harm on opposing party,
Outcome - Minimal change of compromise and a high probability of someone quitting, requiring intervention.

Level 5 – Intractable situation/war – understanding of each side is impossible,
Outcome – highly destructive environment where further escalation is needed.

Support the Project Team Performance

Tools, techniques, and additional leadership skills to help get the best performance from the project team, through staying on track to achieve successful project outcomes .

Implement Ongoing Continuous Improvements

An ongoing effort to improve products, services, or processes.
Often supported by employing organization knowledge from previous project efforts and the capture of Lessons Learned (like retrospectives) continuously throughout the project.

- Key principles of agile with continuous improvement being applied to processes, products, and individuals,
- Often a business strategy identified at the organizational level for all projects to adopt and utilize,
- Organization's project management office (PMO) provides implementation support through OPAs, or a continuous improvement framework such as Agile, Lean or Six Sigma .

Quality Theory Methods

- Six Sigma – respond to customer needs by improving processes by removing defects (William Smith Jr),
- Juran Trilogy – break quality management into planning, control, and improvement (Joseph M. Juran),
- Plan-Do-Study-Act (PDSA) – continuous process improvement to meet customer needs (W. Edward Deming),
- Cost of Quality (CoQ) – quality achieved by prevention and zero defects (Philip B. Crosby),
- Taguchi Quality Control – factors causing variations are identified and controlled (Genichi Taguchi),
- Kaizen Technique – small changes or improvement from workers and continually improving .

Continuous Improvement Tools

- Lessons Learned Register – collect and implement small improvements continuous,
- Retrospectives – looking back at work just completed and planning improvements for next,
- Experiments – includes team feedback and A/B testing to identify improvements.

Continuous Improvement Approaches

- Plan-Do-Check-Act (PDCA) (later changed to PDSA) - involves systematically testing possible solutions, assessing the results, and implementing those that work. The cycle is then repeated to further improve a process or product. Four steps in this methodology are:
  - Plan – Define objectives and processes to deliver a set of desired results,
  - Do – Execute the plan and collect data to determine the effectiveness of the processes,
  - Study – Evaluate the data and compare the results to expected outcomes,
  - Act – Identify issues with the process, determine their root causes, and modify the process to improve it. Planning for the next cycle can then proceed.

- Kaizen - refers to “change for the better,” a culture of improving and self-motivation to continuously improve.
  - Improvements based on many small changes which are less likely to require major expenditure of capital,
  - Ideas come from workers—not expensive research, consultants, or equipment,
  - All employees are expected to continually improve their own performance,
  - Everyone is encouraged to take ownership of their work and to improve motivation.

- Lean Six Sigma - A collaborative team method that provides an enhanced ability to target customer needs and measure performance during project execution and monitoring.

Experiments

Test and gather feedback to both identify improvements as well as potential solutions, providing verification to improve both the efficiency as well as the effectiveness of items being tested.

Feedback

Can come from many sources utilizing small increments with continual review and approval incorporating improvements throughout the development process.

A/B testing

A marketing approach used to determine user preferences by showing different sets of users' similar services—an 'Alpha' and a 'Beta' version —with one independent variable. The one most often selected is considered for further development.

Pareto Chart

A histogram that is used to rank causes of problems in a hierarchical format based on the 80/20 rule to determine where the improvement efforts will create the most improvements.

The 80/20 rule contends that a relatively large number of problems or defects, typically 80%, are commonly due to a relatively small number of causes, typically 20%.

Assess Current CI Methods

- Lessons learned should be captured constantly and/or at set times throughout the project,
- Apply learning to determine and implement appropriate actions to improve both the performance and project environment,
- Include addition process improvement activities into the project,
- Risk register may include potential quality threats and responses on a continual basis.

Conduct Retrospectives

- Gather lessons learned constantly and/or at set times throughout the project, like a milestone, major deliverable, or an iteration,
- Retrospectives should be scheduled frequently, reviewing work performed during a short period of time,
- Can also be done in a more structured manner, usually at the end of a phase or release,

- Focus should be on performance and potential improvements,
- Encourages the team to review what went well and what could have been done better,
- Includes review on work for the product, processes, team dynamics, and other areas that influence the effectiveness of the team,
- Both lessons learned, and retrospectives are taken seriously by the team, continuously identified, and potential actions can be taken immediately to improve the quality,
- Guidelines:
  - Prepare topics to be discussed,
  - Clearly identify two columns for discussion: “What went well” and “What needs improvement”,
  - Encourage participants to add items to these lists, including reason for the improvement,
  - Decide and indicate common items that need improvement,
  - Narrow the list of improvements down to those items that can bring value in the next iteration,
  - Get consensus on a plan for improvement,
  - Identify the tasks that will be affected or improved by the items selected,
  - Implement the changes,
  - Review the result of the changed area at the next retrospective to see if it made a difference.

Agile Improvement Methods

- Agile teams use retrospective ceremonies,
- Discipline Agile has adopted a version of the Kaizen loop strategy for reviewing and implementing small improvement areas referred to as Guided Continuous Improvement (GCI).[17] GCI extends the Kaizen loop strategy using previous proven guidance .

Update Processes and Standards

- Information from lessons learned or retrospectives can apply to the organization’s continuous improvement process, and project

management processes,
- Escalate these lessons for evaluation for consideration at the organizational level by the PMO or CoE.

Improvement Mindset

- Improvements can be supported by additional training, processes, hardware, or equipment that may have been overlooked initially,
- Adopting a “fail fast” mindset allows the team to focus first on those areas that are essential or “must work,”
- Additional time isn’t wasted on developing areas that cannot be implemented if the “must work” item is not successful,
- Change should be measured to determine if the desired effect was met,
- If successful, incorporate into the “way of working” for future activities and efforts,
- Knowledgeable regarding quality theories including:
    - Six Sigma and Lean Six Sigma – respond to customer needs by improving processes by removing defects (William Smith Jr),
    - Juran Trilogy – break quality management into planning, control, and improvement (Joseph M. Juran),
    - Cost of Quality (CoQ) – quality achieved by prevention and zero defects (Philip B. Crosby),
    - Taguchi Quality Control – factors causing variations are identified and controlled (Genichi Taguchi).

Support Performance

- Communicate, and re-communicate, the project's objectives,
- Ensure fluid knowledge-sharing, healthy team environment always,
- Continue healthy dynamics on the team including welcoming new team members and realignment, when necessary,
- Continuous focus on delivering value.

Manage with Objectives, Tolerances, and Thresholds

- Often determined as part of planning session in which the team sets the targets and commitments for the upcoming period,
- Ensure objectives are clearly and effectively communicated throughout the project,
- Acceptable thresholds and tolerances are usually identified as part of the planning efforts for the schedule, budget, quality, and nonfunctional requirements,
- Helps the project manager understand acceptable variations and therefore manage certain issues without needing to escalate to a higher board for resolution.

The Project Manager's Role

Predictive

- Includes more involvement in the oversight and monitoring of project work throughout the project life cycle,
- Starts with the development of a project management plan to help identify those activities and information to be developed and maintained as part of the project work. This plan must continually be reviewed and updated as necessary as the work is done,
- Steers the team toward successful project outcomes.
- Includes areas that can be delegated to other experienced team members.

This can include involvement and oversight in many areas, including:

- Measure and monitor progress, taking appropriate action where necessary,
- Ensure alignment of due dates for project deliverables and project phase completion requirements,
- Manage phase transitions, when necessary,
- Management of project performance and changes to project activities,
- Creation and use of appropriate knowledge provided to and distributed from the project,
- Collect, analyze, and communicate project information to relevant stakeholders,
- Participating in integrated decisions about key changes that impact the project,
- Ensure completion of all project work and formally close each phase, contract, and the project as a whole,
- Ensure alignment with the benefits realization plan.

Team Roles and Responsibilities that Support Performance

Hybrid

- Project manager oversees the integration of project plan components,
- Helps the team to understand the agile mindset and use appropriately tailored processes,
- Delegates control of detailed product planning and delivery to the product owner, including the prioritization of requirements for creation of value,
- Focus on:
  - Building a cross-functional team,
  - Collaborative decision-making environment,
  - Ensuring the team can respond appropriately to changes.

Optimize Communication

- Integrate and implement retrospectives appropriately to continually focus on where both product and way of working improvements

can be made,

- Communicate regularly and with a positive tone based on the communication management plan and communication matrix,
- Review team communications continually to determine if changes or adjustments are needed,
- Utilize both technology and tools to support the work and communication sharing within the team,
- Review and regularly encourage feedback on the usage of the tools to increase the effectiveness and efficiency of these tools.

Use Feedback to Support High Performance

- Feedback is crucial communication, and it should be done regularly, and in both directions—giving and receiving,
- Important to ask for timely and frequent feedback from the team, showing a willingness to listen to them,
- Continue to determine the most appropriate method of communicating –public, or private, individual or group, written or verbal.

Support Team Task Accountability

- Promote accountability by empowering people to take responsibility for work,
- Visibly track task performance and facilitate collaboration,
- Encourage the team members themselves to "self-organize":
  - What work must be done to meet a requirement,
  - How to develop, perform and deliver the results,
  - Who should perform individual tasks.

Roles and Responsibilities:

- Regardless of approach, the team and individuals who have been assigned tasks must understand they are accountable for fulfilling the work to which they have committed,

Predictive

- RAM/ RACI charts describe participation by various project roles in completing work or deliverables,
- Clarifies roles and responsibilities ,

Adaptive

- Seldom any identification of roles and responsibilities, or assignment to individual work activities since teams are self-organizing,
- Key component of the iteration planning meeting.

Hybrid

- Project manager or team lead works with the team to make decisions about roles and responsibilities.

Knowledge Management Discipline

Knowledge Management is a discipline that includes a mixture of experience, values and beliefs, contextual information, intuition, and insights people use to make sense of new experiences and information.

- Knowledge is an asset to both the team and the organization and should be managed appropriately,
- Knowledge is captured throughout the project into the Lessons-learned register,
- Knowledge is consolidated into the Lessons-learned repository at the end of the project,
- Can be divided into two main types: explicit and tacit,

Explicit knowledge

Knowledge that can be codified using symbols such as words, numbers, and pictures. This type of knowledge can be easily documented and shared with others.

- Important to verify the source and date of the content to ensure it is the most current and up to date.

Tacit knowledge

Personal knowledge that can be difficult to articulate and share such as beliefs, experience, and insights.

- Needed to take advantage of the knowledge, skills, and experiences that project team members have gained throughout the project through both types of knowledge .

Knowledge Management: Three Levels

Individual level

- Individual team members need to know how to perform their work in accordance with each assigned task's scope, schedule, and cost —all while maintaining an acceptable level of quality,
- If required knowledge for a particular task is missing, it can be acquired:
  - Research topic to learn what they do not know,
  - Collaborate with other team members to fill in the knowledge gap,
  - Review the projects or organization's knowledge repository.

Project level

- Project managers can solicit knowledge from project managers or project leaders involved with other projects and apply to the current project,
- The Project Management Office (PMO) can provide knowledge regarding defining and maintaining within an organization.

Organizational level

- Program or portfolio managers can seek information from peers to adapt knowledge to their specific need.

Incorporate Knowledge Transfer Opportunities

- Acquiring and transferring knowledge external to the actual project including:
  - Networking,
  - Meetings, seminars, or other in-person and virtual events,
  - Training,
  - Work shadowing
  - Special interest groups, often referred to as Communities of Practice.

Motivating Your Team

- Important to stay motivated to keep the team motivated,
- Continually assess the team to see what is needed to perform at their best.

Right way:

- Consider ways to inspire and motivate the team by providing opportunities, not emphasizing obligations,
- Encourage moments or opportunities to self-assess and reflect on areas for professional growth,
- Provide appropriate training opportunities by asking them what they need,
- Make sure virtual teams continual to feel connected through constant and regular contact,

Wrong way:

- Heavy-handed, one-size-fits-all approaches to improvement or support for team members,
- Constantly scheduling meetings for the sake of having meetings, causing interruptions to planned activities,
- Requiring additional non-project work which causes distractions.

Continuously Realign Team Efforts with Value Delivery

- Stay focused on delivering value through team cohesion, coherence, collaboration, and consensus,
- Ensure an understanding of project goals and vision, as well as project agreements,
- New team members should be welcomed and considered as a potential source of additional and new knowledge.

Maintain Artifacts

- Periodic review of standards and practices is necessary to determine if changes are required and being followed appropriately,
- Project artifacts should be kept current by keeping them easily accessible and visible,
- Utilize configuration management and version control to identify the most recent version,
- Determine if data protection or security mandates for artifact management are applicable to the project,

- Review which artifacts will need to be archived at the end of the project to ensure they are maintained throughout the project.

Evaluate Project Progress

- Tailor what needs to be measured and “only measure what matter,”
- Continually measure variances of actual performance against those identified during planning,
- Tracking performance shows actual work being done by the team, compared with a baseline or an expectation,
- Comparison utilizes variance analysis to determine not only the difference, but the potential impact to the project of that difference.
- Even though done differently, most projects still need to measure progress in some manner for the following areas:
  - Scope - percentage of work completed, change requests,
  - Schedule – actual duration of work compared to projected start and end dates,
  - Budget – actual costs compared to budgeted costs, assessment of procurement usage,
  - Resources – team and procured resource allocations/availability, team and vendor performance appraisal, contract management,
  - Quality – technical performance, defects,
  - Risk – risk register reassessment.

