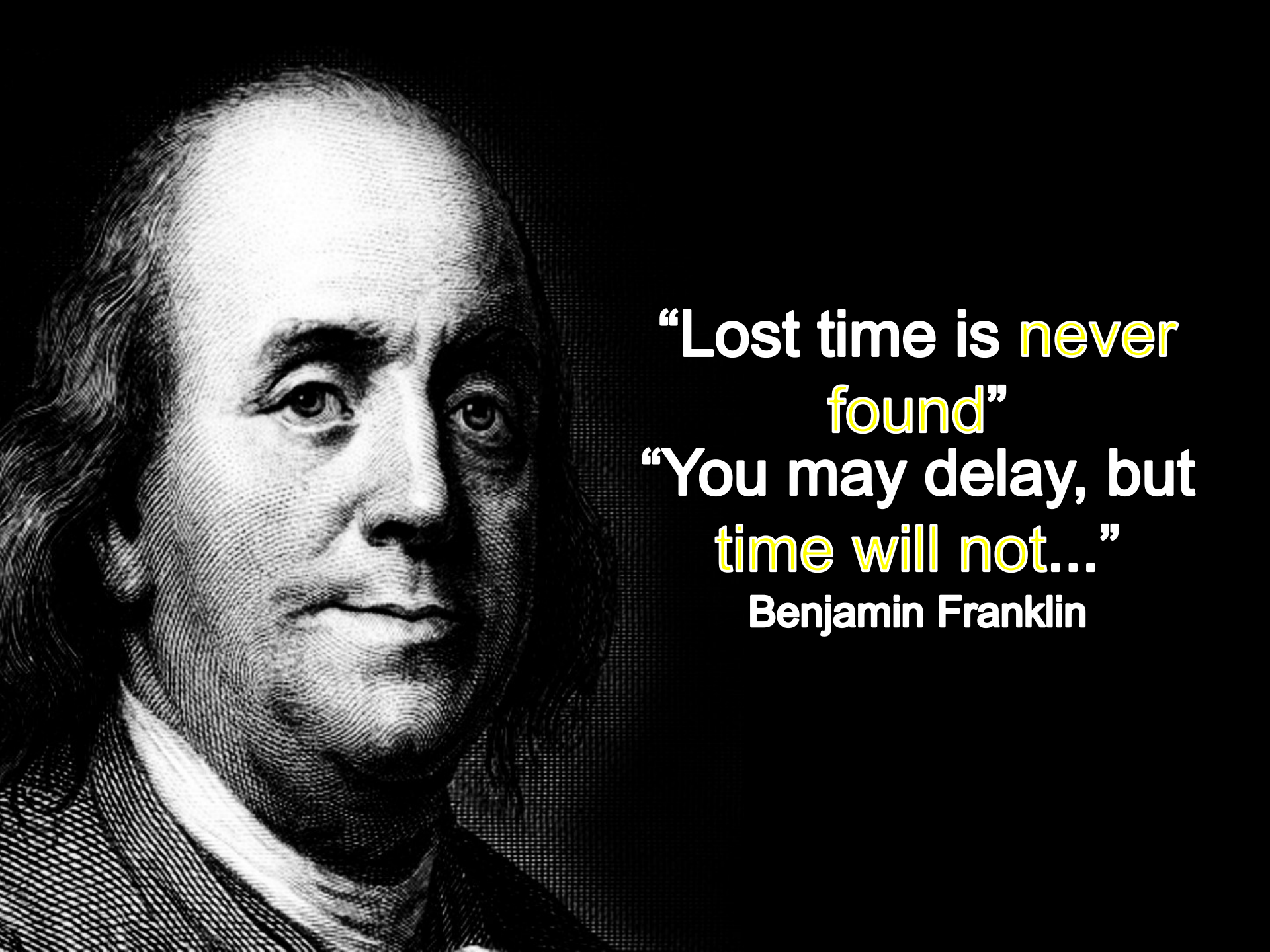
