School of Computer Science and Engineering (CSE)

COMP9900 Information Technology Project
COMP3900 Computer Science Project

2023 Term 3
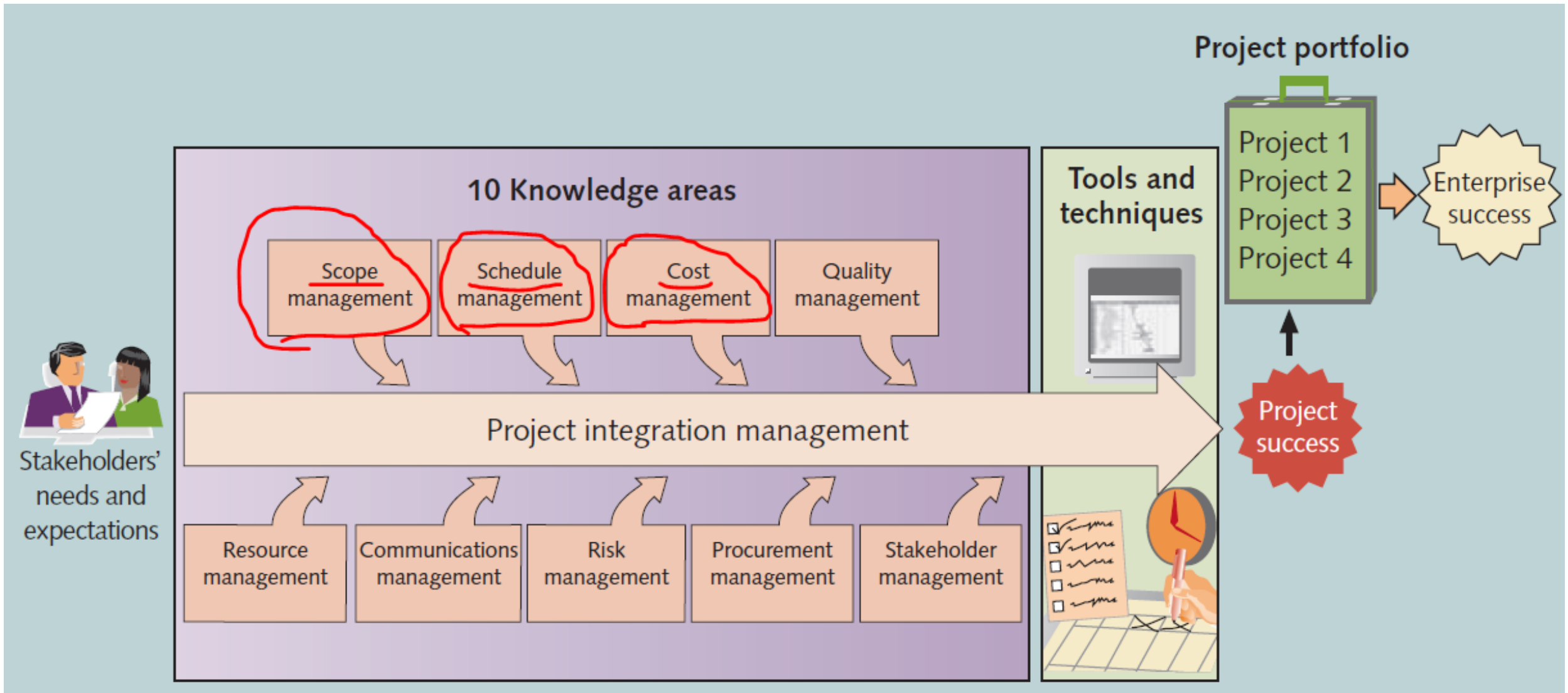
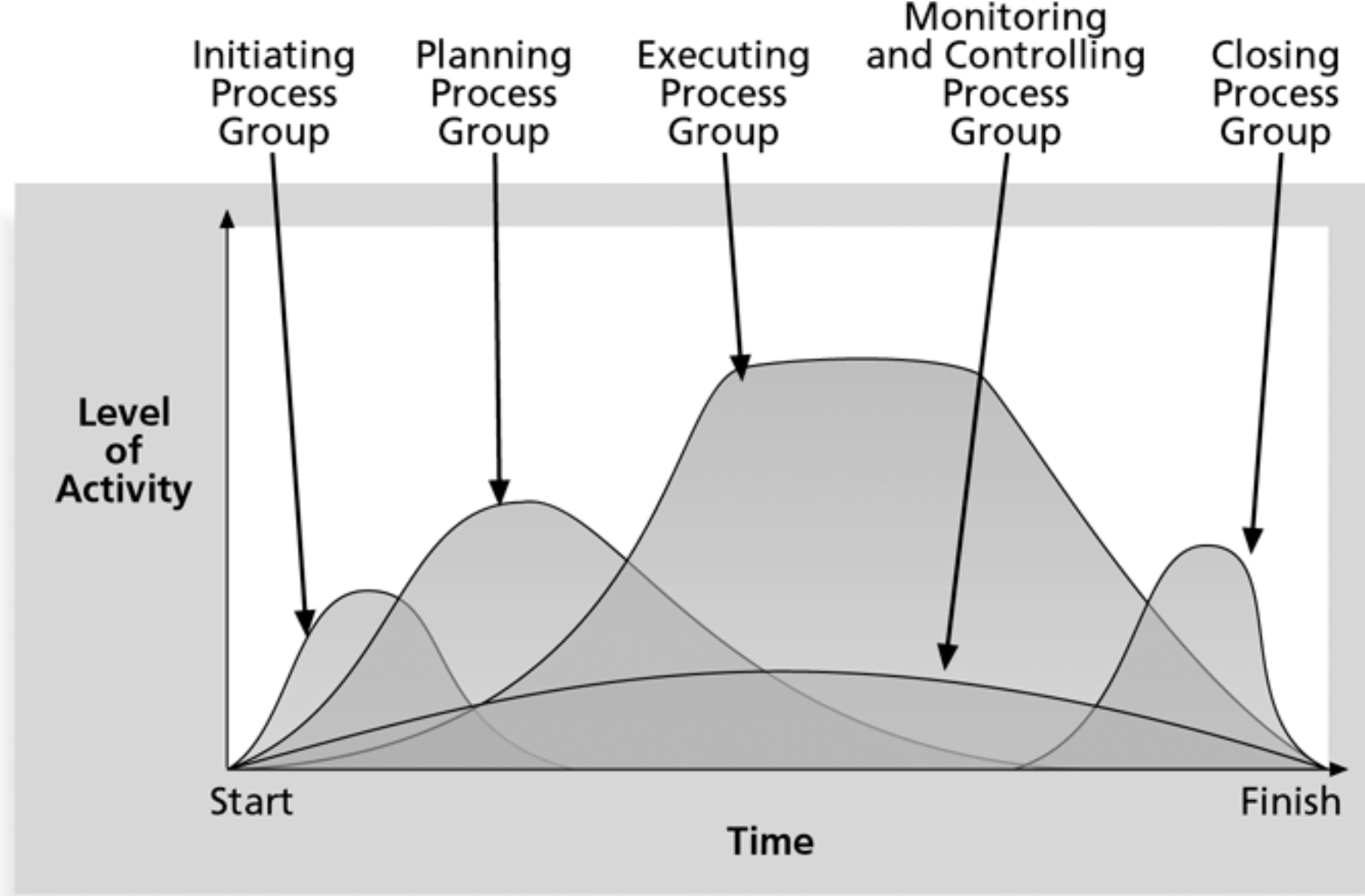## Week 5

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Outline

- Project Management Process Groups

- Project Scope Management

- Project Time Management
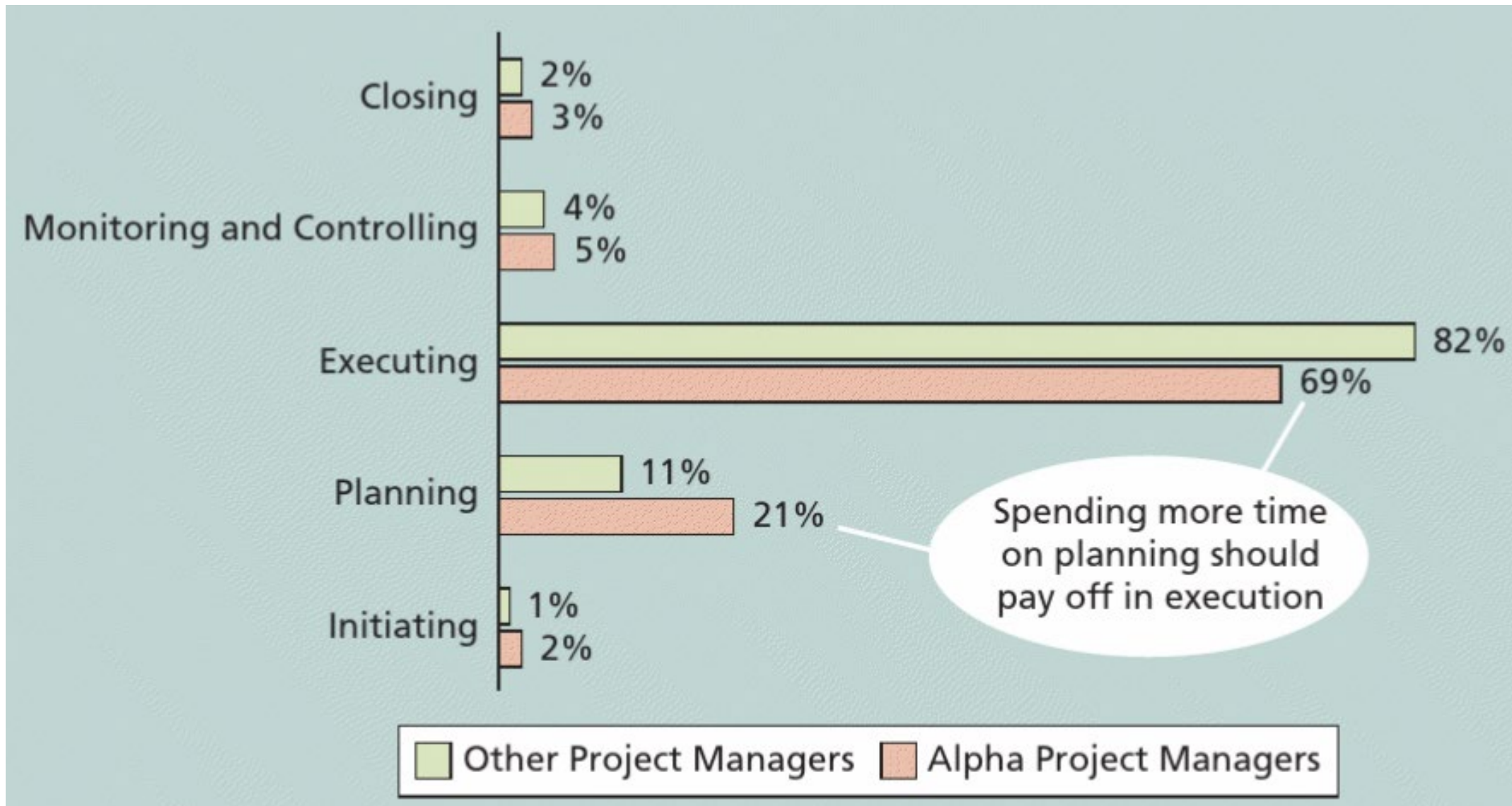
- Week 5 Lab Tasks

- Q & A

Project Management Process Groups

Project Management Framework (Schwalbe, 2018)

Project Management Process Groups (Schwalbe, 2018; PMI, 2018)

Percentage of Time Spent on Each Process Group (Crowe, 2006)

This week → **5. Project Scope Management**

This week → **6. Project Time Management**

In Week 7 → **7. Project Cost Management**

Project Management Process Groups (Schwalbe, 2018)

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
9. Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

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Project Scope Management

What is Project Scope Management?

- There are six main processes involved in project scope management (PMI, 2018):
    1. plan scope management
    2. collect requirements
    3. define scope
    4. create WBS
    5. validate scope
    6. control scope

- One of the most important and difficult aspects of project management is **defining** the **scope** of a project

Processes

- Project **scope** management includes the processes required to ensure a project includes all the work required, to complete the project successfully

- Managing scope is concerned with **defining** and **controlling** what **is** and **is not** included in the project (PMI, 2018)

- Project **scope** is all the work involved in creating the products and the processes used to create them

