

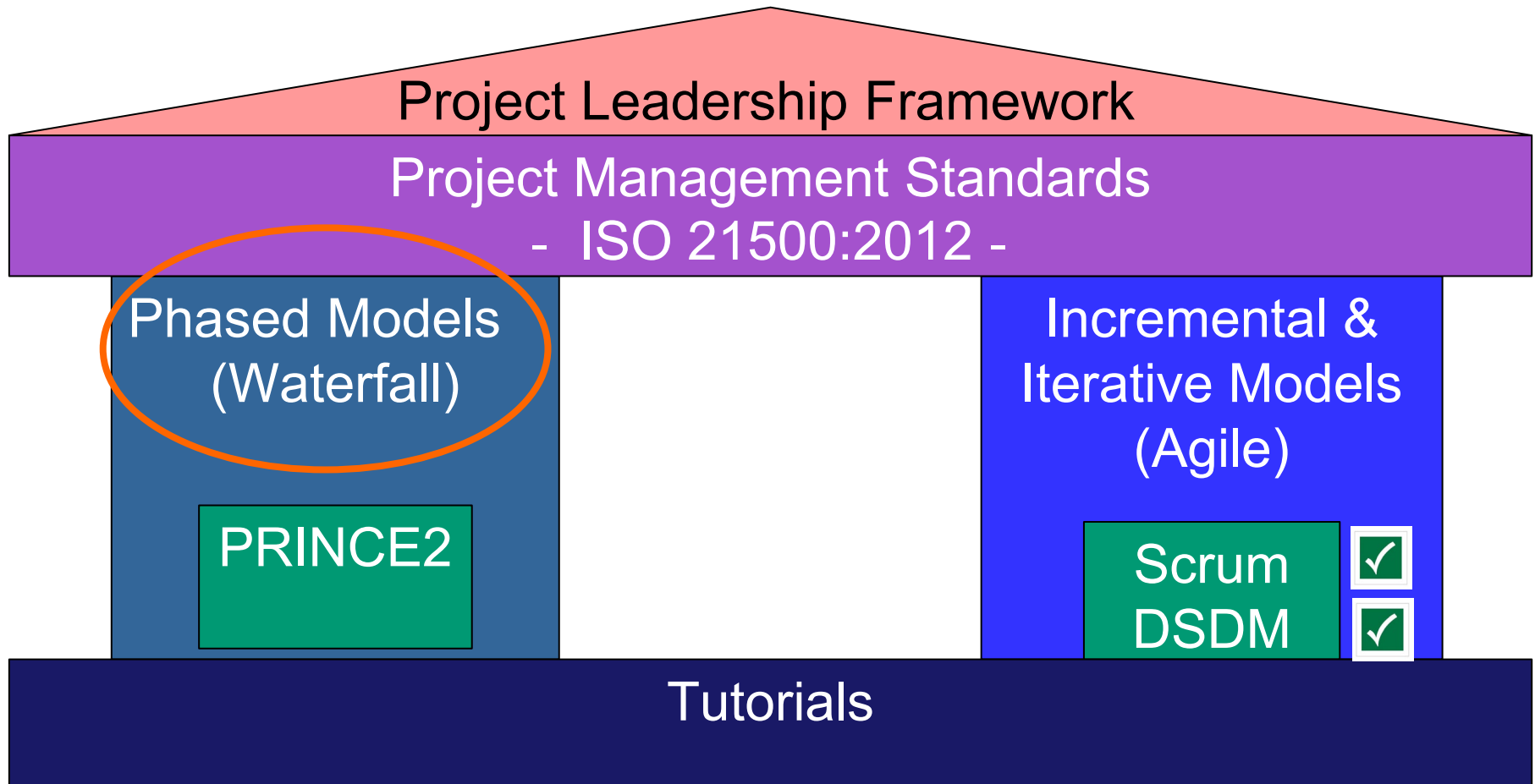
# IFB295 IT Project Management

## **PRINCE2 and Project Management Skills**

**Timebox 9 of 12  
Week 09**

**Lecturer: Sri Nair**

# Unit Themes



# PRINCE2 Methodology summary

## [from timebox 8]

### PRINCE2 (PROjects IN Controlled Environments)

Four(4) Integrated Elements;

- Principles (7)
- Themes (7)
- Processes (7)
- Tailoring – Adapt the themes, management products, processes and roles to a specific project .

PRINCE2 focuses on Products;

Specialist Products - Actual deliverables to be created.

Management Products - Documentation needed to manage PRINCE2 projects.

# PRINCE2 Methodology summary

## [from timebox 8]

**Principles (7)** – provide a framework for good practice

- Continued business justification
- Defined roles and responsibilities
- Learn from experience
- Focus on products
- Manage by stages (Pre-project, Initiation, Subsequent stage(s), Final stage, Post-project)
- Manage by exception
- Tailor to suit the project environment

**Themes (7)** – principles put into action, continuously addressed throughout the project and are integrated into each process.

- Business Case - Continued business justification.
- Organisation - Defined roles and responsibilities
- Quality - Focus on products
- Plans - Focus on products, timescale, cost, quality and benefits.
- Risk - Identify, assess and control uncertain events.
- Change - Handling change requests and issues that arise.
- Progress - Check and control relative to the plan.

# PRINCE2 Methodology summary

## [from timebox 8]

**Processes (7)** - integrated, triggered by an event, crucial to effective management of the project

- Starting up a Project (SU)
- Initiating a Project (IP) – Time, Cost, Quality, Scope, Benefits, Risk.
- Directing a Project (DP) – Project Board manages: Initiation, Stage boundaries, Ad hoc guidance, Closure.
- Controlling a Stage (CS) – Project manager: authorizes work packages.
- Managing a Stage Boundary (SB) – Review at each stage boundary. Continue?
- Managing Product Delivery (MP) – accept, execute, and deliver a work package.
- Closing a Project (CP) – terminate project, review, handover deliverables.

**Stages (5)** – Pre-project / Initiation / Subsequent stage(s) / Final / Post-project.

PRINCE2 strength - its wide applicability as it is generic.

PRINCE2 weakness - not concerned with detailed techniques.

There are many existing planning and control techniques that can be used.

# PRINCE2 Project Scope

Project scope is the part of project planning that involves determining and documenting a list of specific project goals, deliverables, tasks and deadlines. It aims to communicate key information about the project and ensure that stakeholders have a shared understanding.

The scope should be defined at the very beginning of a project and authorised by the Project Board. Once the scope is completely defined then planning can commence.

Only when scope is managed properly can the PRINCE2 Project Manager deliver the products within the requirements of time, cost, risk, and quality.



# PRINCE2 Project Scope

The PRINCE2 Project Brief is one of the Management Products.

PRINCE2 Project Brief should cover the following topics. .

Project Definition – needs to achieve

Project Objectives - Specific, Measurable, Achievable, Realistic & Time-bound (SMART).

Project **Scope** and exclusions –

Project constraints and assumptions -

Stakeholders – interested parties

Business Case – justification

Project Product Description - quality expectations, acceptance criteria, ...

Project Approach – choice of solution

Project Management Team Structure – Organisation Chart for all personnel

Role Descriptions

.... other sections

and References.



# PRINCE2 Project Scope

A **scope statement** is used to confirm a common understanding of the project scope. Typically includes; product or service requirements and characteristics, summary of all deliverables, costs and schedules, constraints, and success criteria.

**Specific.** The more specific the better.

**Measurable.** Use quantitative where possible else qualitative.

**Achievable.** Easy to commit to something you don't have the expertise to complete.

**Relevant.** Should be on completing client goals, and avoid non-value adding tasks.

**Time Bound.** A project is by definition temporary and thus has a time limit.

Any changes to the scope must be managed. This includes the analysis of whether the costs, risks, time, quality, objectives and benefits will be affected by the requested change.