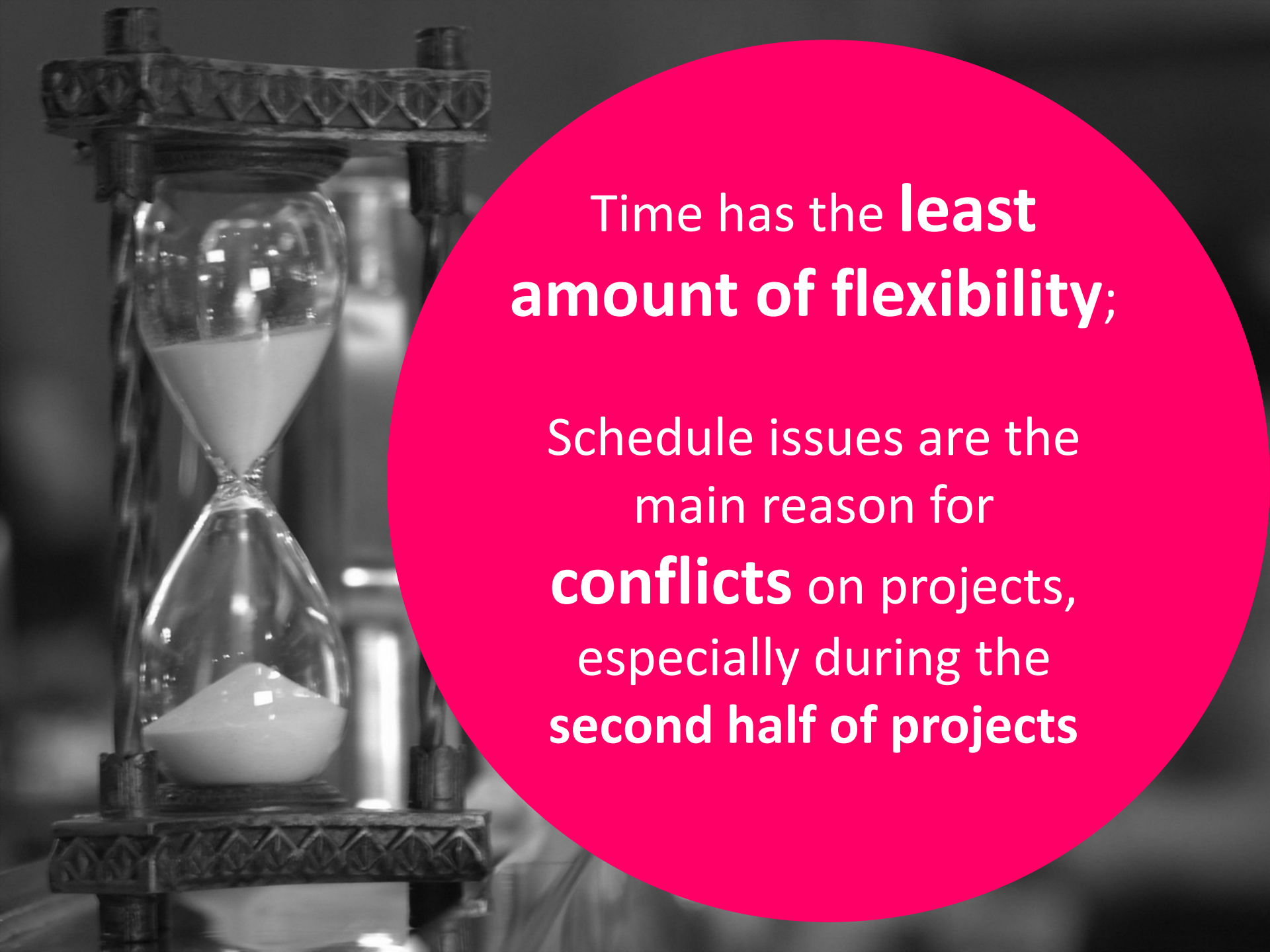
# #6 Project Time

