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Project Management

Unit 2

Project Planning: Scope, Requirements, Scheduling and Resources

Cefriel

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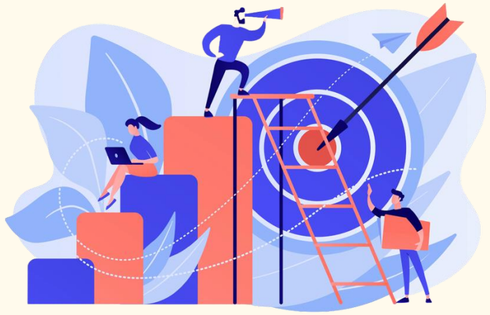
Project Management Module Aims

- Provide a comprehensive overview of project planning, with a focus on scope, requirements, scheduling, and resource management
- Enable participants to understand and apply techniques for defining, decomposing, and estimating project work
- Emphasize the importance of clear requirements and effective communication in project planning
- Equip participants with tools and techniques for monitoring, controlling, and managing project performance
- Introduce risk management principles and processes
- Present Agile project management fundamentals, focusing on the Scrum framework



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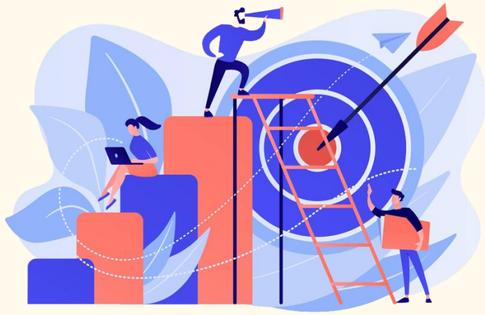
Unit 2 Contents

- **Scope management**: requirements collection, scope definition, WBS creation
- **Requirements**: types (explicit, implicit, emerging, external, unexpressed), prioritization, quality, collection techniques (interviews, workshops, surveys, prototyping)
- **Requirements traceability and validation**
- **Scope statement**: objectives, deliverables, boundaries, constraints, acceptance criteria
- **WBS**: decomposition logic, building methods (top-down, bottom-up, template-based)
- **Activity dependencies**: finish-to-start, start-to-start, finish-to-finish
- **Scheduling**: critical path, float, estimation processes and techniques
- **Resource assignment**: RAM matrix, RACI, resource quantification
- **Budgeting**: internal/external resources, hardware/software, estimation methods



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Project Planning: Scope Management

Effective scope management is the cornerstone of successful project delivery. It ensures that the project includes all the work required, and only the work required, to complete the project successfully—nothing more, nothing less.

Collect Requirements

Gather and document stakeholder needs and expectations to establish a clear foundation for project scope.

Define Scope

Transform requirements into a detailed description of project deliverables and the work needed to create them.

Create WBS

Break down deliverables into manageable work packages that can be assigned, tracked, and completed.

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Understanding Project vs. Product Scope

Product Scope

Defines the features and functionalities that the final deliverable must possess

- Characteristics of the end product or service
- Measurable attributes and capabilities
- Technical specifications and requirements

Project Scope

Encompasses all the work required to deliver the product or service

- Tasks, activities, and processes needed
- Resources and effort allocation
- Timeline and milestone definitions

Key Distinction: Product scope focuses on what is being created, while project scope focuses on how it will be created

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What is a Requirement?

> A requirement identifies a specific characteristic or capability that a system must possess to meet stakeholder needs and achieve project objectives

IEEE Standard Definition

1. A condition or capability needed by a user to solve a problem or achieve an objective
2. A condition that must be met by a system to satisfy a contract, standard, or specification
3. A documented representation of either condition above

> Requirements form the contractual and technical foundation of your project—they must be clear, unambiguous and verifiable.

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Critical Distinctions in Requirements

The Need

The underlying problem or opportunity that drives the project

The Requirement

The documented capability or condition that addresses the need

The Solution

The technical implementation chosen to fulfill the requirement

Understanding these distinctions prevents scope creep and ensures that requirements remain focused on what must be achieved, not how it will be implemented.

