
# Week 2

GSOE9820 Engineering Project Management
Term 3 2021

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# Triple constraint

# Establishing Project Priorities

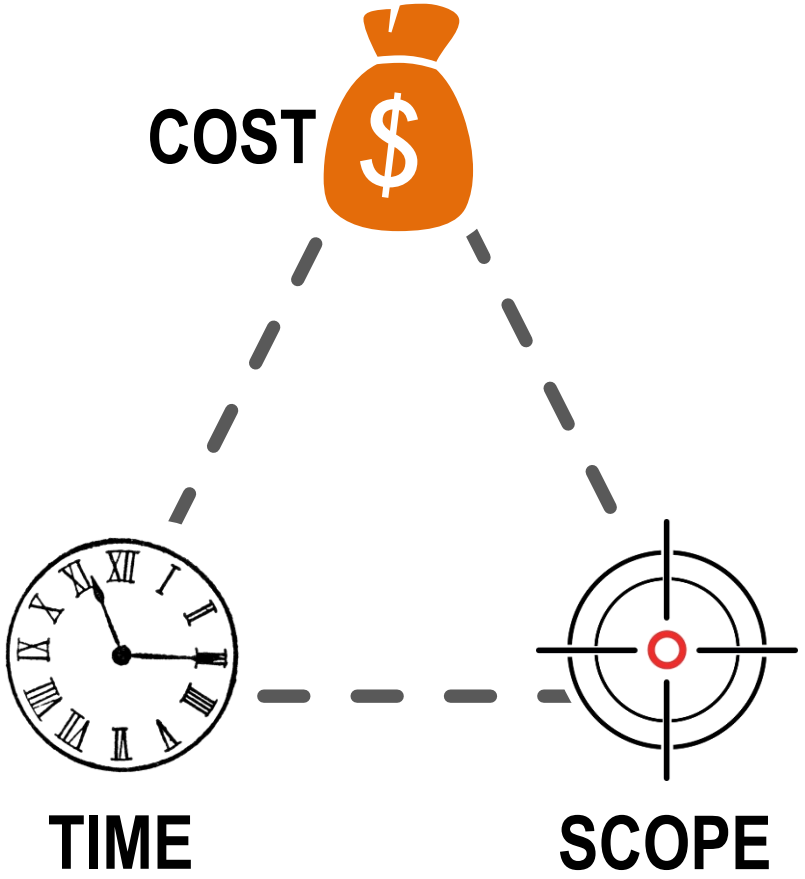
Quality and the ultimate **success** of a project are traditionally defined as **meeting** and/or **exceeding** the **expectations** of key stakeholders (Customer or upper management).

It is often measured in terms of

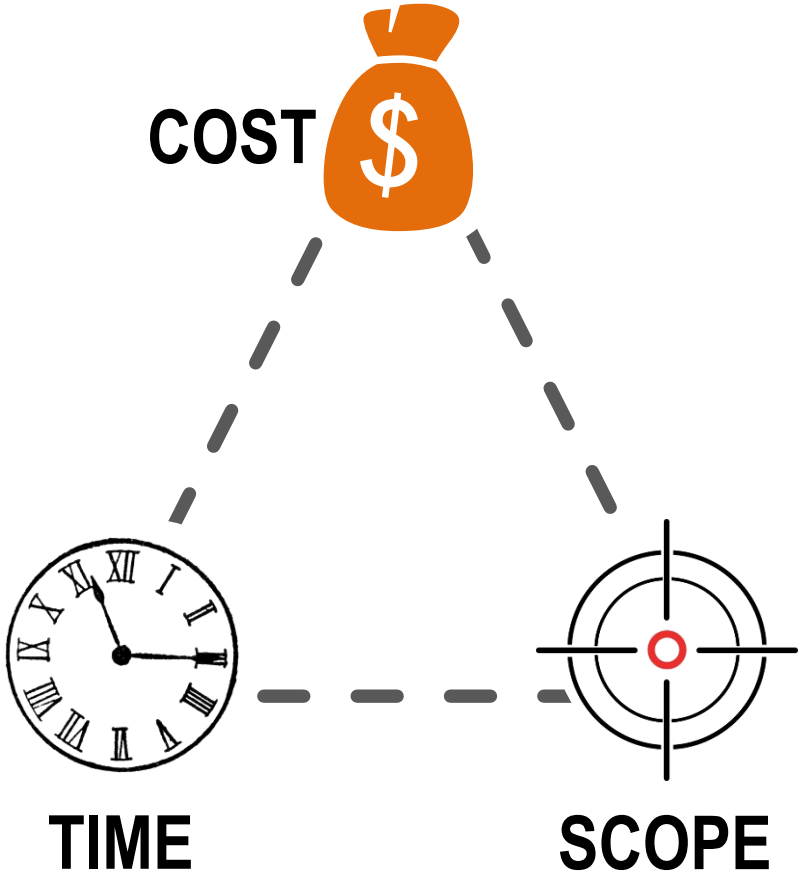
- **Cost** (Budget)
- **Time** (Schedule)
- **Scope** (Performance/Quality)

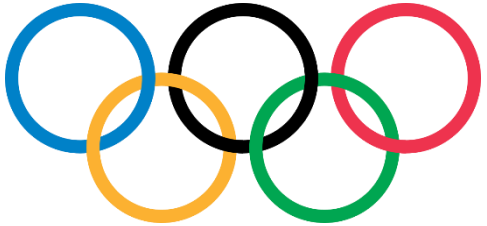

Cost = *function* (Scope, Time)

# Triple Constraint Model




# Key Project Driver



**Olympics**

**Nuclear power plant**

**Apartment complex**

# Trade Offs / Compromises

Causes of Trade-offs

- Shifts in the relative importance of criterions related to cost, time and scope

Managing the priorities of project trade-offs

- **Constrain**
  - A parameter is fixed requirement.
- **Enhance**
  - Optimizing a criterion over others.
- **Accept**
  - Reducing (or not meeting) a criterion requirement

# Project Priority Matrix

The purpose is to **define and agree** on what the **priorities** and **constraints** of the project are so that the right decisions can be made at the appropriate time