PMBOK 5 Ed. – DEI-


“Lost time is never found”
“You may delay, but time will not...”
Benjamin Franklin


Time has the **least amount of flexibility**;
Schedule issues are the main reason for **conflicts** on projects, especially during the **second half of projects**

The process required to manage timely completion of the project

# PROJECT TIME MANAGEMENT

Plan Time

Define Activity

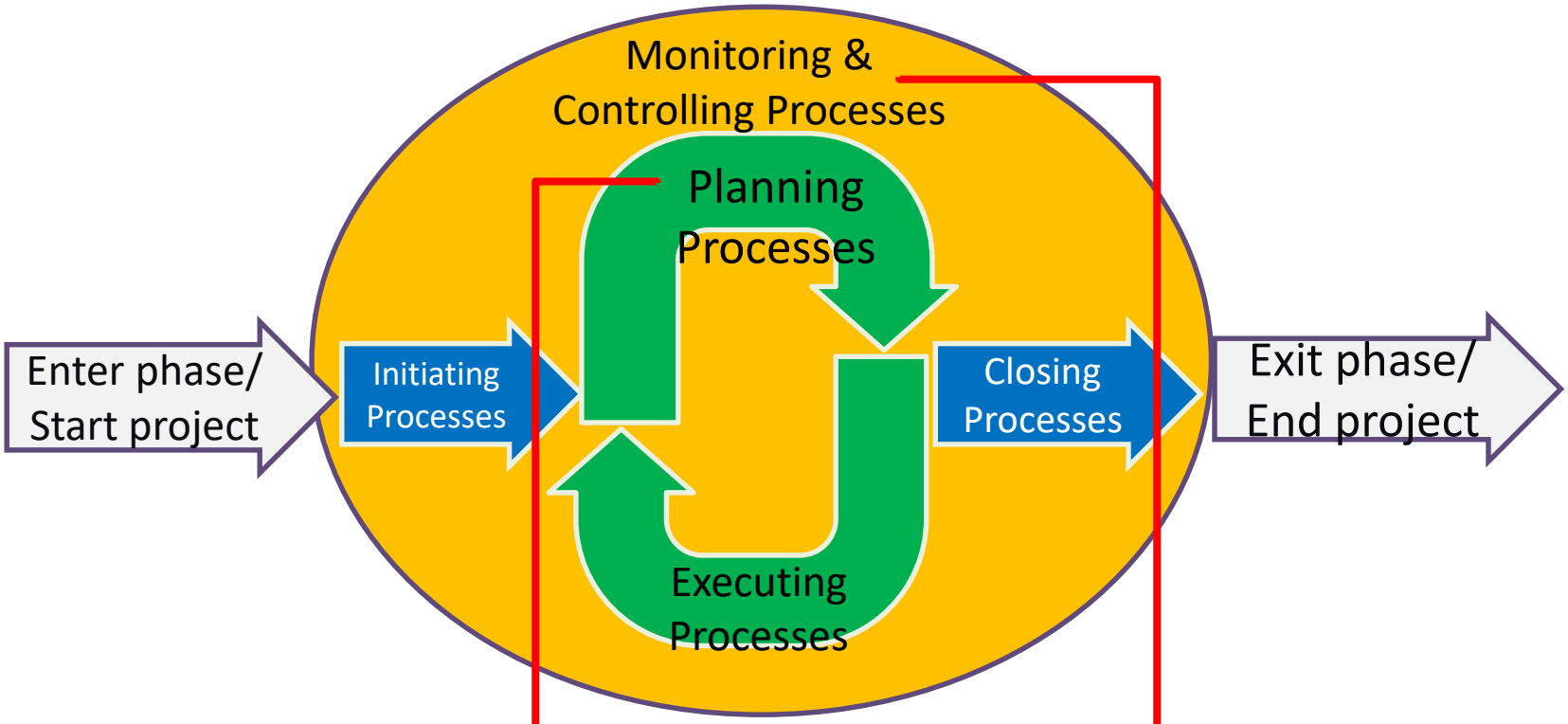
Sequencing Activity

Estimate activity resource

Estimate Activity Duration

