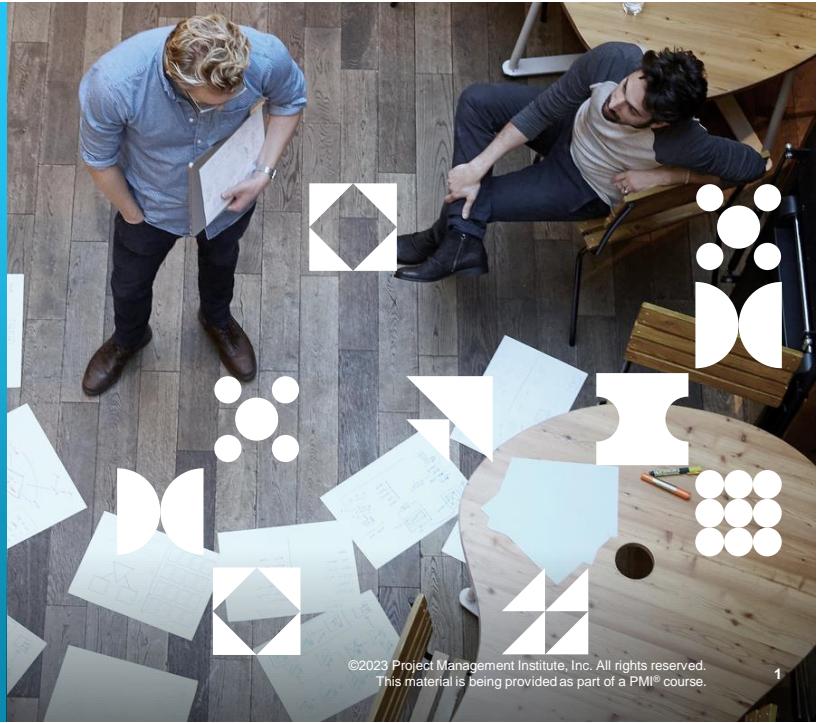


LESSON 3

## PLAN THE PROJECT

- Planning Projects
- Scope
- Schedule
- Resources
- Budget
- Risks
- Quality
- Integrate Plans

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## Learning Objectives

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- Explain the importance of a project management plan.
- Provide an overview of scope planning in both predictive and adaptive projects.
- Provide an overview of schedule planning in both predictive and adaptive projects.
- Discuss resource planning for a project, including human and physical resources and the role of procurement.
- Determine the budgeting structure/method for a project
- Explain the importance of tailoring a budget.
- Identify strategies for dealing with risks and risk planning.
- Assemble a toolkit of possible responses to risks.
- Define quality and how it relates to the outcomes and deliveries for a project.
- Discuss the importance of integrating project management plans and tailoring a change management process.



# Planning Projects

TOPIC A

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## Planning Starts with a Project Management Plan

The document that describes how the project will be executed, monitored and controlled, and closed.

It includes:

- **Subsidiary plans**
- **Baselines**
- **Additional components**



\*See definition tab for list



Enables project managers to ....

- Execute
- Monitor
- Control
- Close



- Establishes guardrails to maintain controls, so ....
- Teams can tailor their way of working and act quickly and flexibly!

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## Project Documents\*

---

Documentation and content created by the team to plan and manage the project effectively

Some documents are project **artifacts**, which need to be maintained and then archived at the end of the project.



*They are not components of the project management plan.*



\*See definition tab for list



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# Collaborative Planning

## Adaptive and Hybrid Development Approaches



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Product owner decides objectives according to customer needs/wants; team executes work and helps product owner **plan the work**

Team members are local domain experts in integration management — how **work will be planned** and completed

Project manager, team lead or scrum master helps focus the team to **execute the planned work**

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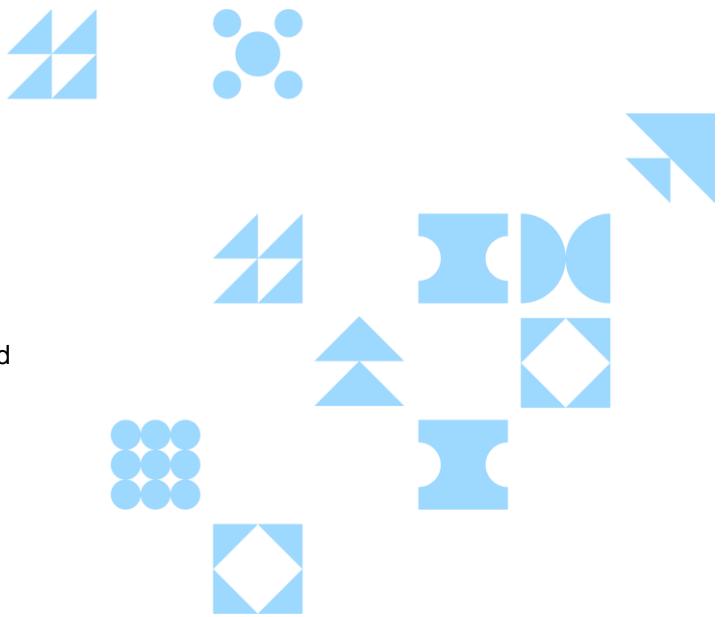
## Planning Across Life Cycles

	Predictive 	Hybrid 	Adaptive 
Requirements specification	Defined in specific terms before development	Elaborated periodically during delivery	Elaborated frequently during delivery
Outcome(s)	Delivered at the end of the project	Can be divided into pieces (incremental)	Delivered after each iteration according to stakeholder-desired value
Change	Constrained as much as possible	Incorporated at periodic intervals	Incorporated in real time during delivery
Stakeholder Involvement	At specific milestones	Regularly	Continuously
Risk and cost controls	Through detailed planning of mostly known consideration	Through progressive elaboration of plans	Done as requirements and constraints emerge

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## Topic Coverage

Differentiation of planning in predictive and adaptive approaches



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# Scope

TOPIC B

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## Scope

- Project scope or product scope?
- Is it fixed or flexible?



LIFESTYLE CENTRE

*Let's use the Shawpe Lifestyle Centre project—the independent case study part of this course—to understand these terms better.*

Click me!

PROJECT  
SCOPE

PRODUCT  
SCOPE

FIXED

FLEXIBLE

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## Adaptability and Resilience in Planning

### Rolling Wave Planning

- A form of **progressive elaboration** applied to work packages, planning packages and release planning
- Used in adaptive or predictive approaches

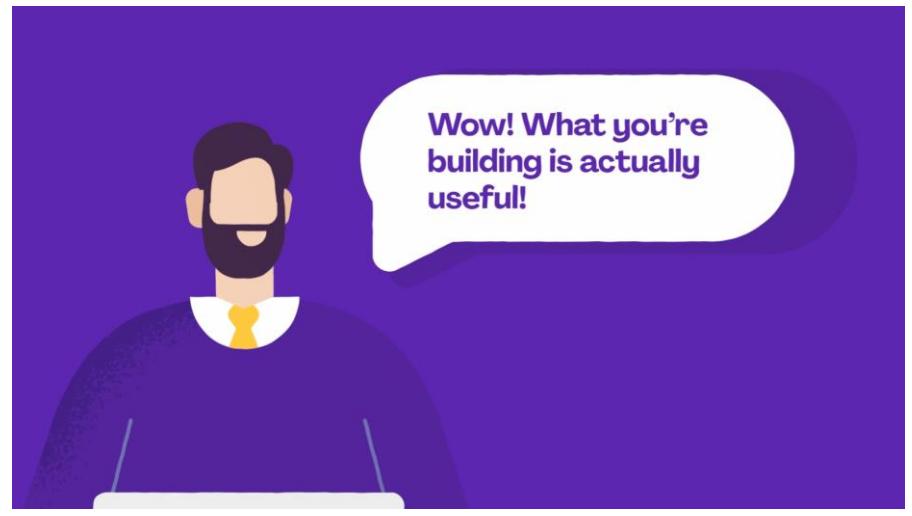


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## MVP or MBI?

Planning for  
Work  
Incrementally

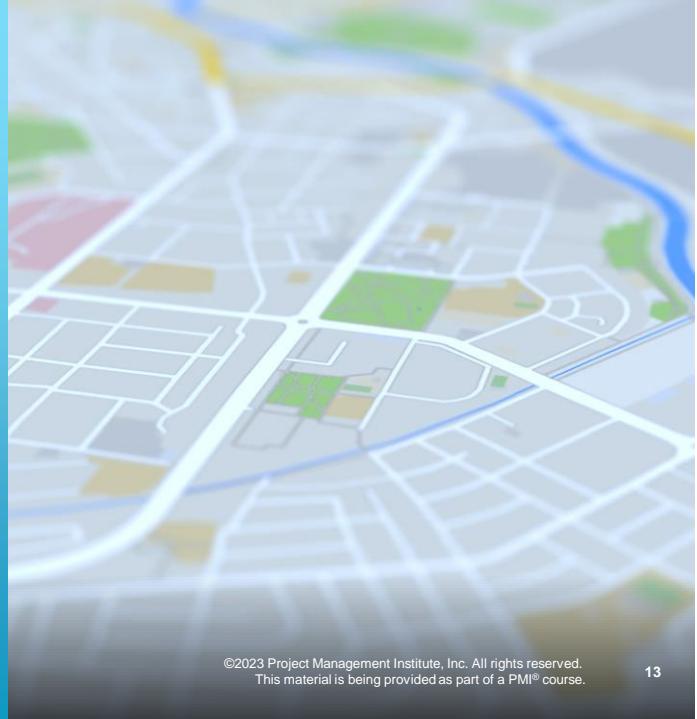


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## Product Roadmap\*

- Envisions and plans the “big picture”
- Displays product strategy and direction and the value to be delivered
- Leads with the overarching product vision and uses progressive elaboration to refine vision
- Uses themes (goals) to provide structure and associations
- Provides short-term and long-term visualization



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## Milestones\*

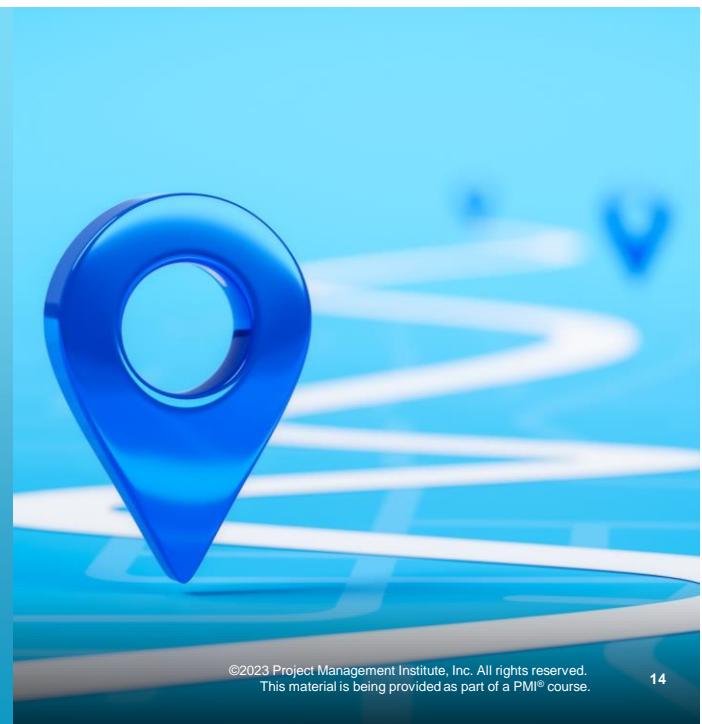
- **Markers** for big events, reviews, due dates, payments or decision-making
- **Prompts** for reporting requirements or sponsor/customer approval
- **Created by** project managers, customers or both

A **milestone list** identifies all milestones and indicates which are:

- Mandatory - required by contract, or
- Optional (estimated on historical information)



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## Scope Planning

### Comparison of Processes

#### PROJECT MANAGER

- Facilitates the [Collect Requirements Process](#)
- Documents requirements in a:
  - Scope statement (text/document)
  - Work breakdown structure (WBS) – (visual)
- Develops schedule, budget, resource and quality plans to deliver requirements



*What might a hybrid scope planning process look like?*

#### PRODUCT OWNER



- Creates and refines release backlog for iteration planning meeting
- Explains each prioritized user story in detail to the team

#### TEAM

- Estimates effort required and creates the iteration baseline, selecting stories to meet the expected velocity for the iteration.
- Places user stories from product backlog into release backlog to support identified features and functions
- Uses a story map to sequence and prioritize user stories in the release backlog

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## Get Started with Requirements?



*Does this kind of project start with requirements?*

*Click each button!*



**Yes!**

In predictive projects, requirements are elicited and set at the beginning of the project.



**Sort of...**

User stories are a different way of thinking about the requirements process.



**Maybe!**

Hybrid projects may elicit and refine requirements or compose user stories.

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## Requirements

What Are They  
and Why Do We  
Need Them?



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### Guidelines for use:

- A requirement is one single measurable statement of a condition or capability.
- It tells how a product, service or result satisfies a business need.