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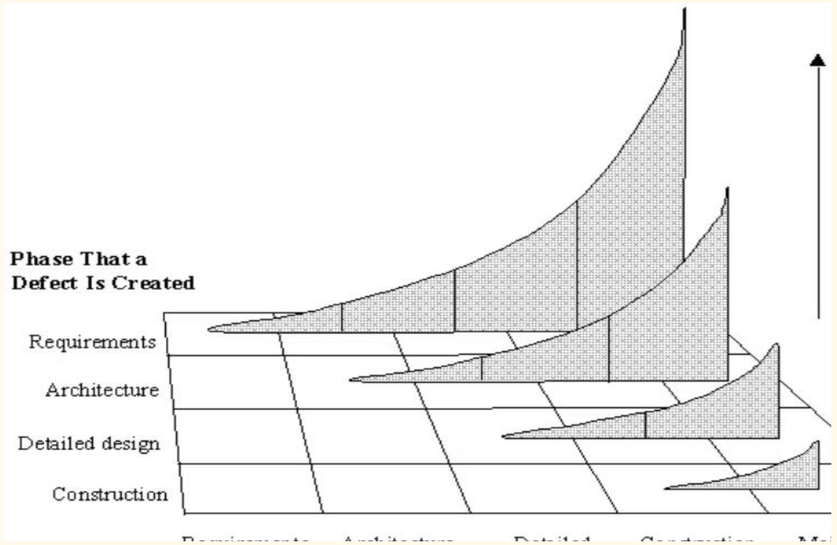
Requirements Prioritization Framework

Not all requirements carry equal weight. Strategic prioritization ensures critical features receive appropriate attention and resources. The matrix below provides a visual framework for categorizing and managing requirements based on importance and urgency.



Strategic Importance

Use this prioritization matrix to classify requirements and guide resource allocation decisions throughout your project lifecycle.

- High Priority: Mission-critical requirements
- Medium Priority: Important but flexible
- Lower Priority: Nice-to-have features

Regular reassessment ensures priorities align with evolving project goals and stakeholder needs.

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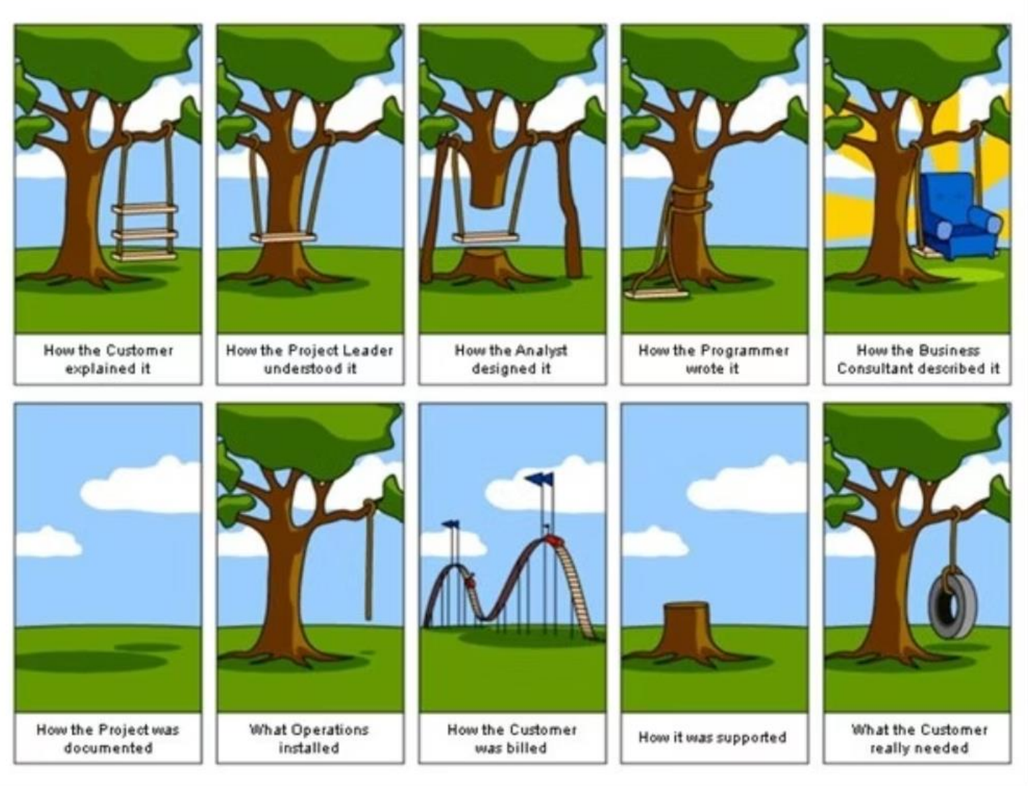
Critical Importance of Requirements

Requirements form the foundation of every successful project. They bridge the gap between stakeholder vision and project delivery, ensuring everyone understands what needs to be built and why. Without clear requirements, projects risk misalignment, wasted resources, and missed expectations.