Developing the schedule

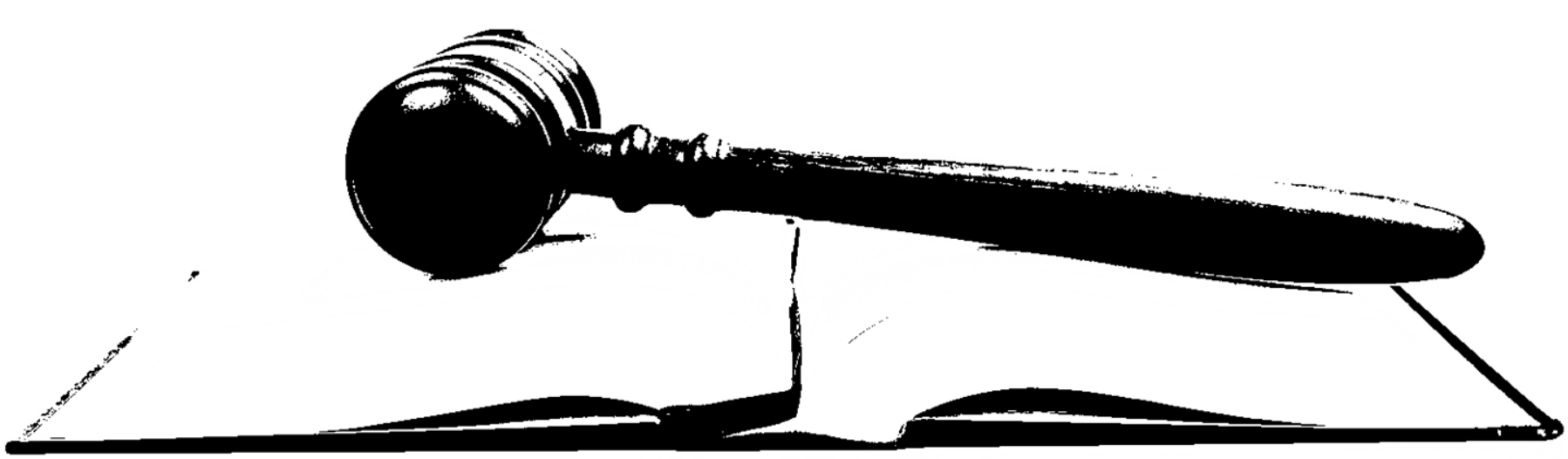
Controlling the schedule

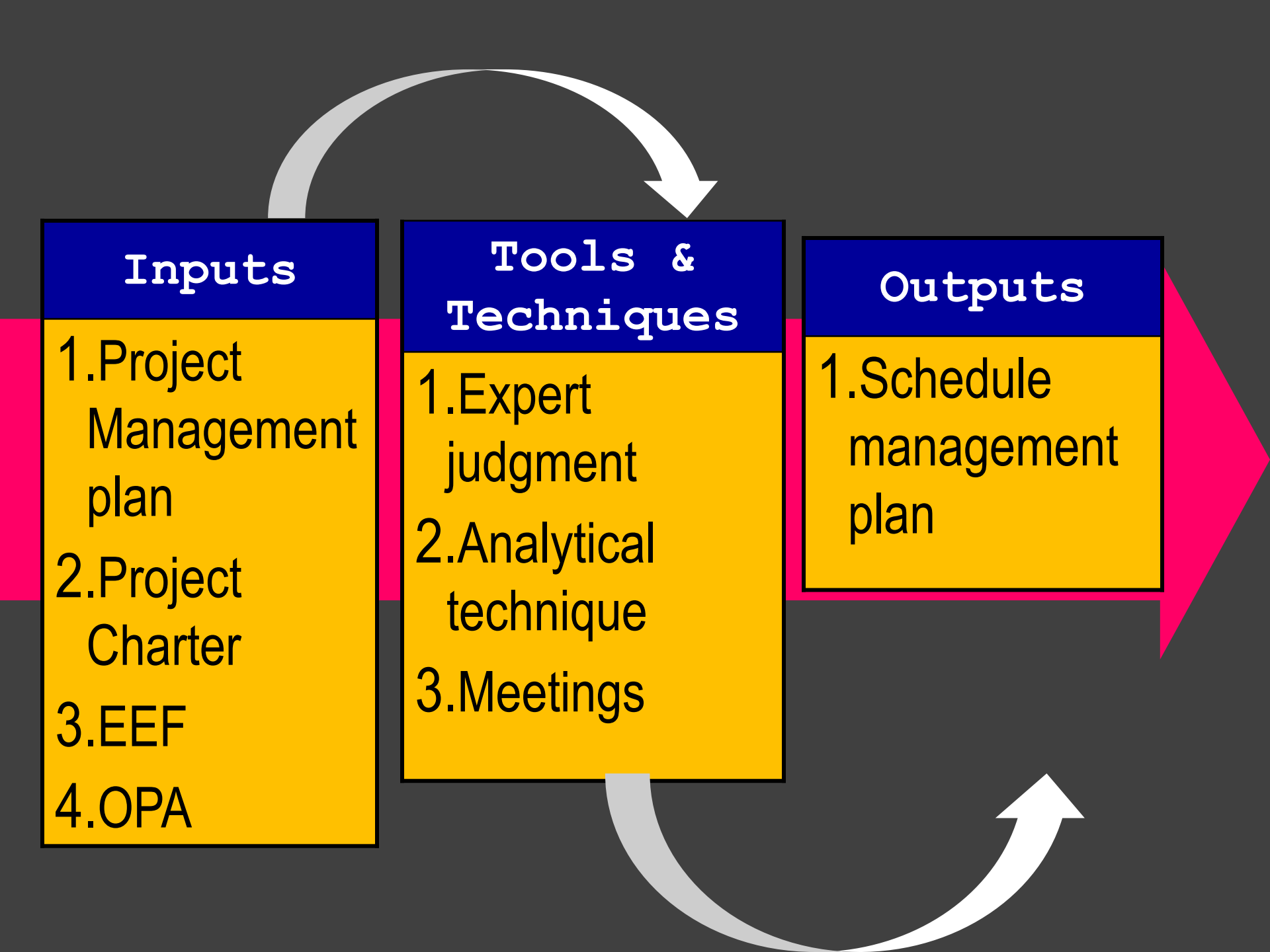



| Knowledge Area | Process | | | | |
|---|---|---|---|---|---|
| | Initiating | Planning | Executing | Monitoring & Control | Closing |
| Scope | | Plan Schedule<br>Activity Definition<br>Activity Sequencing<br>Activity Resource<br>Estimating<br>Activity Duration | | Control time | |

# Plan Time

"Determining the policies, procedures, and documentation to manage time"