**CONSTRAIN**
Fixed requirement

**ACCEPT**
Let this factor be as large as necessary

**ENHANCE**
Actively work to optimise this factor

| Time | Performance | Cost |
|---|---|---|
| | | |
| | | |
| | | |

**Nuclear power plant**

# The WBS

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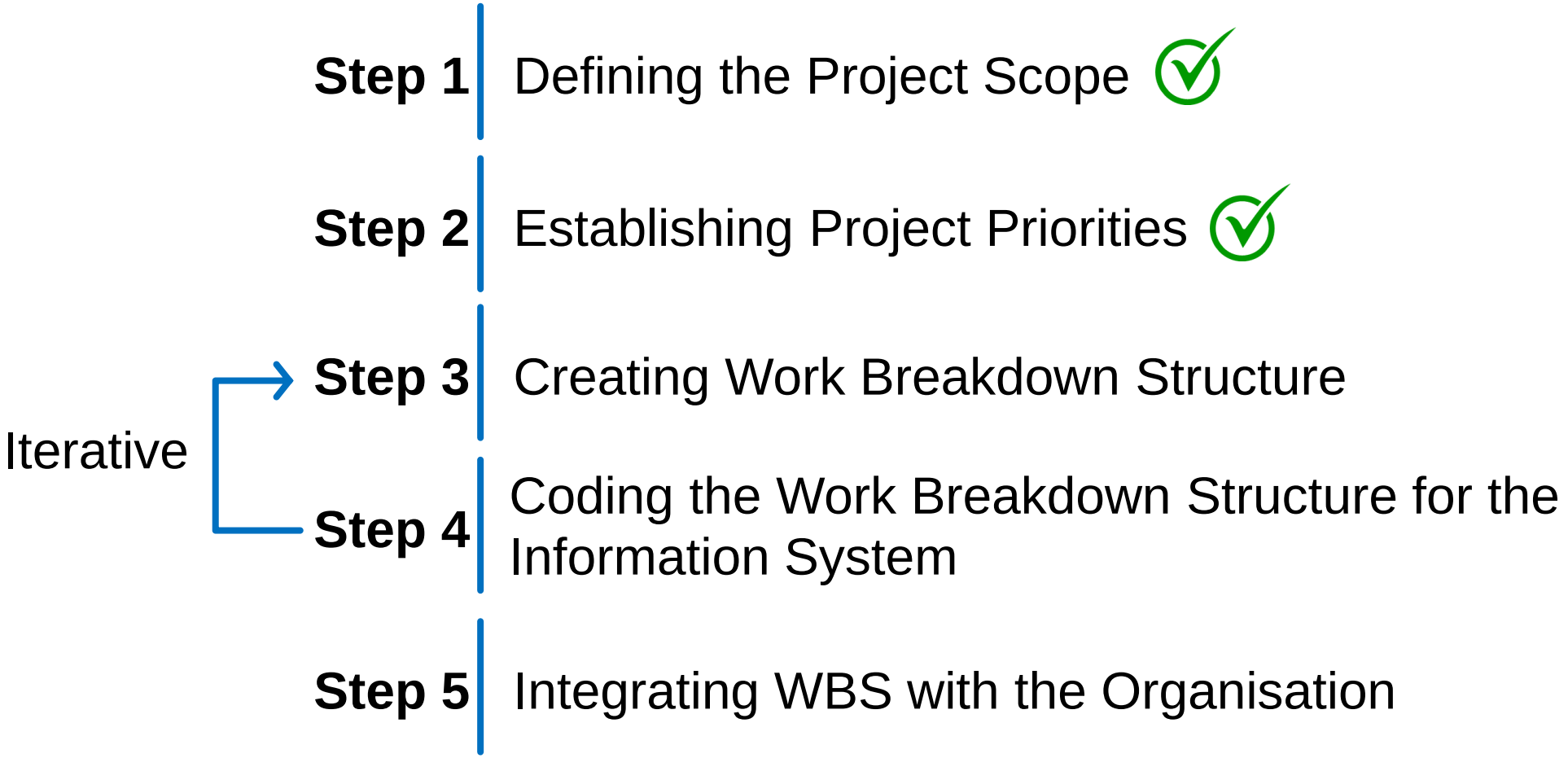
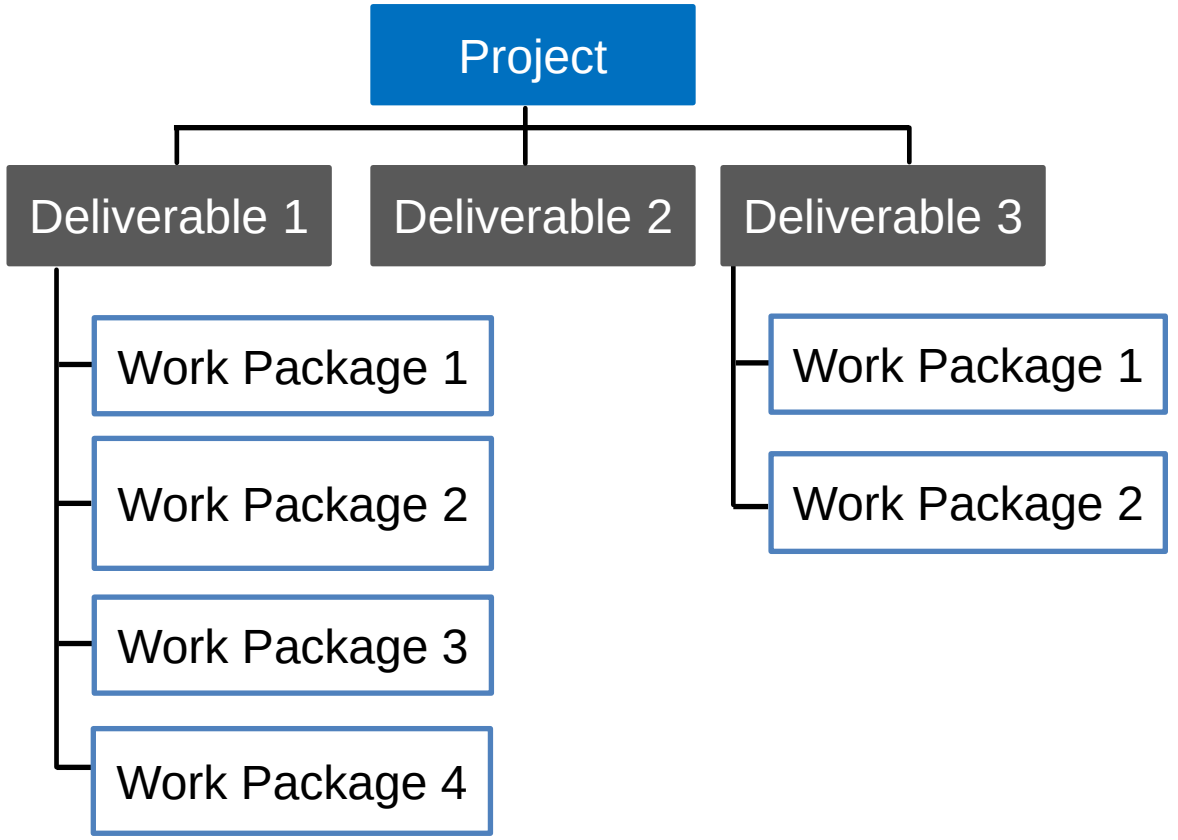
# Generating the WBS



# The Work Breakdown Structure

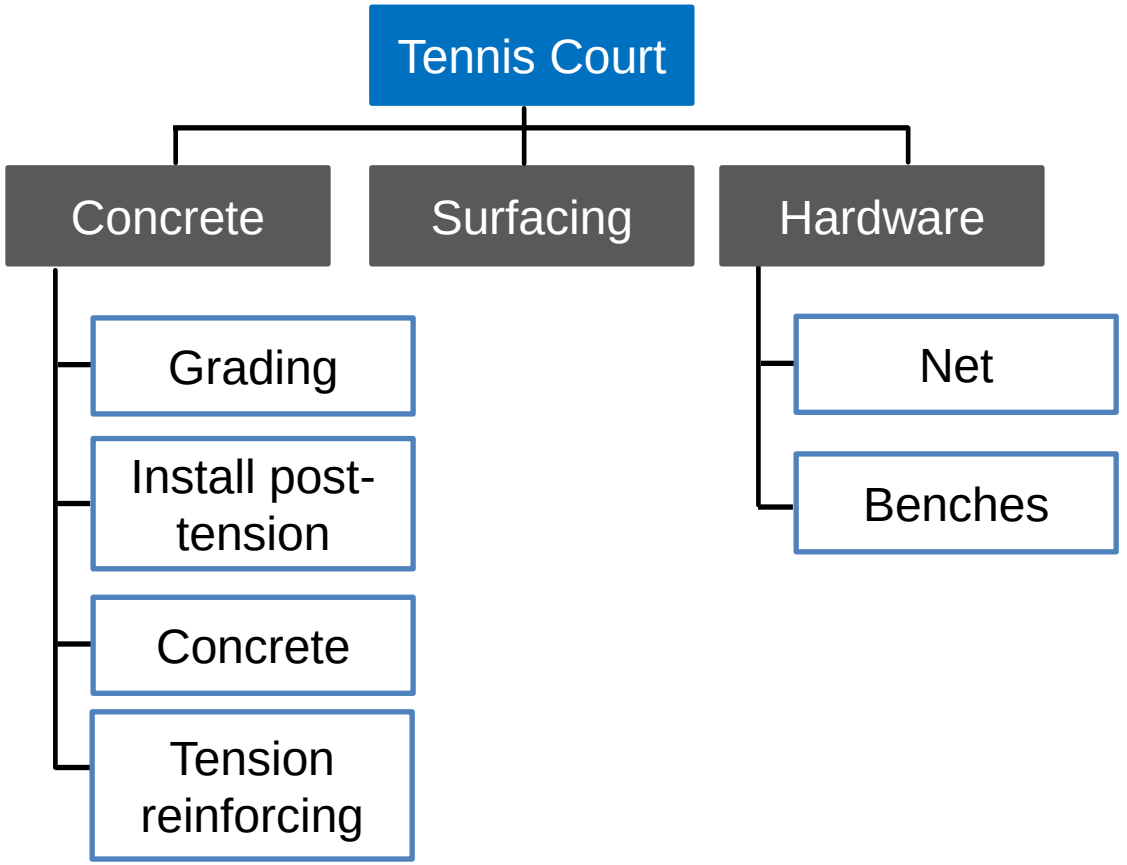
- The WBS is a **hierarchical outline** (map/diagram) that identifies the **total scope of work** to be carried out by the project team accomplish the project objectives and create the required deliverables.
- The WBS subdivides the project work into **smaller,** more manageable **pieces of work**, with descending level of the WBS representing increasingly detailed definition of project work.