# Scope Creep

**Scope creep** occurs when there is uncontrolled changes or growth in a project's scope.

There are many horror stories about projects failing due to scope creep. Causes include:

People have a tendency to want more.

People have a tendency to want to please by doing more

To reduce scope creep - monitor, control and formalise any changes (see Prince2 Change Management process next week).



# PRINCE2 – PM Roles and Responsibility

- Project Manager
  - Plan the project
  - Define responsibilities in team
  - Monitor progress
  - Initiate corrective action
  - Report
  - Participate in control
  - Day 2 Day management

In this Unit we cover planning and focus on relevant Project Management techniques.

# PRINCE2 - Planning

A Project Plan answers these questions:

Why, What, Who, When and How much ?????

Planning horizon - you can only accurately plan in detail a short time in advance.

Three levels of planning;

Project Plan - High level plan: Direction Level by the Project Board

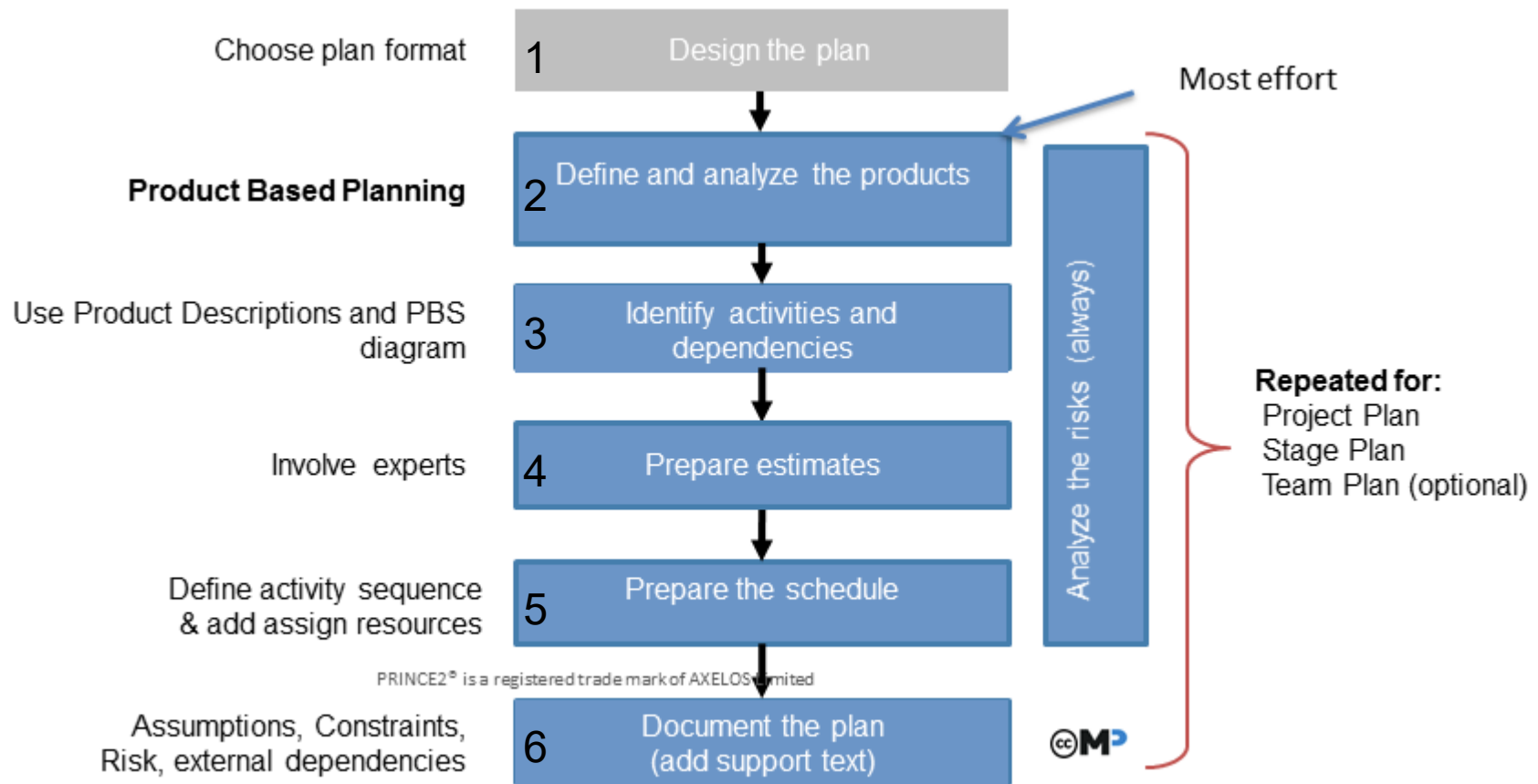
Stage Plan - Created at each stage, detailed: Management Level.

Team Plan - Plan the work in Work packages: Delivering Level.

PRINCE2 uses Product Based planning technique to identify and analyse the planned products.

# PRINCE2 - Planning process (6 steps)

*Steps 1 to 5 this week focusing on techniques for steps 4 and 5.  
Step 6 next week with a focus on specific techniques.*