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What Makes a Good Requirement?

Quality requirements share common characteristics that ensure they can be effectively implemented and validated. Each attribute plays a crucial role in project success.

Verifiable
Can be tested and confirmed through inspection, analysis, demonstration or testing

Clear & Concise
Unambiguous language that all stakeholders can understand without confusion

Complete
Contains all necessary information without requiring additional clarification

Consistent
Aligns with other requirements without contradictions or conflicts

Traceable
Can be linked back to business objectives and forward to design elements

Viable
Achievable within project constraints of time, budget, and technology

Necessary
Directly supports business goals and adds measurable value

Implementation Free
Focuses on what is needed, not how it will be built

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Collecting Requirements: Process and Outputs

The Process

Requirements collection transforms stakeholder needs into documented, actionable specifications. This foundational process involves:

01 Identify the Process Domain

Define boundaries and context for the requirements

02 Analyze Business Requirements

Understand organizational goals and strategic objectives

03 Detect Needs and Constraints

Uncover explicit and implicit stakeholder expectations

04 Identify Supporting Systems

Map existing tools and infrastructure that impact the project

Key Success Factor

Engaging stakeholders and the project team with appropriate approaches is crucial for capturing complete and accurate requirements.

Primary Outputs

- Requirements documentation (unambiguous, clear, complete)
- User scenarios and use cases (UML diagrams)

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Understanding Requirement Origins

Explicit Requirements

Directly stated by stakeholders during formal elicitation sessions—clear, documented, and agreed upon.

Implicit Requirements

Assumed or expected by stakeholders but not explicitly stated—often based on industry standards or common practices.

Emerging Requirements

Surface during the project as understanding deepens - require ongoing stakeholder engagement and adaptive planning.

External Requirements

Imposed by regulations, standards, or contractual obligations—non-negotiable and must be verified for compliance.

Unexpressed Requirements

Needs that stakeholders haven't articulated—discovered through observation, analysis, and probing questions.

Pro Tip: Experienced project managers actively probe for implicit and unexpressed requirements to avoid costly surprises later in the project lifecycle.

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Requirements Collection Techniques

Interviews

One-on-one or small group sessions to gather formal or informal project needs directly from stakeholders and subject matter experts.

Focus Groups

Collegial, moderated sessions where a facilitator guides diverse stakeholders to express needs and requirements cooperatively.

Facilitated Workshops

Structured sessions guided by expert facilitators using proven methodologies:

JAD: Joint Application Development

Collaborative approach common in software development that brings together developers and users to design solutions.

QFD: Quality Function Deployment

Systematic methodology that translates customer requirements into technical specifications and prioritizes features.

Observations (Job Shadowing)

Direct observation of users in their work environment to understand processes, procedures, and pain points firsthand.

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Requirements Tracreability Matrix

The Requirements Traceability Matrix is a critical tool that links requirements to their origins and tracks them throughout the project lifecycle, ensuring nothing falls through the cracks.

Essential Components

- **Complete Requirements List**
  Comprehensive catalog of all identified requirements with unique identifiers
- **Origin and Implementation References**
  Links to source documents and objects that implement each requirement
- **Assessment Criteria**
  Metrics, tests, and thresholds for validating requirement fulfillment
- **Responsibility Assignment**
  Clear ownership for managing and delivering each requirement
- **Validation Status**
  Examination results verifying feasibility, consistency, and traceability

Strategic Benefits

✓ Classifies importance and implementation priorities ✓ Documents links to project planning

✓ Traces progress and highlights changes

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Defining and Managing Project Scope

The Scope Definition Process

This critical process translates stakeholder requirements into a consistent, verifiable solution design. The primary output is the Scope Statement—a comprehensive written document detailing project deliverables and the work required to create them.