***Note: No time component**

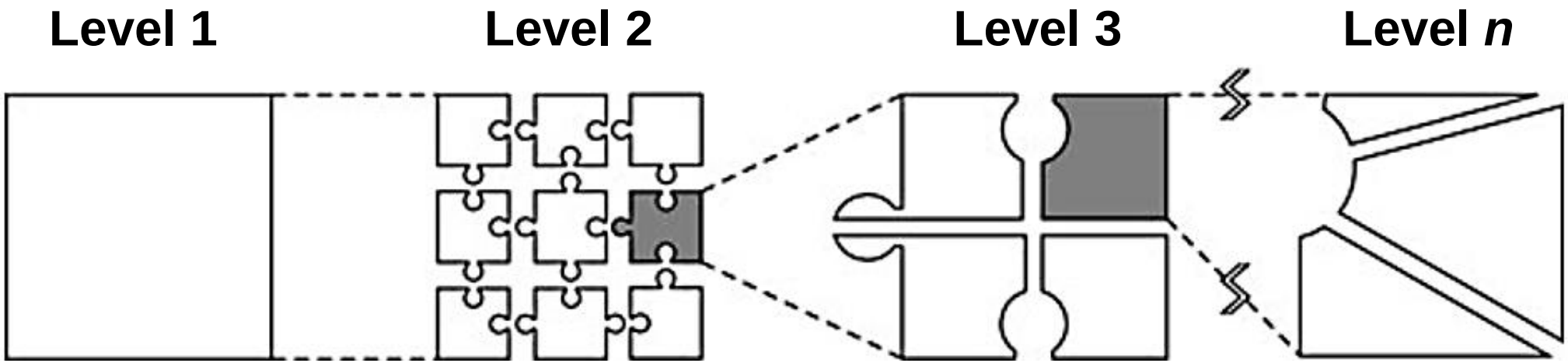
# The Work Breakdown Structure

- It represents a clear **description** of the project's **deliverables** and scope—the **"what"** of the project.
- It is **NOT** a description of a **process** or **schedule** that defines how or when the deliverables will be produced.
- Defines the **relationship** of the **final deliverable** (the project) to its **sub-deliverables**, and in turn, their relationship to **work packages**.




***Note:** Does not define **"HOW"***

# Building a WBS hierarchy




| Project | Deliverables | Sub-deliverables | Work Packages |
|---|---|---|---|
| Complete project | Major deliverables | Supporting deliverables | Identifiable work activities (time, cost, monitoring, controlled) |

# Advantages of using a WBS

To **improve estimating**

To **better control** the project execution

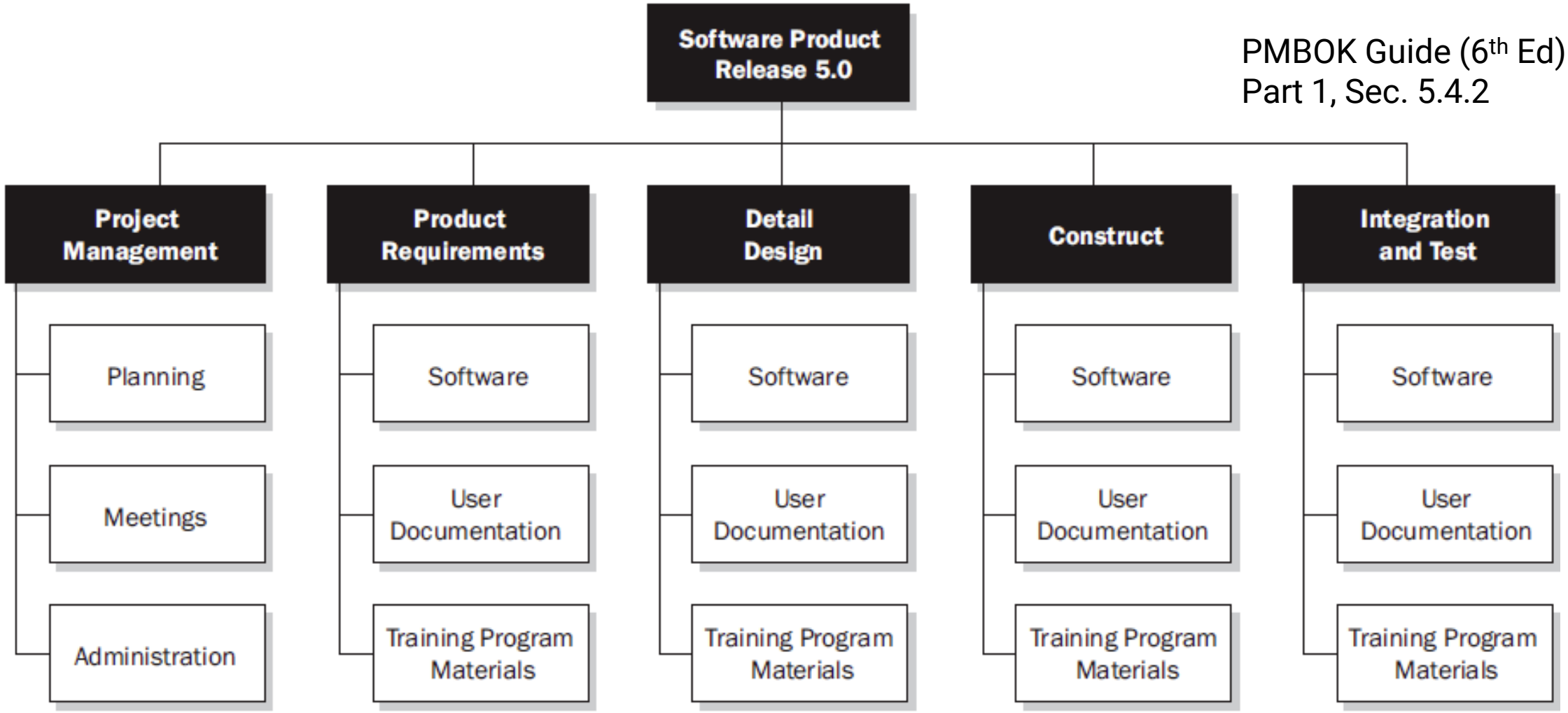

To more accurately **verify** project **completion**

To improve the opportunity for use of **historical information**, which, can aid in both speed and accuracy of future projects.

Is a repeatable process that can be used as **template** for future similar projects.

# **WBS |** Software project

PMBOK Guide (6th Ed)
Part 1, Sec. 5.4.2




The WBS is illustrative only. It is not intended to represent the full project scope of any specific project, nor to imply that this is the only way to organize a WBS on this type of project.

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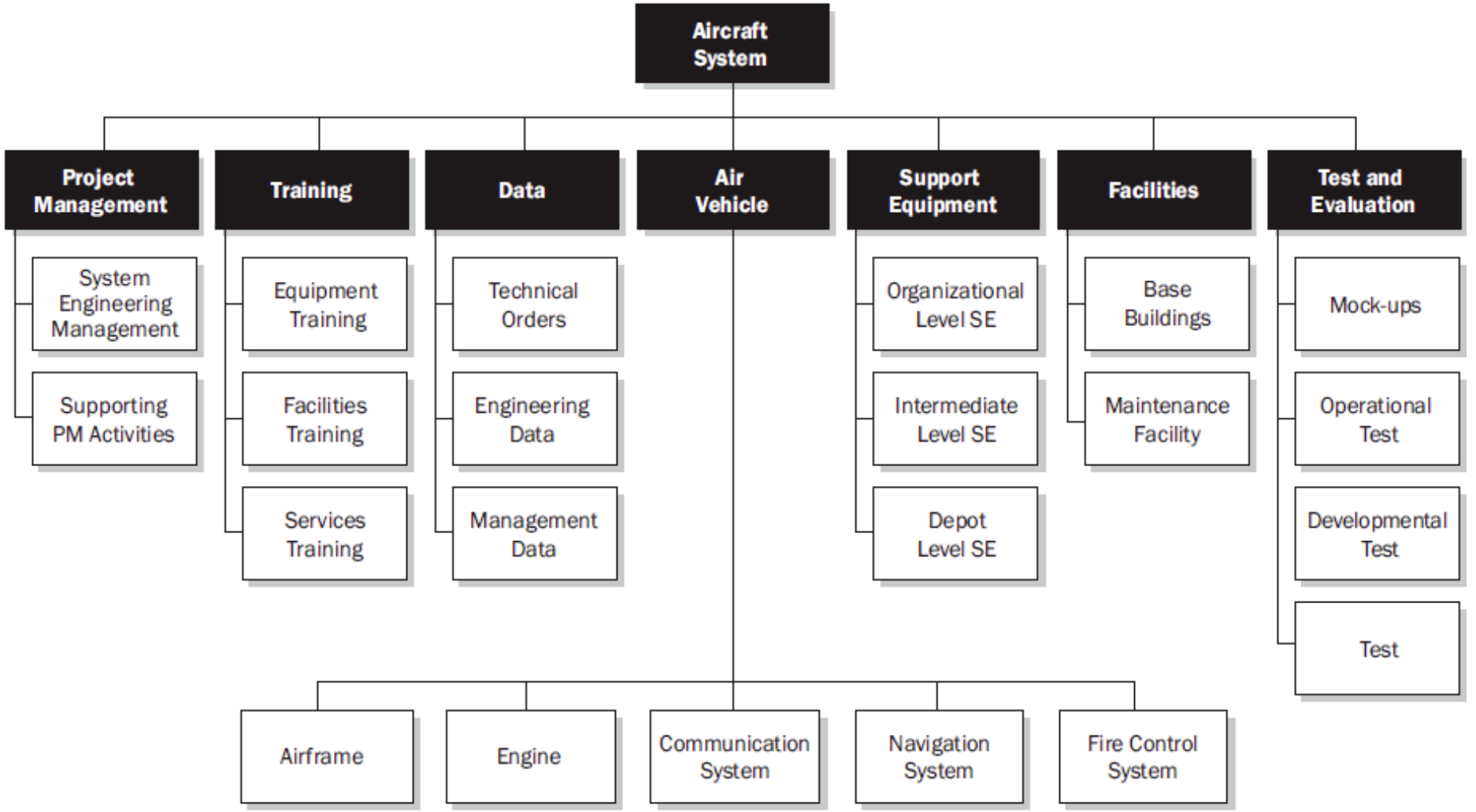
# **WBS** | Engineering project