- A **deliverable** is a product produced as part of a project, such as **hardware**, **software**, or **planning documents**
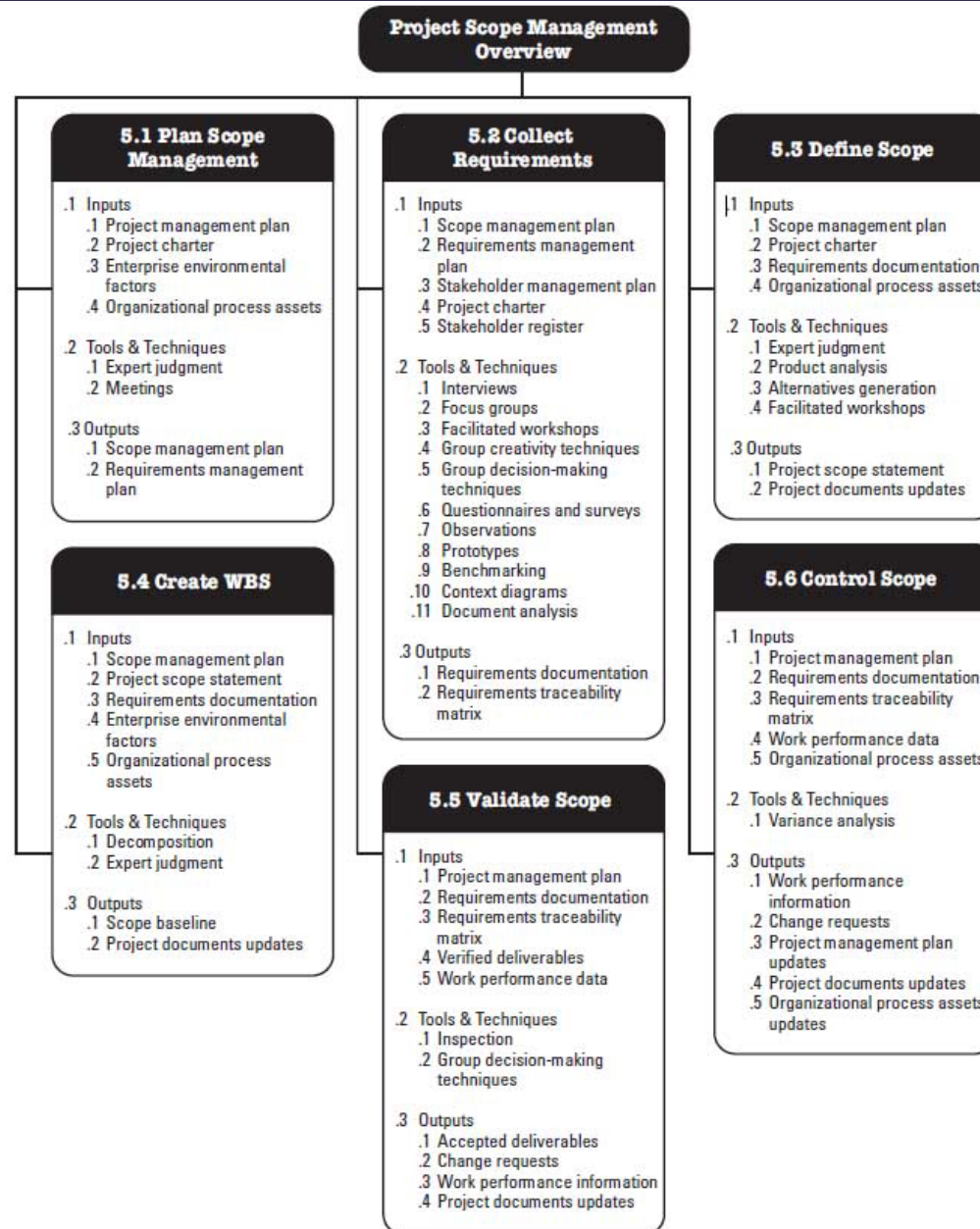
Figure 5-1. Project Scope Management Overview

(PMI, 2018)

1. Plan Scope Management

- Plan scope management is the process of creating a scope management plan that documents how the project will be defined, validated, and controlled

- Key benefit is that it provides guidance and direction on how scope will be managed throughout the project (PMI, 2018)

- Defining and managing the project scope influences the project's success

- The main output is:
  - scope management plan

1. Plan Scope Management (cont'd)

- Scope management plan contains instructions for preparation of the project scope statement, the WBS, and verification of completion of the deliverables, and control requests for changes to the scope (Schwalbe, 2018)

- Components include (PMI, 2018):
  - process to prepare a detailed project scope statement
  - process to create, maintain and approve the WBS
  - process that specifies formal verification and acceptance of the deliverables
  - process to control how requests for changes will be processed

2. Collect Requirements

- Collect requirements is the process of determining, documenting, and managing stakeholder needs and requirements to meet project objectives

- Key benefit is that it provides the basis for defining and managing project scope (PMI, 2018)

- Requirements can be collected using:
  - interviews
  - focus groups
  - facilitated workshops
  - group creativity techniques, e.g., brainstorming, mind mapping
  - group decision making techniques
  - questionnaires
  - surveys
  - prototypes
  - benchmarking

2. Collect Requirements (cont'd)

- Requirements documents may include:
  - business requirements
  - stakeholder requirements
  - solution requirements
  - project requirements
  - transition requirements
  - assumptions and dependencies

3. Define Scope

- Define scope is the process of developing a detailed description of the project and product
- Key benefit is that it describes the project, service, or result boundaries by defining which of the requirements collected will be included in and excluded from the scope (PMI, 2018)
- Stakeholder needs, wants, and expectations are examined and transformed into requirements
- The main output is:
 - scope statement

3. Define Scope (cont'd)

- A project scope statement is a document that includes, a description of the project, including its main objectives, and justification, comprehensive descriptions of all project deliverables, and the characteristics and requirements of products and services outputted as part of the project (Schwalbe, 2018)

- The construction of a project scope statement is vital to project success

4. Create Work Breakdown Structure (WBS)

- The work breakdown structure is an outcome-oriented analysis of the work involved in a project that defines the project's scope
- A WBS is a foundation document in project management because it provides the basis for planning and managing project schedules, costs and changes
- The main outputs include:
  - project scope statement updates
  - work breakdown structure
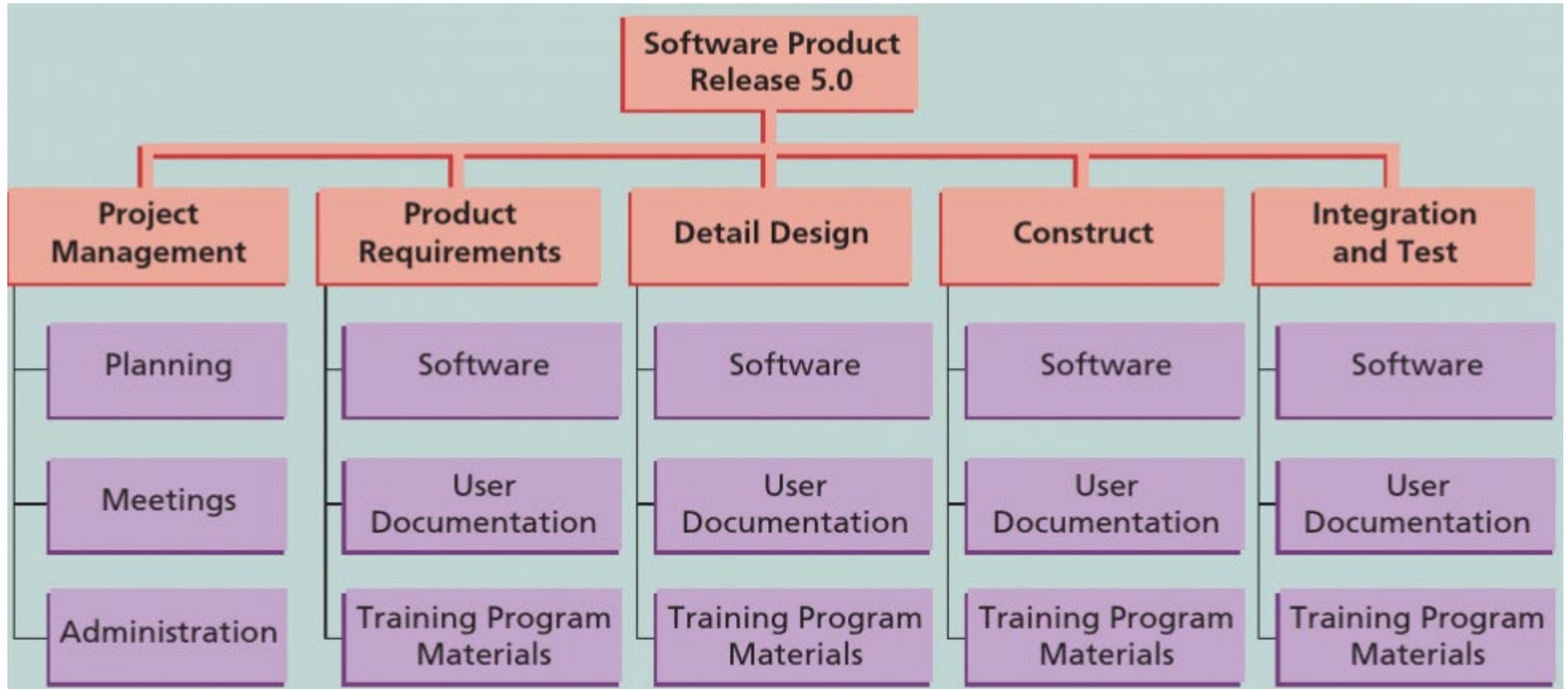 - scope baseline