Project Objectives
Quantitative criteria defining project success—measurable outcomes that stakeholders will use to evaluate completion

Product Scope Description
Detailed description of all product or service features and functionalities that must be implemented

Acceptance Criteria
Specific conditions that must be met to satisfy contracts, standards, and stakeholder expectations

Project Boundaries
Clear specification of what is included in the project and, equally important, what is explicitly excluded

Project Deliverables
Complete list of tangible and intangible outputs whose satisfactory delivery defines project completion

Constraints and Assumptions
Limitations, restrictions, and assumptions that may impact project scope and execution

> The Scope Statement serves as the authoritative reference for all project decisions, the foundation for planning, a guide during execution, and the baseline for evaluating change requests.

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Step 1 : Work Breakdown Structure (WBS)

> The WBS is a deliverable-oriented hierarchical decomposition of the work to be performed to achieve project objectives and produce required deliverables.

01

Foundation for Planning

Originates from project initiation and identifies all activities needed for subsequent planning processes

02

Hierarchical Decomposition

Breaks down the entire project into manageable, measurable components and work packages

03

Flexible Representation

Can be displayed graphically for overview or in text format for detailed operational planning

Graphic Format

Ideal for presenting project structure and providing stakeholders with a comprehensive visual overview

Textual Format

Most practical for organizing day-to-day project activities and detailed work assignments

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Why the WBS is Essential: Monitoring & Team Building

Progress Monitoring

WBS tasks form the foundation for tracking project advancement. Each work package represents a measurable unit that stakeholders use to assess progress and maintain control throughout the project lifecycle.

Team Structure

The WBS serves as the blueprint for building and organizing the project team. It provides the basis for allocating responsibilities, assigning work packages, and ensuring every team member understands their role.

Key Insight: The WBS transforms abstract project goals into concrete, actionable work units that can be assigned, tracked, and completed. This structure is fundamental to successful project execution.

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Why the WBS is Essential: Communication

The Work Breakdown Structure serves as the primary communication tool throughout the entire project lifecycle, facilitating understanding among all stakeholders regardless of their role or involvement level.

Executive & Customer View

Leadership and clients focus on high-level progress by monitoring summary tasks and major milestones.
They need to understand overall project health and trajectory.

Work Team Perspective

Team members concentrate on detailed progress within their specific work packages, tracking daily tasks and deliverables that contribute to larger project goals.

Tailored for Audience

The same work packages can be arranged into different clusters based on the audience.
This flexibility maximizes the WBS's value across diverse stakeholder needs.

Pro Tip: Create multiple views of your WBS organized by different criteria—timeline, department, deliverable type—to serve various stakeholder communication needs effectively.

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WBS Decomposition Criteria

Creating an effective Work Breakdown Structure requires choosing the right decomposition logic. Understanding these six fundamental approaches helps you organize project work in ways that align with your project's unique characteristics and objectives.

In Parts

Break down the final output into individual components, identifying specific activities for each element

In Objectives

Structure according to output performance targets and goals

In Phases

Align with the natural sequence of realization phases

Spatial-Geographic

Structure based on different work locations

In Functions

Organize by different functionalities expected from the project deliverables

Per Deliverables

Organize by progressive, sequential deliverables

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WBS Building Techniques

Three proven methodologies exist for constructing your Work Breakdown Structure. Each technique offers distinct advantages and presents unique challenges. Your choice should align with project clarity, team experience, and deliverable definition.

1	2	3
Top-Down Approach Best for: Projects with limited initial clarity or when PM teams have developing experience Strengths: Enables logical project reorganization, works well with high-level deliverables, offers flexibility for scope evolution Challenge: Determining optimal decomposition depth can be difficult	**Bottom-Up Method** Best for: Projects with well-defined, clear final product or service features Strengths: Starts with low-level deliverables, confirms comprehensive work package inclusion Challenge: Requires identifying all detail-level deliverables and maintaining logical organization; risk of losing big-picture perspective	**Template-Based** Best for: Projects similar to past efforts, allowing customization of proven structures Strengths: Provides coherence across projects, prevents task omission, improves over time, enhances estimation accuracy Challenge: Not universally applicable; requires customization to avoid including unnecessary or excluding necessary deliverables

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Step 2: Understanding Activity Dependencies

Precedence relationships define how activities connect and flow within your project schedule. Understanding these links is critical for realistic planning and identifying the critical path.

1

Finish-to-Start

The most common relationship: Activity B cannot begin until Activity A is fully completed. This sequential dependency is used when one task must finish before another can start.

2

Start-to-Start

Activities B and A begin simultaneously or Activity B starts immediately after Activity A begins. Used when tasks can run in parallel from their start points.