Report on Performance: Tailor If Required

- Most projects find a need to take more of a hybrid reporting method, especially to meet organizational reporting requirements,
- Formal reporting may be required:
  - Highly regulated industry,
  - Cultural context uses formal reports,
  - A stakeholder or stakeholder group requires a detailed or a formal approach,
  - Types of performance reports may include:
  - Dashboards - physical or electronic progress summaries, usually with visuals or graphics to represent the larger data set,

- Milestone and network diagrams – including updated milestone charts, dependencies, and sequences,
- Quality reports – charts and reports based on the quality metrics collected and meet requirements,
- Earned Value Management (EVM) reports – graphs and values based on EVM equations using performance measurement baseline requirements,
- Variance analysis reports – graphs and their analysis comparing actual results to planned, and expected results,
- Work performance reports - representation of work performance information compiled in project documents, intended to generate decisions, actions, or awareness.

Monitor and Control Baselines

- Controlling the baselines utilizes the combined technique of Earned Value.

Scope

Monitor the status of the project and product scope and manage changes to the scope baseline.

- Ensures that all requested changes and recommended corrective or preventive actions go through integrated change control,
- Includes changes to Scope statement, WBS and WBS dictionary, and other baselines affected,
- Uncontrolled changes lead to scope creep .

Predictive

- The approved scope baseline, including the scope statement, the WBS and the WBS dictionary are used to measure the scope,
- Progress is measured against the completion of requirements specified in the scope baseline.

Adaptive

- Scope evolves from the initial product roadmap to user story items in a release backlog and selected by the product owner for the iteration backlog,
- Items on the release backlog are continually reprioritized by the product owner to determine the work the team will address during an iteration,
- Continuous confirmation checks user stories against the definition of done (DoD) and customer feedback to determine completion of product requirements .

Hybrid

- Uses the combination of these approaches, depending on the portion of the scope being planned and delivered using a predictive approach versus that which is using an adaptive approach.

Scope Acceptance and Validation

Customer accepts completed deliverables

- Actual timing of acceptance is often different depending on the approach used,
- Success criteria, determined by the customer (needs and wants) and the team (product requirements) must be in place including:
  - Definition of ready,
  - Definition of done,
  - Iteration/periodic reviews wherein the team and customer inspect the product,
  - Final acceptance criteria,
- Final approval may also be needed to meet organizational requirements for production readiness.

Predictive

- Acceptance criteria for requirements are listed along with each requirement, phase, or project as a whole,
- Organizational requirements must often be met to complete a phase or conform to any production readiness requirements.

Adaptive

- Each user story has an acceptance criteria, often included on the back side of the user story "card."
- Acceptance criteria are measured against the team's DoD,
- The story could be "accepted,"
  - At that time,
  - When a group of related stories have together met the criteria,
  - Again, possibly at the end of the release, just prior to releasing it to the customer.

Control Schedule

Monitor project activities to update project progress and manage changes to the schedule baseline.

- Determines current schedule status and recognizes changes when they occur,
- Analyzes and influences factors that can cause changes to schedule,

- Minimizes risks by taking corrective and preventive actions,
- Changes to schedule require approval from Perform Integrated Change Control process,
- Various ways to track performance across projects according to the delivery schedule determined during planning including:
    - Gantt charts – A visual display of schedule performance over time,
    - Earned value - A measure of work performed expressed in terms of the budget authorized for that work,
    - Quality metrics - A description of a project or product attribute and how to measure it,
    - Variance analysis - A technique for determining the cause and degree of difference between the baseline and the actual performance.
- If necessary to act on the schedule because of measuring performance, three methods are typically used:
    - Adjust the schedule model due to demand and supply of resources,
    - Consider use of smoothing and levelling techniques,
    - Utilize schedule compression techniques including fast-tracking and crashing.

Predictive

- Schedule tracking is done against the schedule baseline and shown either through a milestone chart or tracking Gantt chart,
- Allows the display of not only the planned duration and dates for a work package or activity, but also the actual progress toward completion,
- May be beneficial to use more of a rolling way and progressive elaboration approach, leaving most of the schedule detail activities until closer to the phase being delivered .

Adaptive

- The schedule is done differently depending on whether time-boxed or continuous flow methods are used,

- The “time frame” against which progress can be measured could be a sprint or iteration using a time-boxed approach or the delivery of individual requests using a continuous flow approach,
- Scope delivery, and acceptance of the work within those time frames determines the progress,
- Important to discuss during the retrospective, result the work especially if not accepted. Might be due to not understanding the user story (not meeting the DoR) or accepting more work than being able to complete (velocity).

Hybrid

- Uses a combination of approaches, depending on the portion of the schedule or time frames being planned and delivered using a predictive approach versus using an adaptive approach.
- Track performance and render visualizations to show work contributions:

Information Radiators

- Visual representations are usually displayed on an information radiator, either in a virtual or physical wall display.

Burndown chart (iteration)

- Shows progress being made towards the work committed to for the iteration,
- Vertical axis shows the number of story points determined by the team during the iteration planning meeting,
- Horizontal axis represents the time periods during the iteration during which the number of story points that have been completed,
- The diagonal line shows the total number of story points, or velocity, agreed upon for the current iteration during the iteration planning meeting, and zero on vertical axis,
- The team creates a trigger point, or agreement for when credit can be taken for completion of story points and therefore displayed as “burned down,”
- As work progresses, the number of story points “completed” in each iteration are noted and connected to visibly show the progress to determine whether the current team velocity is on track, any remaining work needed, and expected completion status.

Burnup Chart (release)

- Displays the number of story points that have been completed or accepted, based on the DoD for each iteration,
- Numbers are accumulated during the release to show the overall value of the release,
- A ”baseline” for the release can be determined after estimating the full value of the release backlog,
- Most agile approaches incorporate the lean principles, decide as late as possible on the stories to be included in each iteration ,
- Estimation of the number of stories points or value included in the release is not determined at the start of the release. (Many stories in the release may not end up being prioritized high enough to be included in the release.)

Task Board

- Enable sharing of understanding and evaluating progress,
- Everyone has visible access to work in progress creating an atmosphere of transparency and information-sharing,
- Tasks boards are based on the agile approach with differences in the detail and number of columns shown on the boards,
- Boards organize the tasks from the user stories or requirements onto “cards” to allow visualization of the work being done,
- Columns and detail tracking needs to be tailored for the project in addition to the stages or iterations displayed on the board,
- Generic methods of visualization can include to-do lists or procedure checklists – or simple versions of the requirements traceability matrix .

Task board - Time-boxed approach

- Can range from a very simple chart to one with more columns to track the progress of individual tasks,
- Basic columns include: To Do; In Progress; and Done .

Task board (Kanban board) - Continuous flow approach

- Kanban boards track the progress of individual requests or requirements from arrival until completion,
- Uses columns, queues, and WIP limits to visualize work using a pull-system with each story’s progress as it moves toward completion,

- Allows analysis of blockages with items in columns or queues for an extended period.

Estimate Velocity

- Useful to estimate how much work a team can complete during a timeboxed iteration, referred to as the velocity of the team,
- May vary at the beginning of a project but should be consistent as additional iterations are completed,
- Velocity is calculated by estimating the number of story points that can be completed during an iteration,
- Will be modified as additional iterations refine the number of story points completed and accepted,
- The goal is to achieve a constant velocity from one iteration to the next,
- Velocity is a unique metric for a project, but it can’t be used to compare one team’s velocity with another team.

Continuous Flow Diagram

- Lead and cycle time and throughput measure progress for individual items, requests, or requirements in continuous flow approaches,
- The Cumulative Flow Diagram (CFD) allows teams to visualize both effort and progress and where impediments have impacted the delivery of results,
- Displays:
    - Lead time – length of time required for an item to goes through the entire process, from arrival to delivery,
    - Cycle time – length of actual time worked on an item, from start to delivery,
    - Throughput – number of items entering or exiting the system at any point in time,
    - WIP – measure of work in progress but not completed at any point in time.

Control Cost

Monitor project status to update the project costs and manage changes to the cost baseline.

- Assists in recognition of variances from plan and implements corrective actions to minimize risk,
- Requires knowledge of actual costs spent to date,
- Brings expected cost overruns within acceptable limits,
- Changes to budget require approval by Perform Integrated Change Control process,
- Analyzes relationship between actual work accomplished to expenditures,
- Ensures that cost expenditures do not exceed authorized funding,
- Budget changes can occur because of a variety of reasons, including:
  - New or changed project requirements,
  - Risks, or changes to risk probability or impact,
  - Changes to cost estimates resulting from economic factors like inflation, procurement contract modifications, resource costs, and so on,
- Remember “time is money” and therefore schedule and cost performance are tied closely together and usually analyzed together.

Earned Value Management (EVM)

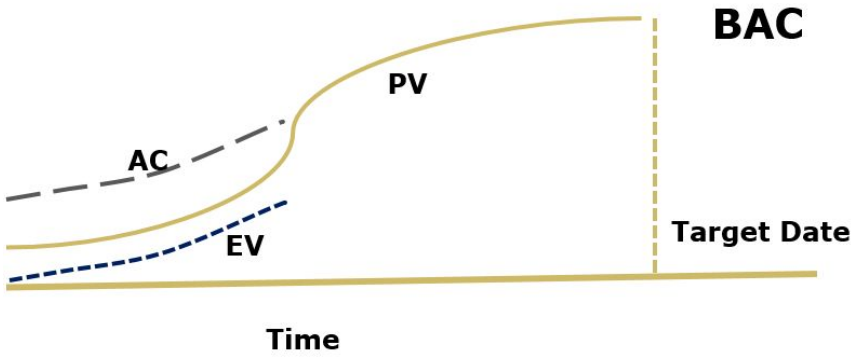
Technique used to measure project progress by comparing actual schedule and cost performance against planned performance as laid out in schedule and cost baselines.

- Historically applied to, and possibly mandated for predictive approaches,
- The original method has been modified slightly for adaptive project usage,
- Combines the analysis of scope completed or “value earned” in comparison to what was planned to be completed at a point in time, and the actual cost needed to earn that value,

- Performance measurement information is identified as part of the subsidiary management plans,
- Each work package and activities are assigned a budget and a schedule,
- Requires understanding of what has been perform and approved, contributing value to the project,
- Progress is captured continuously throughout the project, but usually communicated at a designated reporting time,
- Reporting is often based on planning packages, especially when some work is done internally, and other work performed under a contract.

EVM Factors

- Earned Value (EV) – measure of work performed expressed in terms of budget authorized for the work (what has been achieved, referring to scope),
- Planned Value (PV) – authorized budget assigned to scheduled work during a particular time,
- Actual Cost (AC) – realized cost incurred for the work performed on activity during a specific time,
- In the best case, Earned Value should always be greater than both Planned Value and Actual Cost at any point in time,
- More value should be "earned" than what was planned or scheduled (ahead of schedule), and greater than the actual cost to achieve (under budget).



EVM Measures for Schedule Control

Schedule Variance (SV)

A measure of schedule performance expressed as the difference between the earned value and the planned value.

- Difference between earned value (EV) and planned value (PV):
  - Positive SV is good and indicates the project ahead of schedule,
  - Zero SV indicates project is on schedule,
  - Negative SV is bad and indicates the project is behind schedule.

Schedule Performance Index (SPI)
A measure of schedule efficiency expressed as the ratio of earned value to planned value. (SPI = EV / PV).

- Ratio of earned value (EV) to planned value (PV) that measures schedule efficiency:
  - SPI greater than 1.0 is good and indicates the project ahead of schedule,
  - SPI = 1.0 indicates project is on schedule,
  - SPI less than 1.0 is bad and indicates the project is behind schedule.
- Can be compared to the tolerance identified in the schedule management plan,
- Adjustments may be necessary to get the schedule back on track .

EVM Measures for Cost Control

Cost Variance (CV)
The accumulated amount of budget spent at a given point in time, expressed as the difference between the earned value and the actual cost (CV = EV – AC).

- Difference between earned value (EV) and actual cost (AC):
  - Positive CV is good and indicates project is below budget,
  - Zero CV indicates project is on budget,
  - Negative CV is bad and indicates project is over budget.

Cost Performance Index (CPI)
A measure of budget efficiency expressed as the ratio of earned value to actual cost. (CPI = EV / AC).

- Measures cost efficiency of budgeted resources:

    - CPI greater than 1.0 is good and indicates project ahead of schedule,
    - CPI = 1.0 indicates project is on schedule,
    - CPI less than 1.0 is bad and indicates project behind schedule.
- Can be compared to the tolerance included in the cost management plan.
- Adjustments may be necessary to get the budget back on track.

Additional terms:

- BAC - Budget At Completion – initial budget established for the work to be performed,
- As new baselines are established, they are referred to as the EAC,
- Earned value - EV = BAC x % complete (if not given.)