4. Create WBS (cont'd)

- There are several methods/techniques you can use to create a work breakdown structure (Schwalbe, 2018):

  - using guidelines

  - analogy approach

  - top-down approach

  - bottom-up approach

  - mind-map approach
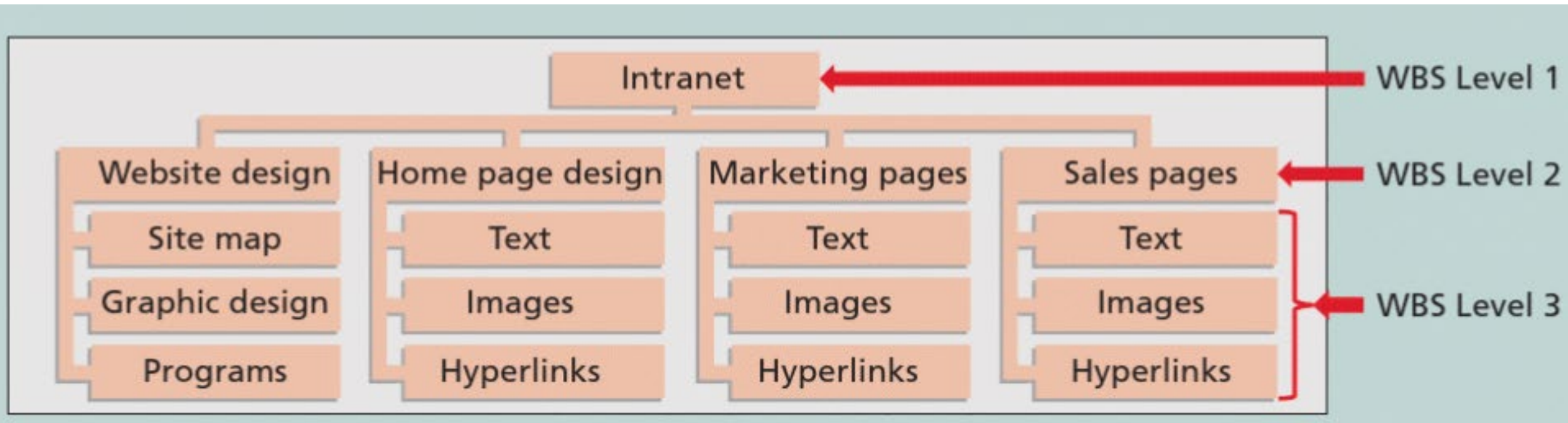
Sample Intranet WBS Organised by Product (Schwalbe, 2018)

Sample Intranet WBS Organised by Phase in Chart (Schwalbe, 2018)

1.0   Software Product Release 5.0
    1.1   Project Management
        1.1.1   Planning
        1.1.2   Meetings
        1.1.3   Administration
    1.2   Product Requirements
        1.2.1   Software
        1.2.2   User Documentation
        1.2.3   Training Program Materials
    1.3   Detail Design
        1.3.1   Software
        1.3.2   User Documentation
        1.3.3   Training Program Materials
    1.4   Construct
        1.4.1   Software
        1.4.2   User Documentation
        1.4.3   Training Program Materials
    1.5   Integration and Test
        1.5.1   Software
        1.5.2   User Documentation
        1.5.3   Training Program Materials

Sample Intranet WBS Organised by Phase in Tabular Form (Schwalbe, 2018)
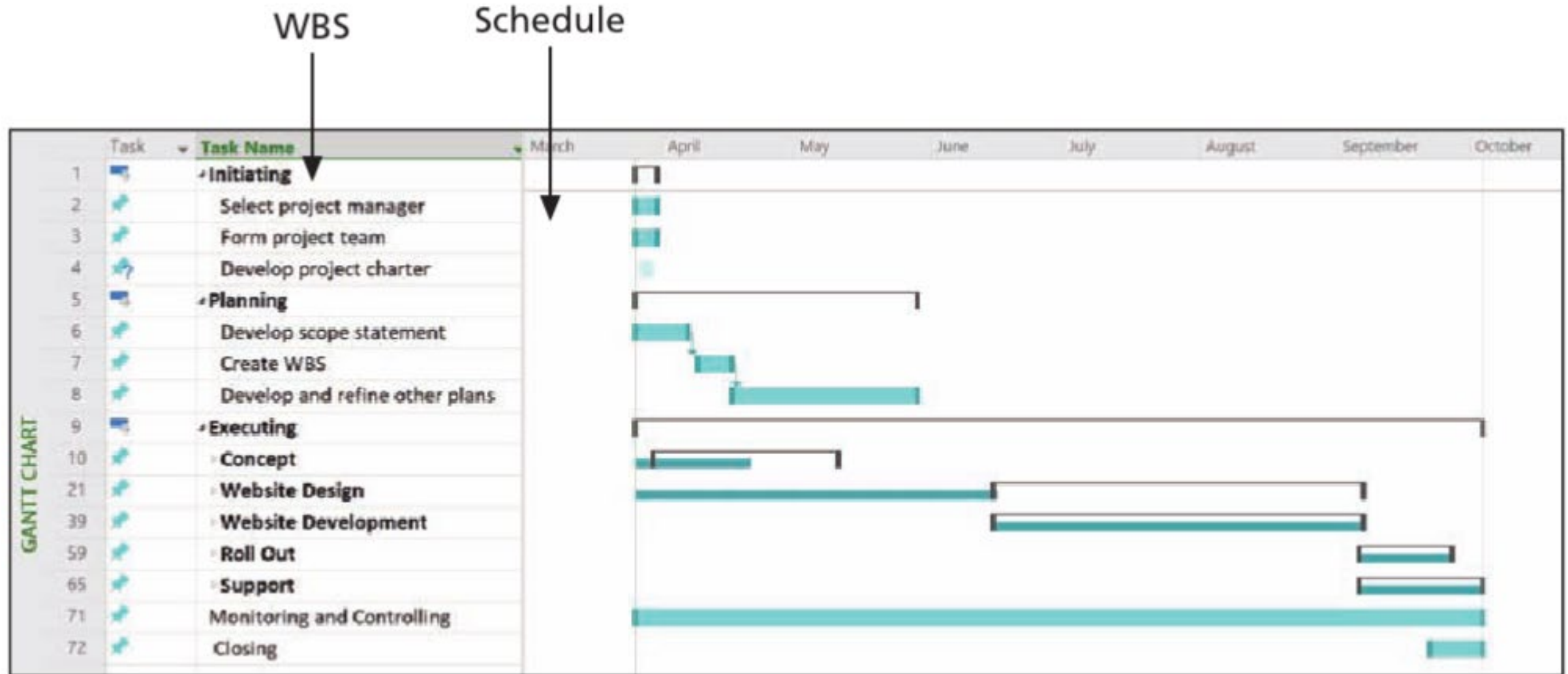
Gantt Chart Organised by Process Groups (Schwalbe, 2018)