3

Finish-to-Finish

Activity B completes at the same time as Activity A or immediately after. This relationship ensures coordinated completion of dependent deliverables.

These precedence links form the backbone of your project network diagram and are essential for calculating the critical path, identifying schedule risks, and optimizing resource allocation.

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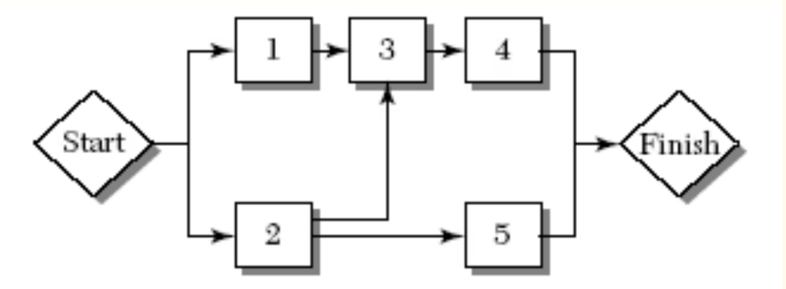
Identifying Activity Relationships

Activities must execute in a specific sequence governed by predecessor links and constraints. These relationships indicate dependencies between activity starts and ends, creating a logical flow of project work.

Dependency Structure

Constraints are expressed through tables or network diagrams that map the logical relationships between activities.

Activity	Predecessor	Resources
1. Analysis	—	Analyst
2. Design	—	Designer
3. Module 1	1, 2	Developer
4. Module 2	3	Developer
5. Module 3	2	Developer



At this stage, assume unlimited resources to focus purely on logical dependencies

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Work Package Estimation

Accurate estimation is the foundation of realistic project planning. Three critical dimensions require careful analysis: duration, cost, and risk reserves. Understanding the distinction between effort and duration is essential.

Duration Estimate

Key distinction: Effort measures work to accomplish; duration measures time needed

Duration ≠ Elapsed time

All activities have a duration that considers both work volume and resource availability

Cost Estimate

Work estimate: Human resource effort with specific professional profiles

Materials estimate: All necessary materials for project success—ideally linked to specific WBS elements

Fixed costs: Other costs not directly tied to specific activities

Reserve Analysis

Time or cost contingency buffers that account for scheduling risks

Can be expressed as:

- Percentage of activity duration
- Fixed person-days
- Result of quantitative risk analysis

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Four-Stage Estimation Process

Project estimation evolves through distinct phases, each providing increased accuracy as project definition matures. Understanding this progression helps set appropriate expectations and refine estimates systematically.

Conceptual

Initial rough estimates based on limited information

Preliminary

Refined estimates as project scope becomes clearer

Detailed

Comprehensive estimates with defined work packages

Final

Precise estimates ready for baseline and execution

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Estimation Techniques Comparison

Four primary estimation methods offer different trade-offs between speed, accuracy, and data requirements. Selecting the right technique depends on available historical data, project uniqueness, and required precision.

1

Expert Judgment

Advantages: No historical data required; works for atypical projects
Limits: Subjectivity influences results; expert knowledge verification can be challenging

2

Analogous / Top-Down

Advantages: Based on real historical data from similar projects
Limits: Projects similar in form may differ substantially in content and requirements

3

Bottom-Up

Advantages: Reduced uncertainty through detailed component analysis
Limits: Determining required resources and duration a priori can be difficult

4

Parametric

Advantages: Simple, objective, reusable models; foundation for rules of thumb
Limits: Models may become outdated; underlying data may no longer apply; requires calibration

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Understanding Critical Path & Float

Not all activities are created equal in project scheduling. While some activities have flexibility in their timing, others must be completed precisely on schedule. Understanding float and critical activities is essential for effective schedule management.