# PRINCE2 - Planning process (6 steps)

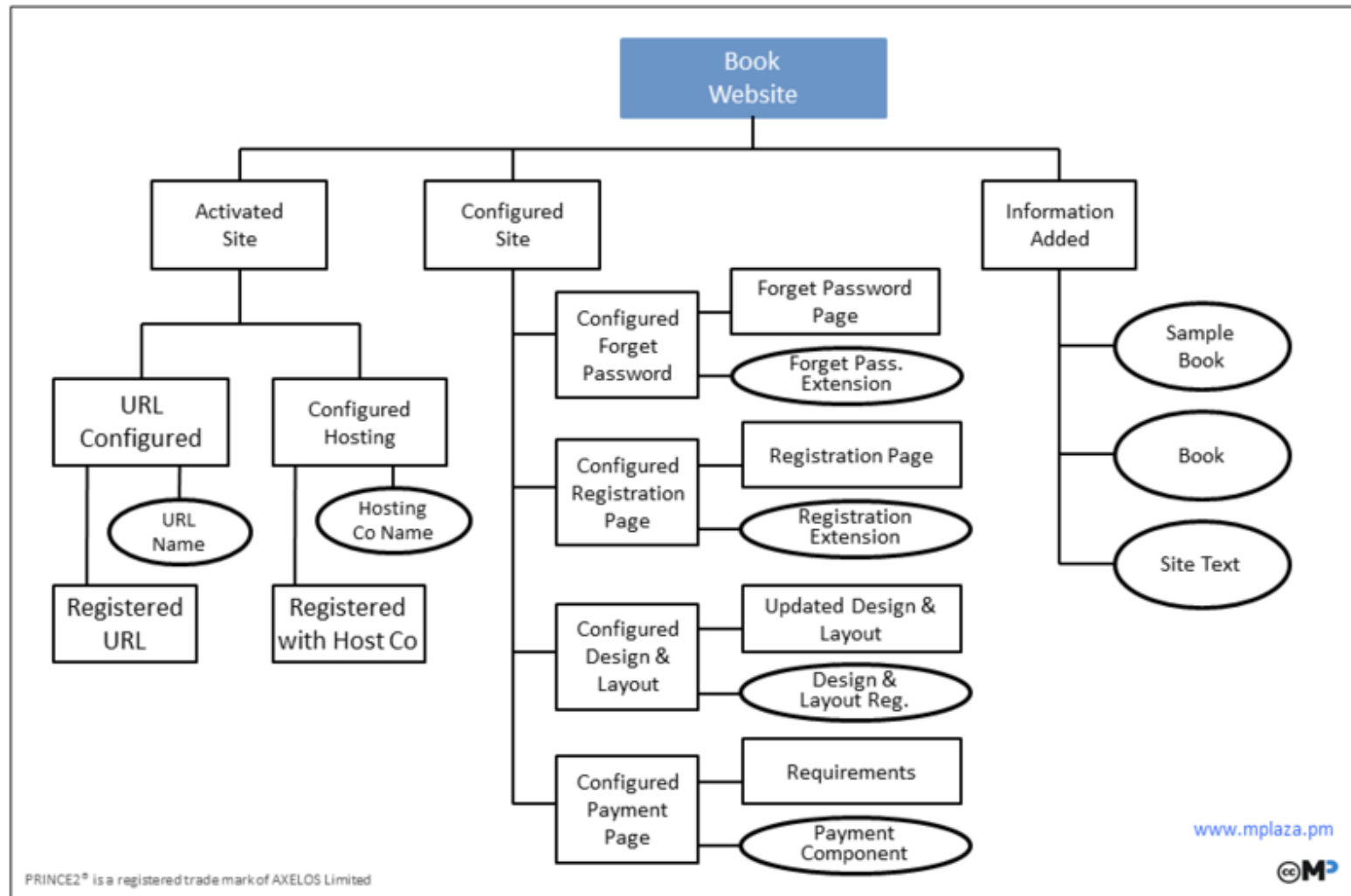
## 1. Design Plan

- Format of planning document use PRINCE2 templates

## 2. Define and analyse the Products

- PRINCE2 uses a Product Based planning technique
- Products are the things the project delivers
- Project product description (main product)
- Create a Product Breakdown Structure (PBS)
  - Break main product down into major products
  - Break each major product down into further products
  - Products described using nouns or outcome in past tense

# Example of Product Breakdown Structure (PBS)



# PRINCE2 - Planning process (6 steps)

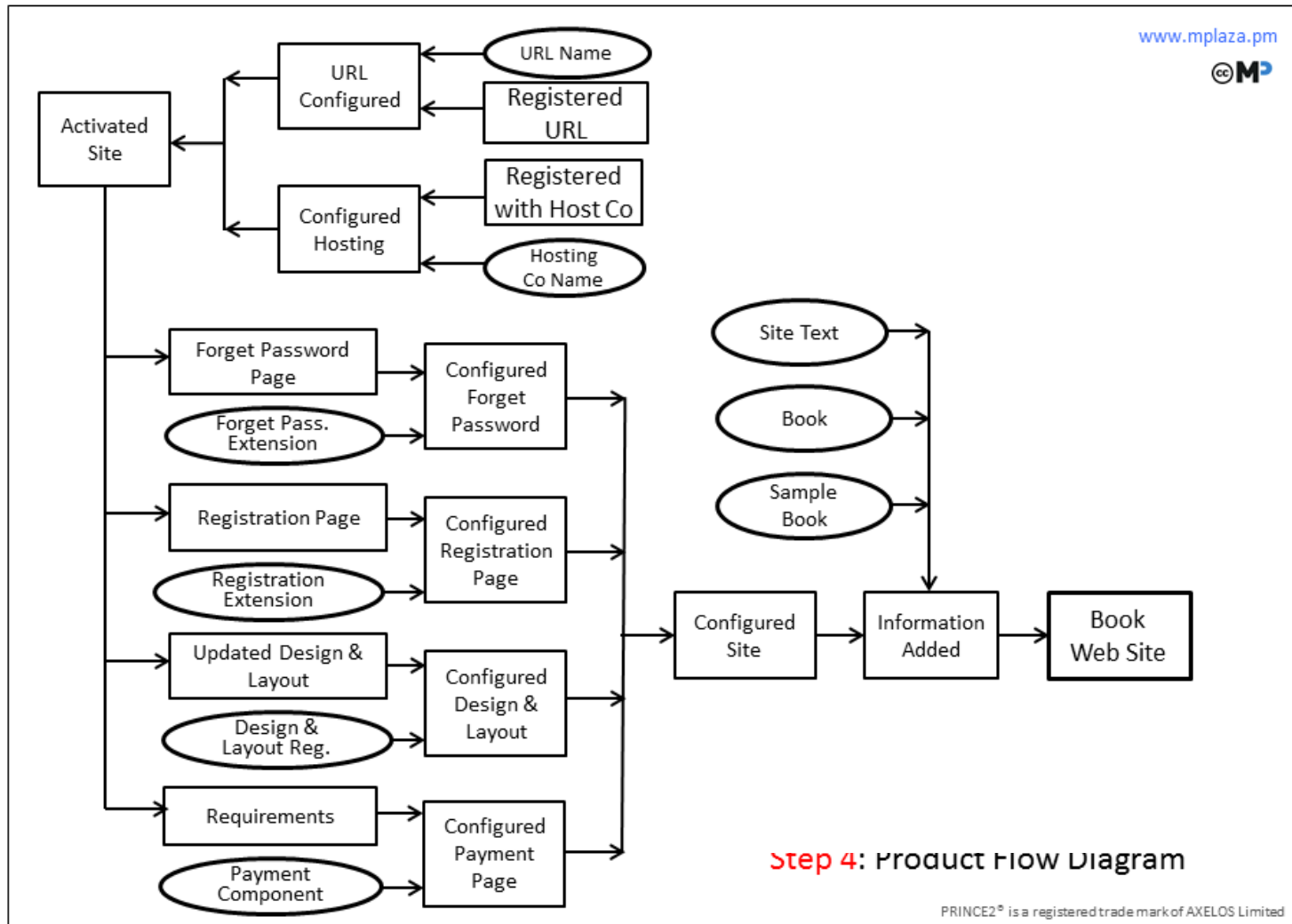
## 3. Identify activities and dependencies

Using the Product Breakdown Structure (PBS)

- Each product is defined in a Product Description (PD's)
- Product Flow Diagram (PFD) is used to define the sequence in which the products of the plan will be developed, and shows the dependencies between them.

Product Description (PD) - defines the detailed nature, purpose, function and appearance of the product, who will use the product, identify the sources of information or supply for the product, identify the level of quality required of the product, identify the activities to produce, review and approve the product, define the people or skills required to produce, review and approve the product.

# Example of Product flow diagram (PFD)





# PRINCE2 - Planning process (6 steps)

## **4. Prepare Estimates and 5. Prepare Schedules.**

PRINCE2 does not define techniques.

The Work breakdown structure (WBS) is presented here as a technique. Using the PBS and WBS to plan a project:

- PBS developed first so that the project outcomes clearly understood. Clarifies what is to be built.
- WBS used to organise the construction of products as a set of work-packages.
- WBS work-packages simplifies resource and team planning.
- The WBS is a detailed delivery plan used to task teams and individuals.