- *Start at a high level before providing details*

- *Must be unambiguous (measurable and testable), traceable, complete, consistent and acceptable to key stakeholders*

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## Document Requirements

- A simple format — e.g., a document listing all requirements, categorized by stakeholder and priority, OR
- More elaborate — e.g., executive summary, detailed descriptions, attachments
- **Requirements traceability matrix**



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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							
004	3.2							
005	4.0							
	5.0							

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# Requirements Management Plan

Plan, Track and Report on Requirements Activities



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- 
- Configuration management activities:
    - Version control rules
    - Impact analysis - tracing, tracking and reporting
  - Required authorization levels for change approval
  - Prioritization criteria/process
  - Product metrics and accompanying rationale
  - Traceability structure, including requirement attributes

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## Types of Requirements

Type	Describes the...
<b>Project</b>	Actions, processes and conditions the project must meet
<b>Product</b>	Features and characteristics of the product, service or result that will meet the business and stakeholder requirements <ul style="list-style-type: none"><li>• Functional – Product features</li><li>• Nonfunctional - Supplemental environmental conditions/qualities that make the product effective</li></ul>
<b>Quality</b>	Conditions or criteria needed to validate the successful completion of a project deliverable or fulfilment of other project requirements
<b>Business</b>	Higher-level organizational needs, reasons for the project
<b>Stakeholder</b>	Stakeholder (or stakeholder group) needs —aka “Reporting requirements”
<b>Transition/ Readiness</b>	Temporary capabilities needed to transition successfully to the desired future state

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## Collect Requirements Process



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- Expert Judgment
- Interpersonal/Team Skills
  - Nominal group technique
  - Observation
  - Facilitation
- Data Gathering
  - Brainstorming
  - Interviews
  - Focus groups
  - Questionnaires and surveys
  - Benchmarking
- Data Analysis
  - Document analysis
  - Alternatives analysis
  - Product analysis (if deliverable is a product)
- Decision-Making Techniques
  - Voting
  - Multi-criteria decision analysis
- Data Representation
  - Mind mapping
  - Affinity diagram
  - Context or use case diagram
- Prototyping — e.g., storyboarding

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## Scope Planning: How to Collect Requirements

	Interviews	Questionnaires/Surveys	Observations	Focus Groups	Facilitated Workshops
Characteristics	<ul style="list-style-type: none"> <li>Identify/define features and functions of deliverables</li> <li>Can be structured, unstructured or asynchronous</li> </ul>	<ul style="list-style-type: none"> <li>Written format</li> <li>Captures information from large groups</li> <li>Yields quantitative data</li> </ul>	<ul style="list-style-type: none"> <li>Physical technique used learn about a specific job role, task or function</li> </ul>	<ul style="list-style-type: none"> <li>Casual/interactive information-sharing</li> <li>Moderator-guided</li> <li>Includes stakeholders and SMEs</li> <li>Yields qualitative data</li> </ul>	<ul style="list-style-type: none"> <li>Sessions organized by project managers to determine requirements and enable stakeholder agreement on project outcomes</li> </ul>
Advantages	<ul style="list-style-type: none"> <li>Handles sensitive/confidential information</li> <li>Helps identify stakeholder requirements, goals or expectations</li> </ul>	<ul style="list-style-type: none"> <li>Quick turnaround</li> <li>Effective with varied and geographically dispersed respondents</li> <li>Yields quantifiable data for statistical analysis</li> </ul>	<ul style="list-style-type: none"> <li>Team can understand where changes might be beneficial</li> </ul>	<ul style="list-style-type: none"> <li>Pre-selected participants for varied opinions</li> <li>Small group for focused approach and gathering specific information</li> </ul>	<ul style="list-style-type: none"> <li>Team can capture requirements</li> <li>Stakeholders can understand the concerns and requirements of others</li> </ul>
Considerations (potential drawbacks)	<ul style="list-style-type: none"> <li>Captures only a single point of view</li> </ul>	<ul style="list-style-type: none"> <li>Time consuming</li> <li>Answer/ data quality depends on question quality</li> </ul>		<ul style="list-style-type: none"> <li>Must prequalify stakeholders</li> <li>SMEs and facilitation are essential</li> </ul>	<ul style="list-style-type: none"> <li>Facilitation is essential</li> </ul>

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## Data Gathering



Use **Benchmarks** to generate product requirements

- Requires best practices to make comparisons
- Evaluates and compares an organization's or project's practices with others
- Identifies best practices in order to meet or exceed them



- *Can you remember the other methods for data gathering?*
- *Why do you think benchmarking is effective in gathering data for scope planning?*
- *Why would you choose it instead of the other methods?*

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## Scope Planning – Requirements Prioritization



Tool or Technique	Description	Benefits
<b>MoSCoW Analysis</b> <i>(developed by Dai Clegg)</i>	Used to reach a common understanding with stakeholders on the importance of each requirement. They indicate: <ul style="list-style-type: none"> <li>M - Must have</li> <li>S - Should have</li> <li>C - Could have</li> <li>W - Won't have (for now)</li> </ul>	<ul style="list-style-type: none"> <li>Compares several points of view</li> <li>Used with timeboxing to focus on the most important requirements</li> <li>Common in agile software development, Scrum, RAD and DSDM</li> </ul>
<b>Kano Model</b> <i>(Product management technique)</i> <i>(developed by Noriaki Kano)</i>	Understand and classify all potential customer requirements or features into four categories of need: <ul style="list-style-type: none"> <li>Delighters/exciters</li> <li>Satisfiers</li> <li>Dissatisfiers</li> <li>Indifferent</li> </ul>	Development efforts can then be prioritized by the things that most influence customer satisfaction and loyalty.
<b>Paired Comparison Analysis</b> <i>(developed by LL Thurston)</i>	Rate and rank alternatives by comparing one against the other	<ul style="list-style-type: none"> <li>Good for small range of subjective requirements</li> </ul>
<b>100 Points Method</b> <i>(aka fixed sum or fixed allocation method)</i> <i>(developed by Dean Leffingwell and Don Widrig)</i>	Vote for importance of requirements in a list; stakeholders distribute 100 points in any way they wish (Like "Monopoly money" method)	<ul style="list-style-type: none"> <li>Good for any size group, even large ones</li> <li>Gives priority to stakeholder decision-making because they must exercise depth of thought</li> </ul>

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## Represent Data

- **Mind Mapping** – Consolidate ideas created through individual brainstorming sessions into a single map to reflect commonality and differences in understanding and to generate new ideas
- **Affinity Diagram** – Allows large numbers of ideas to be classified for review and analysis



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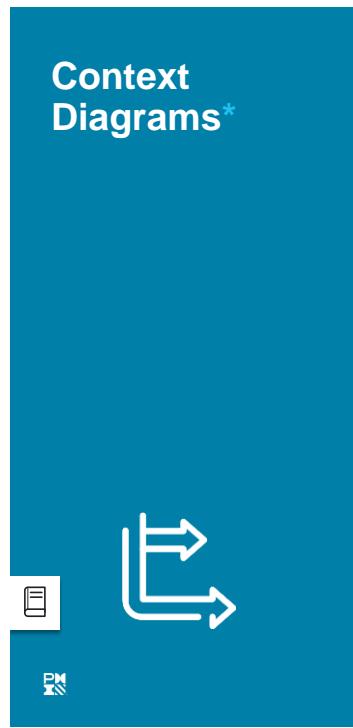
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## Context Diagrams\*



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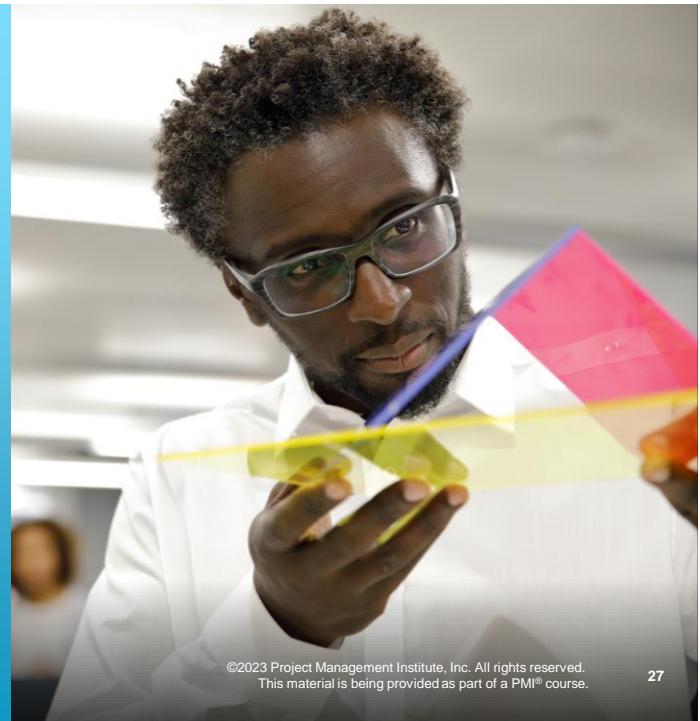
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## Prototyping

- Evaluation and experimentation tool
- Enables early feedback for further development and to develop a detailed list of project requirements
- Storyboarding is a type of prototyping that uses visuals or images to illustrate a process or represent a project outcome.



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## Scope Management Plan\*



- Review of the scope activities for the project and how that work will be done
- Should include processes to prepare a project scope statement
- Enables the creation of the WBS from the detailed project scope statement
- Establishes how the **scope baseline** will be approved and maintained
- Specifies how **formal acceptance** of the completed project deliverables will be obtained
- Can be formal or informal, broadly framed or highly detailed

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## Project Scope Statement



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Includes –

- Scope description - project and product
- Acceptance criteria
- Any required deliverables
- Any out-of-scope items needed for clarification
- Constraints and assumptions



*Once it has been approved and baselined, changes are only permitted in accordance with the change management plan.*

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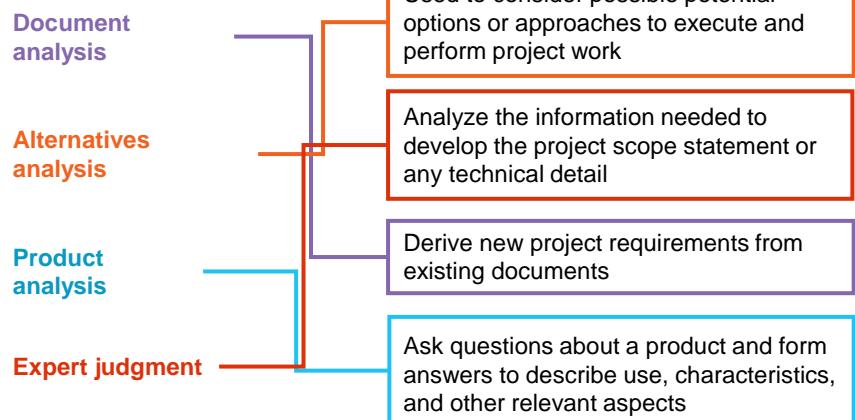
# Scope Planning

## Tools and Techniques for Analysis

Match the requirements analysis tool/technique with the correct description.



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# Product Analysis Methods



## PRODUCT BREAKDOWN

Splits a product and its requirements into components to achieve a clear understanding of work

## SYSTEMS ENGINEERING

Approaches design, integration, and management, and the life cycle of complex systems in a multi-disciplinary way

## SYSTEMS ANALYSIS

Studies a product /service to identify its goals and purposes and create systems/ procedures to achieve them efficiently

## REQUIREMENTS ANALYSIS

Identifies, validates and documents specifications for projects

## VALUE ENGINEERING

Optimizes value in a structured way

## VALUE ANALYSIS

Examines factors affecting product/service cost in a systematic, interdisciplinary way towards success with the lowest cost and required quality and reliability standards

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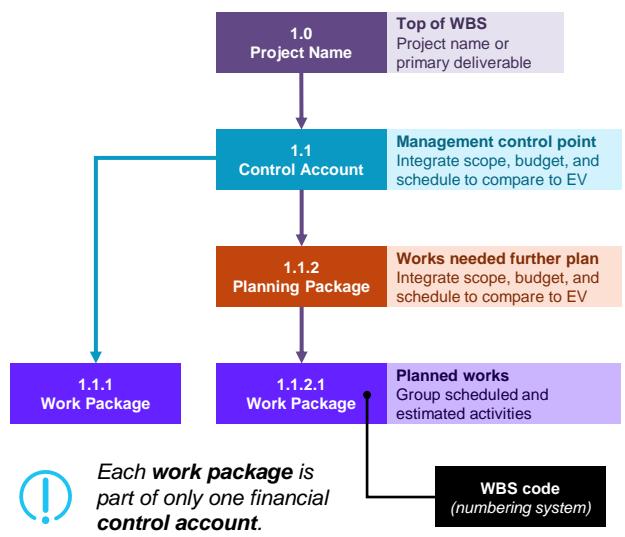
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## Create the Work Breakdown Structure (WBS)\*

- Follow the 100% rule!
  - Include every aspect – nothing extra, nothing missing
- Include project and product components
- Use hierarchical structure
  - Highest – project
  - Next – deliverables
  - Lowest – work package



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## Decompose Work in the WBS

*Divide and subdivide the project scope and deliverables into smaller, more manageable parts*



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Steps:

1. Identify deliverables and the work/tasks needed to accomplish them
2. Structure and organize the WBS
3. Decompose high-level WBS scope components into low-level components
4. Develop and assign a unique identification code to each component from the **code of accounts**
5. Review the decomposition of work packages and verify that they align with the project requirements



*Tailor the level of decomposition to specific project needs and the level of granularity needed to manage the project effectively.*

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## WBS Dictionary

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



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Decompose work and include:

- WBS code 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

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## Scope Baseline



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

Components include:

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

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## Don't Forget to Plan for Transitions / Handovers!