Key Scheduling Concepts

Slack (Float): The flexibility an activity has in its execution timeframe

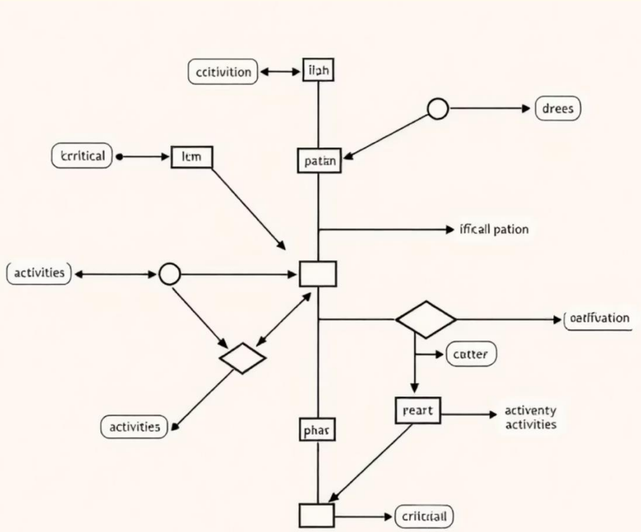
Critical Activities: Activities with zero slack that must be completed on time (Slack = 0)

Delays in critical activities cascade through subsequent activities, impacting overall project timing

$$Float = LS - ES = LF - EF$$

Where: ES = Early Start, LS = Late Start, EF = Early Finish, LF = Late Finish

ES early start	duration	EF early finish
Activity name		
LS late start	Total Float	LF late finish



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Step 5: Optimizing Resource Assignment

Resource assignment is the critical process of optimizing human resources and equipment allocation to achieve efficient project execution. The goal is clear visibility and control to prevent inefficiencies and cost overruns.

Primary Objective

Maintain comprehensive control of all involved resources, avoiding inefficiency and budget increases from last-minute resource additions or shortages.

Resource Quantification

Achieve coherent quantification of both human and equipment resources, ensuring accurate forecasting and allocation throughout the project timeline.

Resource Categories to Consider

1

Limited Resources

Constrained resources with fixed availability that require careful scheduling and potential leveling to avoid conflicts

2

Unlimited Resources

Flexible resources that can be scaled as needed, though cost implications must still be managed

3

Economic Resources

Budget and cost considerations that constrain both limited and unlimited resource allocation decisions

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RAM Matrix: Responsibility Assignment

The Responsibility Assignment Matrix (RAM) clarifies who does what in your project. Using the RACI framework ensures clear accountability and prevents confusion about roles and responsibilities across all activities.

Sample RAM Matrix Structure

Activities	George	Glenda	Tom	Susan	Mary	Craig
Investigate	R	A	I	C		C
Design SW	I	A		C	R	
UAT Plan	R	A		I		C
Phase Signoff	R	A	I	C	C	C

Responsible (R)

Conducts actual work; multiple Rs allowed for team efforts

Accountable (A)

Approves completed work; fully accountable; only one A per activity

Consulted (C)

Provides information or capability; two-way communication

Informed (I)

Receives progress updates; one-way communication

Detail level can vary depending on activity features (work packages, tasks, etc.)

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Budget Definition Components

A comprehensive project budget accounts for multiple cost categories. Understanding how to quantify and allocate these costs ensures accurate financial planning and resource procurement.

Internal Resource Costs

Derived from internal resource effort across different professional profiles

Critical: Include overhead costs in calculations

Base calculations on fully loaded rates that reflect true organizational costs

External Resource Costs

Based on effort from external resources with negotiated rates

Costs established at project initiation through vendor agreements

May include consultant fees, contractor rates, or outsourced services

Hardware & Software Costs

Identified according to project specifications and technical requirements

Typically, not directly linked to WBS in terms of cost allocation

Quantified to ensure correct procurement and timely availability

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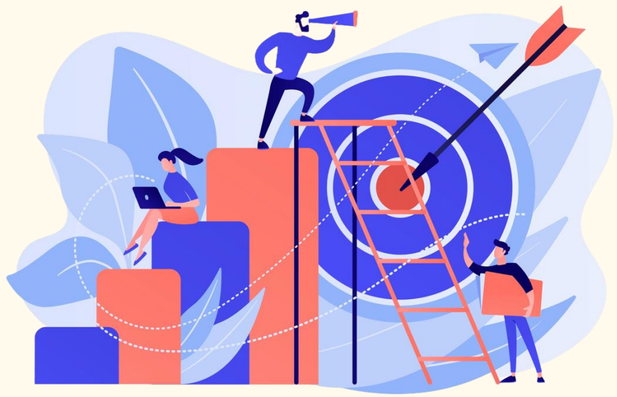
Unit Completed – What's Next?

To consolidate your learning and reflect on the key concepts covered, please take a moment to complete this quiz.

Your feedback and results will help you track your progress and support continuous improvement of the training experience.

Click the link to begin the quiz!



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