# Work Breakdown Structure (WBS)

## **4. Prepare Estimates and 5. Prepare Schedules.**

Work based decomposition;

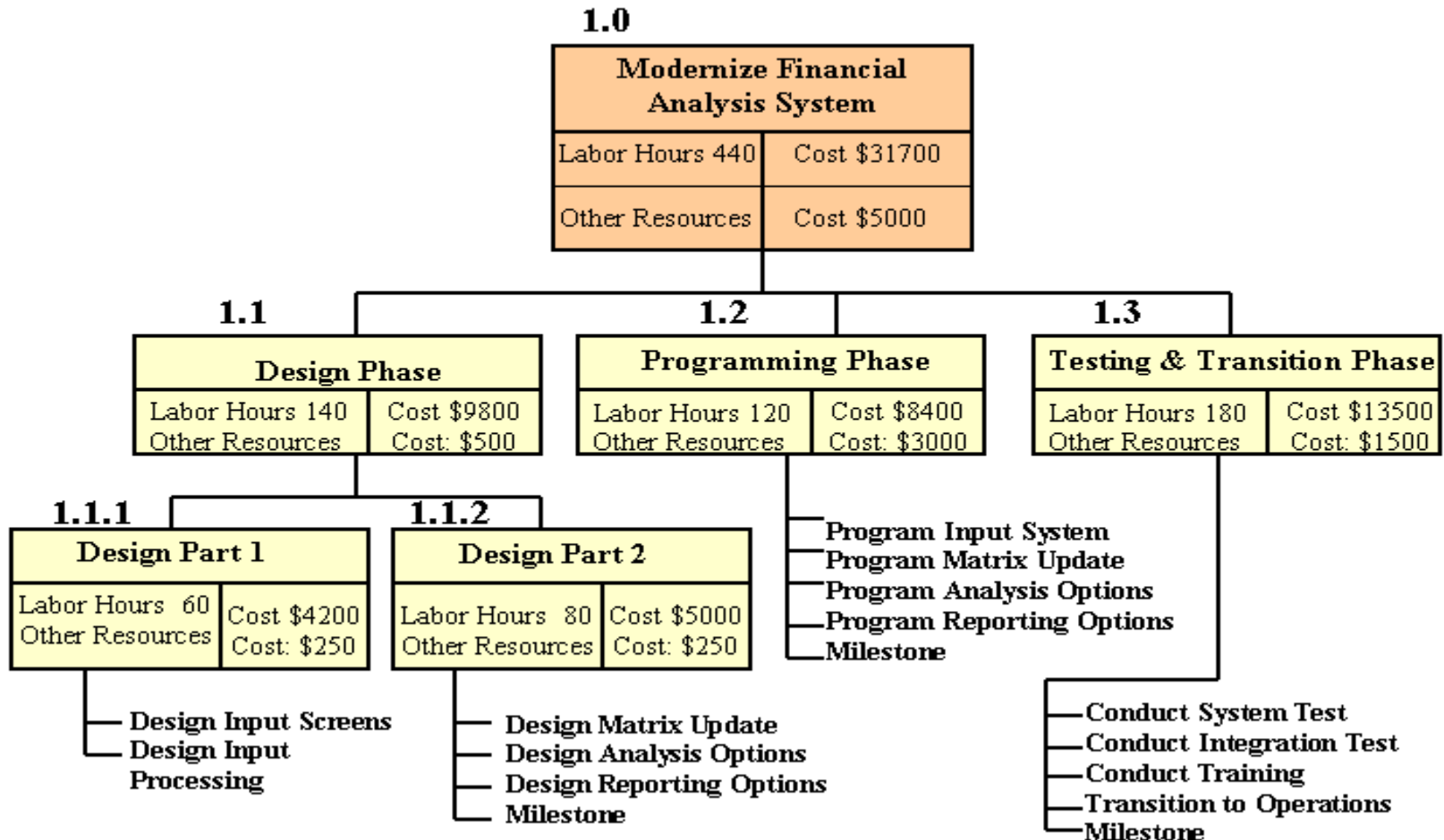
- Activities are derived from Products defined in PBS.
- Use a hierarchical structure and numbering.
- Each level adding increasing detail definition of the work.
- Decomposed in to work packages.

A work package is made up of activities and includes estimates of the required resources, time and cost. These cost estimates are used to determine the overall budget estimate.

Activity – Set of Tasks

# Example of WBS (Hierarchy)

## WBS for Alternative #2: Customize Off-the-Shelf Financial Analysis Software System



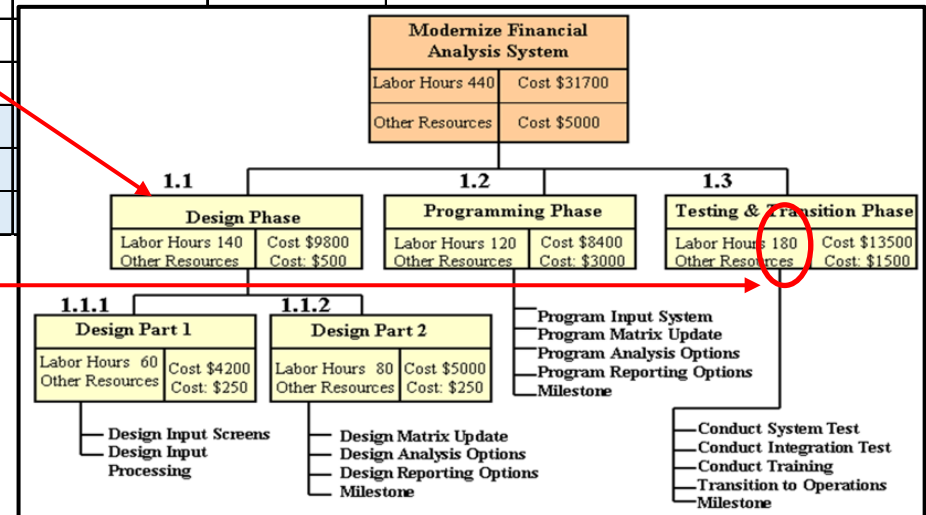
# Example of WBS (Table)

Many tools exist to flip views between Hierarchical, Tabular, Critical Path, Gantt Chart etc. from a single source (usually a table like the one below).

ID	Task	Predecessor	Estimated Duration	HR Cost	Other Cost
<b>1.0</b>	<b>Modernise FAS</b>		<b>440 hrs</b>	<b>\$ 31,700.0</b>	<b>\$ 5,000.0</b>
1.1	Design	Nil	140 hrs	\$ 9,800	\$ 500
1.1.1	Design - Reqts Gathering	Nil	60 hrs	\$ 4,200	\$ 250
1.1.1.1	Screen Design				
1.1.1.x	etc				
1.1.2	Design - prototyping	1.1.2	80 hrs	\$ 5,000	\$ 250
1.1.2.1	Design Matrix Update				
1.1.2.x					
1.2	Programming	1.1	120 hrs	\$ 8,400	\$ 3,000
1.2.1	Input system	1.1			
1.2.2	Matrix update	1.1			
1.2.x	etc.				
1.3	Test & Transition	1.2.1	180 hrs	\$ 13,500	\$ 1,500
1.3.1	System Test	1.2.7			
1.3.2	Integration Test	1.3.1			