5. Validate Scope

- Validate scope is the process of formalising acceptance of the completed project deliverables

- Key benefit of this process is that it brings objectivity to the acceptance process and increases the chance of final product, service, or result acceptance by validating each deliverable (PMI, 2018)

- The main outputs include:
  - accepted deliverables
  - requested changes

Project Time Management

Project Time Management

- Project time management includes the processes required to ensure **timely completion** of a project (Schwalbe, 2018)

- Processes include plan schedule management, define activities, sequence activities, estimate activity resources, estimate activity durations, develop schedule, and control schedule

- These processes interact with each other and with processes in the other knowledge areas (PMI, 2018)

- Project managers cite **schedule** issues as causing the most conflict on projects
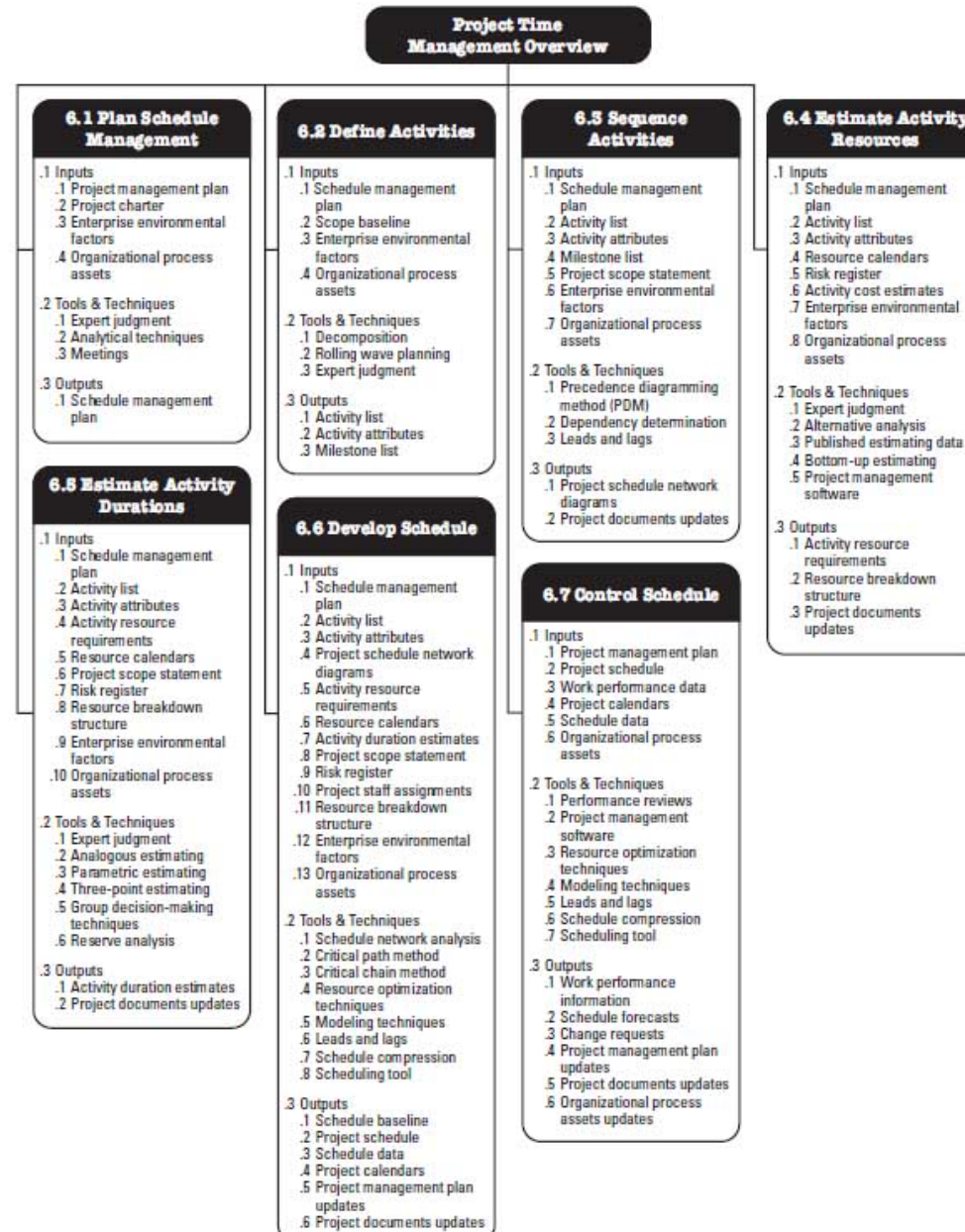
Figure 6-1. Project Time Management Overview

(PMI, 2018)

1. Plan Schedule Management

- Plan schedule management is the process of establishing the policies, procedures, and documentation for planning, developing, managing, executing and controlling the project schedule

- Key benefit is that it provides guidance and direction on how the project schedule will be managed (PMI, 2018)

- The main output is:
  - **schedule management plan**

- The schedule management plan defines control thresholds and how schedule contingencies will be reported and assessed.

2. Define Activities

- Define activities is the process of identifying and documenting the specific actions to be performed to produce the project deliverables

- Key benefit is to break down work packages into activities that provide a basis for estimating, scheduling, executing, monitoring, and controlling project work (PMI, 2018)

- The main outputs are:
  - **activity list**
  - **milestone list**

2. Define Activities (cont'd)

- Defining schedule activities entails recognizing and documenting work that is planned to be carried out

- The activity definition process identifies deliverables at the lowest level in the WBS, called a **work package**

- Work packages are reduced into smaller components called **activities**

- A **milestone** is a significant event that normally has no duration. It often takes several activities to complete a milestone (Schwalbe, 2018)

3. Sequence Activities

- Sequence activities is the process of identifying and documenting relationships among the project activities
- Key benefit is that it defines the logical sequence of work to obtain the greatest efficiency given all project constraints (PMI, 2018)
- The main output is:
  - **project schedule network diagrams**
- A dependency or a relationship shows the sequencing of project activities or tasks
- Schwalbe (2018) suggests four reasons for creating dependencies:
  - **Mandatory** (or hard logic)
  - **Discretionary** (or soft logic)
  - **External** (or relationship with non-project activities)
  - **Internal** (or relationship with project activities)

Network Diagrams

- A network diagram is a schematic display of the logical relationships among project activities

- Two main formats:
  - **Arrow Diagramming Method (ADM)**
  - **Precedence Diagramming Method (PDM)**

- ADM also called **activity-on-arrow (AOA)** network diagram. Activities are represented by arrows. Nodes or circles are the starting and ending points of activities. Can only show finish-to-start dependencies

- PDM also called **activity-on-node (AON)**. Activities are represented by boxes. Arrows show relationships between activities. More popular as it shows different types of dependencies