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Include activities to fulfill transition/implementation in the scope of work

- Consider all stakeholders, schedules, risks, budgets, and quality standards.
- Identify deliverables/outputs



*These can be delivered throughout the project, not just at the end!*

Questions to consider:

- Will the work be new, or an update in the business environment?
- How best to transition the product into a live environment?
- What about decommissioning or removing old systems, processes or materials?
- Did you ensure training and knowledge transfer are complete/satisfactory?



*How do adaptive or hybrid teams “plan” for handovers or transitions?*

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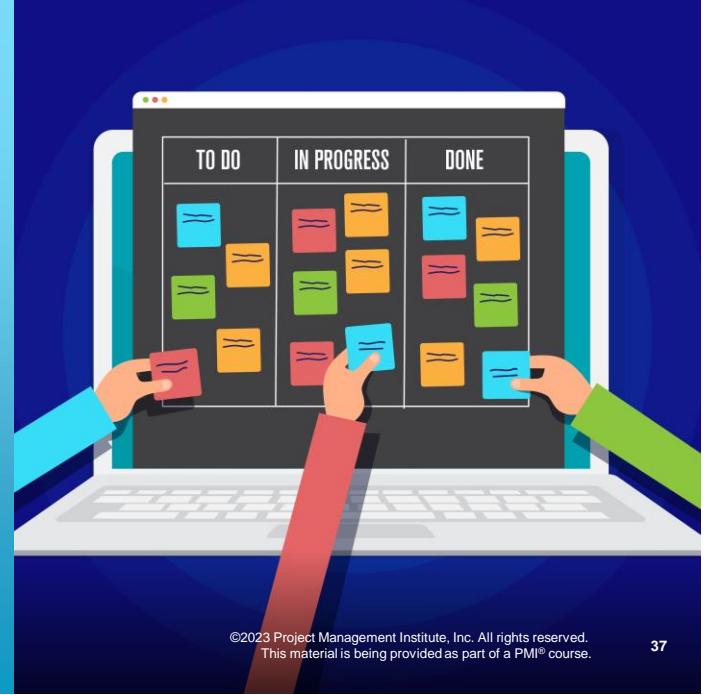
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## Scope Planning in Adaptive Environments

- Incremental or iterative development
- User stories propose an alternative way of viewing the requirements process



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## Release and Iteration Planning



*Planning also takes place at the standup meeting when teams discuss details of work in progress.*



Collaborative planning meetings that break scope into larger releases and then iterations/sprints

At **release planning** (or Agile release planning), decide:

- Number of iterations or sprints needed to complete each release
- Features contained in the release
- Goal dates of each release

At **iteration planning** (or sprint planning):

- Review the highest prioritized user stories or key outcomes
- Ask questions
- Agree on effort required to complete the user story in the current iteration
- Determine the activities required to deliver iteration objectives

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## Backlogs

- Prioritized list of **the known scope of work**
- Information presented in **story form**
- Continually updated by the **product owner in collaboration with teams**



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Example:

A **product owner** creates a **product backlog** and identifies and adds stories in collaboration with the team and stakeholders. Work items describe desired product functionality through user stories.

- The product owner is responsible for prioritizing work according to value.
- The product owner and team collaborate to move work items to the **iteration/sprint backlog**.



*Backlogs may be known by slightly different names on your team or project, but the names are generally descriptive — e.g., requirements backlog, sprint backlog, lean backlog.*

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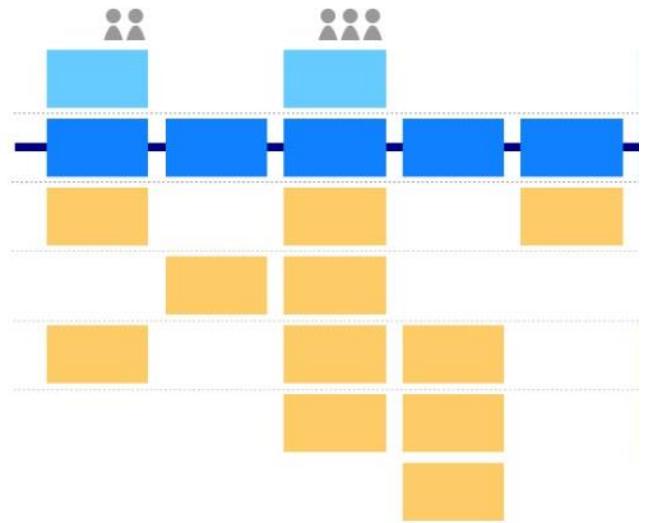
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## User Stories, Story Maps, Roadmaps

- A **story map** organizes **user stories** into functional groups and within a narrative flow (“the big picture”) of the **product roadmap**.
- Helpful for discovering, envisioning and prioritizing the product and a way ahead!
- *Story map technique developed by Jeff Patton*



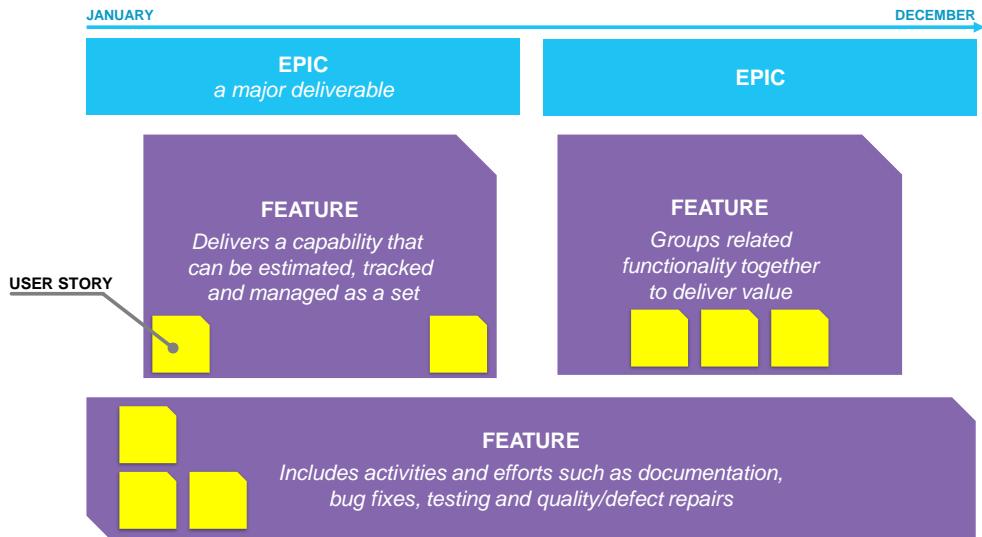
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## Epics > Features > User Stories



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## Prioritize and Refine the Backlog

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- Continual refinement done by product owner/customer prior to iteration planning
- Additional refinement can be done jointly by the team and product owner during the sprint/iteration
- Allows reorganization and reprioritization of work to complete higher-priority items that deliver value first
- Split epics into user stories

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## Plan Scope: Quiz



Which two stakeholders perform project scope planning? *(Choose two)*

- a. Ang Fen, project manager
  - b. Helen Grey, product owner
  - c. Eugene Lowe, project sponsor
  - d. Project team
- 

Ang Fen wants to give the executive team an overview of the work ahead at the next strategy meeting. Which artifact should he show them?

- a. Scope management plan
- b. Product roadmap
- c. Scope statement
- d. Work breakdown structure

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## ECO Coverage



### 2.1 Execute project with the urgency required to deliver business value

- Support the team to subdivide Project tasks as necessary to find the minimum viable product (2.1.3)

### 2.8 Plan and manage scope

- Predictive vs Adaptive approach for scope
- Determine and prioritize requirements (2.8.1)
- Break down scope (e.g., WBS, backlog) (2.8.2)

### 2.17 Plan and manage project/phase closure or transitions

- Determine criteria to successfully close the project or phase (2.17.1)





# Schedule

TOPIC C

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## Get from “A” to “B”

### Overview of Schedule Planning Processes



The project manager ensures that:

- Work package is broken down into required activities
- Dependencies and precedence relationships are determined
- Activity durations are estimated based on average resources
- Critical path is determined
- Resource overallocations are resolved
- Schedule is compressed to meet any constraints



The project team:

- Uses either a time boxed (cadences) or continuous flow method
- Adopts release time frames
- Plans each iteration with work
- Prioritizes, estimates and decomposes user stories into tasks and determines iteration velocity
- *Works with product owner to refine the backlog after each iteration and plan the next*

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## Schedule Management Plan\*



*In hybrid approaches, a schedule management plan can help by placing management controls on the project time line.*

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# Schedule Management Plan Components



Discuss how the schedule management plan can be a beneficial tool in hybrid projects. Who would it benefit?



<b>Project schedule model</b>	<ul style="list-style-type: none"><li>Methodology/tool for schedule development</li><li>Includes maintenance planning, including status updates and progress during execution</li></ul>
<b>Accuracy</b>	<ul style="list-style-type: none"><li>Acceptable range used to determine realistic activity duration estimates</li><li>May include risk contingency</li></ul>
<b>Units of measure</b>	Defined for each resource – e.g., staff hours, days and weeks
<b>Organizational procedural links</b>	Use of WBS to ensure consistency with estimates and schedules
<b>Control thresholds</b>	<ul style="list-style-type: none"><li>For monitoring schedule performance before taking action – e.g., escalation/reviews</li><li>Expressed as percentage deviations from the baseline — e.g., percent ahead or behind schedule</li></ul>
<b>Rules</b>	Performance measurement — e.g., earned value management (EVM) rules
<b>Reporting</b>	Frequency and formats for schedule-related reports
<b>Process descriptions</b>	Describes how schedule management processes are documented

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## Start with Benchmarks and Historical Data

### Benchmarking

- Compares current project schedule with a similar product/service schedule
- Provides a good “starting point” for estimation before detailed analysis
- Assesses feasibility in the initial stage of scheduling

### Historical data

Learn lessons from completed projects in the organization



# Hybrid Schedules

## Example Characteristics and Benefits



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- Tailored plans to combine consistency and management oversight with flexible scheduling of work
- Better product/deliverable quality with incremental or short-term value delivery and change (improvements, fixes) incorporated at intervals
- Product delivery can be divided into subsets according to a plan (milestone or cadence)

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## Predictive Schedule Planning



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The project manager:

- Breaks down a **work package** into the required activities
- Determines **dependencies** and **precedence relationships**
- Estimates the duration of activities based on average resources
- Determines the **critical path**
- Resolves resource overallocations
- Compresses the schedule, if needed, to meet constraints

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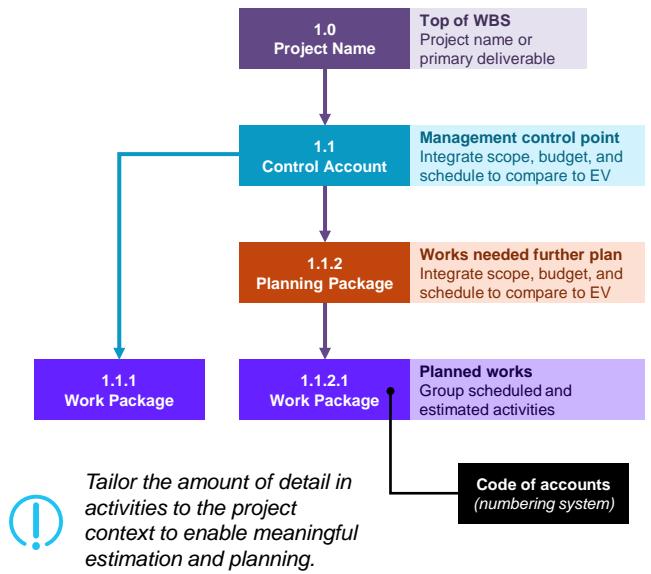
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## Break Down Project Activities\*

- Break down project work packages into activities (noun)
- Enter activities into the **activity list** using a verb statement
- Use the **activity list** to develop the project schedule
- Include duration (start and end day) for every activity



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## Activity Dependency Types

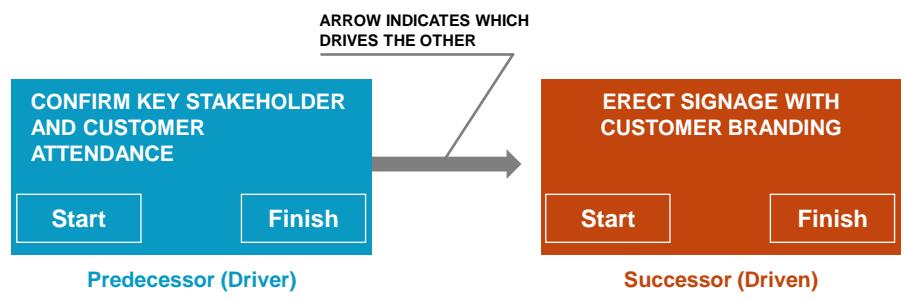
DEPENDENCY TYPES		
	Meaning	Action by Project Manager
<b>Mandatory</b>	Contractually required or inherent in the nature of the work	Must schedule it — No way around this sequence
<b>Discretionary</b>	Established because of best practices or a specific sequence is desired	Can be modified as needed, if replaceable with a better sequence, or if schedule compression is required
<b>External</b>	Activities performed outside the project team's work	Limited or no control
<b>Internal</b>	In project work, contingent on inputs	Has control