Performance Measurement Baselines

Performance measurement effort types:

- Discrete – describes the activities that are likely to be planned/measured for all outputs, including Fixed Formula, Percentage Complete, Weighted Milestone, Physical Measurements, etc.,
- Apportioned – describes the work that shares a direct/supporting relationship towards discrete work, testing of PM activities, which are calculated as a percentage of discrete work,
- Level of Effort (LoE) – describes the activities without deliverables, for instance, assigned earned value (scheduled), troubleshooting, and without schedule variance.

Progress factors:

- Variance at Completion (VAC) – difference of budget at completion (BAC) to estimate at completion (EAC).

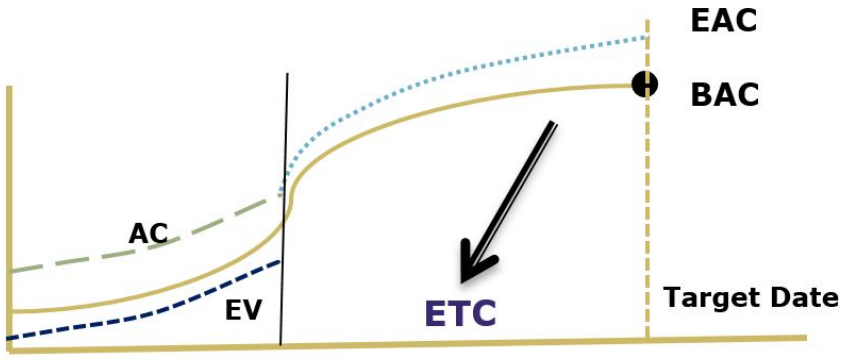
Forecasting:

- Helps determine whether additional analysis, and possibly more funds required for completion,

Estimate to Complete (ETC)

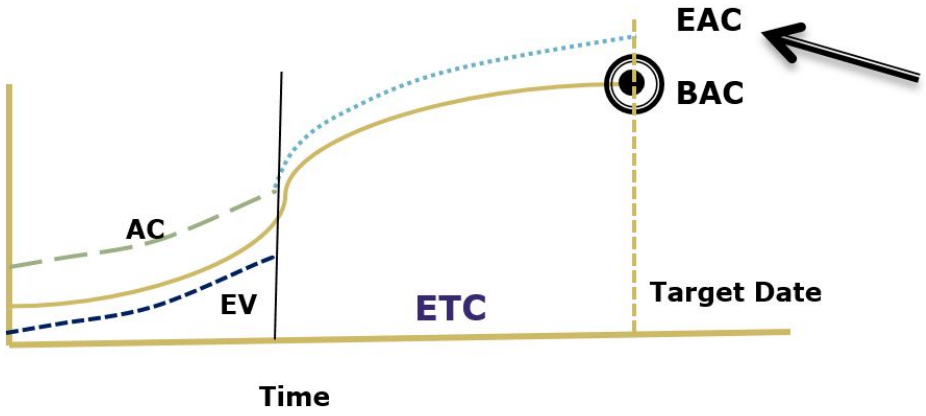
- Based on current work and expenditures if additional money is required “to” complete the project,

- If additional funds are necessary, Estimate at Completion is calculated .



Estimate at Completion (EAC) *– current projected final cost of the project.*

- Based on the current spending efficiency (CPI) and most often calculated as EAC = BAC / CPI, providing minimum amount of funding needed to complete the project .

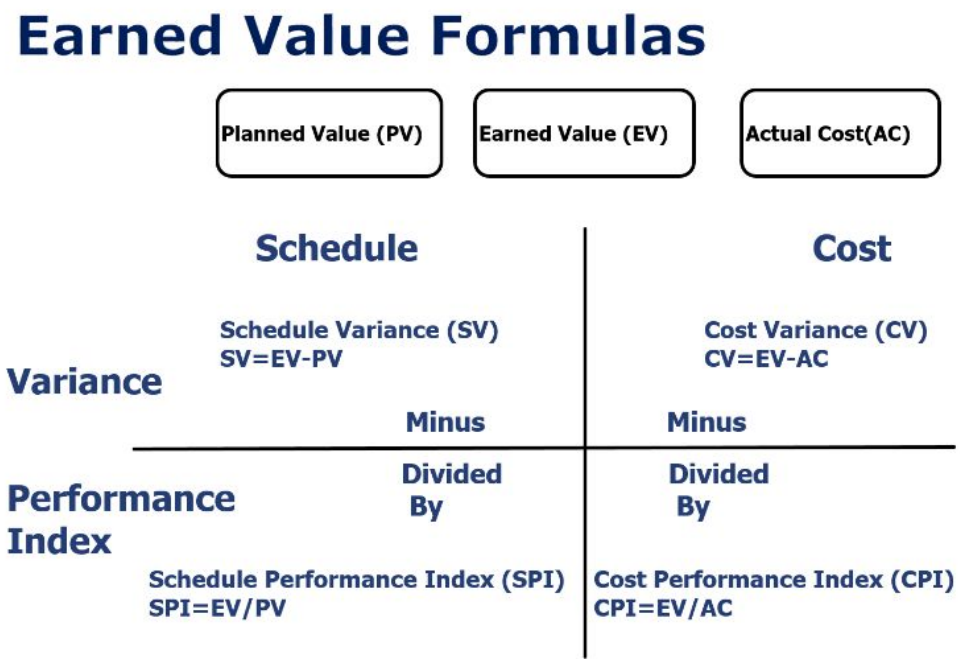


Note: In preparing for the current exam only two formulas are important to remember.

CPI = EV/AC *by remembering CPI and realizing that it includes the cost factor (AC) it is easy to convert it to*
SPI = EV/PV *using the schedule factor (SP).*

EAC = BAC/CPI *which gives the minimum amount needed to meet the completion of the work, based on the <u>current spending rate.</u>*

Earned Value Formulas



Agile Earned Value Management

- Can be used as forward-looking metrics for monitoring and controlling complex and risk projects,
- Performance measures are related to time or schedule,
- Uses comparison of items in the release plan against actual work done,
- Ensures completion of prioritized requirements/user stories within the specified release timeframe,
- A performance measurement baseline (PMB) needs to be established understanding:
  - How many iterations are planned for the release,
  - How many story points identified for the release (provided the method used identifies these at the release level),
  - What is the release budget based on the resources and time (not necessarily based on the number of story points).
- Modifications from predictive approach include:
  - Planned value: the budgetary value for the planned work in an iteration,

    - Earned value: the budgetary value for completed work in an iteration,
    - Actual cost: actual cost incurred to complete an iteration deliverable,
- SPI = ES/AT - Completed features/planned features.
- CPI = EV/AC – Earned value/actual cost.

Physical Resource Management

Ensures that physical resources assigned and allocated to the project are available as planned; monitors the planned versus actual utilization of resources; and performs corrective action as necessary.

- Concerned with physical resources including equipment, materials, facilities, and infrastructure,
- Ensures assigned resources are available right time, right place and right amount and released when no longer needed,
- Ensure physical resources assigned are available as planned,
- Monitors the usage or consumption of materials, supplies, and equipment helping determine if additional resources are needed (referred to as resource allocation) including:
    - What has been used,
    - What is still needed at any point in time,
    - Will a delay be incurred to acquire additional items,
    - Whether in alignment with what was planned,
    - Includes expenditures for the various resources,
    - Reporting on utilization as identified in the project management plan.
- Important to realize when these resources are no longer needed and are released so as not to incur additional expenses,
- Monitors planned vs actual utilization of resources.

Manage Contract Resources

Manage procurement relationships, monitor contract performance, and make changes and corrections as appropriate.

- Both team members and external contractors require a combination of leadership power skills and tailoring for performance measurement,
- Continual monitoring of project suppliers and vendors is needed to make sure contracted work is progressing and whether any changes might impact the budget, but also timeline, quality, or risk,
- Both sellers and buyers are required to ensure that all contractual obligations are met,
- Captures details for early terminations in accordance with termination clause of agreement,
- Organization, contracts, or agreement may require formal progress reports— typically documented in the SOW or agreement,
- If formal reports are not required, continually check with suppliers to ensure work is proceeding as expected, on time, and within cost parameters,
- Contract administration may be separate from project organization,
- Requires monitoring of payments to seller related to work accomplished,
- Need to notify the appropriate financial entity when work has been completed, including the authorization of payment of the final invoice.

Contract Changes and Disputes

- The way in which changes in contracts are usually handled is specified in the contract itself, in addition to the organization and project change process.

Predictive

- Changes to baselines and contract issues must be assessed for impact to approved baselines and approved or rejected by the appropriate change control system.

Adaptive

- Because change is expected using an adaptive approach the deliverables are not specified in the typical agile contracts,
- Changes to the work are determined and prioritized by the product owner .

Evaluate and Monitor Risk

Monitor implementation of agreed-upon response plans, tracking identified risks, identifying, and analyzing new risks and evaluating risk process effectiveness throughout the project.

- As the project proceeds, it is important to continually monitor risks and their triggers,
- Enables project decisions to be based upon current information about overall project risk exposure and individual project risks, including determination:
  - Are project assumptions still valid?
  - Have risks changed or been retired?
  - Are risk management policies and procedures being followed?
  - Have contingency reserves been modified?
- If a risk occurs, the actual implementation of the planned risk response is set in motion ,
- If a risk has occurred, both the initial response chosen, as well as the actual response required should be reviewed,
- Contingency reserve should be reviewed, especially if contingency was required to handle the risk.
- Requires constant reevaluation including:
  - Identification of possible new risks,
  - Risks that have changed based on additional information now being available,
  - Time during which it might have occurred may have passed,
  - Assessing the effectiveness of the chosen risk response.

Predictive

- Identification and specify the risk approach for the project in the subsidiary risk management plan.

Adaptive

- Risk management is incorporated throughout the project with iterative and incremental practices,
- Anticipated risks are identified, and shown on a risk burndown chart at the beginning of a release,

- As the risk is handled or longer presents a risk to the project, it is “burned down”.

Risk audits

- Risks audits may be performed to examine and document the effectiveness of the implemented risk responses,
- Also reviews the complete risk management process and its effectiveness, and how closely the activities follow the initial risk management plan,
- The format should be defined before it is conducted, and if a common activity, included in the subsidiary risk management plan,
- Policies and procedures regarding this risk audit should be part of the OPAs available to the project.

Reserve Analysis

A method used to evaluate the amount of risk on the project and the amount of schedule and budget reserve to determine whether the reserve is sufficient for the remaining risk.

- Often referred to as the contingencies (time or money) identified for individual activities, or work packages and added to the project budget.

Predictive

- Reserve analysis is often done to determine how much if any reserve remains especially after a problem has occurred and contingency has been required to cover the resolution .

Adaptive

- Don’t usually identify contingencies and reserves,
- These situations are handled through the prioritization and estimation of the effort required on individual stories.

Risk Register

- Risks are initially identified at the beginning of a project, release, or iteration, but should be continually addressed,
- The risk register must be updated to include current knowledge and the situation for both newly identified and existing risks,

- Agile teams may use a simplified form of a risk register; sometimes called a risk list or log.

Evaluate and Manage Quality

Monitoring and recording results of executing the quality activities (including testing) to assess performance and recommend necessary changes.

- Ensures project outputs are complete, correct and meet customer expectations,
- Assesses performance and compliance with applicable standards, requirements, regulations, and specifications,
- Relevant to the project approaches and activities,
- Evaluation of the quality of a deliverable and conformance criteria is through inspection and testing,
- Project activities and processes are assessed through reviews and audits, or guidelines provided by a Quality Assurance functional group,
- Quality activities should be incorporated in project work focusing on detection and prevention of errors and defects .

Predictive

- As deliverables are produced, a quality process includes:
  - Reviewing the deliverable and verifying that it meets both functional and nonfunctional requirement,
  - Identifying and suggesting potential improvements,
  - Validating whether the deliverables align with compliance requirements,
  - Providing feedback on any variances identified.
- The project manager is responsible for monitoring QA reports and recommendations to address identified defects or noncompliance issues .

Adaptive

- Built in as part of the process and everyone is responsible,
- The team, customer, and product owner together define quality goals and metrics,

- Feedback from iterations, identified and discussed during retrospectives, is used to continuously monitor quality,
- Methods used to measure quality, include:
  - Service Level Agreements (SLAs),
  - Key Performance Indicators (KPIs),
  - Measures stipulated in contracts,
  - Team's own or adopted framework - Lean Six Sigma,
- Because of the increase in hybrid approaches, these adaptive concepts are often seen in predictive approaches today also.

Hybrid

- Regardless of the terminology and approach, the quality for each requirement or user story must be met to obtain approval for the work completed,
- Predictive projects identify acceptance criteria for each deliverable in the scope statement within the scope baseline,
- Agile projects associate the acceptance criteria with individual stories.

Quality Tools: Predictive

Data gathering tools:

- Checklist/Check sheets,
- Statistical sampling,
- Questionnaires and Surveys .