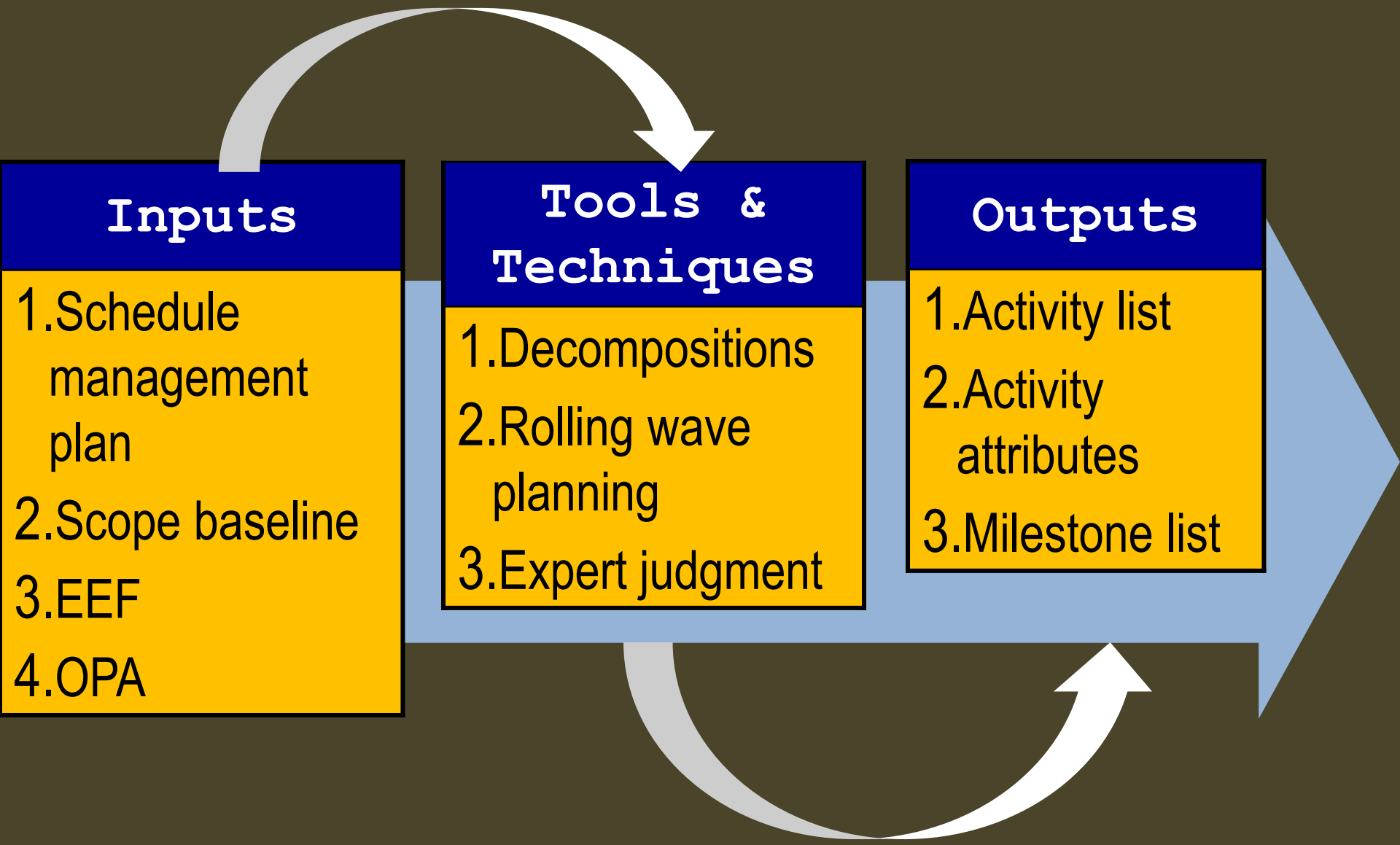



Inputs
1.Project Management plan
2.Project Charter
3.EEF
4.OPA
Tools & Techniques
1.Expert judgment
2.Analytical technique