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## Precedence Relationships

- Activity dependencies determine precedence relationships (aka logical relationships) and the order in which activities are performed
- Show these using the **precedence diagramming method** (PDM)



- Precedence indicates which activity drives the relationship
- Predecessor usually occurs earlier in time than successor

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## Types of Precedence Relationships

- A. Obtain occupancy permit from Oasestown building department
- B. Confirm tour guide
- C. Confirm key stakeholder and customer attendance
- D. Complete landscaping and decoration
- E. Identify finished spaces for the tour
- F. Erect signage with customer branding

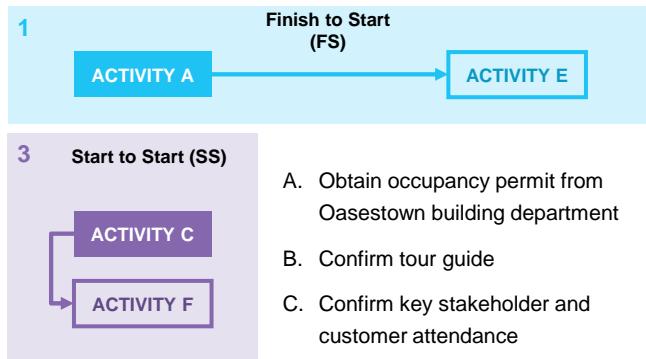


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## Lags and Leads in Precedence Relationships

Add **lead** and **lag** times of up to 2 weeks to activities

Document activities and related assumptions



*Leads and lags do not have a value, so do not include them in duration estimates.*

- A. Obtain occupancy permit from Oasestown building department
- B. Confirm tour guide
- C. Confirm key stakeholder and customer attendance
- D. Complete landscaping and decoration
- E. Identify finished spaces for the tour
- F. Erect signage with customer branding

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# Activity Duration Estimate Terminology



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## Activity Duration Estimate

- The quantitative assessment of the likely number of time periods required to complete an activity

## Elapsed time

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

## Effort

- The number of labor units required to complete a scheduled activity or WBS component, often expressed in hours, days, or weeks; contrast with duration

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## Estimating Techniques



<b>Analogous</b>	<ul style="list-style-type: none"><li>Uses <b>historical data</b> from a similar activity or project to estimate duration (or cost)</li><li>aka “top-down estimating.”</li></ul>	<ul style="list-style-type: none"><li>Less costly and time consuming</li><li>Used when project information is limited</li></ul>	<ul style="list-style-type: none"><li>May be inaccurate, depending on quality of historical information</li></ul>
<b>Parametric</b>	<ul style="list-style-type: none"><li>Uses an <b>algorithm</b> to calculate duration (or cost) based on historical data and project parameters.</li><li>Durations can be <b>quantitatively determined</b> — multiply quantity of work to be performed by the number of labor hours per unit of work</li></ul>	<ul style="list-style-type: none"><li>Can produce higher levels of accuracy depending on sophistication of data from model</li><li>Scalable and linear</li></ul>	<ul style="list-style-type: none"><li>Does not account for a learning curve — i.e., work gets easier as team becomes more expert</li><li>Uniform units of work are not typical in projects</li></ul>
<b>Three-Point</b>	<ul style="list-style-type: none"><li>Defines an <b>approximate range</b> of an activity's duration, using <b>most likely, optimistic, and pessimistic</b> estimates</li><li>Used when historical data is insufficient, or subjective</li></ul>	<ul style="list-style-type: none"><li>May improve accuracy of single-point estimations by including risk and uncertainty factors</li></ul>	<ul style="list-style-type: none"><li>Requires detailed resource information</li><li>Requires expert knowledge to estimate tasks</li></ul>
<b>Bottom-up</b>	<ul style="list-style-type: none"><li>Uses <b>aggregates</b> of the estimates of the <b>lower level components of the WBS</b></li></ul>	<ul style="list-style-type: none"><li>Very accurate and gives lower-level managers more responsibility</li></ul>	<ul style="list-style-type: none"><li>May be very time consuming</li><li>Can be used only after the WBS has been well defined</li></ul>

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## Three-Point Estimation Examples

### Triangular Distribution (average)

#### FORMULA

$$E = (O + M + P) / 3$$

- Optimistic = 3 weeks
- Most Likely = 5 weeks
- Pessimistic = 10 weeks

#### EQUATION

$$(3 + 5 + 10) / 3 = 6 \text{ weeks}$$



*PERT is based on a probability distribution; therefore, we can calculate a standard deviation:*

$$(P - O) / 6 = PERT \text{ Standard Deviation}$$

### BETA Distribution (PERT average)

#### FORMULA

$$E = (O + 4M + P) / 6$$

- Optimistic estimate = 3 weeks
- **Weighted** most likely estimate = 5 weeks
- Pessimistic estimate = 10 weeks

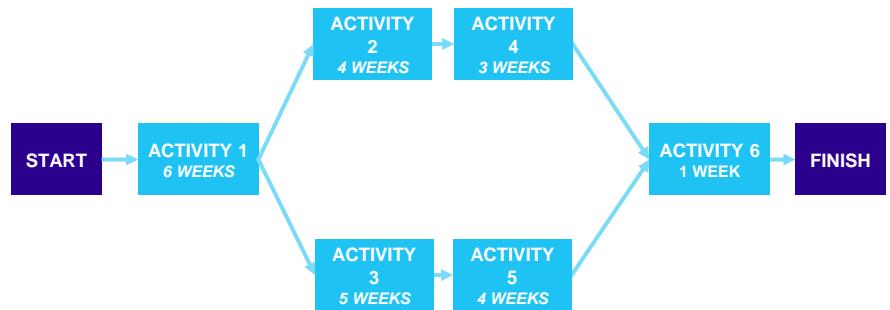
#### EQUATION

$$[3 + 4 (5) + 10] / 6 = 5.5 \text{ weeks}$$

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## Critical Path\* Method

Sequence mandatory **critical path activities** to find the longest path through a project and to determine the **shortest possible project duration** and the amount of **flexibility** in the schedule



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

$$1[6w] + 3[5w] + 5[4w] + 6[1w] = 16\text{-week critical path}$$

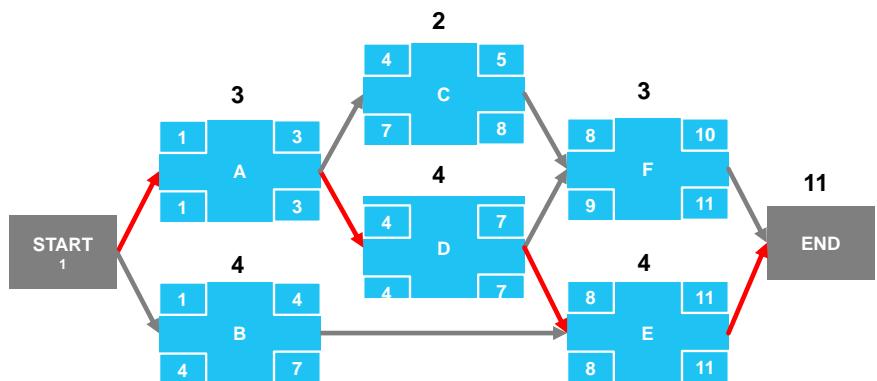
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## Network Diagram with Date and Dependencies

Calculate:

- Critical path
- Forward pass
- Backward pass
- Float



### KEY

ES	DUR	EF
ACTIVITY		
LS	FLT	LF

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## The Project Schedule

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- Includes start and finish activities
- Uses specific dates and in a certain sequence
- Sets dates for project milestones
- Coordinates activities to ensure on-time project completion
- Tracks project progress based on schedule performance and provides visibility of project status to upper management and project stakeholders

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## Schedule Presentation Formats



Select the type of schedule to suit your project!

- Roadmap
- Gantt Chart
- Milestone Chart
- Project Schedule Network Diagram



*Do you remember the name of the tool we used for scheduling activities in a project plan?*

**Hint:** *The output is a project schedule network diagram.*

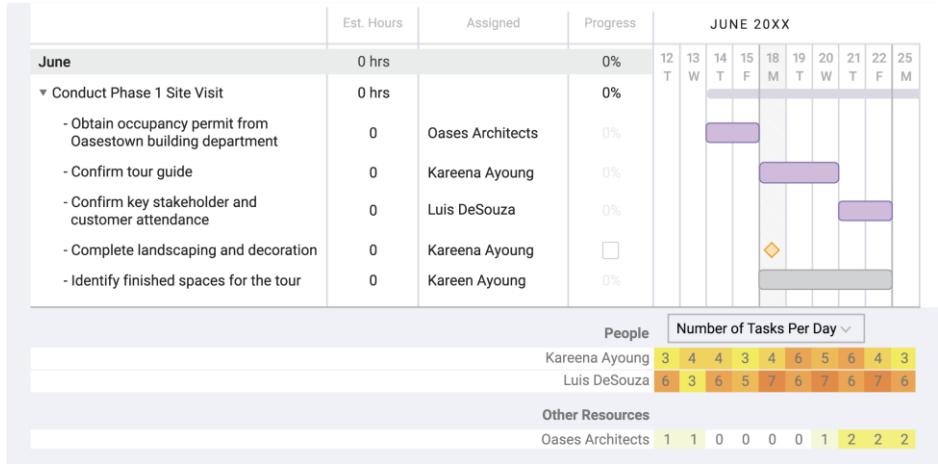
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## Gantt Chart

Visualize and Track the Project Over a Time Line



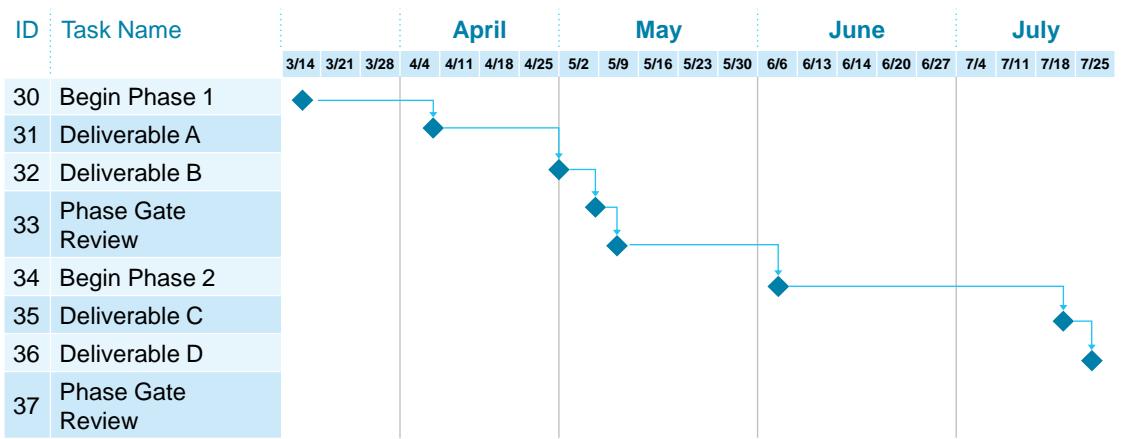
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## Milestone Schedule

Present Milestones with Planned Dates



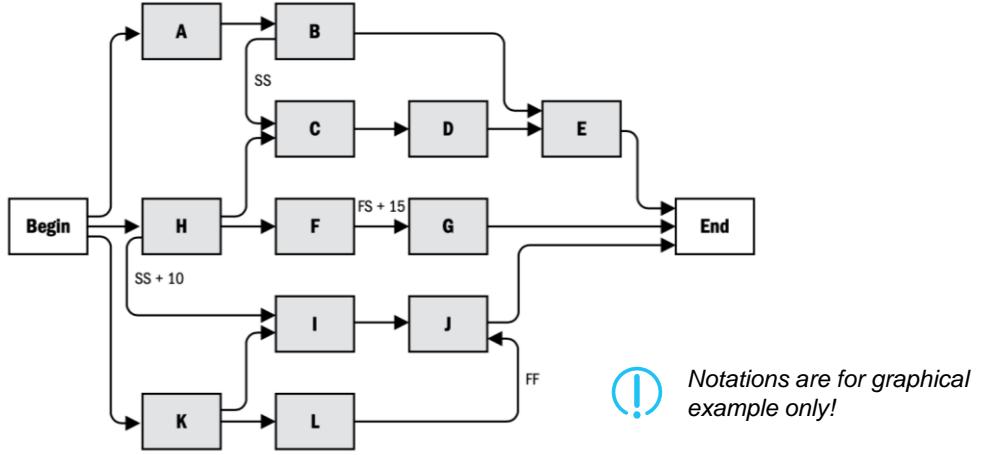
Remember that milestones have zero duration

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## Project Schedule Network Diagram

### Visualize Interrelationships of Activities



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## Resource Optimization



### Smoothing

- Adjusts the activities within predefined resource limits and within free and total floats
- Does not change the critical path nor delay the completion date
- Method may not be able to optimize all resources

### Levelling

- Adjusts start and finish dates based on resource constraints
- Goal is to balance demand for resources with available supply
- Use when shared or critically required resources have limited availability or are over-allocated
- Can change the critical path

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# Schedule Compression Techniques



## Fast-tracking

- Perform activities in parallel to reduce time
- May result in rework, increased risk and increased cost