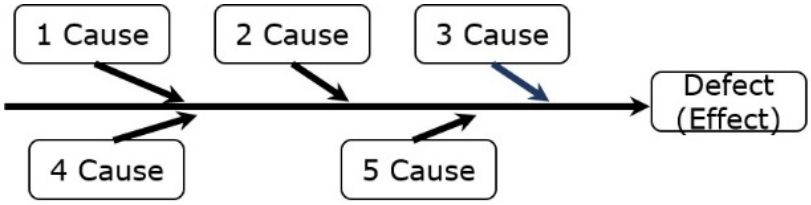
Data analysis techniques:

- Performance reviews,
- Root cause analysis.

Data representation/visualization techniques

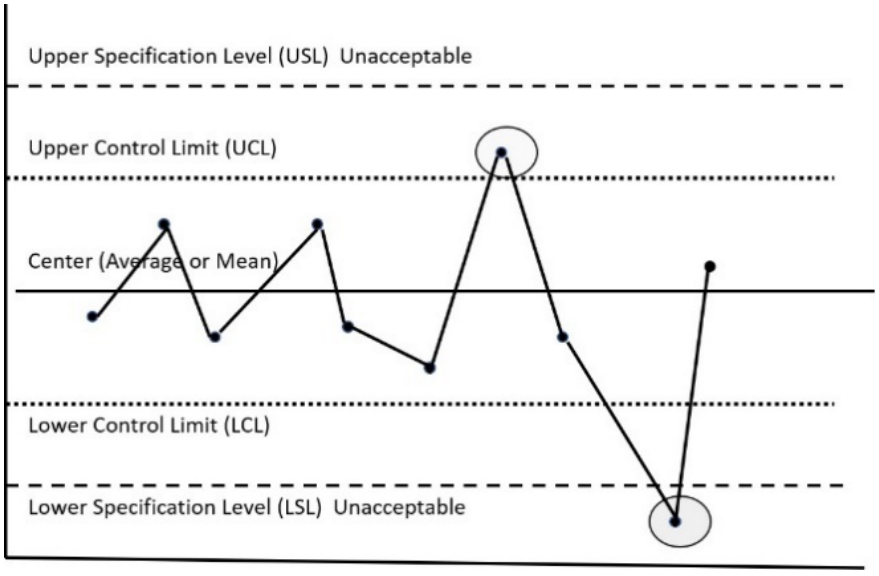
Ishikawa/Fishbone/Cause and Effect

- Used for root cause analysis breaks down the causes of a problem to determine how various factors are linked to determine the root cause of the problem,
- Also, may utilize the agile "5 whys" approach, continually asking why to help determine the root cause.



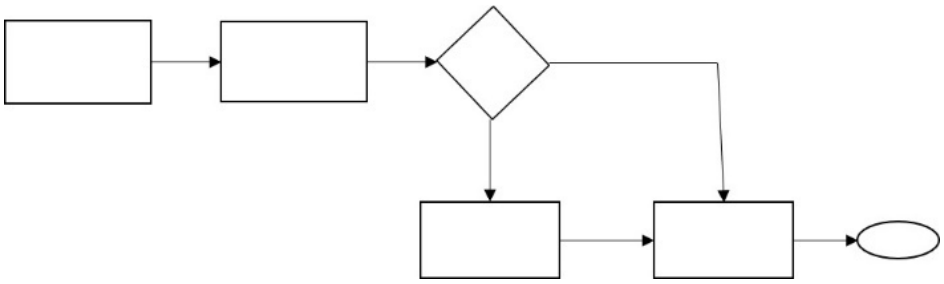
Control Chart

- Plotting of expected variation of data within control and specification limits to determine predictability, behavior, and stability of a process,
- Control limits are three standard deviations on either side of the centerline, reflecting expected variation (99.96% of results),
- Specification limits represent customer requirements greater than the control limits,
- Rule of seven indicates a trend, consecutively increasing or decreasing.



Flowchart

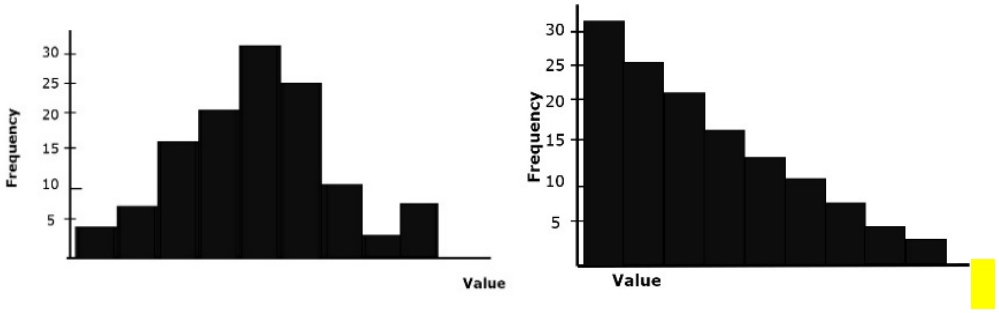
- Mapping of a process with activities, decision points,
- Used to analyze and verify processes, rules, and potential waste.



Histogram/Pareto Chart

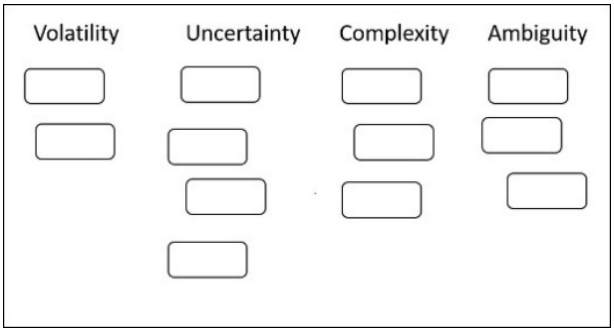
- Vertical bar chart (histogram) showing frequency of various values,
- Pareto principle – 80% of results come from 20% effort or causes,
- Pareto Chart – version of histogram sorted in high to low order (80/20 rule),
- Visually indicates where problems may need further analysis.

Histogram **Pareto Chart**



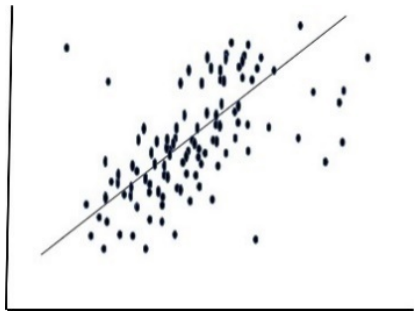
Affinity Diagram

- Allows large numbers of ideas to be classified for review and analysis,
- Grouping of ideas from data gathering sessions.



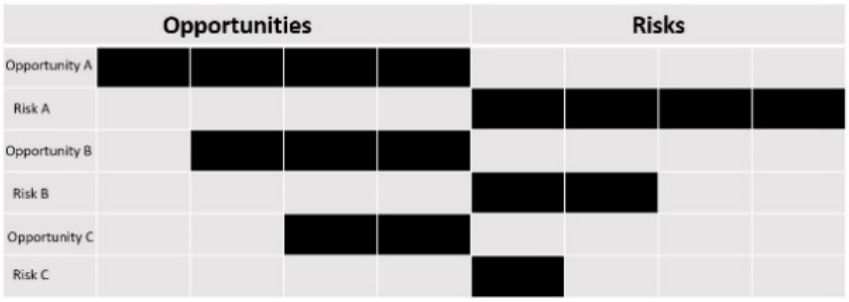
Scatter Diagram/Correlation Chart

- Shows relations between two variables,
- May show relationship between elements of a process and quality defects.



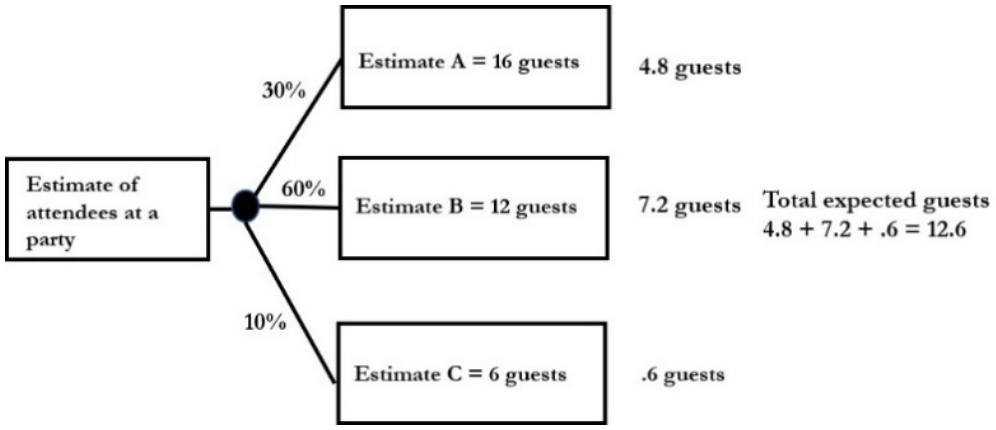
Sensitivity Analysis (Tornado Diagram) - Sorted representation of opportunities and risks

- Shows the relative importance and impact of items with a high degree of uncertainty compared to those relative known and more stable.



Decision Tree Analysis

- Evaluates implications of a chain of multiple options of uncertainty,
- Used to support a judgement as to which is the best choice of two or more courses of action,
- Branches represent decisions or events with associated costs and risks,
- Uses the combination of probability and impact assessment with the probabilities of all paths equal to 100%.



Quality Tools: Adaptive

- Can use the quality tools usually associated with predictive approaches,
- Additional quality evaluation and management activities that are used include:
  - Definition of Done (DoD) – determined by the team to help identify the requirements which must be met to consider something as Done,
  - Acceptance criteria – tied to each user story or requirement to identify what must exist before the requirement is accepted, especially by the product owner or stakeholder.

Quality Audit

A structured, independent process to determine if project activities comply with organizational and project policies, processes, and procedures.

- Improve the quality performance of a project,
- Can be conducted regularly, on a schedule, or in ad hoc fashion,
- The result is usually communicated in the form of a quality report.

Predictive

- Often specified in the quality management subsidiary plan.

- Topics include adherence to:
  - Quality management policy,
  - Collection and use of information (especially confidential or sensitive information),
  - Analytical methods and the results achieved when these methods are used,
  - Cost of quality (both conformance and non-conformance aspects),
  - Quality process design and usage.

Adaptive

- Might be done prior to the release of the product – or during Iteration H.

Hybrid

- Can include continuous review and improvements in adaptive approaches.

Manage Project Changes

- Change is inevitable, but it is rarely insurmountable,
- Strategies, tools, and techniques exist for managing project changes, and depend on life cycle and development approaches,
- A change in a project can come from anywhere, internal to the project, from the organization,
- Something that changes one of the baselines or measures will affect the project.

Predictive

- Approaches control of changes to a project in a methodical way, following an approved change management system including:
  - Use of the integrated change control process and establishment of a change control system,
  - A change request process to review and assess the impact of all requested changes,
  - A change control board, or authorized body, to review and approve or reject changes,
  - Communication of the status and ultimate decision on the change request,
  - Managing changes to deliverables, project documents and the project management plan through artifact management.
- Types of change requests:
  - Corrective action – Adjusts the performance of the project work with the project management plan,
  - Preventive action – Ensures future performance of the project work with the project management plan,
  - Defect repair – Modifies a non-conformance within the project,
  - Scope change – change to baselined scope (within impact to other areas including, schedule, cost, quality, risk, resources, etc.).
- Important to be aware and alert of any of areas including:

    - Inaccurate initial estimates,
    - Specification changes,
    - New regulations,
    - Missed requirements,
    - Confusion from written or visual documents,
- May reduce the chances of missing any requirements, it cannot guarantee that every requirement is captured, and captured correctly,
- A Change Control Board (CCB) handles change requests based on the determination of approval levels of changes which were identified in the Change Management Plan, (which is a part of the Project Management Plan),
- Not ALL change requests must be approved by the CCB.
- The approval level is defined as part of the project management plan in the change management plan.

Adaptive

- Incorporate and expect change to be a part of normal work,
- Modify their processes to handle change continually,
- Controls within the development and feedback cycles are:
    - The product owner role – the key decision maker for changes on the team, focusing on the intended value to the business of a change,
    - Full participation by allowing everyone on the team participation in refining the backlog,
    - Encouragement of feedback by stakeholders, and potentially customers, through participation in demos to ensure the changes work as intended and requirements are understood,
    - Project team considers requested changes and identifies potential solution options, this allows for adaptation, while the feedback is immediately relevant and should improve the quality of the change while reducing overall cost and risk,
    - Iteration or sprints are closed cycles. No changes are allowed during a sprint. Change is managed by the product owner

through the backlog refinement activities.

Changemaker and a Change Leader

- Project management principles address the reality of dynamic and perpetual change including:
  - Be a diligent, respectful, and caring steward,
  - Recognize, evaluate, and respond to system interactions,
  - Navigate complexity,
  - Create a collaborative project team environment,
  - Demonstrate leadership behaviors,
  - Optimize risk responses,
  - Effectively engage with stakeholders,
  - Tailor based on context,
  - Embrace adaptability and resiliency,
  - Focus on value,
  - Build quality into processes and deliverables,
  - Enable change to achieve the envisioned future state.

Monitor the External Business Environment

- Project teams need to operate with an appropriate level of awareness of what's happening outside of the project to handle potential impacts,
- Changes in the business environment most likely will influence the project, including:
  - Cost or availability of goods and resources,
  - Timings in the context of national or cultural holidays and events,
  - Natural disasters.