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PMBOK Guide (6th Ed)
Part 1, Sec. 5.4.2

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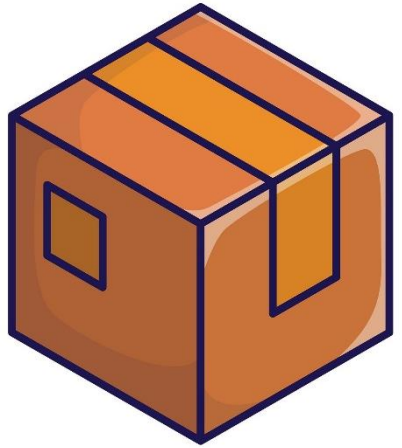
# Work Packages

A work package is the **lowest level** of the WBS.

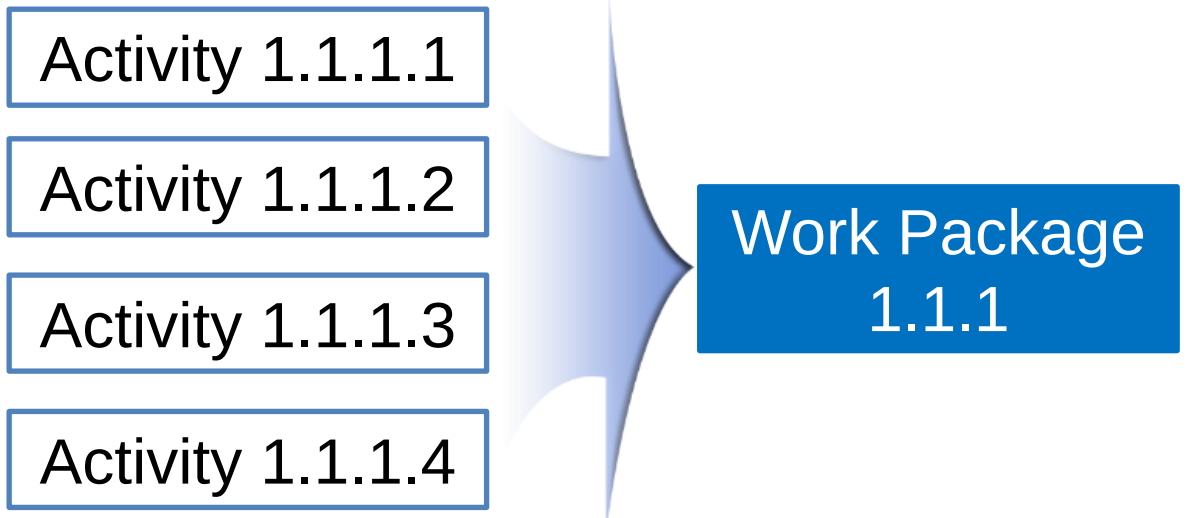
It is **output-oriented** and contains the project details:

1. Defines **work** (What)
2. Identifies **time** to complete a work package (How long)
3. Identifies a time-phased **budget** to complete a work package (Cost)
4. Identifies **resources** needed to complete a work package (How much)
5. Identifies a **person responsible** for units of work (Who)
6. Identifies **monitoring points** for measuring success (Milestones).



# An Activity

- A distinct, **scheduled portion of work** performed during the course of a project.
- A **series of actions** results in a work package
- It is generally **defined using a verb** (polishing, testing)
- It cannot be handed over to the project stakeholders



# Coding the Work Package

The WBS Coding System defines:

- Levels and elements of the WBS
- Organisation elements
- Work packages
- Budget and cost information

- The most commonly used scheme is **numeric indention**
- Allows reports to be consolidated at any level in the organisation structure
- On larger projects the WBS is often further supported with a WBS dictionary

| Numbering element | Description | Level |
|---|---|---|
| 1.0 | Project/Contract name | 1 |
| 1.1 | Major project Subsystem | 2 |
| 1.1.1 | Task | 3 |
| 1.1.1.1 | Subtask | 4 |
| 1.1.1.1.1 | **Work Package** | 5 |
| 1.1.1.1.1.1 | **Components** | 6 |

Example of alternative coding scheme : **3R-237A-P2-33.6**

# WBS Tips

**Tip 1** Plan outcomes, not just actions

**Tip 2** No work package should be described in more than one sub-deliverable (mutually exclusive)

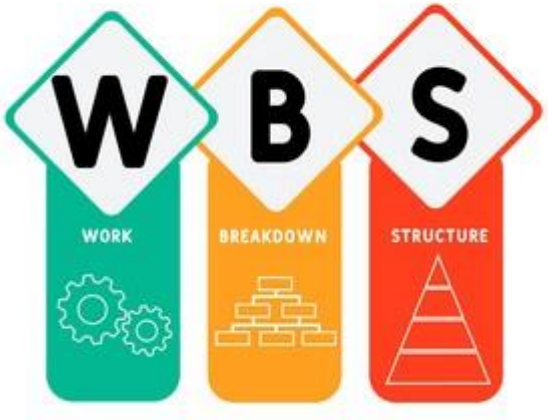
**Tip 3** 100% Rule = The WBS must capture all deliverables of the project

**Tip 4** Level of detail

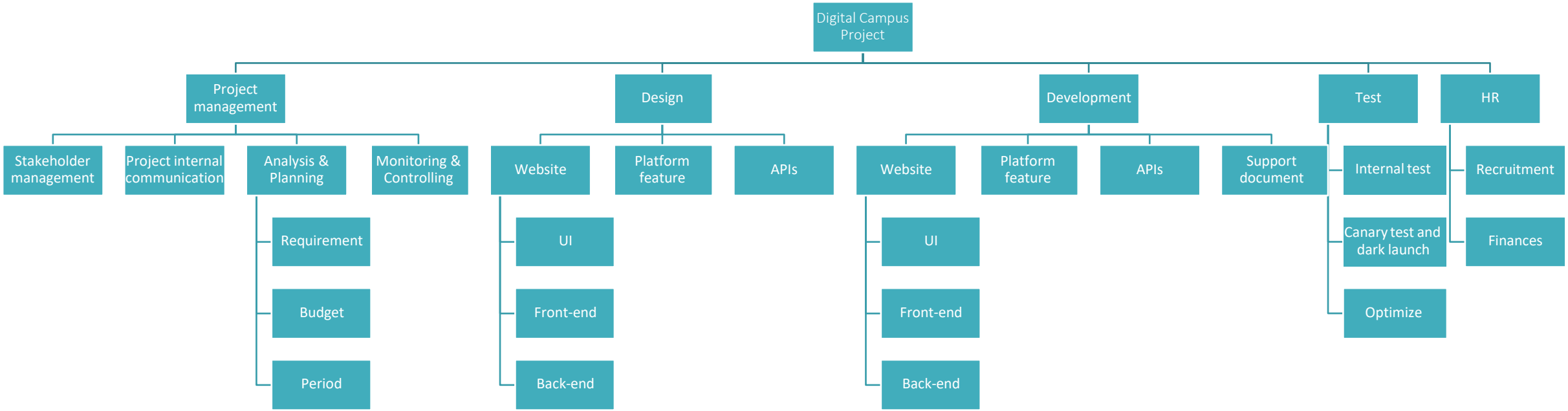
- Work Packages should be small enough for 1 person to manage
- No activity should be longer than 10 days or a single reporting period