## Crashing

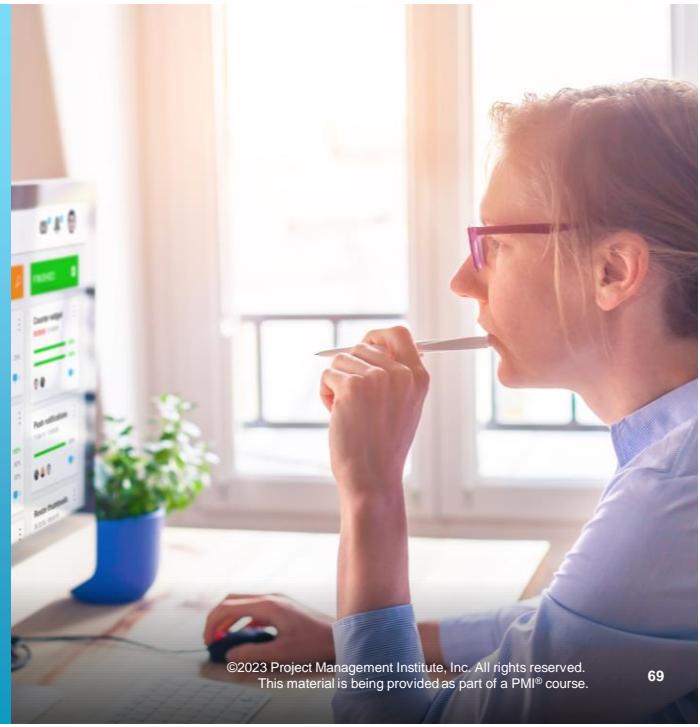
- Shortens schedule duration for the least incremental cost by adding resources – e.g., overtime, additional resources
- Works only for activities on the critical path
- Does not always produce a viable alternative and may result in increased risk and/or cost

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## Schedule Baseline\*

- Complete schedule planning activities
  - Add the schedule baseline to the **project management plan**
-  *Ideally, this happens before the project starts.*
- Compare actual progress to the baseline while the team works
  - Use the formal change control process to make changes to the baseline



## Special Intervals



What are special intervals known as in your projects?



**Black-out times** - deliverables are handed over for implementation:

- Suspends changes
- Reduces risks as the solution is released to customers

**“Go Live”** - at the end of the project timeline



Negotiate black-out times as project approaches release

**Iteration H** or **hardening sprint** – conducted prior to final release

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# Schedule Management in Adaptive Environments

## Guidelines



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- Depends on team composition and life cycle
- Project team works with the product owner to decide
- Develop the roadmap to show release functionality and timeframes
- Choose an approach:
  - Time-boxed scheduling with backlog
  - On-demand, continuous scheduling
- Project team selects activities for delivery within an iteration (or sprint)
- Teams produce increments of value for delivery and feedback

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## Adaptive Scheduling Approaches

### Comparative View

On-Demand (Kanban/Lean-based)	Time-boxed/Iterative
<ul style="list-style-type: none"><li>Allows individual requests to be addressed</li><li>Levels out work of team members</li><li>Best when activities are divided equally</li></ul> <p> <i>Does not work well in projects with complex dependency relationships</i></p>	<ul style="list-style-type: none"><li>Uses progressive elaboration (rolling wave) to schedule activities</li><li>Uses a specific work interval — e.g., two weeks</li><li>Allows changes at any time during project</li></ul>
Prioritize requests to determine start sequence then sequence stories individually through completion	Define requirements with user stories then prioritize stories
Team pulls work from queue	Select work based on priority and time box; add remaining stories to backlog; reintroduce stories later, based on priority
Provides incremental business value	Delivers business value early and incrementally

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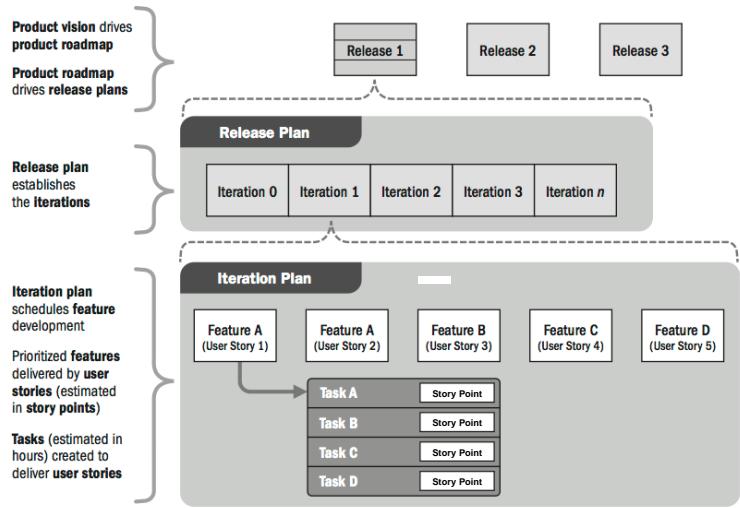
## Adaptive Planning Overview

A release schedule usually lasts from 3-6 months.

Time-boxed iterations or sprints typically last 1 - 4 weeks.

Assign story points to tasks to determine the amount of work

**Velocity** – the capacity of the team to complete work



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## Working with Features

Scheduling aligned to features ensures associated work is coordinated.

Associating features with the **product roadmap** offers visibility of when blocks of functionality can be released to the business and end users.



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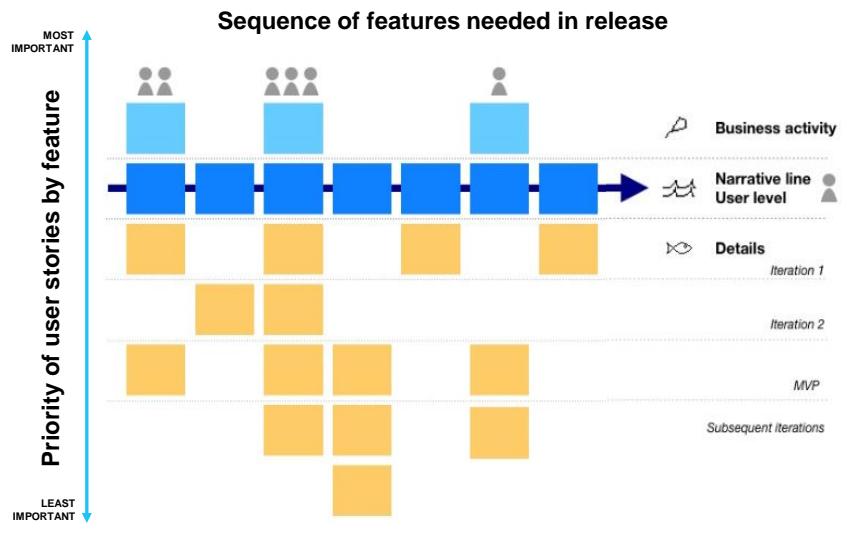
## Agile Release Planning

### Story Mapping

- Group stories by **sequence** and **priority**
- Sequence **features** and functions for the release
- Prioritize user stories in the **release backlog** and associate them with features and functions



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## Measure Effort, Not Time

### Relative sizing

- Compares effort of multiple user stories through assignment of values (XS, S, M, L, XL)



*Use common **t-shirt sizes** to assign values to user stories.*

### Story points

- Uses a relative measure – e.g., numbers in the **Fibonacci sequence** – to identify the level of difficulty or complexity of a user story or task

### Planning poker

- Estimates effort or relative size of development effort
- Uses a deck of cards with modified Fibonacci numbers to vote on user stories



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## Definition of Ready (DoR)\* and Definition of Done (DoD)\*



Agile teams need to know when they can be “ready” to do the work and when that work is “done.”

**DoR** - What needs to be in place so the team can begin work?

- Depends on the environment’s complexity and lessons learned from past iterations.
- Use DoR checklist to communicate and collaborate with stakeholders about readiness for work or progress.

**DoD** describes the goal or desired state. It must be informed by the DoR.



*DoD is similar to **acceptance criteria** in predictive projects.*

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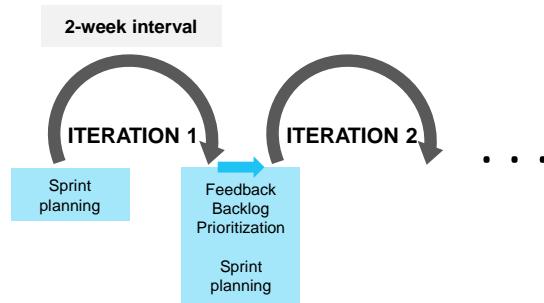
## Reprioritize Sprint / Iteration Backlog\*



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The product owner and team collaborate to move work items from a release backlog to an **iteration/sprint backlog** for the upcoming sprint.

Team holds a sprint planning meeting before each sprint, which typically lasts 2 weeks.



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## Hybrid Scheduling Models Example



Can you identify which aspects of this scheduling model are predictive and which are adaptive?  
Can you identify who does each of the tasks listed?



Project manager plans high-level project phases and milestones; scrum master runs sprints using agile processes

- Identify project work types and try to break them down
- Create a prioritized work backlog which fulfils project phase or achieves milestone
- Work in iterations/sprints of 2 - 4 weeks (use shorter sprints for less experienced team to facilitate alignment)
- Plan work before every iteration using prioritized backlog items
- Estimate every task to decide how many can fit in a single sprint
- Hold a retrospective at the end of every sprint; capture metrics to adjust timing and task estimate for next sprint

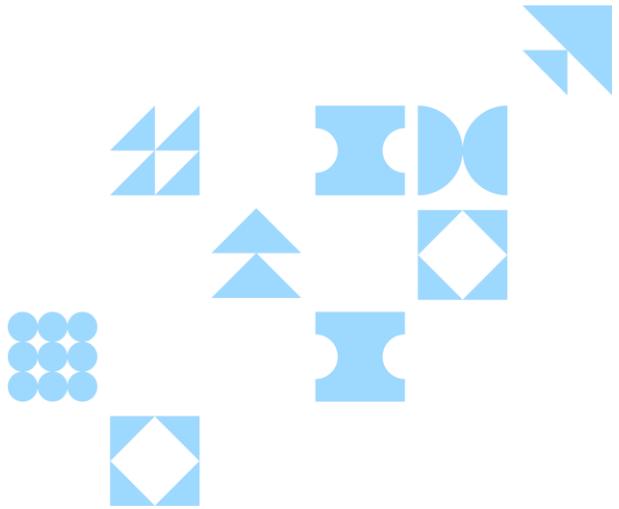
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## ECO Coverage



### 2.6 Plan and manage schedule

- Predictive vs adaptive approach for schedule
- Estimate project tasks (milestones, dependencies, story points) (2.6.1)
- Utilize benchmarks and historical data (2.6.2)
- Prepare schedule based on methodology (2.6.3)



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# Resources

TOPIC D

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## Resources

### People and Equipment

- Value and empower internal human resources, yet
- Leverage external sources to ensure you have the best team and equipment possible!



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## Resource Management Plan\*



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- **Identify resources** - People and equipment
- **How to acquire them**
- **Peoples' roles and responsibilities**
  - Role – A person's function in a project
  - Authority - Rights to use resources, make decisions, accept deliverables.
  - Responsibility - Assigned duty
  - Competencies and skills required
- **Project Organization Chart** – (Visual with resource categories and reporting relationships)
- **Project team resource management** – Guidance on how to define, select, manage and release resources
- **Training** - Strategies and requirements
- **Team development methods**
- **Resource controls** - Methods for ensuring non-human-resources are available as needed
- **Recognition plan**

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## Assign Resources and Allocate Responsibilities



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- Assign team members to project
- Decide roles and responsibilities
- Create team directory, organization chart and the schedule



*Project schedules, resource assignments and budgets are all interrelated and can be created at the same time.*

- Tailor responsibilities according to team, needs and project approach
- Consider technical and “soft” skills:
  - Experience, knowledge, skills
  - Attitude
  - Global/regional factors

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## Use Resource Calendars\*



- Document resource availability (people, equipment, material, etc.) during a planned activity period.
- Use when estimating project activities and understanding dependencies
- Specifies when, and for how long, identified team and physical resources will be available during the project
- Progressively elaborate and update it throughout the project



**Resource calendars** can be used in any kind of project!

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## Responsibility Assignment Tools



Responsibility assignment matrix (RAM) or **RACI chart**:

- Designates types of accountabilities assigned to resources or stakeholders
- Keeps information visible



### RESPONSIBLE

*A team member*

- Performs work to complete the task or create the deliverable
- Every task has at least one responsible person

### ACCOUNTABLE

*On the team  
(leadership/  
management)*

- Delegates and reviews the work involved in a project
- Ensures the responsible person/team knows project expectations and completes work on time
- Each task has only one accountable person

### CONSULT

*Stakeholders*

- Provides input and feedback on project work
- Not every task or milestone needs a consulted party



*Consider all stakeholders, but invite only necessary input*

### INFORM

*Usually not project decision makers*

- Needs to be informed of project progress because their work might be affected, but don't need details

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# Adaptive Resource Planning

## Quiz



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*Which of these are true? (Choose several)*

- 
- Teams self-organize to distribute work. **TRUE**
  - Adaptive teams never have a leader. **FALSE**
  - Team members are a mix of generalists and specialists. **TRUE**
  - Team members should be T-shaped. **TRUE**

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## Filling Resource Needs

Make or Buy?  
Borrow?