Example AOA diagram (Schwalbe, 2018)
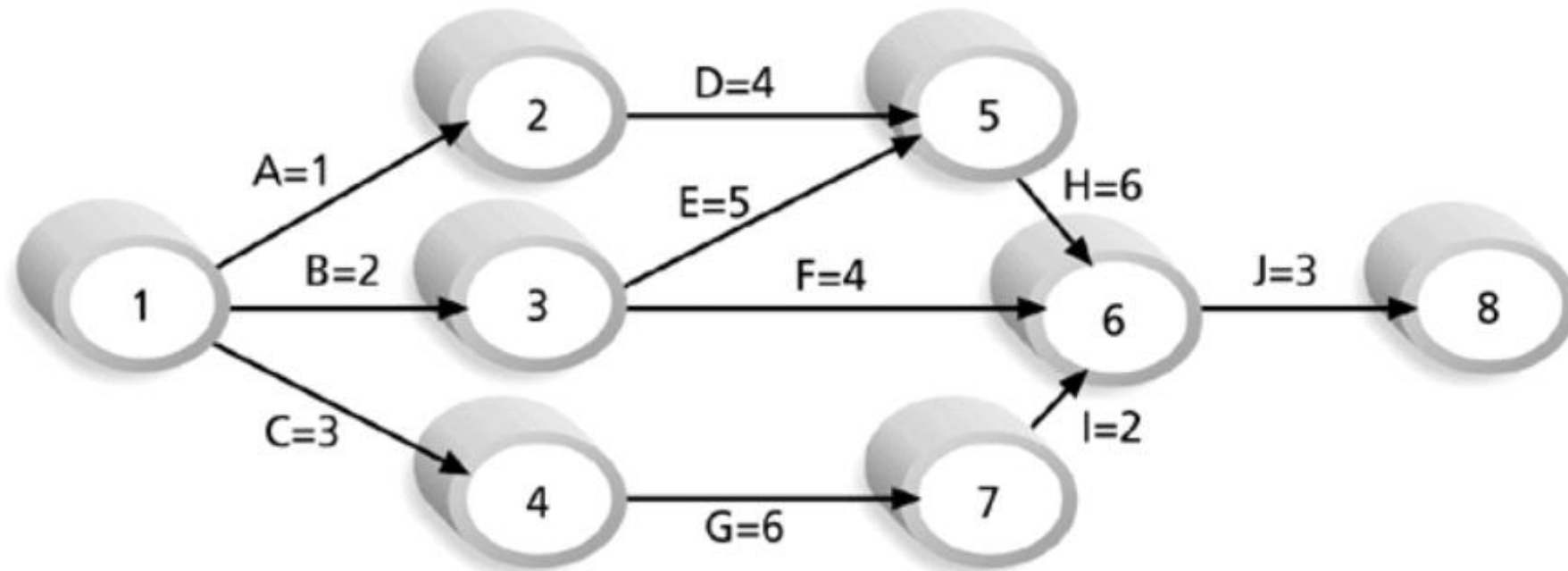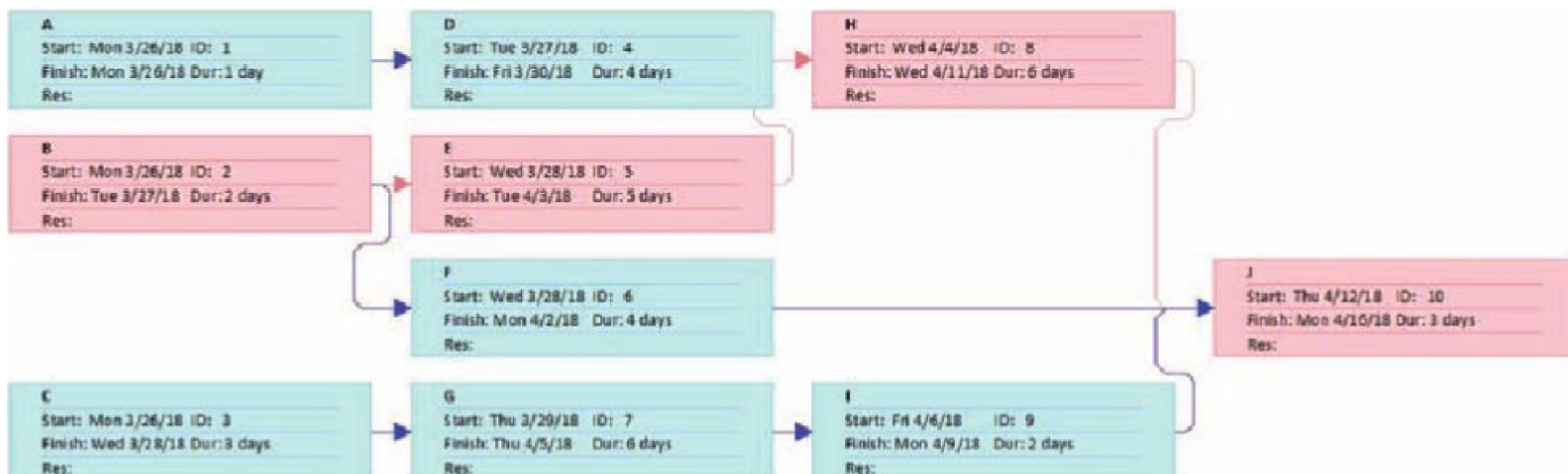

Note: Assume all durations are in days; A=1 means Activity A has a duration of 1 day.

Example AON diagram (Schwalbe, 2018)

4. Estimate Activity Resources

- Estimating activity resources is estimating the number of resources (people, equipment and materials) a project team need to carry out project tasks (Schwalbe, 2018)

- Key benefit is that it identifies the type, quantity and characteristics of resources required to complete the activity allowing more accurate cost and duration estimate (PMI, 2018)

- The main outputs include:
    - **activity resource requirements**
    - **resource breakdown structure**
    - **project document updates**

4. Estimate Activity Resources (cont'd)

- Important considerations in activity resource estimating include (Schwalbe, 2018):

    - how difficult are the activities?

    - is there unique aspects impact on resources?

    - what is the organisational history?

    - what are the organisational policies?

    - is there sufficient resources?