Manage Contract Changes

- Changes that are associated with contracts are treated somewhat separately,

- Likely to be a shared responsibility with the organization—including procurement, finance and/or a functional department,
- Important to work with the vendor when contract changes are required,
- Escalation may be required to the sponsor and/or legal representation.

Contract Change Control System

- System used to collect, track, adjudicate, and communicate changes to a contract,
- Might be a component of the integrated change control system or a separate system at the organizational level,
- Specific to controlling changes to contracts,
- Specifies the process by which project contract changes can be made, often included in the actual contract terms and conditions,
- Includes documentation, dispute-resolution processes, and approval levels to authorize the changes to contract specifications.

Types of Contract Changes

- Because of the legal aspects of a contract, any changes may require the involvement of other organizational functions, including procurement, finance and/or a functional department,
- Often specifically described in the terms and conditions of each contract, including:
  - Administrative changes are non-substantive and are usually about the way the contract is administered,
  - Contract modification is a substantive change to the contract requirements, requiring extensive time and energy for all parties, including legal involvement, to agree to the modification,
  - Supplemental agreements are addendums to a contract which is negotiated separately, including a work order or MOU that augments a previously agreed-upon master agreement with specifics for deliverables,

    - Constructive changes are made or caused by the buyer through action or inaction and may lead to legal ramifications,
- Termination of contract happens when the vendor defaults or for the customer's convenience and is handled differently depending on who is terminating the agreement and the reason for termination.

Managing Disputes

- When a change leads to a dispute, it is critical to seek legal advice to ensure the terms of the contract are observed,
- Important legal concepts relating to contracts, include:
    - Warranty – This is the promise, explicit or implied, that goods or services will meet a pre-determined standard, The standard may cover reliability, fitness for use, and safety,
    - Waiver - A legally binding provision in which one party in a contract agrees to forfeit a claim without the other party becoming liable, even inadvertently,
    - Breach of Contract - Failure to meet some or all the obligations of a contract, it may result in damages paid to the injured party, litigation, or other ramifications,
    - Cease and Desist Letter - A letter sent to an individual or a business to stop (cease) allegedly illegal activities and to not undertake them again (desist). Often used as a warning of impending legal action if it is ignored.

Claims Administration

- A procedure used to settle contract disputes,
- It includes the processing, adjudicating (deciding) and communicating any claims that are made against the contract.
- These can also be known as claims, disputes, or appeals,
- If these cannot be resolved in a timely manner, they are often referred to and handled through alternative dispute resolution (or ADR).

Alternative dispute resolution (or ADR)

Arbitration and Mediation (ADR) is used for contract disputes and involves escalating to an outside panel, rather than pursuing legal resolution.

Update Project Management Plan With Changes

Predictive

- Baselines and other artifacts that possibly could be impacted by an approved request include:
  - Scope including work packages and individual requirements,
  - Quality metrics and acceptance criteria,
  - Timelines in the project schedule,
  - Team member assignments.

Adaptive

- The product owner, or team, might adjust the delivery of stories by reprioritizing to allow for changes to be incorporated into the backlog.

Manage Project Issues and Impediments

- Risks are not always negative, but if they become project issues, then they need to be acted on and resolved,
- Problem solving combines two different areas for project managers:
  - Addressing and removing obstacles as the team is performing the work,
  - Managing and resolving project issues.

Impediments

Situations, conditions, and actions that slow down or hinder progress.

An obstacle that prevents the team from achieving its objectives. Also known as a blocker[18].

Obstacles

Barriers that are movable, avoidable, or able to be overcome with some effort or strategy.

Blockers

Events or conditions that cause stoppages in the work or any further advancement.

Note: An outcome of the review of materials has been a recommendation to move away from distinguishing among the terms "obstacle," "blocker," and "impediment.". However, as this training and the exam are aligned to the ECO and NOT the PMBOK Guide, and therefore exam questions may continue to be written using the ECO terminologies, then we will continue to "loosely" use the distinctions.

- A critical role for the servant leader is to maximize value delivery by removing impediments progress by team members,
- Agile project teams identify obstacles during the daily standup,
- The scrum master takes these and helps to remove them so the team can continue working,
- Obstacles may be outdated processes, based on the organizational structure,
- Sometimes they are people resistant to change.

- Regardless, all obstacles need to be addressed, often requiring change management concepts including:
  - Determine critical impediments, obstacles, and blockers for the team,
  - Prioritize critical impediments, obstacles, and blockers for the team,
  - Use network to implement solutions to remove impediments, obstacles, and blockers for the team,
  - Reassess continually to ensure impediments, obstacles, and blockers for the team are being addressed.

Issue or Impediment?

- Any hindrance affecting the project team's work reduces productivity and the ability for the project to meet its objectives,
- Any actions taken to address and remove the conditions or causes helps the team and the project produce value,
- Includes considering the physical team space to shield the team from non-value activities.

Issue

A condition that may have an impact on the project objectives.

Impediment

An obstacle that prevents the team from achieving its objectives, also known as a blocker.

- Predictive teams use the term issue log to help identify and track items that have occurred and need resolution,
- Adaptive teams often refer to this same artifact as an impediment log .

Risks and Issues[19]

There is a big difference between risks and issues.

Risks

A risk is generally defined as an event that might impact a project:

- Focus on a future potential event,
- Can be positive or negative,
- Documented in the risk register,
- Response is called a “risk response”.

Issue

An issue is a risk that has happened and has or will impact the project.

- Focus is on the present – it has occurred,
- Will always be negative,
- Documented in the Issue Log,
- Response is called a “workaround”.

Note: This differentiation needs to be understood for the exam.

Issues

- Issues can arise in many processes and project work,
- Most often during monitoring and controlling—or in an agile project, at any moment.
- Areas prone to issues include:
  - Scope change control,
  - Schedule control,
  - Cost control,
  - Project variance analysis,
  - Quality,
  - Risk,
  - Procurement,
  - Communications.

Issue Resolution - Predictive

An issue log is used to record and monitor information on active issues. Issues are assigned to a responsible party for follow up and resolution.

- As issues are discovered, promptly add them to the issue log,

- Assign an owner to each issue who is the point of contact and responsible for tracking the progress of the workaround and reporting back status,
- Provide realistic due dates and make every reasonable attempt to meet them,
- Address open issues at every status meeting and retrospective,
- Limit the number of open issues to a manageable number often using a prioritization factor based on importance or impact,
- Don’t hesitate to escalate an issue to the project sponsor or appropriate stakeholder if it exceeds the threshold of the project manager and/or begins to have a major effect on the project.

Issue Resolution – Adaptive

- Discover and identify a problem,
- Usually raised by the team as an “obstacle” during the daily stand-up meeting,
- Figure out how to solve it,
- May involve gathering and providing additional information from stakeholders or the organization to the team.

Problem Solving

- General adaptive and hybrid approaches take a broader view towards problem-solving including:
  - Track the impediments,
  - Reprioritize product backlog, including postponement for additional understanding,
  - Backlog assessment and refinement can also explore alternatives to overcome or avoid the risk; or in some instances, remove the work item or blockage altogether,
  - Assess the impact on the product backlog, scheduled activities, and other lists of work items in reference to problems,
  - Use daily standup meetings, follow-on brainstorming to help arrive at a solution,
  - Address during retrospectives, especially to review whether the initial solution solved the problem,

- Be a servant leader creating an unobstructed path for the project team so they may contribute and deliver.

Close the Project/Phase

Finalize all activities for the project, phase, or contract.

- Finalizes all activities for project, phase, or contract,
- Closing activities should be part of the “project” requirements and included in the WBS under the project management function,

Predictive

- Uses a closeout process, often including the traceability matrix to ensure all requirements have been completed and approved,
- Gathering lessons learned information,
- Establishes procedures to investigate and document reasons for early termination,
- Organizational resources, including team members, are released,
- Procedures to investigate and document reasons for early termination are performed, if needed,
- Project or phase information is archived.

Adaptive

- Adaptive approach reviews at end of iteration and final acceptance are done prior to release of the product,
- Review complete work at the end of an iteration and obtain final acceptance prior to the “release” the result to the customer,
- The team then continues to the next release.

Hybrid

- Planned work is completed and meets the organizational definition of done (DoD).

Fulfillment Closure

- In adaptive and hybrid projects, “definition of done” may define the required state of completion of individual iterations, or at the final release to the customer.

Predictive approach

A set of conditions that is required to be met before deliverables are accepted.

- Acceptance of the deliverables according to the acceptance criteria often is part of the organization's OPAs, meet the criteria set for quality and compliance in the organization,
- May include partial acceptance as part of the individual demonstrations or review, with final acceptance covering the integration of individual requirements,
- Partial acceptance may also include a milestone "sign-off" or approval,
- The requirements traceability matrix is often key to ensuring that all requirements for specified deliverables have been completed and approved.

Adaptive approach

Definition of Done is the team's checklist of all the criteria required to be met so that a deliverable can be considered ready for customer use.

- At the end of an iteration, the team and stakeholders assess the product/service being demonstrated against the DoD,
- Final acceptance is received prior to the release of the product .

Hybrid approach

- Acceptance of deliverables may include partial acceptance as part of the individual demonstrations or review, with final acceptance covering the integration of individual requirements.

Forced Closure (Premature)

- Closing activities must be completed whether the project comes to a successful conclusion or closed for other reasons.
- Examples of premature closure include:

Changes in requirements or needs

- Internal change - a change to the business case,
- External change – a legal or regulatory change prohibits continuation,
- Project/deliverable is no longer wanted by the organization.

Impediments encountered

- Financial support has been removed to support the completion of the requirements,

- Cost of the project exceeds the benefits,
- Risks with significant consequences make successful completion impossible.

Transitions

- Effective transition of knowledge and deliverables or products increases the likelihood that the result will be successfully adopted,
- Additional activities are usually required to transition the result to the customer or end-user,
- Includes knowledge transfer through training, or documentation, as well as any data conversion or procedure updates that might be required,
- These are identified as transition requirements early in the project,
- Important to identify and schedule the work needed to meet the transition requirements,
- Often includes a sustainment plan to identify the requirements needed to deliver the benefits realization.

Predictive

- May create a transition plan or rollout plan, in addition to a sustainment plan,
- Especially important when a substantial change is being made to the organization,
- Not listed as a subsidiary plan of the project management plan but supports any transition requirements,
- Usually, the responsibility of a business analysis or domain SME.

Adaptive

- The output from every iteration is handed over to the product owner,
- Integrated into the functionality that is delivered to the customers as part of the release.

Hybrid

- Create a solution that delivers value either iteratively or in an incremental way to the organization.

Transition/Handover Readiness

- Before transitioning the project result to the customer, they must be ready to receive it,
- All parties need to be “ready” including not only the end users, the business, but also the support staff,
- Releasing, delivering, and deploying the project’s work into an environment that is not ready may diminish or negate its value – including the organization’s acceptance of changes,
- Verify customer readiness before beginning the final transition or closing,
- Especially important when an existing product or service is being upgraded,
- Successful adoption impacts the ability to provide the expected benefits realization,
- Final readiness check is often defined as part of the OPAs as a final phase gate and may be reviewed and approved through a Go/No Go decision or final production approval meeting.

Transition/Handover Activities

- Training on the new or updated product or service,
- Documentation regarding the new or updated product or service, including updated policies and procedures,
- Potential data conversion from old systems to the new system,
- Effective communication regarding the change and potential impact to the organization,
- Post-implementation support, either internally or by an outside support team.

Finalizing Contracts

- Contract documentation is archived, often based on OPAs or organizational requirements,
- Includes collecting, indexing, and filing several items to ensure easy access in the future if there is a requirement to refer to them,
- Closure of any contract should be done whenever the work is completed, not just at the end of the project,
- Contract artifacts often include:
    - Contract schedule, both planned and actual,
    - Scope requirements and deliverables,

- Quality metrics and results,
- Cost performance, both planned and actual,
- Contract change documentation, including approval signatures,
- Payment records and financial documents, including approved invoices,
- Inspection results,
- Additional documents, manuals including “as-built” or “as-developed,” and technical documents as needed for support.

Paying and Closing Contracts

- Project contracts must be closed before the project can be closed,
- Includes ensuring that the work under the contract has been successfully completed,
- All invoices must be received, and payments must be completed before Accounts Payable can close out the contracts or accounts.

Benefit Realization

Value is delivered when the customer organization can use, or realize, the requested benefits of a project.

- Preferred method is for projects to deliver benefits early through the identification of incremental outcomes,
- Some projects are only able to deliver the benefits when they are finished.

Early and Long-Term Benefits Realization

- Adaptive life cycles are designed to deliver incremental value as soon as possible,
- May be years after a predictive project closes for benefits to be realized and value delivered,
- Depending on the nature of the work, the type of project, and the desired outcomes.

Benefits Transition and Sustainment

Benefit Management Plan is an artifact developed prior to the project, used as part of the business case, and which is reviewed periodically by a project professional to verify benefit delivery.