# Example of WBS (Table)

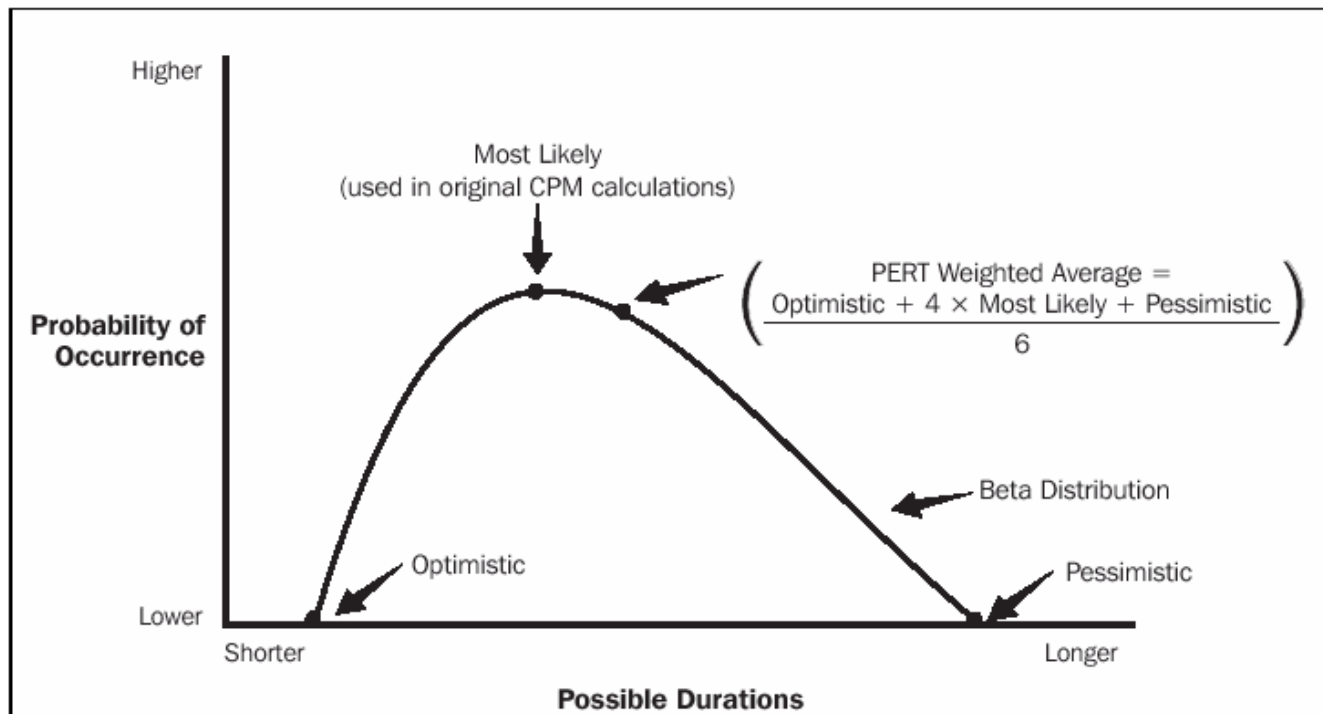
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1.2.x	etc.				
1.3	Test & Transition	1.2.1	180 hrs		
1.3.1	System Test	1.2.7			
1.3.2	Integration Test	1.3.1			



# Estimate duration of a WBS task

- Past experience
- Expert opinion
- Three point estimate

PERT Duration Calculation for a Single Activity



# Estimate duration of a WBS task

Three point estimate;

- Most optimistic duration (a)
- Most likely duration (m)
- Most pessimistic duration (b)
- Estimated Time (ET)

$$\text{Estimated Time (ET)} = \frac{a + 4m + b}{6}$$

$$\text{Variance} = s^2 = \left( \frac{b - a}{6} \right)^2$$

# Example: Project with 9 tasks (S to Z)

Calculate Estimated Time (ET) for WBS Tasks.

- Most optimistic duration (a)
- Most likely duration (m)
- Most pessimistic duration (b)

$$\text{Estimated Time (ET)} = \frac{a + 4m + b}{6}$$

ID 2, Task Y:  $ET = (1 + (4 \times 4) + 13) / 6 = (1 + 16 + 13) / 6 = 30 / 6 = 5 \text{ days}$

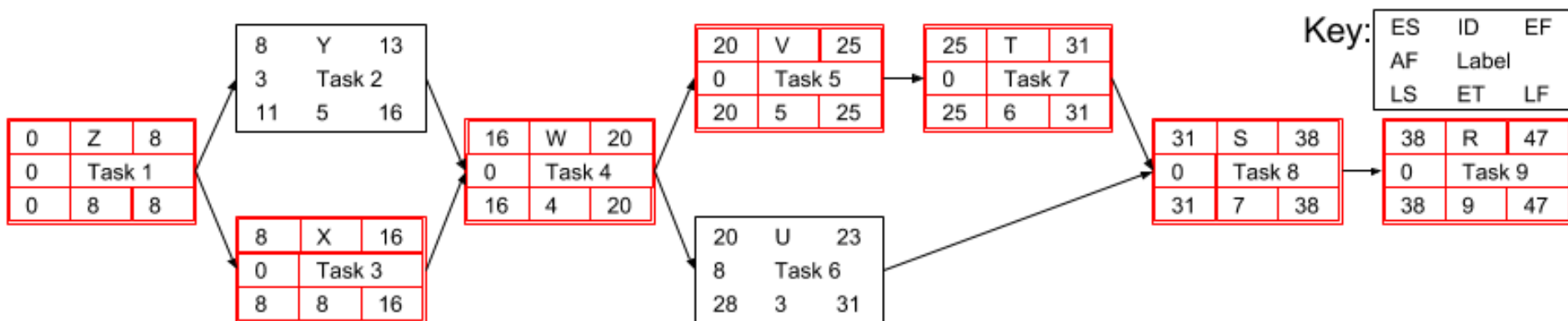
ID	Task	Optimistic(a)	Most likely(m)	Pessimistic(b)	Estimated(ET)
1	Z	6	7.5	12	8.00
2	Y	1	4	13	5.00
3	X	3	8.75	10	8.00
4	W	1	4	7	4.00
5	V	1	5.5	7	5.00
6	U	1.5	2.5	6.5	3.00
7	T	4	6	8	6.00
8	S	4	7	10	7.00
9	R	7	8	15	9.00

Question: Is the sum of the Estimated Times the project duration?



# Network diagrams

- Determines relationship between WBS tasks.
- Used to calculate the duration of the project.
- Determine which tasks are Critical and those with Slack.
- Help schedule resources (we do this in week 10).
- Create schedule by identifying start and finish times of tasks.



Network diagram - Activity on Node (AON).

# Network diagrams

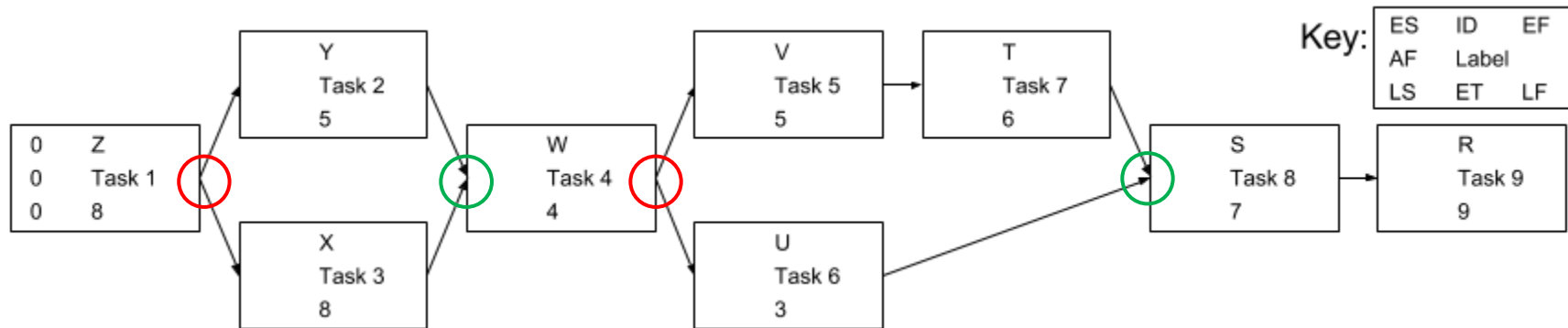
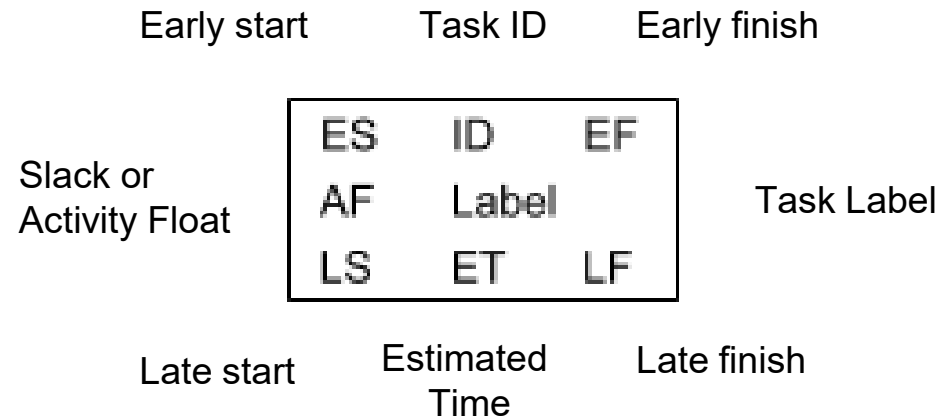
## Procedure to create a Network diagram from WBS.