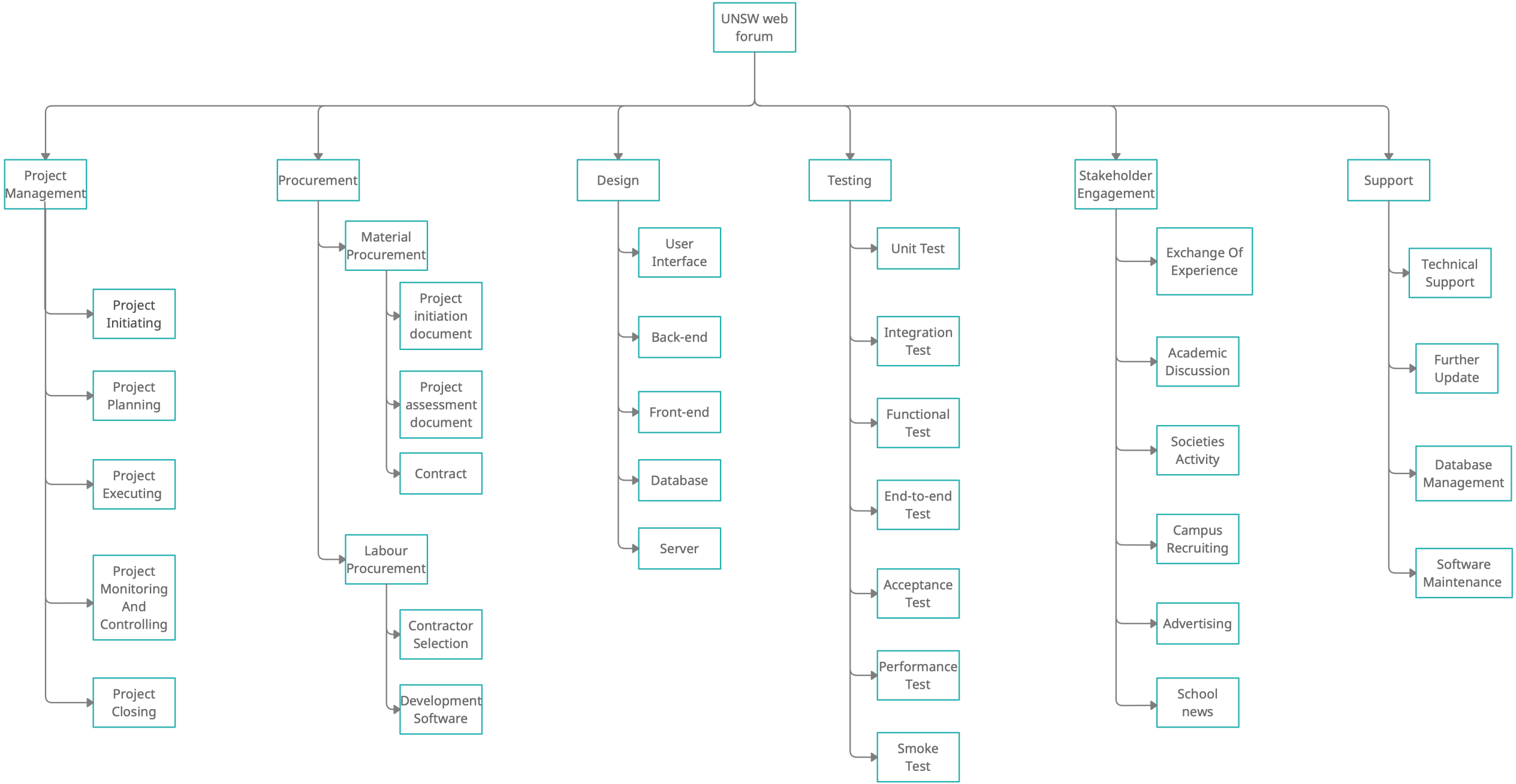
# Common WBS Misconceptions

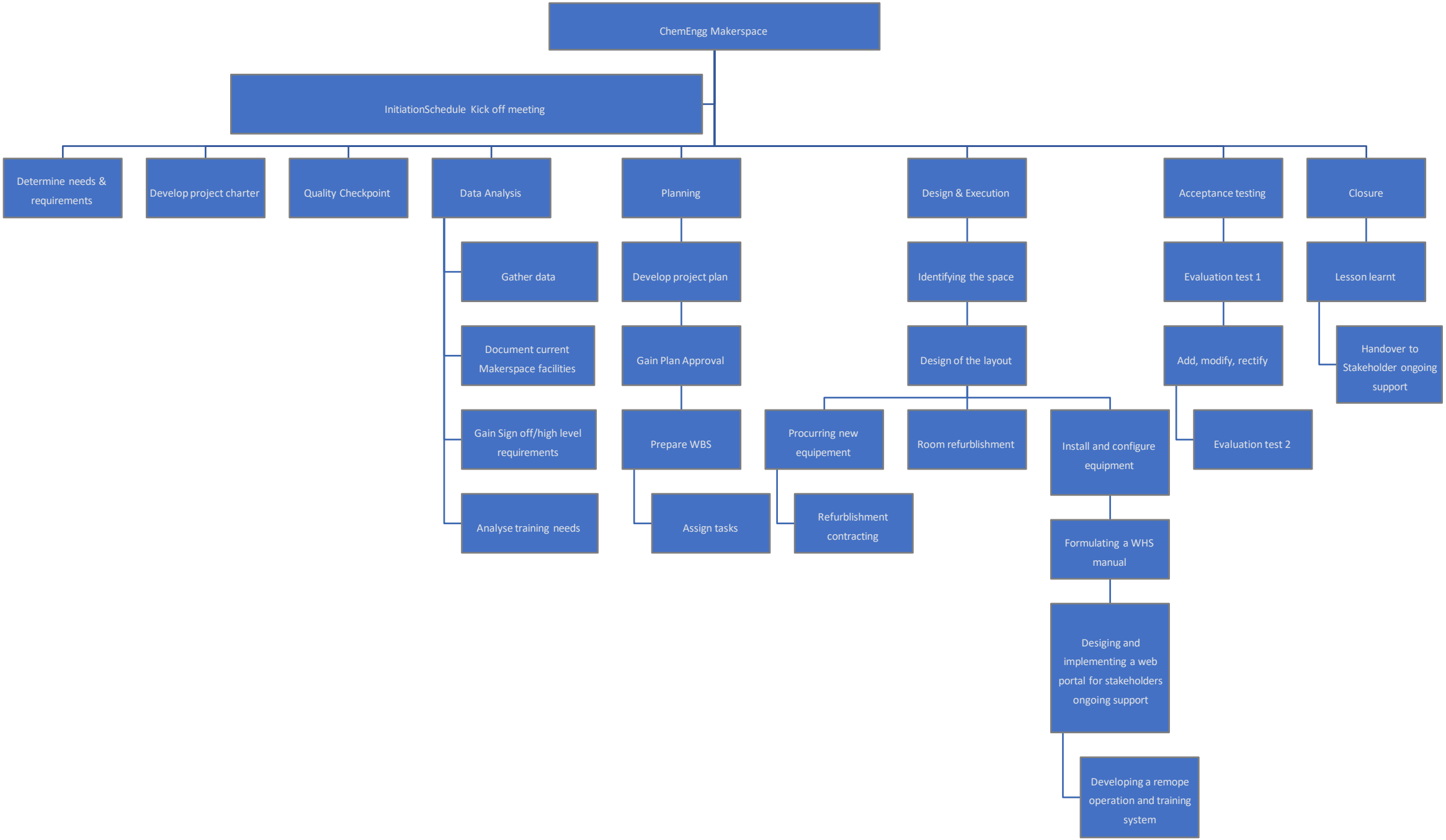
- A WBS is **NOT** an exhaustive **list of work**. It is instead a comprehensive classification of project scope.
- A WBS is neither a project plan, a schedule, nor a chronological listing. It specifies **what** will be done, **NOT how or when**.
- A WBS is **NOT** an **organisational hierarchy**, although it may be used when assigning responsibilities.



# WBS Examples




UNSW web forum
Project Management
Project Initiating
Project Planning
Project Executing
Project Monitoring And Controlling
Project Closing
Procurement
Material Procurement
Project initiation document
Project assessment document
Contract
Labour Procurement
Contractor Selection
Development Software
Design
User Interface
Back-end
Front-end
Database
Server
Testing
Unit Test
Integration Test
Functional Test
End-to-end Test
Acceptance Test
Performance Test
Smoke Test
Stakeholder Engagement
Exchange Of Experience
Academic Discussion
Societies Activity
Campus Recruiting
Advertising
School news
Support
Technical Support
Further Update
Database Management
Software Maintenance


ChemEngg Makerspace
InitiationSchedule Kick off meeting
Determine needs & requirements
Develop project charter
Quality Checkpoint
Data Analysis
Gather data
Document current Makerspace facilities
Gain Sign off/high level requirements
Analyse training needs
Planning
Develop project plan
Gain Plan Approval
Prepare WBS
Assign tasks
Design & Execution
Identifying the space
Design of the layout
Procurring new equipement
Refurblishment contracting
Room refurblishment
Install and configure equipment
Formulating a WHS manual
Desiging and implementing a web portal for stakeholders ongoing support
Developing a remope operation and training system
Acceptance testing
Evaluation test 1
Add, modify, rectify
Evaluation test 2
Closure
Lesson learnt
Handover to Stakeholder ongoing support

# Project Charter

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# Project Charter Vocabulary

**Strategic goals**

Describe the **direction of change** of the organization

‘Company **strategy** is to **innovate** and **improve** our **services** faster than our competitors.’