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External sourcing considerations:

- What is the impact on cost, time or quality?
- Is there an ongoing need for the specific skill set?
- How steep is the learning curve?
- Are required resources available within the organization?
- Would outsourcing allow the team to focus?

Use a **make-or-buy analysis** to make the best decision for your team.

**Make-or-buy decisions** are part of a procurement strategy.

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## Plan the Procurement Strategy

- Prerequisite OPAs
- Acquisition method
- Contract types
- Procurement phases

- Work with organization's finance or procurement department
- Use pre-approved vendors before requesting a new vendor
- Observe purchase amount limits per signatory — i.e. contracts valued over a certain threshold must be co-signed
- Use defined bidding process and templates
- Require RFPs for contracts valued over a certain threshold
- Follow escalation procedures for approval of spending limits
- Pay contracts at a defined time – e.g., upon completion of work or at the end of a project, with net payment terms

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## Procurement Management Plan\*

- Specifies the types of contracts that will be used
- Describes the process for obtaining and evaluating bids
- Mandates standardized **procurement documents**
- Describes how providers will be managed



*Your organization's procurement function will be involved in developing this plan. Work with them closely and use the correct procurement documents to avoid problems.*

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## Procurement Documents

### Bid and Proposal Activities



- **Statement of Work (SOW):** Details of work required
- **Request for quotation (RFQ):** Bid/tender or quotation, including only cost
- **Invitation for Bid (IFB):** Buyer requests expressions of interest in work
- **Request for information (RFI):** Buyer requests more information from seller
- **Request for proposal (RFP):** Buyer-issued statement of work required
- **Expression of Interest (EOI):** Seller-issued expression of interest in work

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## Formal Procurement Processes

### RFPs, Bidder Conferences



Organizations in highly regulated industries or government

Or, if a project needs specialist work or wants to find the best quality available.

Use RFPs, **bidder conferences**, and formal processes to ensure **all prospective vendors have a clear and common understanding of the procurement**

Work closely with the procurement officer or department

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## Source Selection Criteria\*

Work with external resources whose values, skills and attributes are aligned with your project's.



- Overall or life-cycle cost
- Understanding of need
- Technical capability
- Management approach
- Technical approach
- Warranty
- Financial capacity
- Production capacity and interest
- Business size and type
- Past performance of sellers
- References
- Intellectual property rights
- Proprietary rights

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## Qualified Vendors

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- Are pre-approved by the organization
- Have a history of work with the organization
- Are often “preferred” because they are proven, and their accounts are already set up



*Look in the lessons learned repository to find historical data about vendors.*

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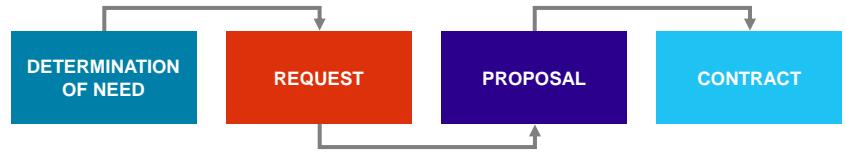
## Contracts\*

Negotiate  
Productive  
Relationships



### Contracts:

- Legalize working agreements
- Give structure to working relationships
- Further collaboration with partners
- Consider risks associated with contract types
- Deliver benefits to the buyer - different benefits by type
- Can be tailored for the partnership



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## Contract Types (1 of 3)

**Cost-reimbursable contracts** - For projects with expected, significant scope changes

Involves payments (cost reimbursements) to the seller for all legitimate actual costs incurred for completed work, plus a fee (seller profit)

**Cost plus fixed fee (CPFF)**

- Reimburses seller for all allowable costs for performing contract work; fixed-fee payment calculated as a percentage of the initial estimated project costs.
- Fee amounts do not change unless the project scope changes.

**Cost plus incentive fee (CPIF)**

- Reimburses seller for all allowable costs for performing contract work; predetermined incentive fee based for achieving contract-specified performance objectives.
- Shares costs between buyer and seller if final costs are less or greater than the original estimated costs
- Bases cost sharing on a pre-negotiated cost-sharing formula — e.g., an 80/20 split over/under goal costs

**Cost plus award fee (CPAF)**

- Reimburses seller for all legitimate costs
- Bases majority of fee on satisfying subjective performance criteria defined and incorporated into the contract
- Determines fee based on buyer's assessment of seller performance and not subject to appeals

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## Contract Types (2 of 3)

**Fixed-price contracts** – sets a fixed total price for a defined product, service, or result; used when requirements are well defined and no significant scope changes are expected.

**Firm fixed price (FFP)** Price of goods set at beginning; won't change unless scope changes

- Gives buyer and seller flexibility
- Allows for deviation from performance — i.e., financial incentives tied to achieving agreed-upon metrics (cost, schedule, awesomeness)
- Sets price ceiling; any further costs charged to seller

**Fixed price with economic price adjustments (FPEPA)**

**Pre-approved vendors or international payments**

- Allows for special provisions for predefined final adjustments to the contract price — e.g., inflation, cost increases (or decreases) for specific commodities

## Contract Types (3 of 3)

### Time and materials contracts

- Also called “time and means”
- Combine aspects of both cost-reimbursable and fixed-price contracts
- Used when a precise scope or statement of work is unavailable
- Used often for augmenting staff, acquiring experts or gaining external support

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## “Agile” Contract Types

<b>Multi-tiered structure</b>	<ul style="list-style-type: none"><li>• Create a master service agreement to capture fixed items - e.g., warranties, arbitration</li><li>• List variable items in a schedule of services - e.g., service rates, product descriptions</li><li>• Use a SOW to itemize dynamic items - e.g., scope, schedule, budget</li></ul>
<b>Emphasize value delivered</b>	<ul style="list-style-type: none"><li>• Structure milestone and payment terms based on value derived at milestones</li><li>• Focus on the value of feedback in product development</li></ul>
<b>Fixed-price increments</b>	Decompose scope into smaller, fixed-price micro-deliverables (user stories), giving customer more control over how the money is spent and limiting the supplier's financial risk.
<b>Not-to-exceed time and materials</b>	<ul style="list-style-type: none"><li>• Limit budget to fixed amount, allowing customer to add ideas by removing existing ones</li><li>• Monitor work to avoid overage (or add contingency hours)</li></ul>
<b>Graduated time and materials</b>	<ul style="list-style-type: none"><li>• Connect quality and timely delivery of work (use DoD) to financial award – reward for early and reduce for late delivery</li></ul>
<b>Early cancellation option</b>	<ul style="list-style-type: none"><li>• Enable flexible delivery of scope, using DoD - e.g., if partial scope delivery satisfies customer, contract can be cancelled for a fee</li></ul>
<b>Dynamic scope option</b>	<ul style="list-style-type: none"><li>• Gives option to vary scope and fund innovation at specific points while limiting supplier risk</li><li>• Vary scope at specific points to adjust features and innovate</li></ul>
<b>Team augmentation</b>	<ul style="list-style-type: none"><li>• Embed supplier's services directly into the customer organization; fund team instead of scope</li></ul>

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## Components of Contracts

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- Description of work - deliverables and scope
- Delivery date and schedule information
- Identification of authority, where appropriate
- Responsibilities of both parties
- Management of technical and business aspects
- Price and payment terms
- Provisions for termination
- Applicable guarantees and warranties
- Intellectual property
- Security, confidentiality, data privacy

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## ECO Coverage

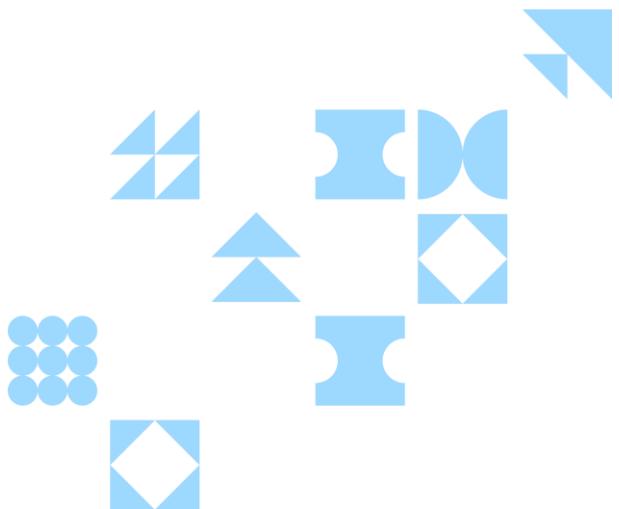


### 1.6 Build a team

- Deduce project resource requirements (1.6.2)

### 2.11 Plan and manage procurement (resources)

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



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# Budget

TOPIC E

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## Budget Planning Overview

Consider:

- Cost as well as value
- Organization and stakeholder attitudes towards budget and costs



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Create budget in accordance with project life cycles:

 Begin with fixed budget and amend with change control process

 Hybrid approaches add adaptability around surety

 Use ***burn rate***

 Agile teams collaborate with stakeholder partners and finance stakeholders to suggest incremental budgeting approaches (agile mindset)

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## Predictive Budget Planning



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- Create a **cost management plan**
- Employ **estimating techniques** to assign costs to activities
- Tailor a **cost baseline**
  - Is used to monitor and measure cost performance throughout the project (compares with actual results)
  - Includes budget contingencies to address identified risks
  - Can be changed only through formal change control procedures

The **budget at completion (BAC)** is the highest point on the cost baseline. The BAC is the sum of all budgets established, or the value of total planned work.

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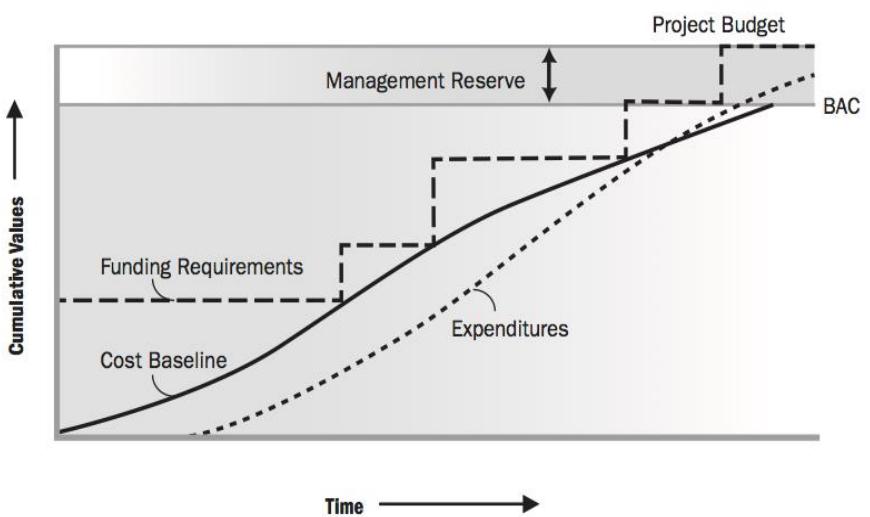
## Check with Organization

### Funding Limit Reconciliation

- Compare planned project expenditure against funding limits
- Align work/expenditures on the schedule to level the rate of expenditures



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## Historical Data

Start with What's Known

- Check lessons learned repository for budgets, estimates from previous, similar projects or data from the last iteration
- Look for valuable cost-estimating information - both successes and shortcomings
- Use analogous and estimating techniques, based on similar situations



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## Resource Costs



- Match project need to resource attributes (availability, experience, knowledge/skills, attitude)
- Create initial estimate based on average rate
- Modify as needed

- Assign a blended rate
- Estimate points (effort) using planning poker or affinity diagram to find the number of user stories that can be completed based on team velocity
- Use a simple formula to estimate the cost per point:
  - $\Sigma (\text{loaded team salaries for period } n) / \text{points completed in interval } n$
- Use a formula to estimate budget:
  - $(\text{Cost per point} * \text{total point value of items to be completed}) + \text{other expenses} = \text{forecast budget}$

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## Estimate Costs



Estimate the cost for each activity or work package in a project.

Cost estimates should include:

- Direct labor
- Materials
- Equipment
- Facilities
- Services
- Information technology
- **Contingency reserves**

Use:

- Rough order of magnitude (-25 to +75%)
- Definitive Estimate (-5 to +10%)
- Phased estimate



Expecting the scope to change?

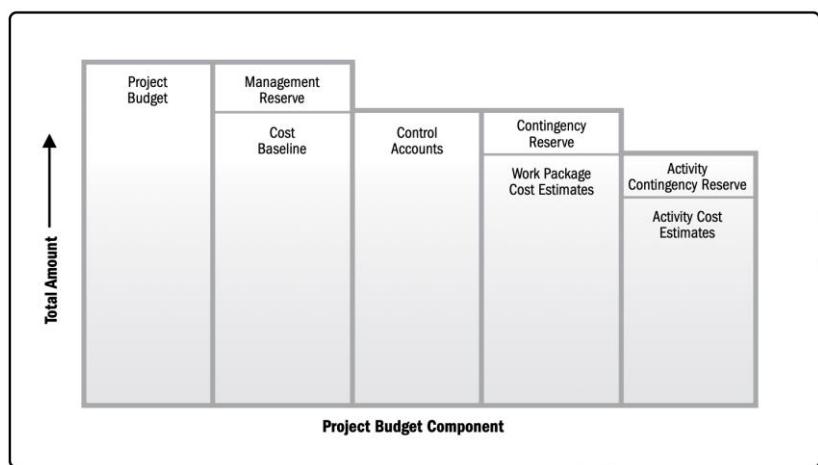
Use lightweight estimation methods for high-level estimating.