1. Calculate Estimated Time (ET) for WBS Tasks.
2. Determine the relationship between tasks using precedence.
3. Draw Network.
4. Determine the duration of the project by calculating early start (ES) and early finish (EF) times with a forward pass through the network.
5. Determine the Critical Path tasks and those with Slack by calculating late finish (LF) and late start (LS) with a backward pass through the network.

# Example: Project with 9 tasks (S to Z)

Determine the relationship between tasks with precedence.

ID	Task	Pred.	Estimated Time (ET) days
1	Z		8
2	Y	<b>Z</b>	5
3	X	<b>Z</b>	8
4	W	<b>Y,X</b>	4
5	V	<b>W</b>	5
6	U	<b>W</b>	3
7	T	<b>V</b>	6
8	S	<b>U,T</b>	7
9	R	<b>S</b>	9



*Burst Point      Merge Point      Burst Point*

*Merge Point*

# Example: Project with 9 tasks (S to Z)

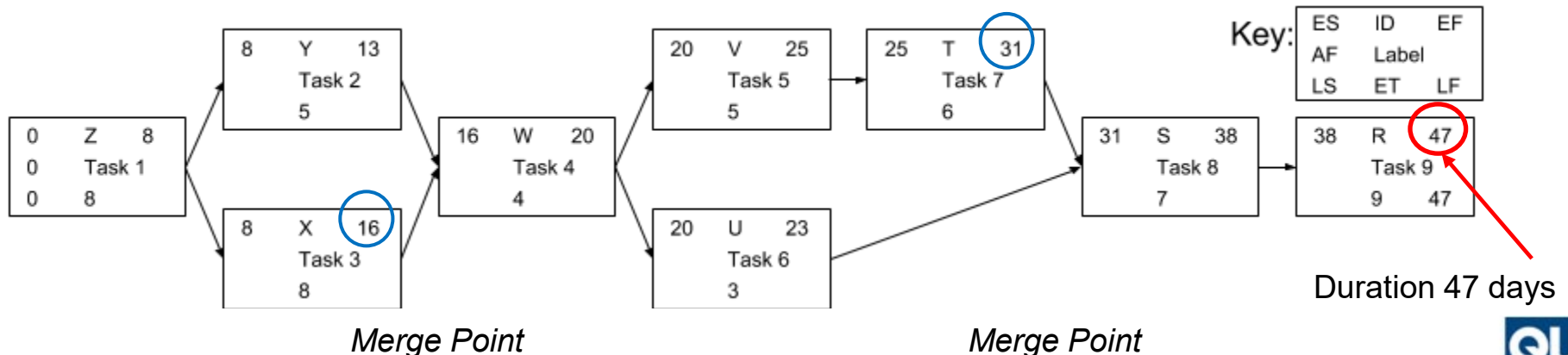
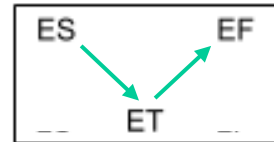
To determine the duration of the project.

ID	Task	Pred.	Estimated Time (ET) days	ES	EF
1	Z		8	0	8
2	Y	Z	5	8	13
3	X	Z	8	8	16
4	W	Y,X	4	16	20
5	V	W	5	20	25
6	U	W	3	20	23
7	T	V	6	25	31
8	S	U,T	7	31	38
9	R	S	9	38	47

Forward pass – an *additive move* through the network from *start to finish*. To calculate project duration.

## Forward Pass Rules (ES & EF)

- $ES + ET = EF$
- EF of predecessor = ES of successor
- **Largest** preceding EF at a merge point becomes ES for successor



Merge Point

# Example: Project with 9 tasks (S to Z)

To determine the duration of the project.

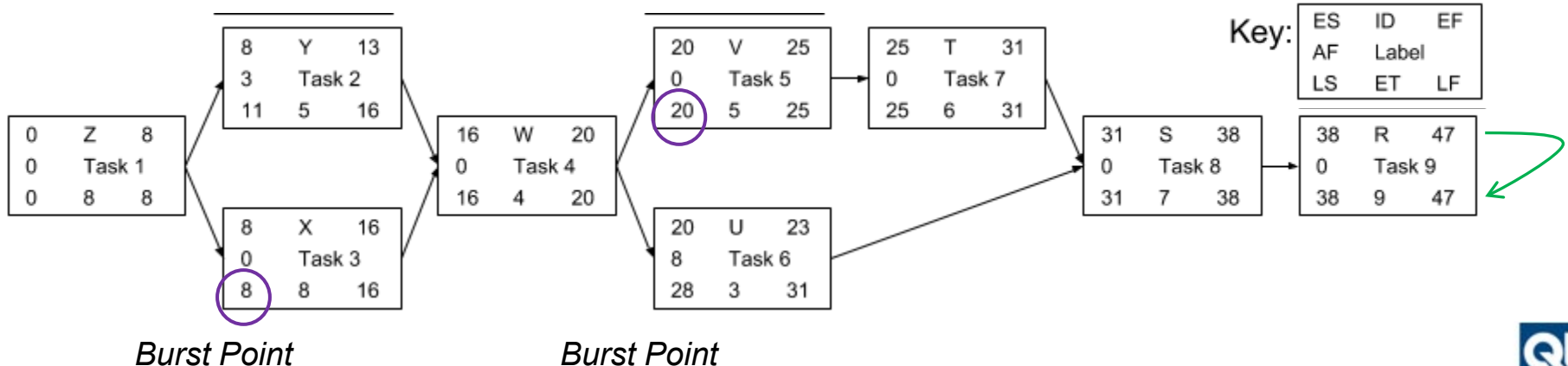
ID	Task	Pred.	ET days	ES	EF	LS	LF
1	Z		8	0	8	0	8
2	Y	Z	5	8	13	11	16
3	X	Z	8	8	16	8	16
4	W	Y,X	4	16	20	16	20
5	V	W	5	20	25	20	25
6	U	W	3	20	23	28	31
7	T	V	6	25	31	25	31
8	S	U,T	7	31	38	31	38
9	R	S	9	38	47	38	47

Backward pass – a *subtractive move* through the network from *finish to start*. To identify critical path tasks and those with slack.