- The value expected to be delivered at the end of the project is described in the benefits management plan,
- Specifies the time frame for when both short- and long-term benefits will be realized,
- Also often includes the assumptions, constraints and risks that might prevent the project from achieving the benefits,
- Often used initially to authorize the project by examining the requested benefits and determine if both the tangible and/or intangible business value can be realized from the project effort.

Predictive

- Any ongoing activities beyond the project or iteration related to the delivered product or service are carried out by the receiving organization, or a support organization,
- This ensures continued benefits are delivered by the project .

Adaptive

- Improvements identified for work not included in the current release are placed on the backlog,
- They are then reprioritized for the next or future iterations or releases.

Hybrid

- Mixture of approaches, tailored to ensure efficient and effective delivery of benefits,
- Includes planning for continued benefits creation.

DevOps

A collection of practices for creating a smooth flow of delivery by improving collaboration between development and operations staff.

- Support staff is often referred today as DevOps,
- May be present regardless of the project approach being used.

Benefits Owner

- Benefit owner is identified and has responsibility for ensuring the achievement of the benefits are realized,
- Ensure that the benefits are realized through the development of the sustainment plan,
- Assists in the transition of the benefits to the receiving organization,
- Ensures that the benefit measures and metrics identified in the sustainment plan are established and followed,
- Provides reports to organizational management on the value and realization of delivered benefits,
- Work begins as soon as the benefits are delivered and continues after the project—often for many years.

Predictive - Benefits owner may be a business analyst, sponsor, or operations manager.

Adaptive – Product owner is responsible for ensuring that the project work provides benefits for the organization through continual reprioritization of requirements/stories.

Verification of Benefits Realization

- In hybrid and adaptive projects, product owners or project managers facilitate frequent reporting on benefits realization,

including:

- Tangible benefits – progress made toward realization of the identified benefit,
- Intangible benefits – qualitative or subjective determination of realization of benefit,
- Benefits at risk of not being met as planned,
- Negative impact on strategic objectives is not met,
- Potential cancellation or end for project team support.

Knowledge Transfer

- Knowledge transfer occurs during the project between team members and stakeholders,
- Repeated at the end of the project with the receiving organization,
- Becomes an asset to the organization and future projects as part of the historical project information,
- Includes:
  - Archiving of project artifacts per the OPAs,
  - Consolidating the individual lessons learned captured throughout the project,
  - Adding to the organization's lessons learned repository.

Knowledge Management During Closing

- Knowledge transfer consists of connecting individuals, in person or virtually, to share tacit knowledge and collaborate,
- Consolidated at the end to provide historical information for future projects,
- This should be a time to praise, celebrate and motivate the team on a job well done,
- Though celebratory, real work of knowledge capture and reflection is encouraged at these final meetings,
- Activities that are traditionally done as part of project closure include:
  - Final retrospectives to discuss the overall lessons learned from the project,
  - Archival of all project information to be part of the organization's historical knowledge,
  - Finalization of the lessons learned registers compiled during the project,
  - Incorporation of the lessons learned to the knowledge management/lessons learned repository,

- Transition any required knowledge from the project team to the organization including technical documentation, updated policies and procedures and any required skills training.

Final Project Retrospective

- More structured retrospective, reviewing previous retrospective results and lessons learned register,
- Led by an external facilitator to enable all team members and key stakeholders to participate,
- Usually a more formal, and lengthier review than those held continuously throughout the project.

Predictive

- Scheduled at the end of the phase or the project,
- A final “all-hands” meeting at the end of a phase or the project,
- An opportunity to debrief and find ways to improve performance and participation for the next phase or project.

Adaptive

- Schedule at the end of a releases,
- Final meeting just prior to release of the product, looking back on all the improvements and challenges made.

Consolidate Lessons Learned

Lessons-learned register - A project document used to record knowledge gained during a project. The knowledge attained can be used in the current project and entered into the lessons-learned repository for subsequent use.

Lessons-learned repository - A central store of historical lessons learned information from various projects across jurisdictions.

- Lessons learned are valuable knowledge assets for an organization,
- Important to be thorough and conscientious in the approach to reviewing and finalizing these documents,
- The purpose of the lessons learned is to archive and share knowledge with the organization and future project teams.
- These types of lessons learned focus on:
    - Developing recommendations,

    - Reviewing recommendations with other managers in other departments,
    - Developing implementation plans,
    - Implementing those plans,
    - Typical topics covered in lessons learned include:
- Scheduling - Include any relevant scheduling problems or issues, and strategies implemented to deal with schedule or resource constraints,
- Conflict management - Include any issues including documentation of the nature and source of the conflict, the impact the conflict had on the project, and how management intervened in response to the conflict,
- Customers and vendors - If a vendor or customer is excessively litigious or unreasonable to work with, that information should be conveyed to the sales and legal departments and documented in the lessons learned repository. If the customer or vendor experience is positive, then capture the potential for future sales or working together,
- Strategic – These typically affect the organization's project management methodology or significantly improve a template, form, or process and whether the reuse of this project's artifact help a team get more done with the same resources and deliver work sooner,
- Tactical – If this type of project is under consideration again, what should be stopped, started, and/or continued so it can be executed flawlessly?

Final Report

Final report: A summary of the project's information on performance, scope, schedule, quality, cost, and risks.

Predictive

- Closing activities for predictive projects are usually documented as part of the OPAs and the project management plan.

Adaptive

- Completed at the end of a release including:

- Finalizing all project, phase, or contract activities,
- Archiving all required information,
- Gathering lessons learned information,
- Documenting any reasons for early termination of the project, if necessary,
- Reviewing any outstanding work packages,
- Change requests and potential risks,
- Releasing project resources, including personnel, equipment, funding,
- The information from the project's lessons learned registers included in the final report often includes:
    - Scope changes – major impact based on scope changes and the source and handling of those changes,
    - Schedule impacts – relevant scheduling problems or issues and how these were dealt with, especially as concerned resource constraints,
    - Risks and issues – issues that arose, including those within the team or between the team and customers. Include documentation of the nature and source of the issue and the impact on the project. Note whether issues had been previously identified as a risk. Capture notes about whether the proper reserves were identified, and whether they were needed,
    - Stakeholder relationships - Make a note of significant stakeholder relationships, including preferences, specialties, or anything unique to their interaction,
    - Vendor relationships - If a vendor or customer is excessively litigious or unreasonable to work with, that information should be conveyed to the sales and legal departments and documented in the lessons learned repository. If the customer or vendor experience is positive, then capture the potential for future sales or working together,

- Artifacts – Identification of any project's artifacts that should become part of the OPAs or templates to get more done with the same resources and deliver work sooner,
- Recommendations - Focus on developing recommendations, reviewing recommendations with others, developing appropriate implementation plans, and implementing those plans.

Framework

The framework that is shown on the following pages shows five (5) process groups, ten (10) knowledge areas, and many processes.

These processes may be done one-time, continually, or as needed during the project work. There is no expectation that processes as conducted sequentially as shown in this framework – either by Process Group, or by Knowledge Areas – but related based on the output of a process and the inclusion of that output as an input in other processes.

It is important to understand the purpose of processes, the key outputs created and then determine when, and to what level of detail they should be performed .

Process Groups

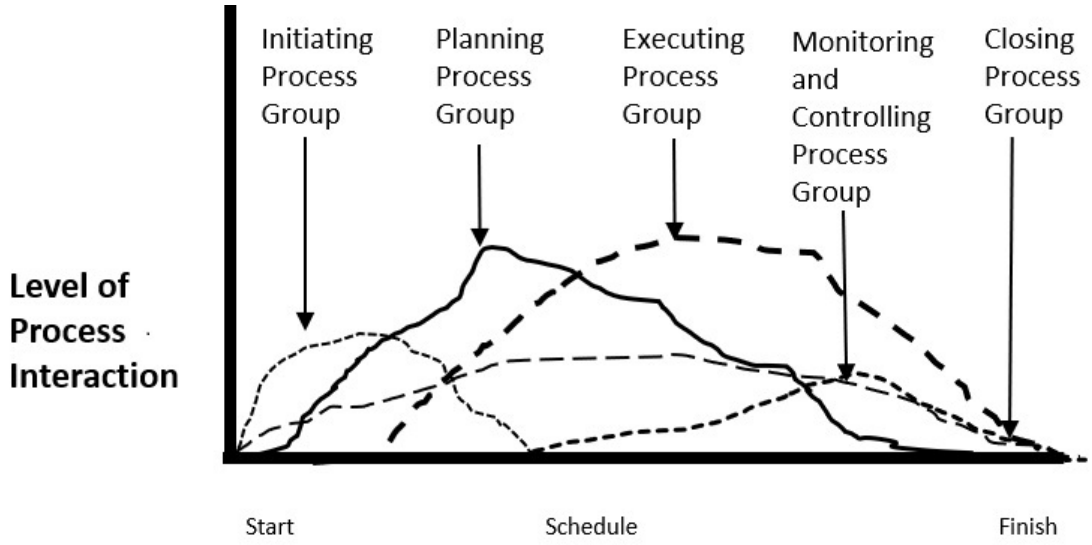
Logical grouping of project management activities, deliverables and various tools and techniques. The Project Management Process Groups include initiating processes, planning processes, monitoring and controlling processes, and closing processes. [20]

- Basic nature of projects: Start, Work, End
- Names are nouns ending in “ing”

Process Group	Purpose
Initiating	Authorizes start of new project or phase
Planning	Plans project activities and establishes baselines
Executing	Perform the work planned
Monitoring & Controlling	Tracks, reviews, and regulates process and

	performance and administers change control
Closing	Complete or close project or phase

There are NOT phases of a development lifecycle.



- All processes overlap,
- Initiating starts at the beginning and usually is complete at the end of planning,
- Planning starts almost immediately and continues almost to the end,
- Re-planning must be done when change requests are approved.
- Executing starts shortly after project initiation and winds down as deliverables are completed,
- Monitoring and Controlling goes throughout the project with more emphasis during the middle portion of the project,
- Closing starts as soon as the first contract is completed, or the first deliverable is accepted and goes until the project is done.

Project Management Knowledge Areas

An identified area of project management defined by its knowledge requirements and described in terms of its component processes, practices, inputs, outputs, tools, and techniques.

Project Integration Management

Processes and activities needed to identify, define, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.

Process	Key Deliverables
Develop Project Charter	Project Charter Assumption Log
Develop Project Management Plan	Project Management Plan
Direct and Manage Project Work	Deliverables Work Performance Data
Manage Project Knowledge	Lessons Learned Repository
Monitor and Control Project Work	Work Performance Reports
Perform Integrated Change Control	Approved Change Requests Change Log
Close Project or Phase	Final Product, Service, or Result Final Report

Project Scope Management

Ensure that the project includes all the work required, and only the work required, to complete the project successfully.

Process	Key Deliverables
Plan Scope Management	Scope Management Plan

	Requirements Management Plan
Collect Requirements	Requirements Documentation Requirements Traceability Matrix
Define Scope	Project Scope Statement
Create WBS	Work Breakdown Statement Scope Baseline
Validate Scope	Accepted Deliverables
Control Scope	Work Performance Information

Project Schedule Management

Manage the timely completion of the project.

Process	Key Deliverables
Plan Schedule Management	Schedule Management Plan
Identify Activities	List of Activities, Activity Attributes
Sequence Activities	Project Schedule Network Diagram
Estimate Activity Duration	Activity Duration Estimates, Basis of Estimates
Develop Project Schedule	Project Schedule Schedule Baseline
Control Schedule	Work Performance Information Schedule Forecasts

Project Cost Management

Planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget.

Process	Key Deliverables
Plan Cost Management	Cost Management Plan

Estimate Cost	Cost Estimates, Basis of Estimates
Determine Budget	Cost Baseline
Control Costs	Cost Forecasts

Project Quality Management

Incorporates the organization's quality policy regarding planning, managing, and controlling project and product quality requirements, to meet stakeholder's expectations.

Process	Key Deliverables
Plan Quality Management	Quality Management Plan Quality Metrics
Manage Quality	Test and Evaluation Documents
Control Quality	Quality Control Measurements Verified Deliverables

Project Resource Management

Identify and acquire the resources needed for the successful completion of the project.

Process	Key Deliverables
Plan Resource Management	Resource Management Plan Team Charter
Estimate Activity Resources	Resource Requirements Resource Breakdown Structure
Acquire Resources	Physical Resource Assignments Project Team Assignments Resource Calendars
Develop Team	Team Performance Assessments

Manage Team	
Control Resources	Work Performance Information

Project Communications Management

Timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and ultimate disposition of project information.

Process	Key Deliverables
Plan Communications Management	Communications Management Plan
Manage Communications	Project Communications
Monitor Communications	Work Performance Information

Project Risk Management

Risk management planning, identification, analysis, response planning, response implementation and controlling risk on a project.

Process	Key Deliverables
Plan Risk Management	Risk Management Plan
Identify Risks	Risk Register Risk Report
Perform Qualitative Risk Assessment	Probability Impact Matrix
Perform Quantitative Risk Assessment	
Plan Risk Responses	Risk Responses
Implement Risk Responses	
Monitor Risks	

Project Procurement Management

Purchase or acquire products, services, or results needed from outside the project team.