3.Meetings
Outputs
1.Schedule management plan

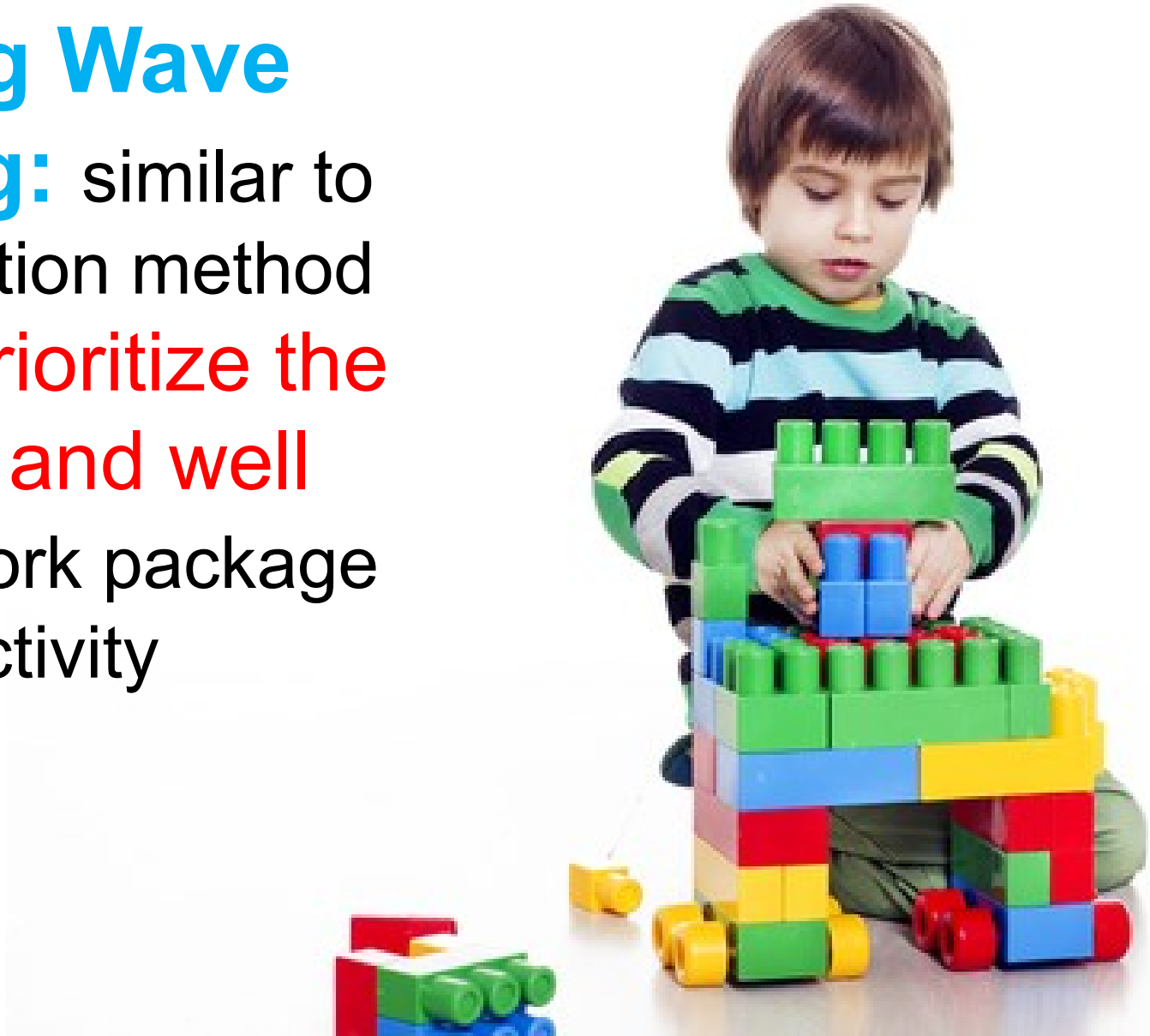
"Identifying **the specific activities** to produce the project deliverables"