## Backward Pass Rules (LS & LF)

- $LF - ET = LS$
- LS of successor = LF of predecessor
- **Smallest** succeeding LS at a burst point becomes LF for predecessor

LS ← ET ← LF



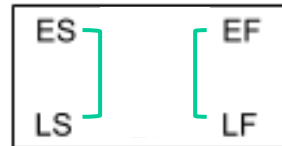
# Example: Project with 9 tasks (S to Z)

Identify Critical Path tasks and those with Slack

ID	Task	Pred.	ET (days)	ES	EF	LS	LF	Slack
1	Z		8	0	8	0	8	0
2	Y	Z	5	8	13	11	16	3
3	X	Z	8	8	16	8	16	0
4	W	Y,X	4	16	20	16	20	0
5	V	W	5	20	25	20	25	0
6	U	W	3	20	23	28	31	8
7	T	V	6	25	31	25	31	0
8	S	U,T	7	31	38	31	38	0
9	R	S	9	38	47	38	47	0

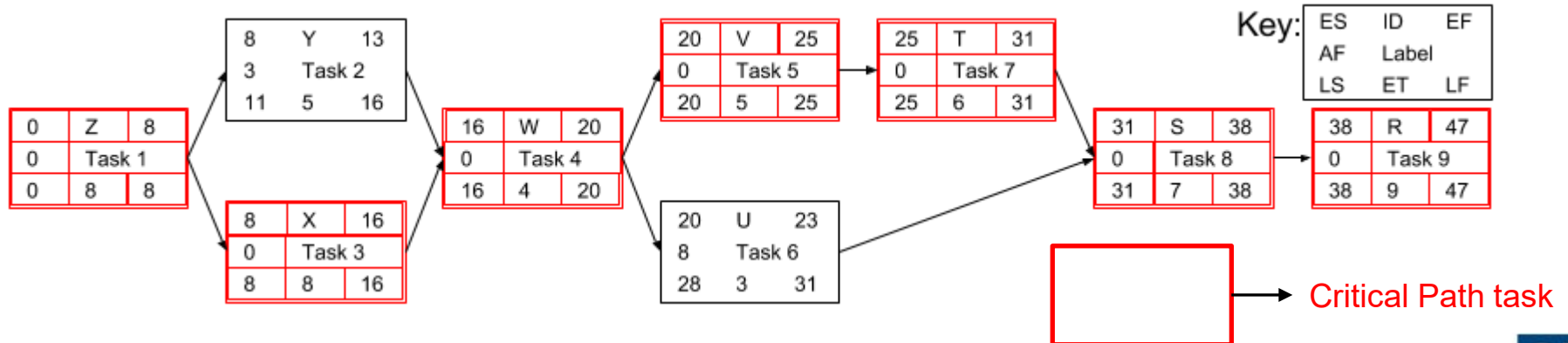
Slack or Activity Float (AF) is calculated by:

$$AF = LF - EF = LS - ES$$



Critical path (CP) – the **longest path** from end to end which determines the **shortest project duration**.

CP = Z-X-W-V-T-S-R = 47 days



Note: For CP tasks Slack = 0,  
Non-CP tasks Slack ≠ 0

# Network diagrams: Lags in Precedence relationships

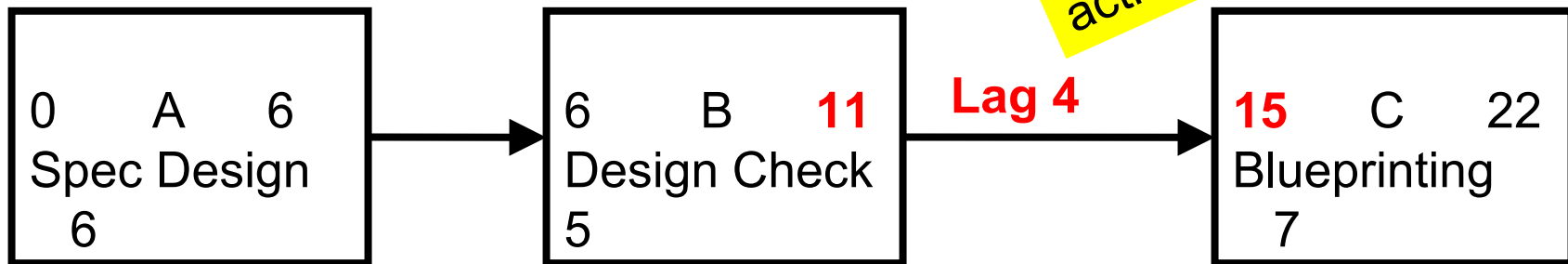
The logical relationship between the start and finish of one task and the start and finish of another task.

## Four logical relationships between tasks

1. Finish to Start (most common)
2. Finish to Finish
3. Start to Start
4. Start to Finish (never used and not shown)

# 1. Finish to Start Lag

Most common type of sequencing  
Shown on the line joining the nodes  
Added during forward pass  
Subtracted during backward pass

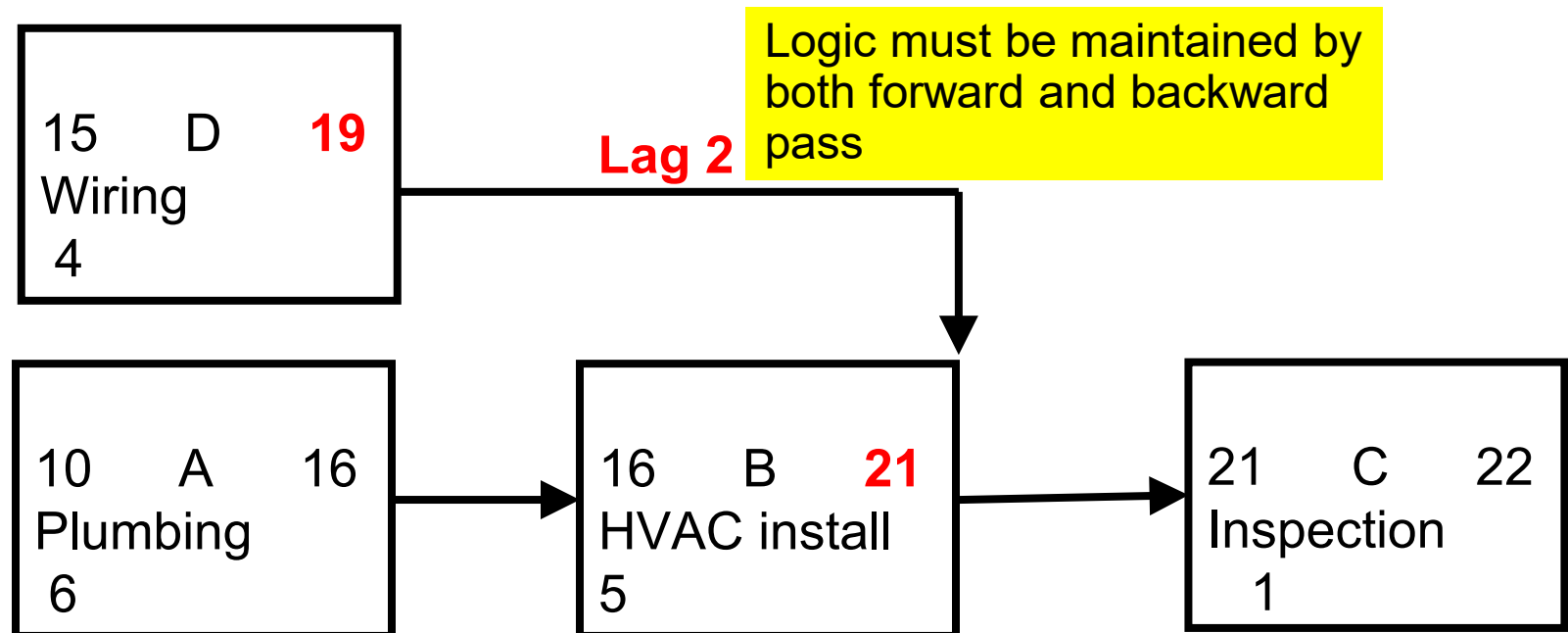


Blueprinting activity can not be delivered until 4 days after the completion of the design check and therefore a lag of 4 days is included to ensure resources are not allocated and unused for the four days.