5. Estimate Activity Durations

- Estimate activity duration is the process of estimating the number of work periods needed to complete individual activities with estimated resources

- Key benefit of this process is that it provides the amount of time each activity will take to complete, which is a major input into the **develop schedule** process (PMI, 2018)

- The main outputs include:
  - **activity duration estimates**
  - **project document updates**

Estimation Techniques

- Calculating best estimates is important

- Techniques include:

  - **expert judgement**

  - **analogous estimating**

  - **parametric estimating**

  - **three-point estimating**

6. Develop Schedule

- Develop schedule is analysing activity sequences, durations, resource requirements and schedule constraints to create the project schedule model

- Key benefit of this process is that by entering schedule activities, durations, resources, resource availabilities, and logical relationships into the schedule tool, it generates a schedule model with planned dates for completing project activities (PMI, 2018)

- The main outputs include:
  - **schedule baseline**
  - **project schedule**

Gantt Charts

- Gantt charts provide a standard format for displaying project schedule information by listing project activities and their corresponding start and finish dates in a calendar format

- Gantt chart symbols include **black diamonds** represent **milestones**, **thick black bars** represent **summary tasks**, **lighter horizontal bars** indicate **durations of tasks**, and **arrows** show **dependencies between tasks**

- Some project managers use the **SMART** criteria to help define milestones. SMART guidelines suggest milestones should be **S**pecific**, M**easurable, **A**ssignable, **R**ealistic, and **T**ime-framed
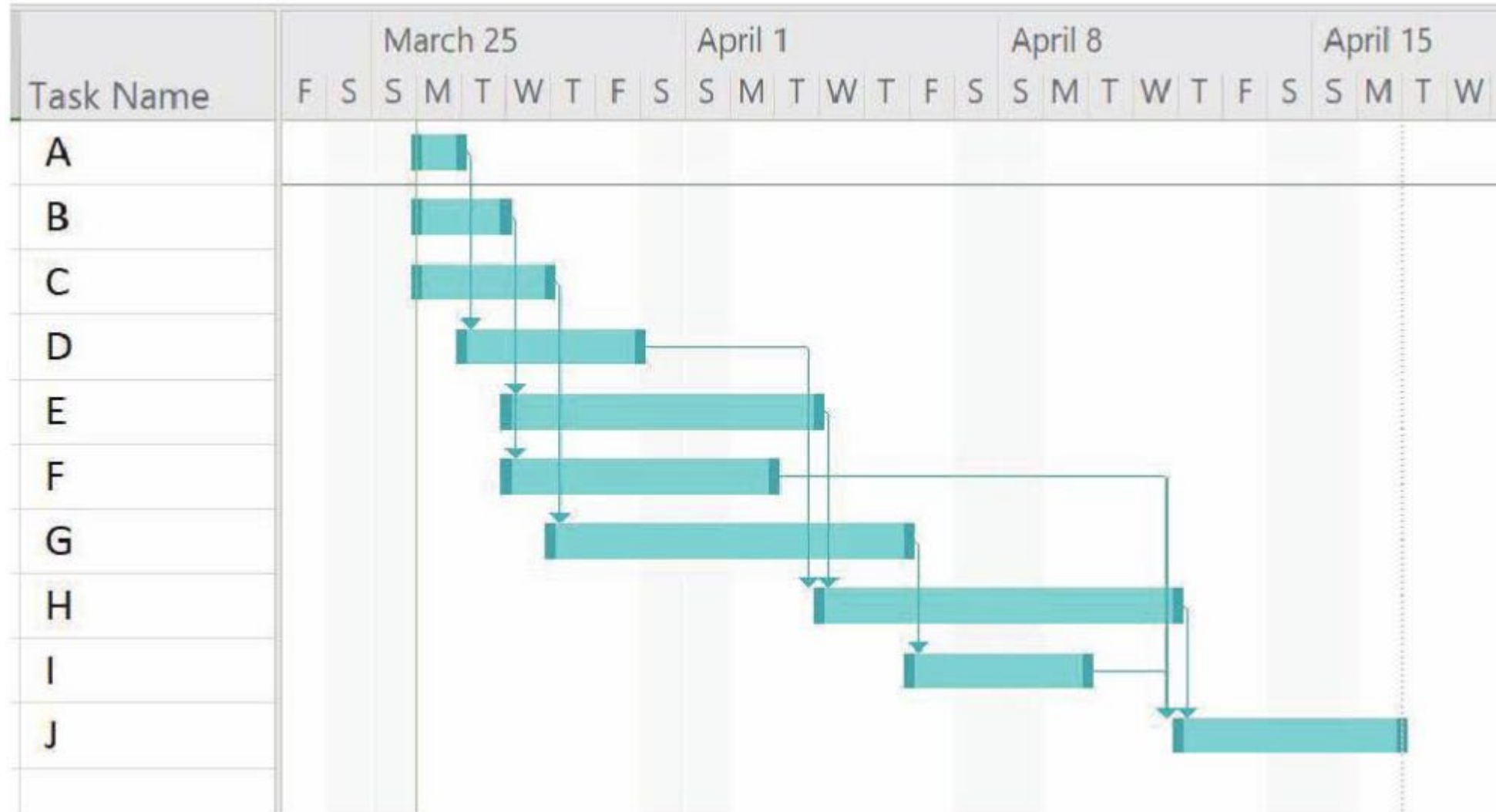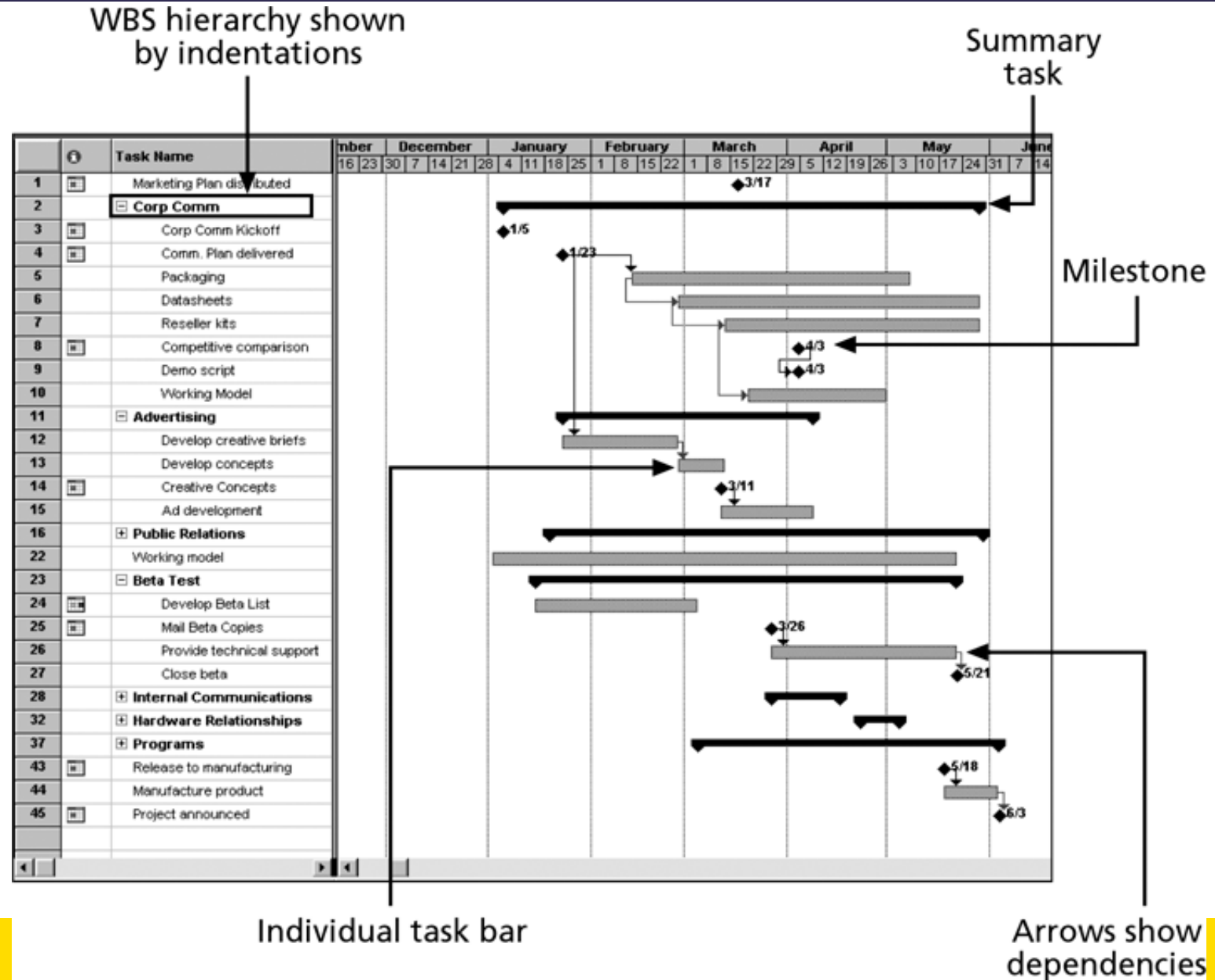
Gantt Chart for Previous Project (Schwalbe, 2018)