**Objectives**

**Specific achievements** resulting from the project work, that can be measured.

‘The objective of this project is to design and implement a **new** customer **feedback system**.’

**Deliverables**

The **tangible results** of doing project work, that can be verified.

New **menu structure**, **plan** for customer journey, **graphics design brief**…

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# Setting SMART(A) objectives

*A Multi-resolution Manufacturing cell…*

| | |
|---|---|
| **Specific** | A robot cell… for research into **incremental forging technology** |
| **Measurable** | A robot cell for research into incremental forging technology… that will be **used** by **PhD students** and **student project teams** |
| **Action-oriented** | **Design** and **Build**… an MM cell for research into incremental forging technology that will be used by PhD students and student project teams |
| **Realistic** | (All areas) |
| **Timely** | Design and Build an MM cell for research into incremental forging technology that will be used by PhD students and student project teams… **within six months** of delivery of major components. |
| **(Achievable)** | (All areas) |

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# Project Charter Vocabulary

| | | |
|---|---|---|
| **Requirements** | What the project **deliverables** or other outcomes must do for the **stakeholders** | ‘Customers must be able to **provide feedback** and **comments** to us at any point in their customer journey.’ |
| **Scope (scope statement)** | A written description of the **project boundaries** in and major **deliverables**. | ‘The project includes an **app** to enter information; it does **not** include a **database**’ |
| **Scope (Work Breakdown Structure)** | A **systematic, hierarchical decomposition** of all the deliverables into constituent parts | ‘The new customer feedback system includes a mobile app to enter information; it does not include a database to store historical data.’ |
| **Benefits** | The (positive) **effects** that occur when **stakeholders** interact with the **deliverables**. | ‘The new customer feedback system will **show** our marketing team **how** our **services are performing** straight away’ |

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# The Project Charter | Purpose

- Formally **authorizes** the existence of the **project**
- **Gives** the project manager **authority** to apply resources to project activities
- Provides a **direct link** between the **project** and the **strategic objectives** of the organisation
- Shows organisation **commitment** to the project
- Creates a **formal record** of the existence of the project


PMBOK Guide (6th Ed), Part 2, Sec. 2

# Charter and PMP in the project lifecycle

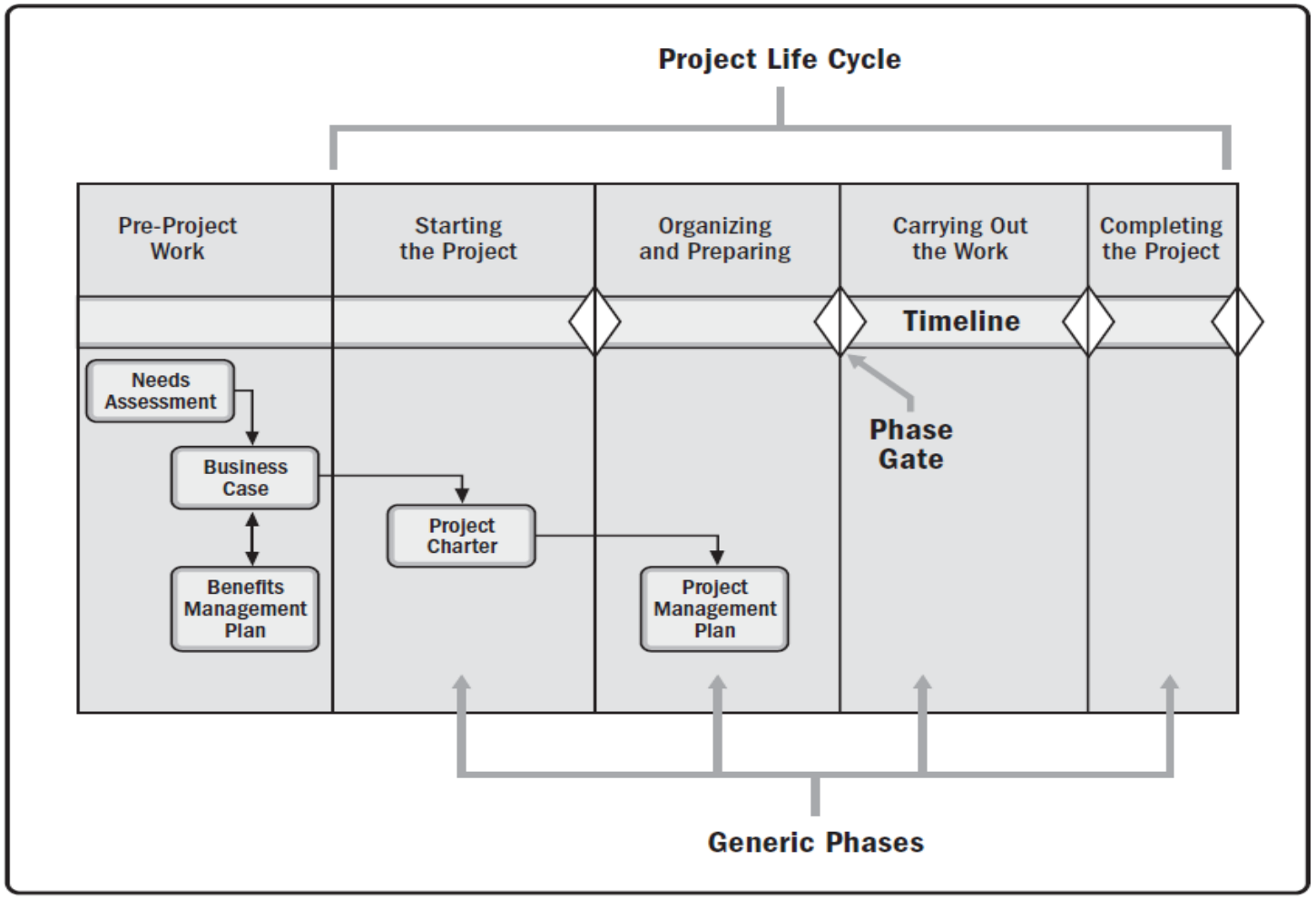


Figure 1-8. Interrelationship of Needs Assessment and Critical Business/Project Documents

PMBOK Guide (6th Ed), Part 1, Sec. 1.2.6

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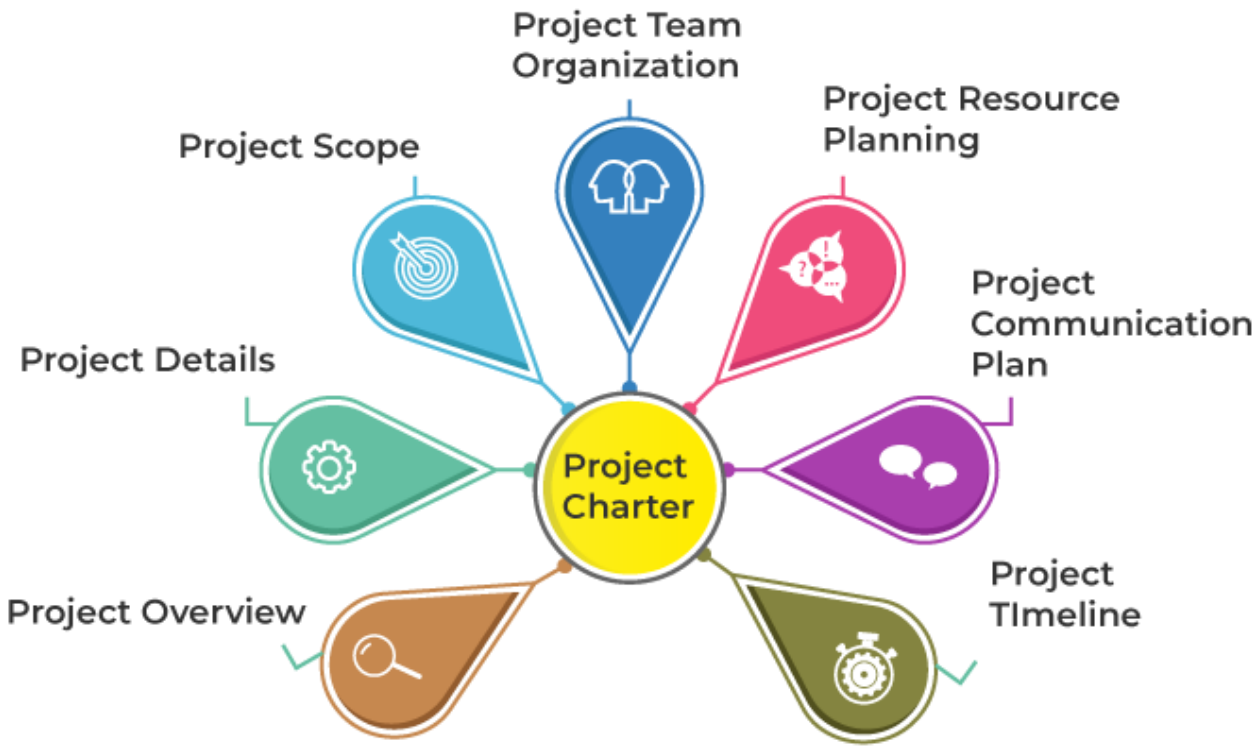
# What goes into your Project Charter?