Process	Key Deliverable

Plan Procurement Management	Procurement Management Plan Procurement Strategy Bid Documents Source Selection Criteria Statement of Work (SOW)
Conduct Procurements	Selected Sellers Agreements
Control Procurements	Closed Procurements Work Performance Information

Project Stakeholder Management

Identify people, groups, organizations impacted by the project that could impact, or be impacted by the project,
Analyze stakeholder expectations and their impact on the project,
Develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

Process	Key Deliverables
Identify Stakeholders	Stakeholder Register
Develop Stakeholder Engagement Plan	Stakeholder Engagement Assessment Matrix
Manage Stakeholder Engagement	
Monitor Stakeholder Engagement	

Project Management Processes

A Systematic series of activities directed towards causing a result such that one or more inputs will be acted upon to create one or more outputs.

- The selection of processes, and the extent to which they are applied by a specific project should be based on the needs of the project along with any organizational policies, procedures, or governance requirements,
- Processes can be used once or at predefined points in the project; performed periodically as needed; or performed continuously throughout the project.

Agile Basics

Agile is a mindset defined by values, principles and manifested through many different practices based on specific needs.

Key Concepts

- Early and continuous delivery,
- Welcome changing requirements,
- Maximize work not done,
- Collaborative work environment,
- Motivated, self-organizing individuals,
- Transparency and open communications,
- Continual improvement process, product, and people.

Frameworks

- All frameworks focus on continuous improvement; delivery of value; respect for people; minimize waste; being transparent and adapting to change.

Lean

- Originated in manufacturing,
- Key principles include deciding as late as possible; moving closer to the customer; shorter cycles; eliminating waste; empowering team; building integrity; amplify learning; see the whole.

Scrum

- Utilizes iterative and incremental approach for software development where planning is difficult,
- Highly iterative with short, repeating cycles,
- Ceremonies include sprint planning meeting; daily scrum; sprint review; and sprint retrospective,
- Artifacts include product backlog; release backlog; sprint backlog; user stories; tasks; burndown charts; task board.

Extreme Programming (XP)

- Developer-centric methodology for software development,
- Practices include team and customer joint involvement; pair-programming, test-first programming, (continual improvement of design); planning on weekly and quarterly cycle; continuous integration and incremental deployment.

Kanban

- Origin in manufacturing for visual process management system for scheduling inventory control and replenishment,
- Continuous flow of work with emphasis on just-in-time delivery,
- Utilizes visible status of process with Kanban board and work-in-progress limits.

Disciplined Agile (DA)

- Process decision framework that puts individuals first and offers only lightweight guidance to help teams optimize their processes,
- Learning-oriented hybrid agile approach, utilizing lean and agile techniques, for IT solution delivery,
- Has a risk-value delivery lifecycle, is goal-drive, is enterprise aware, and is scalable.

Additional Systems Development Approaches

- DSDM (Dynamic Systems Development Methodology)
- FDD (Feature Driven Development)
- TDD (Test/Acceptance Test Driven Development/Business-Driven Development)

Agile Planning

Levels of Planning

- Progressive elaboration – details “progressively” emerge as more information is known,
- Rolling wave – planning is done as move closer to implementation.

Strategic

- Selecting,
- Initiating.

Visioning

- Chartering – identifies vision and minimum viable product (MVP),
- Roadmap – identifies release timeframes features and themes,
- Product backlog – combined list of potential requirements written in user story format,
- Iteration zero (establishes environment for first iteration – like construction staging).

Release planning

- Provides a summary timeline of scheduled releases (3-6 months) based on the product roadmap and vision,
- Determines the number of iterations or sprints in a release,
- Empowers the product owner and team to determine how often to deliver a “releasable” product,
- Timeline defines which feature(s) will be available at the end of each release or iteration,
- Features (add value) or epics (large user stories),
- Story map to prioritize and sequence features and associate user stories,
- Release backlog – selected from product backlog for upcoming release.

Iteration planning

- Iteration backlog – prioritized stories from release backlog for upcoming iteration,
- Minimal marketable features (MMF) – smallest set of functionality of value,

- User stories tasks.

Backlogs

- List of requirements, usually written in user story format,
- Additional stories and detail added as timeframe approaches for delivery.

DEEP

- **D**etailed appropriately,
- **E**stimable,
- **E**mergent (not static),
- **P**rioritized.

Backlogs

- **Product backlog** – initial set of identified requirements of user stories,
- **Release backlog** – selected stories from the product backlog to be included in upcoming release,
- **Iteration backlog** – prioritized stories from release backlog to be included in upcoming release.

Backlog refinement/grooming

- Initial user stories are often not well defined,
- Splits epic user stories,
- Creates new user stories because of newly discovered needs,
- Removes or marks user stories no longer relevant,
- Updates the items in the backlog,
- Improves value of user story.

Agile Artifacts

Burndown charts

- Visual graphic displays presented in a simple format, may be part of an “information radiator,”

Burndown chart

- Shows the amount of work remaining, usually within an iteration,
- Used to analyze variance to ideal burndown of work committed to during planning,
- The diagonal line is ideal burndown against which daily actual remaining is charted.

Burnup chart

- Shows the amount of work completed, usually within a release.

Ground rules

- Rules that are developed, applied to, and are enforced by all team members.

Minimal Marketable Feature (MMF)

- Smallest deliverable that can add value to users.

Minimal Viable Product (MVP)

- Fewest number of features that would provide value to a customer.

Personas

- Representation of stakeholders for a user story to help identify additional information and processes that may be required.

Product roadmap

- Expands the long-term vision of the product by identifying themes, various features, and release timeframes,
- Utilizes rolling wave planning and progressive elaboration.

Sizing

- Estimating a function or user story based on the effort required.
- May include relative prioritizing, affinity estimating, wideband Delphi estimating, story points and planning poker techniques.

Story points

- Method of estimating effort required to deliver user story,
- Often uses planning poker technique with values based on Fibonacci sequences.

Refactoring

- Improvement of a product or portion of a product without changing the functionality.

Retrospective

- Allows team to learn, improve, adapt and be more effective by reviewing work effort, like lessons learned, continually throughout the project, rather than waiting until the end of the project.

User stories

- Short textual description of initial requirements, often placed on index cards using user story format,
- Format: “As a Stakeholder”; what needs to be accomplished (goal); benefit to stakeholder (motivation),
- Three C’s: Card (sizing); Conversation (details); Confirmation (acceptance criteria).
- INVEST
  - **I**ndependent of all others,
  - **N**egotiable – not specific,
  - **V**aluable,
  - **E**stimable to an appropriate approximation,
  - **S**mall – to fit within an iteration,
  - **T**estable.

Velocity

- The amount of work that a team can complete during an iteration, usually measured by story points. The team strives to maintain a consistent velocity by estimating the effort of the work that can be delivered.

- For more information on the basic concepts of Agile, please visit our Introduction to Agile course on www.facilitatedmethods.com.

How to Answer Exam Questions

- If you prepare and study the material in a course and this guide, and practice PMI-supplied test questions in test banks and simulators, you will pass the exam,
- The PMP exam consists of 180 questions with 5 of those questions as unscored practice questions. That leaves 175 questions that count toward your score,
- You have 230 minutes or 3 hours and 50 minutes to finish the exam. So, there is plenty of time to answer all the questions on the exam,
- There are two 10-minutes optional breaks scheduled: the first break after 60 questions, second break after another 60 questions, then the remaining 60 questions before finishing the exam,
- Answer every question in each section before requesting the break. Be sure to click the button to indicate to the proctor when taking a break and when returning.

Exam Domains

- The Exam Content Outline (ECO) lists three domains and the percentage of questions based upon each domain.

Power Skills - People (42% of the questions)

- This domain includes various topics related to interpersonal skills, “soft” skills, or power skills from the PMI® Talent Triangle including building and leading teams, interacting with stakeholders, supporting teams, managing conflict, and more.

Ways of Working - Process (50% of the questions)

- This domain from the PMI Talent Triangle® covers the traditional “technical” project management activities such as planning and managing scope, schedule, resources, budget, communication, risk, quality, stakeholders, and procurement.

Business Acumen - Business Environment (8% of the questions)

- This domain focuses on topics including organizational strategy, project compliance and regulations, benefits, organizational

change, and external influenced, the knowledge of which is needed to deliver successful projects.

Heuristics – Rule of Thumb

- These helpful hints are heuristics - or a rule of thumb that works most of the time but not all the time, but many students have found them very useful.
- Organizations have a certain philosophy or a way of working so you need to consider when answering questions and not the way you have worked,
- Some assumptions about organizations included in exam questions:
  - Organizations use multiple project management techniques in their way of working on projects,
  - No two projects, approaches (predictive, adaptive or hybrid), or teams use the same techniques. They can vary quite a bit depending on the organization,
  - There is a repository of knowledge that is available to every project manager so always consider this previous experience of the organization when answering questions,
  - Forget how you managed projects in the past, especially the terminology and procedures you used in your organization.
- You need to understand how PMI® thinks about projects. Their underlying philosophy is that you are managing an organization that has a well-established PMO, with governance and project management processes and templates in place referred to as Organizational Process Assets or OPA's,
- There is also an assumption that you will have historical information from previous project efforts available to you when you start a project. When you finish the project, you will in turn add your project documentation to that historical database,
- Remember that the various publications and guidelines from PMI® and other sources can help you determine the activities that best fit your project. The exam is NOT based on the PMBOK® Guide (either 6th or 7th edition). There is no single rigid methodology by any means,

- To pass the exam, you will need to answer the questions based on PMI's project management philosophy and mindset,
- This may not be in total agreement with the way you currently manage projects, but for the exam you must put on your "PMI® hat",
- What often throws people off is incorrectly thinking the PMBOK® is a standard, not a regulation to be followed,
- It was developed by project managers all over the world and contains a body of knowledge for project management, so it works on some projects, sometimes on some types of pf project, and not on most projects, most of the time across many types of projects,
- The PMBOK® Guide provides excellent guidance for project managers applying good project management practices within predictive, adaptive/agile or hybrid environments.

Types of Questions

- The questions are based upon project management situations that require you to select the best or most correct answer,
- There are several types of questions:
  - Multi-choice, (where you select 1 answer),
  - Multi-response (where you choose 2, 3 or 4 answers, You need to select all answers to get the questions correct or else it is scored as wrong),
  - There are a few True/False questions,
  - One or two fill in the blank questions,
  - 1 or 2 matching items (Where you will drag items on the right of the screen to items on the left of the screen),
  - And a few hot spot questions (Where you move an item to an area on the screen or simply click on the correct position on a chart or diagram on the screen),
- Math questions have been changed to interpret the answer rather than needing to memorize formulas to determine the correct answer,
- You can often select the correct answer without having to calculate a specific number,

- For earned value questions, compare the figures in the question to determine if a project is:
  - Behind schedule and over budget,
  - Ahead of schedule and over budget,
  - Behind schedule and under budget,
  - Ahead of schedule and under budget.

Level of Difficulty Questions

- Some people think that all the questions on the exam are difficult or tricky. That's not true,
- Easy Questions: About 30% of the questions are straight forward and easy to answer. (You will probably get 85-90% of these questions correct),
- Moderate Questions: About 40% of the questions are moderate, and you can eliminate 2 of the answers. (You will probably get 65-70% of the answers correct),
  - For moderate level of difficulty of questions, you will usually see that you can strike through two of the answers giving a 40-50% chance depending upon the number of answers,
  - Read the question again to see which answer best fits the question by comparing the differences to determine which one is the best answer for the question,
  - Look for keywords to answer the question. Remember that many of the questions look like they contain two correct answers, but you are looking for the most correct answer based upon the keywords of the question or regarding the project management situation the question is describing,
- Difficult Questions: About 30% of the questions are difficult to answer. (You will probably get 55-60% of these answers correct),
- When answering questions, try to determine if the situation refers to before or at the start of a project, the planning of the project, performing the activities or work of the project, controlling the scope, schedule, cost, etc. or completing a phase or closing a project,

- Next, consider what is the subject matter the question is referring to. This will lead to the activity that the question is referring to and perhaps what should be considered next,
- If the situation question is referring to scope, then the answer(s) should be related to project scope,
- You will probably see answers that are related to schedule, cost, or risks, etc. that you can eliminate,
- The questions will usually ask what you will do next or first.

Avoid Extreme Words

- When you see these words in the answers such as:
  All, Always, Never, Only, None,
  Exam Tip: This hints that they are not the correct answer.

Example Question*:*

The *PMBOK® Guide is the standard for:*

A. Managing all projects all the time across all industries.
B. Managing all projects all the time across some types of industries.
C. Managing most projects most of the time across many types of industries.
D**.** Managing some projects some of the time across some types of industries.

Answer:

You see the word: *All* several times in the first two answers, so can eliminate them.

Now compare the words, Most to Some in the last two answers:

C: most projects, most of the time, across many types of industries
would be harder to accomplish than answer in,
D: some projects, some of the time across some types of industries.
The last answer (D) is the correct answer.

Avoid the word: ALL

- Let's look at another example of avoiding the word ALL in an answer.

Let's look at another question:
Which of the following is the best approach for estimating effort?