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## Project Budget

- Use the bottom-up approach to aggregate activity costs, work package costs and cost baseline
- Include **contingencies** to support risk management



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## Adaptive and Hybrid Budget Planning

### Guidelines/Example



- Focus on short-term budgeting and metrics versus long-term
- Set time periods for work and prioritize work within those time periods.
- Base cost on the resources used for that time period



### Examples

- Estimate budget based on current data, plus a forecast algorithm that is based on historic data or expert guidance — e.g., lean or Kanban
- Use a “top-down” approach, using gross-level estimation techniques such as planning poker and affinity grouping on feature sets, then employing progressive elaboration and rolling-wave planning methods to drill down to the task level on a just-in-time basis (iteratively)
- Revise budget at sprint planning intervals

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## Budget Considerations



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- Estimate budget based on the length of time of the project
- Burn rate includes:
  - Number of team members
  - Blended or actual team member rates
  - Time of involvement
- Assumption of full-time team involvement
- If additional equipment or supplies are required, add them to the estimated cost



*Product owner may control the budget, depending on team composition.*

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## ECO Coverage





# Risks

TOPIC F

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## Risk

Conditions of  
Uncertainty

- 
- Risk originates from a wide range of known and unknown causes within and outside the business environment.
  - Risk development is indicated by a **trigger condition**.
  - Risks can be positive (**opportunities**) or negative (**threats**).
  - If a risk becomes an **issue**, you must act!



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## Project Risks

### SLC Examples



#### Project Risks

- Working with new vendors and building processes
- Supply chain issues for correct bricks
- Building code compliance
- Key stakeholder conflict
- Retail market changes – decline of in-store shopping
- Site survey shows risk of slippage from coastal erosion < 25 years

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## Risk

### Business Context

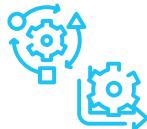


- *Likelihood of a risk event vs. the potential impact*
- *Opportunity vs. threat*



**Business risks** represent an opportunity for gain or loss.

**Project risk management** systematically maximizes the probability of positive events and minimizes the probability and consequences of negative events.



As project uncertainty increases, the risk of rework increases; adaptive life cycles use smaller increments of work to enable **feedback and progressive elaboration** of scope.

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## Create Risk Strategy

First, understand risk parameters for the organization and the project!



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How would you describe the organization/ project's **risk appetite**?

- Risk-seeking?
- Risk-neutral?
- Risk-averse?

The **risk threshold** is tied to individual and organizational risk appetites. Do you know:

- Which are too high to accept?
- Which are low enough to just be accepted?



- What criteria determines inclusion in the **risk register**?

### Management Guidelines

- Use qualitative (high, medium, low, etc.) or quantitative (numerical) ratings
- Set a maximum risk exposure level that can be managed without escalation

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## Define/Refine Risk Management Approach



Set initial risk strategy, then define and refine it!

Factor in project characteristics:

- Size
- Complexity
- Importance
- Development approach

Create a [risk management plan](#)!

In the plan:

- Risk strategy
- Methodology
- Roles and responsibilities
- Funding
- Timing
- Risk categories
- Stakeholder risk appetite
- Definition of risk probability and impact
- Probability and impact matrix
- Reporting formats
- Tracking documents

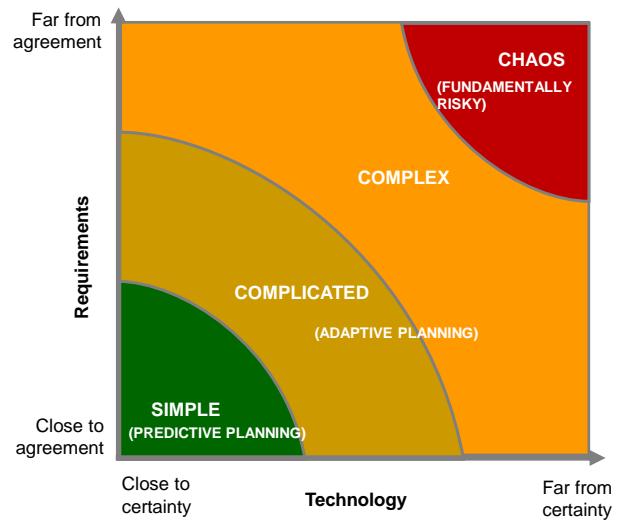
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## Inherent Risk

- Agile projects include risks in user stories and as part of backlog work items
- Teams discuss risks at planning meetings, during the normal course of work
- Teams place risks in a **risk register**, use **information radiators** to ensure visibility and a **backlog refinement** process that includes constant risk assessment



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## Risk Identification Techniques



Use a **prompt list** to evaluate the external environment for risks.



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### Data Gathering and Analysis

- Risk breakdown structure (RBS)
- Brainstorming
- Nominal group technique
- SWOT analysis
- Affinity diagram
- Assumption analysis
- Document review
- Delphi technique
- Monte Carlo simulation (larger organizations)

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# Risk Breakdown Structure

Uses typical categories, such as:

- Technical
- Management
- Commercial
- External



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RBS Level 0	RBS Level 1	RBS Level 2
0. All Sources of Project Risk	1. Technical Risk	1.1 Scope definition 1.2 Requirements definition 1.3 Estimates, assumptions, and constraints 1.4 Technical processes 1.5 Technology 1.6 Technical interfaces
	2. Management Risk	2.1 Project management 2.2 Program/portfolio management 2.3 Operations management 2.4 Organization 2.5 Resourcing 2.6 Communication
	3. Commercial Risk	3.1 Contractual terms and conditions 3.2 Internal procurement 3.3 Suppliers and vendors 3.4 Subcontracts 3.5 Client/customer stability 3.6 Partnerships and joint ventures
	4. External Risk	4.1 Legislation 4.2 Exchange rates 4.3 Site / facilities 4.4 Environmental / weather 4.5 Competition 4.6 Regulatory

Example RBS

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## Assess Risks

Qualitative *then*  
Quantitative

Perform the subjective **qualitative assessment** first.

Prioritize risks for further analysis by assessing and combining their probability of occurrence and impact in a **probability/impact matrix**.

Then, if further support is required, use a **quantitative assessment**.



*Not every risk needs quantitative assessment.*

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## Create Risk Probability and Impact Definitions

### Example

#### + / - IMPACT ON PROJECT OBJECTIVES

SCALE	PROBABILITY	TIME	COST	QUALITY
VERY HIGH	>70%	>6 months	>\$5m	Very significant impact on overall functionality
HIGH	51-70%	3-6 months	\$1m-\$5m	Significant impact on overall functionality
MEDIUM	31-50%	1-3 months	\$501k - \$1m	Some impact in key functional areas
LOW	11-30%	1-4 weeks	\$100k-\$500k	Minor impact on overall functionality
VERY LOW	1-10%	1 week	<\$100k	Minor impact on secondary functions
NIL	<1%	No change	No change	No change in functionality

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## Probability and Impact Matrix

- Use numeric values and/or colors
- If using numbers, multiply them to give a probability impact score – this makes evaluating relative priority easier!



*This is NOT a quantitative evaluation.*

		IMPACT (SEVERITY)				
		1	2	3	4	5
PROBABILITY (LIKELIHOOD)	1	VERY LOW 1	2	3	4	5
	2	2	LOW 4	6	8	10
	3	3	6	MEDIUM 9	12	15
	4	4	8	12	HIGH 16	20
	5	5	10	15	20	VERY HIGH 25

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## Risk Register\*



Risk Description	Impact Description	Impact Level Score	Probability Level Score	Risk Score (probability and impact multiplied)	Trigger Condition	Planned Response	Owner
	<i>What will happen if the risk is not mitigated or eliminated</i>	Rate 1 (LOW) to 5 (HIGH)	Rate 1 (LOW) to 5 (HIGH)	<i>(IMPACT X PROBABILITY) Address highest first.</i>	<i>What indicates the risk will occur.</i>	Action plan	<i>Who's responsible</i>
Supply chain issues for correct bricks		5	1	5	Supplier notification		L. De Souza
Building code compliance		5	2	10	Pre-checks fail		K. Ayoung
Working with new vendors and building processes		3	3	9	Delays or conflict		K. Ayoung

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## Risk List

Risk	Probability (1-10)	Impact (1-10)	Magnitude
• Working with new vendors and building processes	5	6	30
• Supply chain issues for correct bricks	5	10	50
• Building code noncompliance	5	10	50
• Key stakeholder conflict (Josie Bynoe)	4	6	24
• Retail market declining	8	10	80
• Site survey shows risk of slippage from coastal erosion < 25 years	5	3	15

Teams can add (tailor) columns for:

- Owner
- Status
- Date identified
- Date resolved
- Days active
- Resolution strategy



*In addition to a risk list or a risk register, teams use information radiators and a backlog refinement process with risks added, which are discussed at various planning meetings.*

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# Quantitative Risk Analysis Methods

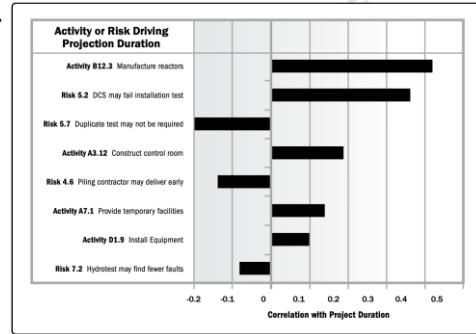
## (1 of 2)

- **Simulations**
- **Sensitivity analysis**
- *Decision tree analysis*
- *Influence diagrams*
- *Expected monetary value (EMV)*



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- **Simulations** - Use computer models to determine risk factors
- **Monte Carlo simulations** produce a quantitative risk analysis model by using schedule and/or cost inputs to produce an integrated quantitative cost-schedule risk analysis
- **Sensitivity analysis** -
- Output is the **Tornado diagram**, a horizontal bar chart comparing relative importance of various risks, highest on top



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## Quantitative Risk Analysis Methods (2 of 2)

- *Simulations*
- *Sensitivity analysis*
- **Decision tree analysis**
- **Influence diagrams**
- **Expected monetary value (EMV)**



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### Decision tree analysis

- Branches represent decisions or events, each with associated costs and risks
- The end-points of branches represent the outcome (negative or positive)

### Influence diagrams

- Quality management graphical aid
- Shows elements of uncertainty caused by risks using ranges or probability distributions



*Used when decision trees are too complex.*

### Expected Monetary Value (EMV)

- Multiply the monetary value of a possible outcome with its probability of occurrence to calculate the EMV of each branch
- Select the optimal one

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## Risks

### Time, Cost and Life Cycle



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“Predictive projects are most often affected by the impact of cost-related risks, whereas adaptive projects are affected by the impact of time-related risks.”



*Do you agree or disagree?  
Why?*



*Do you think each of these typical risks is more typical of predictive or adaptive project? Can you explain why?*

#### Typical Risks

- Delivery date slips
- Stretched resources
- Lack of clarity
- Scope creep

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## Risk Response

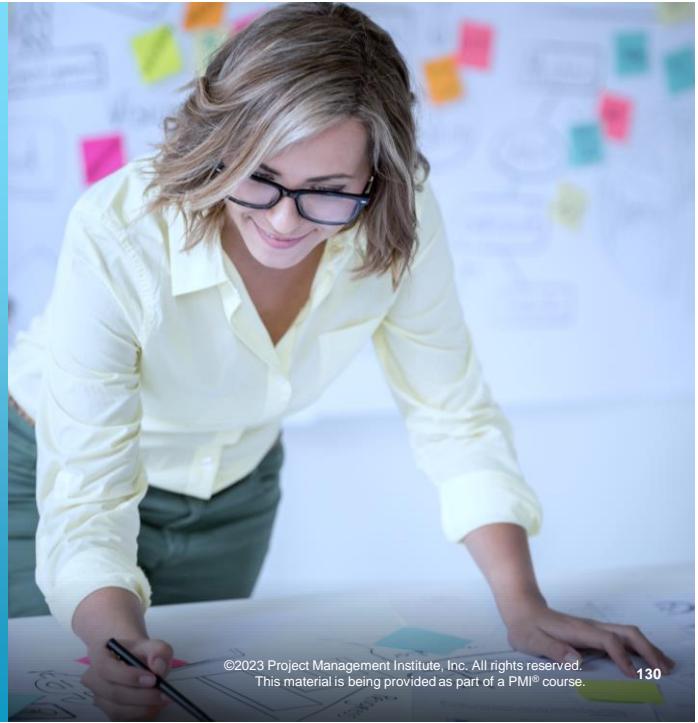
### Good Practice

Risk responses should be:

- Appropriate for the significance of the risk
- Cost effective
- Realistic within the project context
- Agreed to by relevant stakeholders
- Owned by a responsible person



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## Plan Risk Response

### Guidelines and Terminology



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- A trigger condition signals a risk can develop
- Team implements a risk response
- A **secondary risk** can arise as a direct result of the risk response implementation
- **Residual risk** can remain after risk responses have been implemented
- Have a **contingency (fallback) plan** ready in case the primary risk response fails
- The **contingency reserve (or allowance)** is the budget within the cost baseline that is allocated for identified risks and their response strategies

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## Risk Response Strategies

Prepare strategies for threats (negative) as well as opportunities (positive) and for individual project risks and overall project risk.