| PMBOK 6th Ed. Part 1, Sec 4.1.3.1: charter item |
|---|
| Project purpose |
| Objectives and success criteria |
| Requirements |
| Assumptions, constraints |
| Description and project boundaries |
| High level risks |
| Summary milestone schedule |
| Summary budget |
| Stakeholder list |
| Approval requirements |
| Definition of success |
| PM nomination |
| Sponsor nomination |



# Stakeholder Identification

After understanding the business case, the organizational context and needs for the project, the **first step** in planning is to **identify** the project **stakeholders**.

Identifying and analysing your stakeholders is the best way to start writing the project charter…

PMBOK Guide (6th Ed), Part 2, Sec. 1.6
PMBOK Guide (6th Ed), Part 1, Sec. 13.1 & 13.1.2

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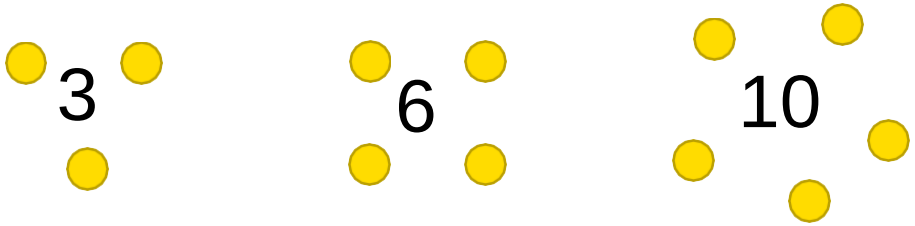
# Project team and project internal stakeholders

1. Why can't you have too many people in a team?
   Too many communication channels = Too much complexity.



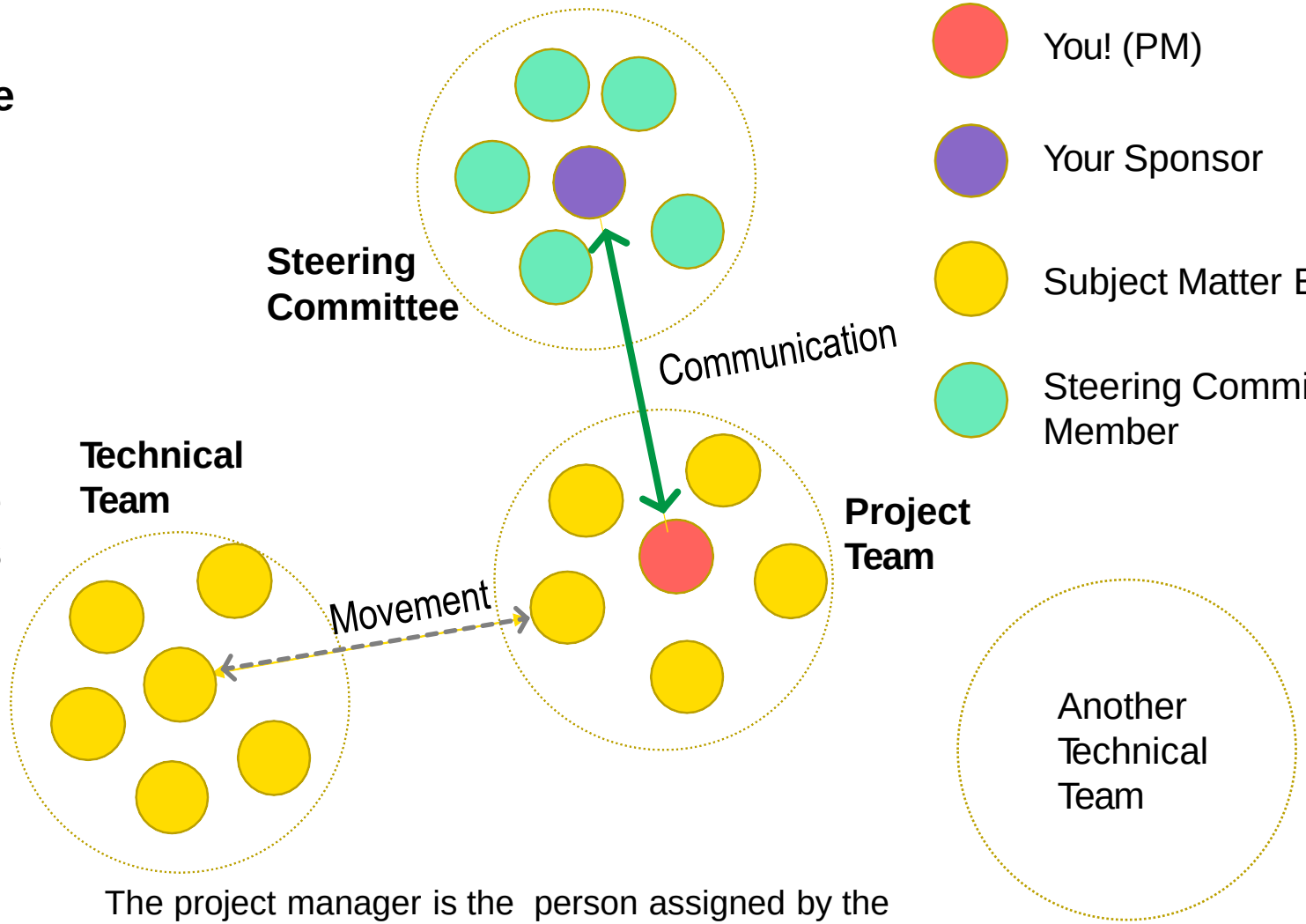

15, 21, 28...

$$\frac{n(n-1)}{2}$$

2. Therefore, we need to introduce some **structure** around **communication channels** and team members
   - Organisational
   - Communication structures created by the PM

# Project key stakeholders

- **PM** has a **central coordinating role** for the project team.
- **PM** needs a **strong 2-way line** of communication to the Project **Sponsor**.
- **Sponsor chairs steering committee**, uses it to make timely decisions.
- Subject Matter Experts have leading role in their technical teams (may be a PM themselves)
- **Technical Teams** can be **internal** to project executing organization or could be **contractors or suppliers**
- There can be **many technical teams**




The project manager is the person assigned by the performing organization to lead the team that is responsible for achieving the project objectives.

# How do we find stakeholders?

- Identify stakeholders: Brainstorming, expert judgement, surveys, questionnaires, meetings
- Analyse stakeholders
- Classify stakeholders

EXAMPLE

Stakeholders in ‘100% digital delivery and assessment of courses due to COVID-19’

- Students
- Convenor
- Guest lecturers
- Experienced demonstrators
- New demonstrators
- School management team
- Engineering faculty school management team

Tip | Identify **stakeholders** as **people**, not organizations or other inanimate entities.