A. The project manager estimates **all** the work,
B. A team lead estimates **all** the work,
C. The work is estimated by the people who will be asked to do the work,
   This is considered a best practice,
D. The estimates are inflated to avoid second guessing from the customer.

Answer:
The project manager or a team lead, estimating all the work, is not considered a best practice, even though many project managers in the past had to estimate a project by themselves,
INFLATED is an extreme word. *We don't exaggerate the numbers!*
This would be considered an unethical practice,
Therefore, C is the correct answer.

More Suitable Words

- Here is a list of more suitable words that indicate a correct answer,
- When you see words including best, may, least, ensure, update, investigate or advise; they may lead you to a correct answer, but keep in mind that these hints work most of the time but not always,
- You still need to read the question thoroughly.

Look for the Keyword "Ensure" in the Answer

- When you see the word, "Ensure," this is a hint that it is more often or not the correct answer. It is ensuring what the question is all about.
- When you read the other answers, you will see that they don't address answering the question at all, so the word Ensure is a very

helpful hint to getting the correct answer.

- This works when one of the answers contains the word, “Ensure.” This won’t work for questions that contain the word “Ensure” several times in the answers, you need to consider other options.
- You will probably see 5 -7 questions in the exam.

What should you do – First, Next, Best Course of Action Questions?

- Many questions focus on what the project manager should do first or next or following best practice.
- The answer refers to the need to gather or seek out information, analyze the situation before deciding to act. It might require referring to an artifact, such as a project management plan, quality management plan, or change management plan, to determine how the project was originally planned and now needs to be updated to reflect a change, especially based on actual results.

Best Leadership Styles

- Several questions will address the best leadership styles for project managers.
- This includes identifying and engaging all team members and stakeholders throughout the project from beginning to end.
- Project managers need to take ownership of any problem or issues and not pass them off to someone else.
- PMI® believes project managers should be proactive and preventative therefore, doing nothing will not be a correct answer.
- Some of the questions will demonstrate Servant Leadership by putting the team first to address whatever their needs to overcome obstacles.
- Additionally, the project manager exhibits Emotional Intelligence behaviors by recognizing how to behave in difficult situations and collaborate with team members in a constructive and empathetic way.

Best Practices

- Project managers should not only be involved in the creation of the project scope, schedule, budget and quality and risks but be aware of scope creep, schedule slippage, uncontrolled costs, and unidentified risks.
- They should continually review the assumptions, constraints and risks about the project and be aware of any changes to them.
- They should prioritize the quality, governance, compliance, and safety requirements and never skip steps or artifacts to finish sooner.
- They should be proactive rather than reacting to situations, especially risks, and practice transparency, collaboration, and good communication with all team members and stakeholders.

Project Management Terminology

- There is a difference in the naming and terminology of the various project management concepts based on the difference between predictive and adaptive approaches,
- Understanding these differences will help you answer the questions correctly,
- There will be questions about artifacts which refer to documents, deliverables or other work products produced during a project,
- The names of these may be different depending on the approach (predictive, adaptive or hybrid) that is being used.
- The major artifacts are referred to deliverables, and you need to understand their purpose, what they include and how they are used during the project.
- These include project charter, project management plan, scope statement, scope baseline, risk register, issue log, etc.,
- You should also be familiar with the predictive and adaptive techniques that can be used for data gathering, data analysis and data representation,
- This includes understanding the differences between the various techniques.

Soft versus Harsh Approach

- Most organizations such as PMI® recommend the use of a softer approach to people and project activities and not the hard approach when encountering problems,
- If the answer sounds harsh, then it probably isn't the correct answer.

Examples:
When you seem terms such as a waste of time to estimate, team member is not allowed to be assigned to another project, **reprimand** the team member**,** or **ignore** the issue in the answers, then they are not the correct answer to the question.

Questions Based Upon Definitions

- Some of the questions are derived from the definition of an artifact, a person's role in the project or a tool or technique.

Question:
Which statement best describes project stakeholders?

A. *Anyone making money from the project – Maybe part of strategic or project objectives but not for stakeholders,*
B. A customer paying for the project's output – *Partially true but not the definition,*
C. *The organization delivering the project's products - Partially true but not the definition,*
D. *Anyone affected by the project, its outputs, and its operation is derived from the definition you see below from PMI® and it sounds like a PMI® questions.*

Doubt Answers with Unfamiliar Terms

- If a term in the answer is unfamiliar to you or doesn't match terminology presented while studying, then it probably is not a valid answer,
- Some exam tackers may think they missed it during preparation, but the exam creators add these false terms to confuse you or throw you off, so ignore them.

Negative Questions

- You will see a few questions that will have a negative word such as: Not, except, excluding.

Question:
Agile feedback methods include all the following except?

A. Sprint retrospective
B. Reflective improvement
C. **Team performance reviews**
D. Timebox close-out

- Agile feedback methods are Sprint retrospective, Reflective improvement, and Timebox close-out that mean the same thing but are from various agile methods,
- Team performance reviews is a predictive method activity.

Note: You may have a few negative type questions like this, but most of the questions are positive where you will have to select 2, 3 or 4 answers to a question.

Know Agile Terminology

- If you are not familiar or only know 1 agile method such as Scrum, then learn the agile methods and terminology in a course because there are a lot of agile questions on the exam.

Question:
Bringing the entire project team, customer, or product owner onsite to work together is an example of:

A. Team integration *(Pulling everyone together) sounds good but not the correct term,*
B. Active participation *(Getting everyone to participate) also sounds good but not the correct term,*
C**. Co-location *(Correct agile term),***
D. Osmotic communication *(Over hearing conversations) The team is already co-located and is hearing conversations.*

Similar Wording

- When seeing similar words in the answers, read the words carefully to compare them,
- Here is an ethics question:
- PMI® considers the four supporting values of the Code of Ethics that are most important are:
  - **A. Responsibility,** loyalty, **fairness,** and **respect,**
  - **B. Responsibility, respect, fairness, and honesty,**
  - **C.** Loyalty, profitability, **fairness,** and **honesty,**
  - **D.** Diversity, **responsibility, fairness,** and **honesty.**
- Compare the words and see Responsibility in A, B and D, so being responsible sounds like an ethics value,
- Loyalty in A and C, but loyalty is not an ethical value so eliminate A and C,
- Fairness in all 4 answers, so you know fairness is correct,
- Respect shows up in A, B but we eliminated A,
- Profitability is only in answer C and is not an ethical thing plus we eliminated C,
- So that leaves diversity in D compared to respect in B.
- Responsibility, fairness, and honesty are the same in D and B,
- Respect is treating others with dignity; it promotes diversity in the project team,
- So, the correct answer is B,
- Of course, you should have memorized these 4 core values of the code of ethics,
- Other ethical questions are based upon not taking something of value or going out to an expensive restaurant, for a vendor to have preference over other vendors. These are not ethical things to do.

Similar Questions

- Using the content of one question to answer another question could provide the answer to a previous question that you are not sure of,
- The testing software allows you to go back to that question to answer it correctly,

- You can navigate back to the previous question within the active portion of the exam (60 questions) before a break or the end of exam after you have answered the last 60 questions,
- The wording in one question may help you determine the answer in another question,
- This happens with questions regarding earned value questions network diagrams, PDM method, critical path, and forward and backward pass questions,
- These are all related concepts and there is a high likelihood that several questions will provide you with the correct answer to another question,
- This seems to happen 2 – 4 times during the exam for some test takers.

Agile Tools and Techniques

- Agile is an iterative approach to project management that helps teams deliver value to their customers faster instead of at the end of a project,
- An agile team delivers work in small increments. Requirements, plans, and results are evaluated continuously so teams have a natural mechanism for responding to change quickly,
- Know correct names and purpose of agile tools and techniques.

Adaptive/Agile Keywords

- Certain adaptive/agile terms are based on definitions. There is probably one question about the Manifesto for Agile Software Development,
- It has 4 values.

Through this work we have come to value:

Individuals and interaction	*over*	*process and tools*
Working software	*over*	*comprehensive documentation*
Customer	*over*	*contract*

collaboration		*negotiation*
Responding to change	*over*	*following a plan*

Note: You will also need to know the 12 agile principles so look back at the first part of this eBook to remember them. It is a good idea to review them a few days before your exam, so they are fresh in your mind.

Agile Framework Source

- Remember and understand the different agile tools and techniques by their respective agile frameworks referred to in the question.

Question:
Which of the following is not an agile Extreme Programming (XP) role? *(This question is expecting you know the difference between XP and Scrum.)*

A. Product owner *(Scrum role),*
B. Coach *(XP) Similar to scrum master,*
C. Tracker *(Unique to XP to track progress which is a role of a project manager in a predictive approach, but they use the term: review project or team performance),*
D. Tester *(XP official test role).*

Skip the Question

- Remember about 30% of the questions are difficult or lengthy and it can be a struggle to answer them, so go ahead and skip them for now,
- Go back to answer the questions before the break, or at the end of the exam,
- The software will prompt the test taker if a question is unanswered.

Trust Your Intuition

- For those questions where you don’t know the answer and you are guessing, trust your intuition and don’t change your answer,

- This is especially true when you get close to the end of the testing time,
- Do your best to eliminate at least one answer.
- Also look at the longest answer, as it is often the correct answer.

Final Recommendation

- Practice many legitimate tests several times. Legitimate tests are based upon the most recent test requirements of the ECO and are often provided by PMI®,
- When searching on the Internet, be aware of many old practice tests are available to you at a very cheap price, but they won't help in passing the exam because they do not reflect the content of the current exam,
- When taking a practice test question and getting the wrong answer, try to understand why you got it wrong,
- A lot of times, it is because you didn't read the question correctly or didn't understand it,
- Always try to eliminate two answers so you have a 50/50 chance of a correct answer,
- Read the last sentence of the question first and then look at the answers to determine if you can answer it correctly,
- Some of the questions have more information than needed to answer the question,
- Remember to study and prepare for the exam and retake the practice questions many times until your test scores are in the 80% range,
- These hints and the practice questions will not only help to pass the exam but also score above target,

- If you want to practice questions provided to Authorized Training Partners (ATP) from PMI® that are very similar those on the current PMP® exam, please check Facilitated Methods Website: **www.facilitatedmethods.com**,
- Available test banks include PMP® Lesson Questions 2023 (20) questions at a time) or Simulated PMP® Exam Questions, (60 questions at a time).

Good Luck and let us know when you pass the exam.

About the Authors

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Greta is the cofounder of Facilitated Methods and is a certified Project Management Professional (PMP)®, certified Program Management Professional (PgMP)®, and certified Risk Management Professional (PMI-RMP)® with extensive experience as an executive and consulting IT professional, both domestically and internationally. Her experience enables her to concurrently manage multiple high-risk, high-tech projects. Her areas of experience include program management, project management, agile scrum, customer relationship management, business intelligence and systems development.

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He has written numerous articles for ProjectTimes.com, BATimes.com, and AllPM.com as well as for the PMI® chapter's newsletter. He has spoken on project management for various PMI® chapters and organizations including the PMI® Congress 2015 - North America Conference and the Art of Projects in Budapest, Hungary in 2022.

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[1] *The exam is based on the PMP® certification exam content outline (ECO), not the (PMBOK® Guide) or other reference books. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Seventh Edition will now be a reference to inform the development of the exam items. However, before any validated exam item is added to the exam, there is a very rigorous and thorough review and field test cycle. This process takes multiple months.*

[2] *https://agilemanifesto.org*

[3] *https://agilemanifesto.org/principles*

[4] *– PMBOK® Guide – Seventh edition*

[5] *Refer to PMI's Business Analysis for Practitioners: A Practice Guide.*

[6] *https://www.prosci.com/methodology/adkar*

[7] *Refer to PMI's Managing Change in Organizations: A Practice Guide.*

[8] *More about the Brightline Compass and the five building blocks here: https://www.brightline.org/resources/transformation-compass/*

[9] *There is a section in the Governance for Portfolios, Programs, and Projects practice guide from PMI that specifically refers to the role of governance on a project. Also, governance is identified as a domain within the Program Management Standard 4th edition.*

[10] The PMI Code of Ethics and Professional Conduct can be found at **www.PMI.org/Ethics**

[11] *Navigating Complexity: A Practice Guide*

[12] *Agile Practice Guide and Michelle Sliger "Agile estimation techniques." Paper presented at PMI® Global Congress 2012 https://www.pmi.org/learning/library/agile-project-estimation-techniques-6110*

[13] *https://www.pmi.org/disciplined-agile/mindset/promises/safety*

[14] *Further reading: https://www.pmi.org/learning/library/motivation-increase-project-team-performance-7234*

[15] *PMI's Disciplined Agile Coach certification: https://www.pmi.org/certifications/agile-certifications/disciplined-agile-coach-dac*

[16] *Alban Institute. "Levels of Conflict." https://www.vnim.org/Resources/Leas'%20Five%20Levels%20of%20Conflict.pdf*

[17] https://www.pmi.org/disciplined-agile/gci/guided-continuous-improvement

[18] *Definitions in the PMBOK 7th edition Glossary*

[19] *https://www.pmi.org/learning/library/characterizing-unknown-unknowns-6077*

[20] These definitions are taken from the Glossary of the (PMBOK® Guide) – Sixth Edition

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