## 2. Finish to Finish Lag

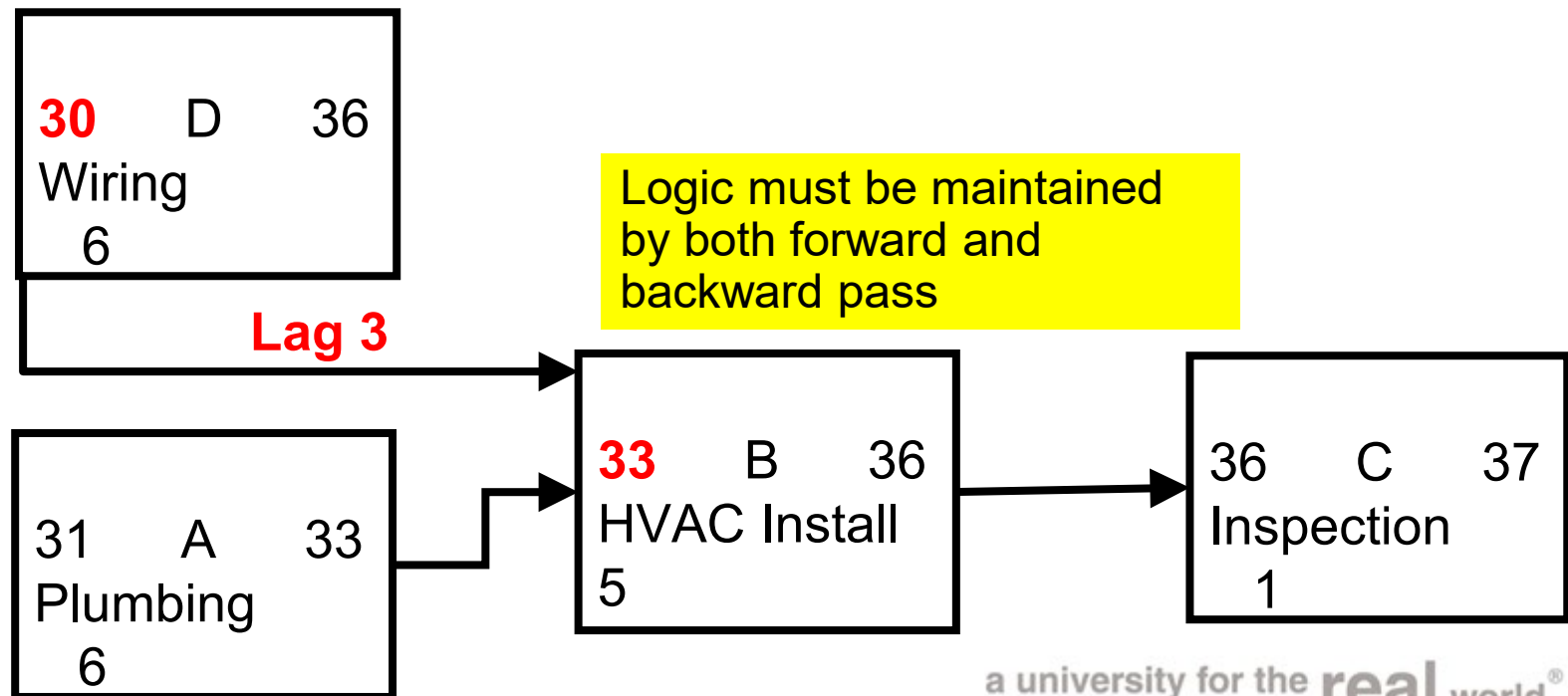
Two activities share a similar completion point  
The mechanical inspection cannot happen until wiring, plumbing, and HVAC installation are complete



### 3. Start to Start Lag

Where two or more activities can start simultaneously or  
When a lag is used between the start of one activity after an earlier activity has commenced so that they commence at the same time.

Wiring has its start lagged by 3 days to ensure it starts at the same time as HVAC activity, on day 33 of the project.



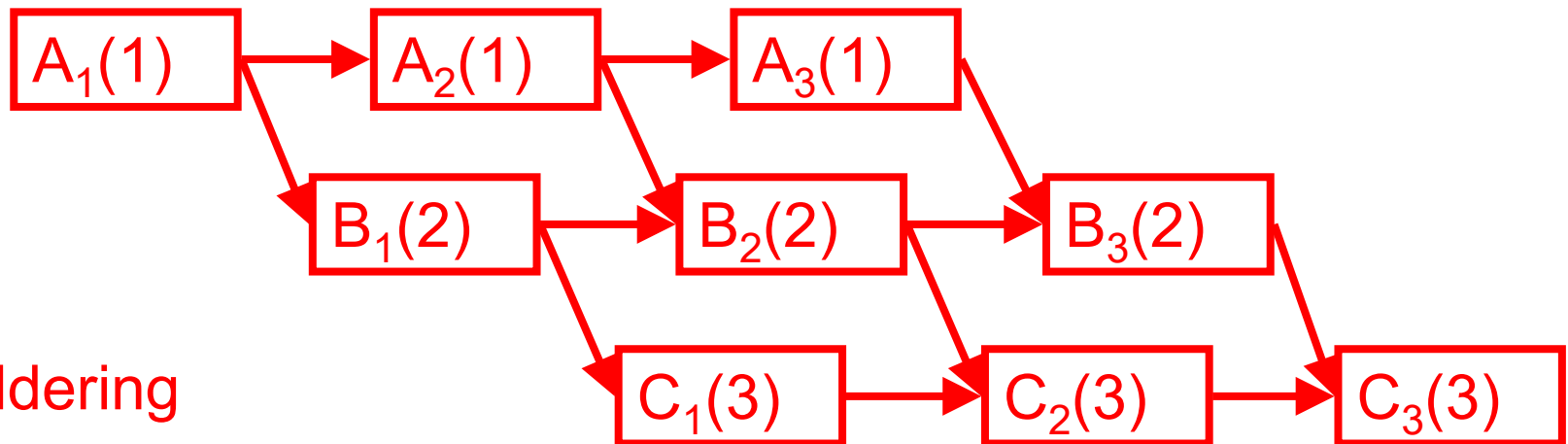
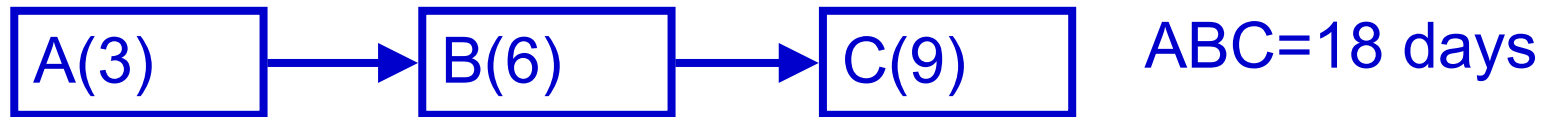
# Reducing duration of the Project

Techniques to reduce the duration of the project;

- Eliminate tasks on the critical path.
- Convert serial paths to parallel paths when possible.
- Overlap sequential tasks using Laddering.
- Shorten the duration on critical path tasks. Identify potential tasks to shorten the duration by the following ranked list.
  1. Early tasks
  2. Longest tasks
  3. Easiest tasks
  4. Tasks that cost the least to speed up

# Reducing duration of the Project

Laddering - A Project ABC can be completed more efficiently if laddering using subtasks are used.



Laddering

Laddered ABC = 12 days

$$A_1(1) + B_1(2) + C_1(3) + C_2(3) + C_3(3) = 12 \text{ days}$$

# PRINCE2 - References

The material presented in weeks 9 and 10 on PRINCE2 are from a number of sources including;

<http://prince2.wiki/PRINCE2>

<https://www.axelos.com/best-practice-solutions/prince2/what-is-prince2>

<https://en.wikipedia.org/wiki/PRINCE2>

Google