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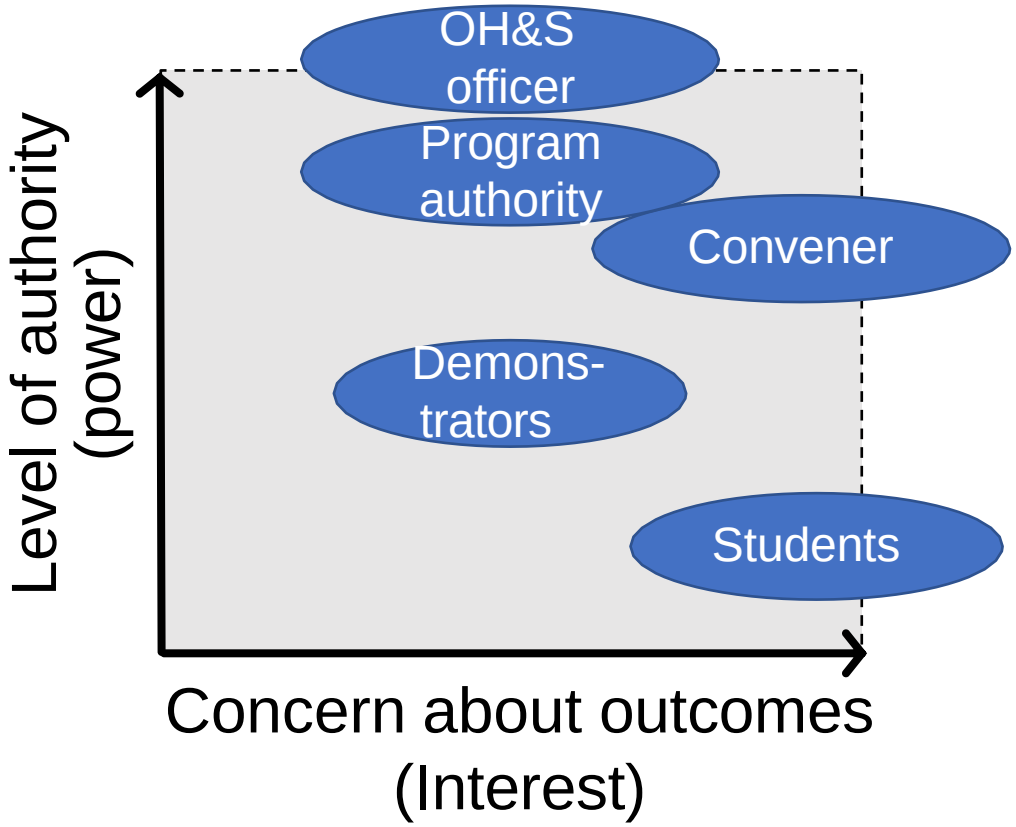
# Benefits make sense when related to stakeholders

| Benefits | Stakeholders |
| --- | --- |
| • Study from abroad → | • Students |
| • Use new technology → | • Convener |
| • Work at home → | • Guest lecturers |
| • Use last year's resources → | • Demonstrators |
| • Large cohort → | • Program authority |
| • Comply with social distancing rules → | • OH&S officer |

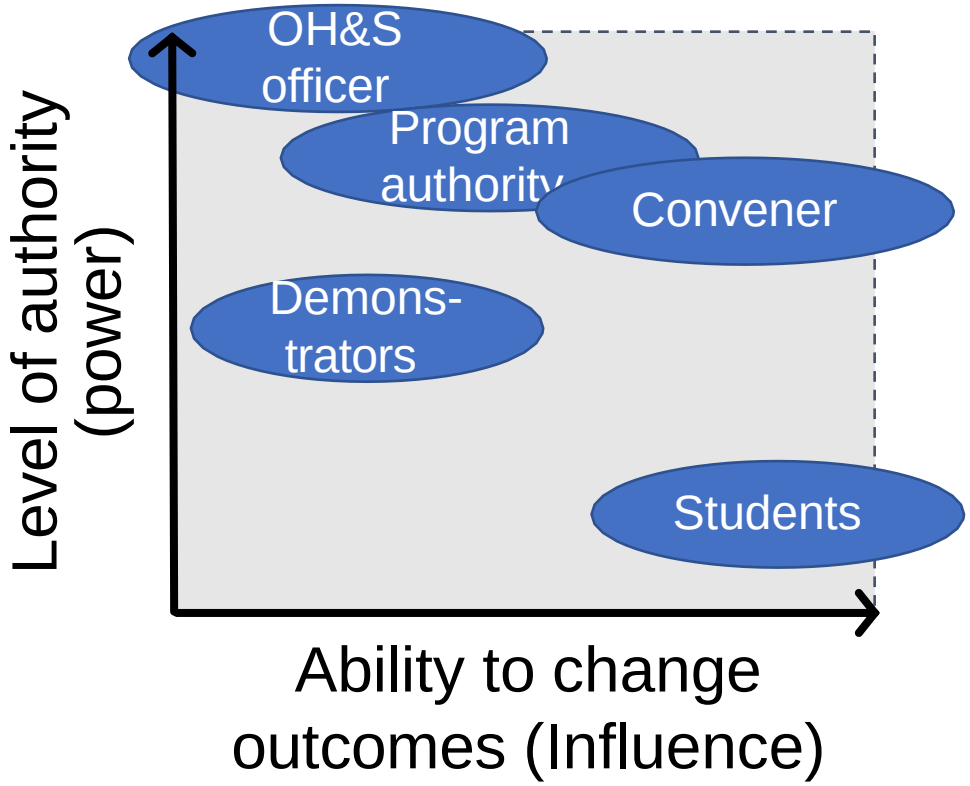
Example: Some benefits of migrating to online delivery

# Methods for stakeholder analysis

## Power-interest grid




## Power-influence grid




(part of PMBOK 'Identify Stakeholder 13.1.2.4')

# Engagement level of stakeholders

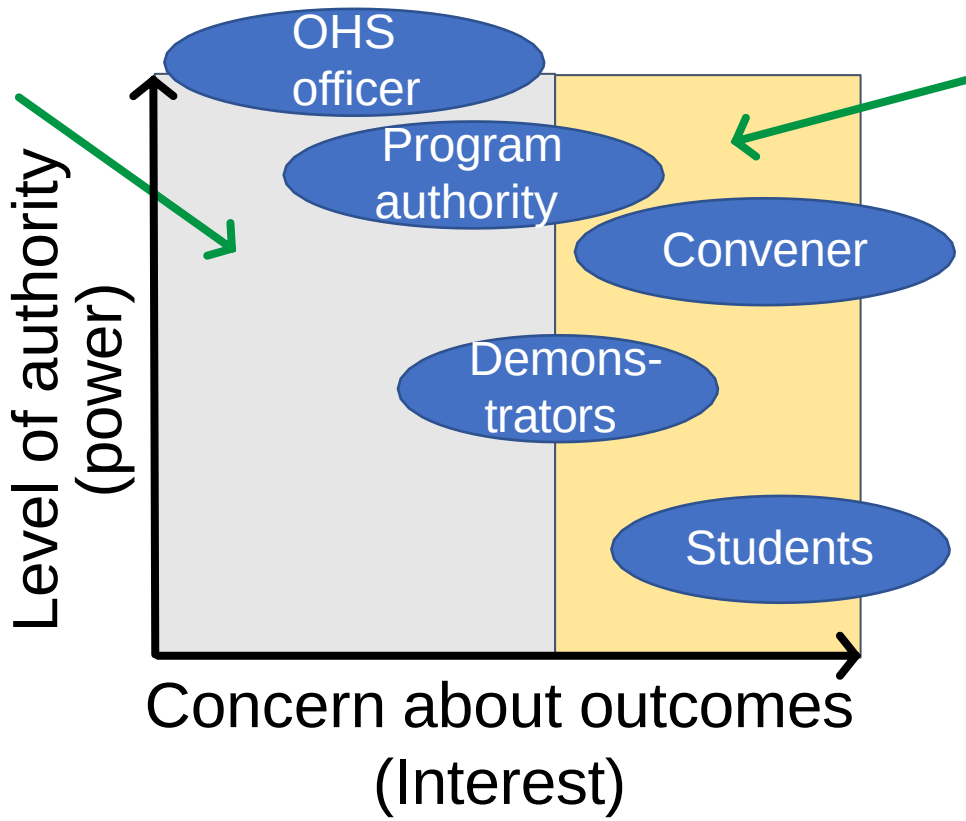
| Name | Unaware | Resistant | Neutral | Supportive | Leading |
|---|---|---|---|---|---|
| OH&S officer | C → | | D | | |
| Program authority | | | | CD | |
| Convener | | | | C → | D |
| Demonstrators | | | C → | D | |
| Students | | C → | | | D |

C = Current position
D = Desired position

# Outcomes of Stakeholder Classification

## Power interest grid

Final Metrics and/or grade report




Frequent communication in MS Teams

This would be one way to inform the project **Communications Plan**….

Many other PM Plans require input from the Stakeholder:

- Project charter,
- Benefits realization,
- Risk management,
- Change management,
- Human resource…

PMBOK Guide (6th Ed), Part 1, Sec. 13.1.3.1

# More videos on project stakeholders

Kasimtseva, N. “Identify Project Stakeholders” video in course Managing Project Stakeholders, accessed 16/02/2021, LinkedIn Learning accessed through UNSW

Biafore, B. “Identify Project Stakeholders” video in course Project Management Foundations accessed 16/02/2021, LinkedIn Learning accessed through UNSW

Biafore, B. “Analyze project Stakeholders” video in course Project Management Foundations accessed 16/02/2021, LinkedIn Learning accessed through UNSW