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THREAT	OPPORTUNITY
ESCALATE	ESCALATE
AVOID	EXPLOIT
TRANSFER	SHARE
MITIGATE	ENHANCE
ACCEPT	ACCEPT

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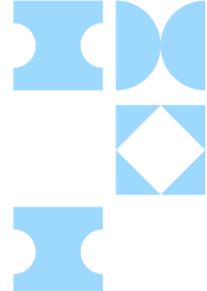


### 2.3 Assess and manage risks

- Determine risk management options (2.3.1)
- Iteratively assess and prioritize risks (2.3.2)

### 3.1 Plan and manage project compliance

- Determine necessary approach and action to address compliance needs (risk, legal) (3.1.6)
- Determine potential threats to compliance (3.1.3)



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## Quality

TOPIC G

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## Quality

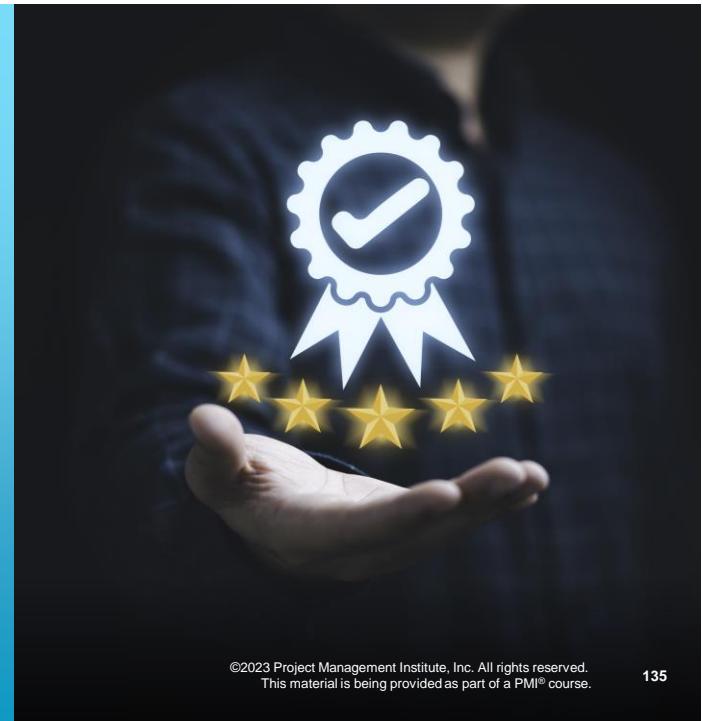
The degree to which a set of inherent characteristics fulfill requirements.

Include:

- Stakeholder expectations and end-user satisfaction
- Compliance with standards and regulations
- Continuous improvement



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## Cost of Quality (CoQ)

Money spent during project to avoid failure

- **Prevention costs (Build a quality product)**
  - Training
  - Document processes
  - Equipment
  - Time to do work “right” – resources, infrastructure expenses
- **Appraisal (quality assessment)**
  - Testing
  - Inspections

Money spent during/after project because of failures

- **Internal failure costs**
  - Rework
  - Scrap
- **External failure costs**
  - Liabilities
  - Warranty work
  - Lost business

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## Stakeholder and Customer Expectations of Quality



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### PRODUCT/DELIVERABLE

Identify quality requirements during requirements elicitation; create **quality management plan**.

### PROCESSES

Ongoing observation and checking of processes stated in quality management plan; overseen by a **quality policy**.



*Your organization should have a **quality policy** which applies to all projects. If your organization does not have a quality policy, then your project needs to create one.*

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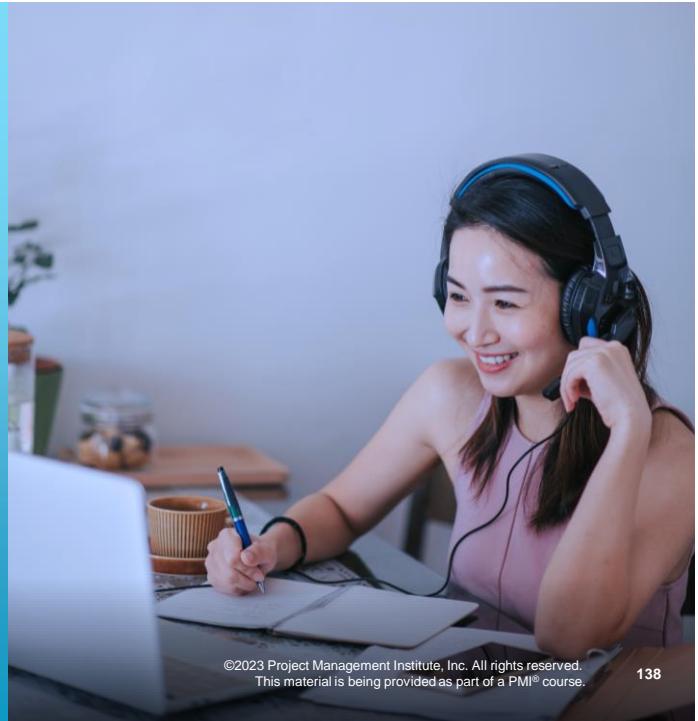
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## Quality Management Plan

- Activities and resources that achieve the quality objectives
- Formal or informal, detailed or broadly framed
- Reviewed throughout the project
- Benefits:
  - Sharper focus on the project's value proposition
  - Cost reductions
  - Mitigated schedule overruns from rework



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## Compliance Requirements

Internal and external standards, such as:

- Appropriate government regulations
- Organizational policies
- Product and project quality requirements
- Project risk

Compliance actions:

- Classify compliance categories
- Determine potential threats to compliance
- Analyze the consequences of noncompliance
- Determine necessary approach and action to address compliance needs



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# Quality Standards and Regulations



		Example
<b>Standards</b>	Documents established as a model by an authority, custom, or by general consent.	Dictionary
<b>Regulations</b>	Requirements that can establish product, process, or service characteristics, including applicable administrative provisions with government-mandated compliance.	Language rules
<b>De facto standards or regulations</b>	Widely accepted and adopted through use, but not yet. . .	Words are used widely in groups, like slang or jargon.
<b>De jure standards or regulations</b>	Mandated by law or approved by a recognized body of experts.	Word enters dictionary and becomes a defined word.



A number of international institutes are devoted to quality, including:

- American Society for Quality (ASQ) - ISO 9000 Series
- The Chartered Quality Institute (CQI)
- ASTM International

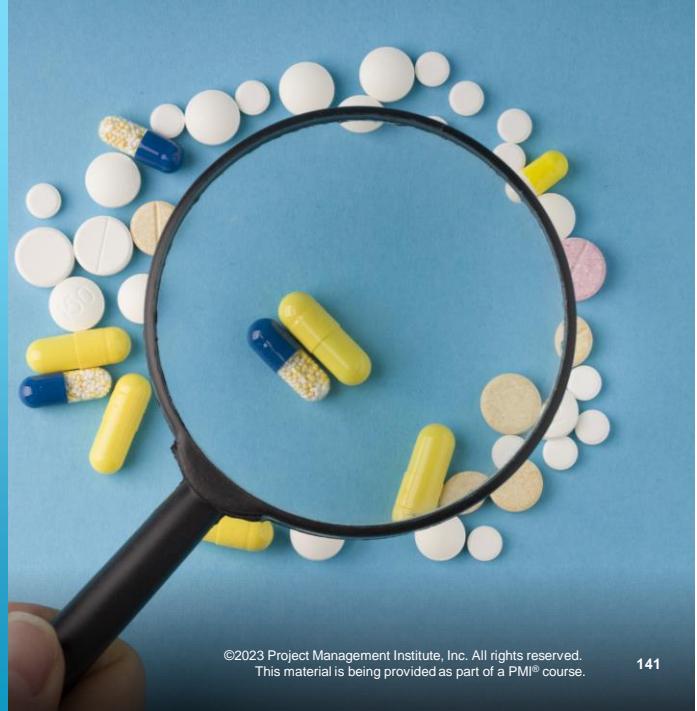
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## Discussion

### Quality Standards and Regulations

What standards and regulations are relevant in your industry?



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## Quality Metrics, Checklists, and Processes



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**Metrics** measure desired quality attributes for your product or project through testing, use of tools, processes.

Include a tolerance level that factors in what the customer will accept and describe the desired quality level in the acceptance criteria and DoD.

Include **checklists**, **templates** and **quality artifacts** in the quality management plan.



Adaptive teams use retrospectives and small batch cycles to ensure quality.

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## Quality Methods for Continuous Improvement

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**Six Sigma (aka Lean Six Sigma)** – DMAIC framework (Define, Measure, Analyze, Improve, Control) – focus on removing waste

**Kaizen** – “change for better/improve”

**(PDCA) Plan – Do – Check – Act** – Shewhart/Deming

**Agile methods** - **Scrum, Kanban, Crystal Methods** (software), etc.

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## ECO Coverage



### 2.7 Plan and manage quality of products / deliverables

- Determine quality standard required for project deliverables (2.7.1)

### 3.1 Plan and manage project compliance

- Use methods to support compliance (3.1.4)
- Measure the extent to which the project is in compliance (3.1.7)



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# Integrate Plans

TOPIC H

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## Integrating Plans

### An Important Step



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Overall, the scope, schedule, budget, resources, quality and risk plans must support desired outcomes.

An integrated view of all plans can:

- Identify and correct gaps or discrepancies
- Align efforts and highlight how they depend on each other — so your team works better!
- Help assess and coordinate the project during its life cycle



*The result of this step is an **integrated project management plan!***

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## Integrate Plans



At the end of the planning stage, combine all planning results from knowledge areas.



*Specific to project manager role, this task cannot be delegated.*



Reframe the approach to “plan integration” and figure out a way forward to work with the various planning elements – adapt it while working!



Adaptive processes and agile ceremonies provide a structure to continuously integrate plans or aspects of a project.

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## Change Control

Use a **change management plan** to set a process and assigned roles for change



Questions about Change	Typical Answers
Who can propose a change?	Roles are assigned
What exactly constitutes a change?	A change is proposed or an event changes one of the project baselines or measures
What is the impact of the change on project objectives?	Recommend evaluation method
What are steps to evaluate a <b>change request</b> before approving or rejecting it?	Required steps per quality policy
Who has the authority to approve various types and levels of change?	Change control board, other approvals
When a change request is approved, what project documents will record the next steps (actions)?	Change log
How will you monitor these actions to confirm completion and quality?	Quality metrics, RAM/RACI charts, information radiators

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## Plan for Complexity and Change

- Organization's system
- Human behavior
- Uncertainty or ambiguity



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### Systems-based

- **Decoupling:** Disconnect parts of the system to simplify it and reduce the number of connected variables
- **Simulation:** Use similar, unrelated scenarios to try to understand the complexity

### Reframe the Problem

- **Diversity:** View the system from different perspectives
- **Balance:** Reconsider the type of data used

### Process-Based

- **Iterate:** Plan iteratively or incrementally; add features one at a time
- **Engage:** Really engage with stakeholders
- **Fail safe:** Plan for failure

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## How to Approach Complex Plans

### Fail Fast and Self-Correct!

Instead of planning, rely on **tailoring, adaptability and resilience**

Adopt mindsets and frameworks that prioritize **collaboration** over instruction and control



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## ECO Coverage

### 2.9 Integrate project planning activities

- Consolidate the project/phase plans (2.9.1)
- Assess consolidated project plans for dependencies, gaps, and continued business value (2.9.2)
- Analyze the data collected (2.9.3)
- Collect and analyze data to make informed project decisions (2.9.4)
- Determine critical information requirements (2.9.5)

### 2.10 Manage project changes

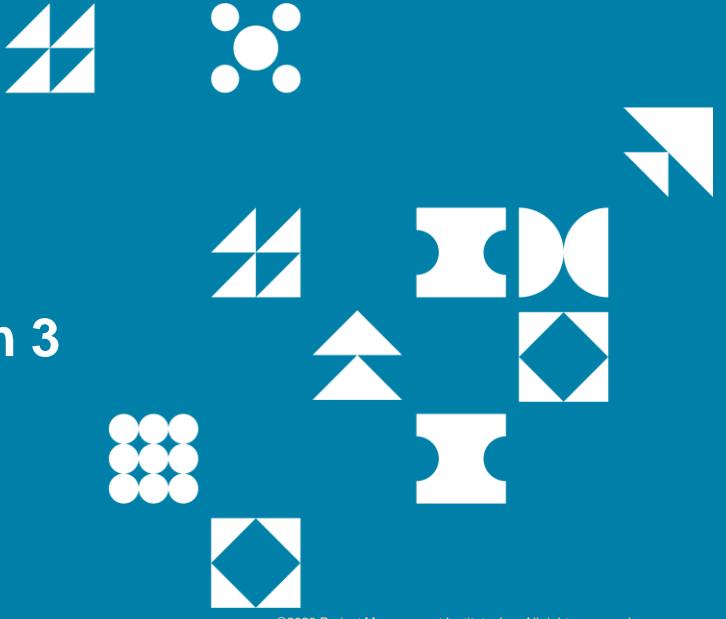
- Determine strategy to handle change (2.10.2)



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## End of Lesson 3



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