Example Gantt Chart (Schwalbe, 2018)

Critical Path Method

- **Critical path method** is a network diagramming technique used to predict total project duration

- The **critical path** is the longest path through the network diagram which has the least amount of slack or float

- **Slack** or **float** is the amount of time an activity can be delayed without delaying a succeeding activity or the project finish date

- The critical path helps project managers make schedule trade-offs, by determining the free slack or free float

Determining the Critical Path (Schwalbe, 2018)
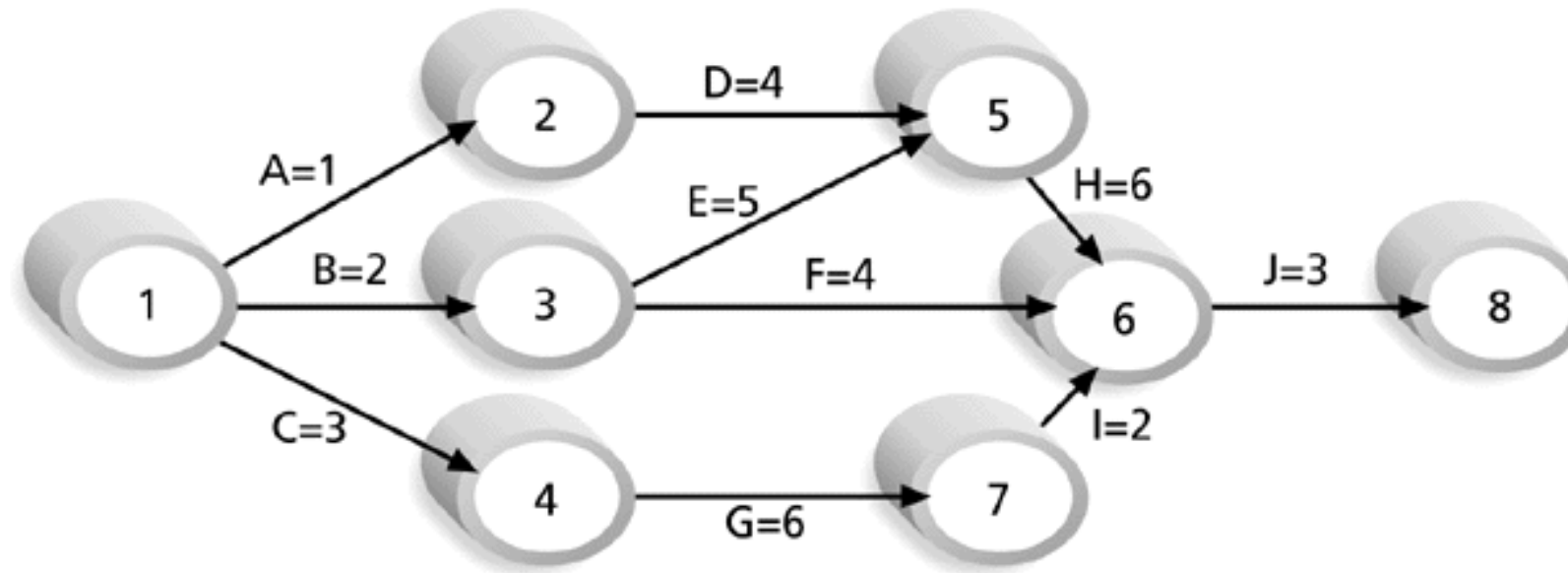
Note: Assume all durations are in days.

Path 1:	A-D-H-J	Length = 1+4+6+3 = 14 days
Path 2:	**B-E-H-J**	**Length = 2+5+6+3 = 16 days**
Path 3:	B-F-J	Length = 2+4+3 = 9 days
Path 4:	C-G-I-J	Length = 3+6+2+3 = 14 days

Since the critical path is the longest path through the network diagram, Path 2, B-E-H-J, is the critical path for Project X.

Program Evaluation and Review Technique (PERT)

- PERT is a **network analysis technique** used to estimate project duration when there is a high degree of uncertainty about the individual activity duration estimates

- PERT applies the **critical path method** to a weighted average duration estimate

- PERT uses a **three-point estimate** or **probabilistic time estimates** including **optimistic**, **most likely**, and **pessimistic** estimates of activity durations

PERT formula and Example

$$\text{PERT weighted average} = \frac{\text{optimistic time} + 4 \times \text{most likely time} + \text{pessimistic time}}{6}$$

$$\text{PERT weighted average} = \frac{8 \text{ workdays} + 4 \times 10 \text{ workdays} + 24 \text{ workdays}}{6} = 12 \text{ workdays}$$

where:
optimistic time = 8 days
most likely time = **10 days**
pessimistic time = 24 days

Therefore, you'd use **12 days** on the network diagram instead of 10 when using PERT for the above example

Week 5 Lab Tasks

Week 5 Lab Tasks

- Progressive demos should be only between the mentor and the group presenting for F2F labs. For Online labs, the break-out group/room for the progressive demo should only have the mentor and the group presenting in it. Clients are welcome to join.

- A reminder that **Progressive Demo A** will take place **during Week 5 lab** and must be **live** (**not recorded**)

- Agree with your team members on a time for when you will conduct your team's **Retrospective A meeting** which should be as soon as possible after your progressive demo and preferably on the same day

Week 5 Lab Tasks (cont'd)

- Your presentation should not exceed 12 minutes and not be less than 10 minutes (excluding Q & A time)

- Not all members are required to speak for Progressive Demos A and B. However, all team members need to be **present during the whole demo** otherwise they will get 0/2.5 mark for that progressive demo

- Have your retrospective meeting and take notes during the meeting, write your Retrospective A report, and submit it to Moodle as documented in the assessment specification

Week 5 Lab Tasks (cont'd)

- You can demo your system using your own computer and not necessarily in the clients' environment

- However, your system needs to be **tested regularly** and **must run** in **the clients' environment** since the marking of your final project will be done in this environment

- Your team's **Retrospective A** report is due **Week 5 Saturday 14/10/2023 @ 9.00pm**

- Make sure your team schedules a meeting with the clients in Week 5 to **show them your progress** and to **get more feedback** before you start **Sprint 2**

References

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Q & A