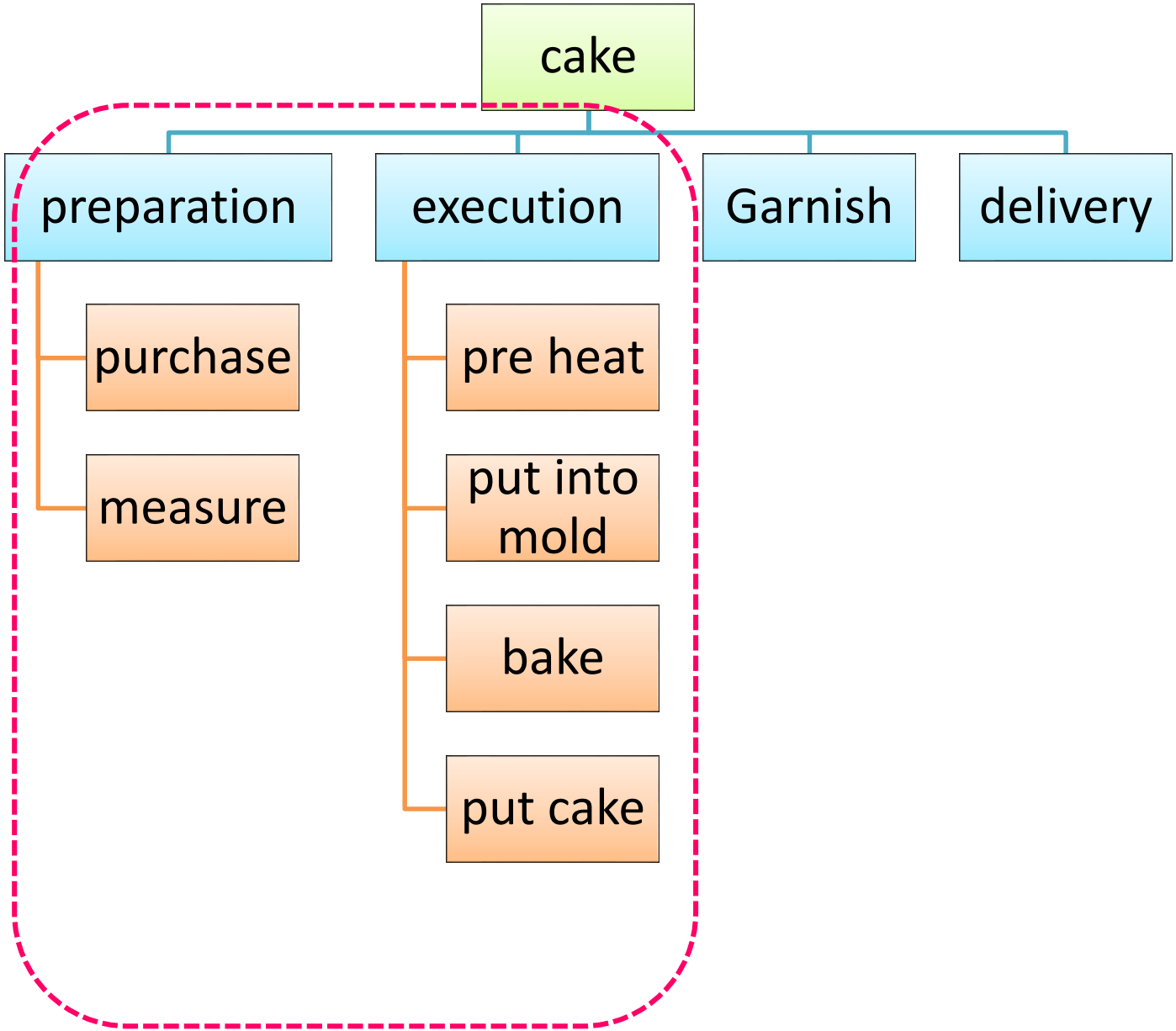
Work package decomposed into activities

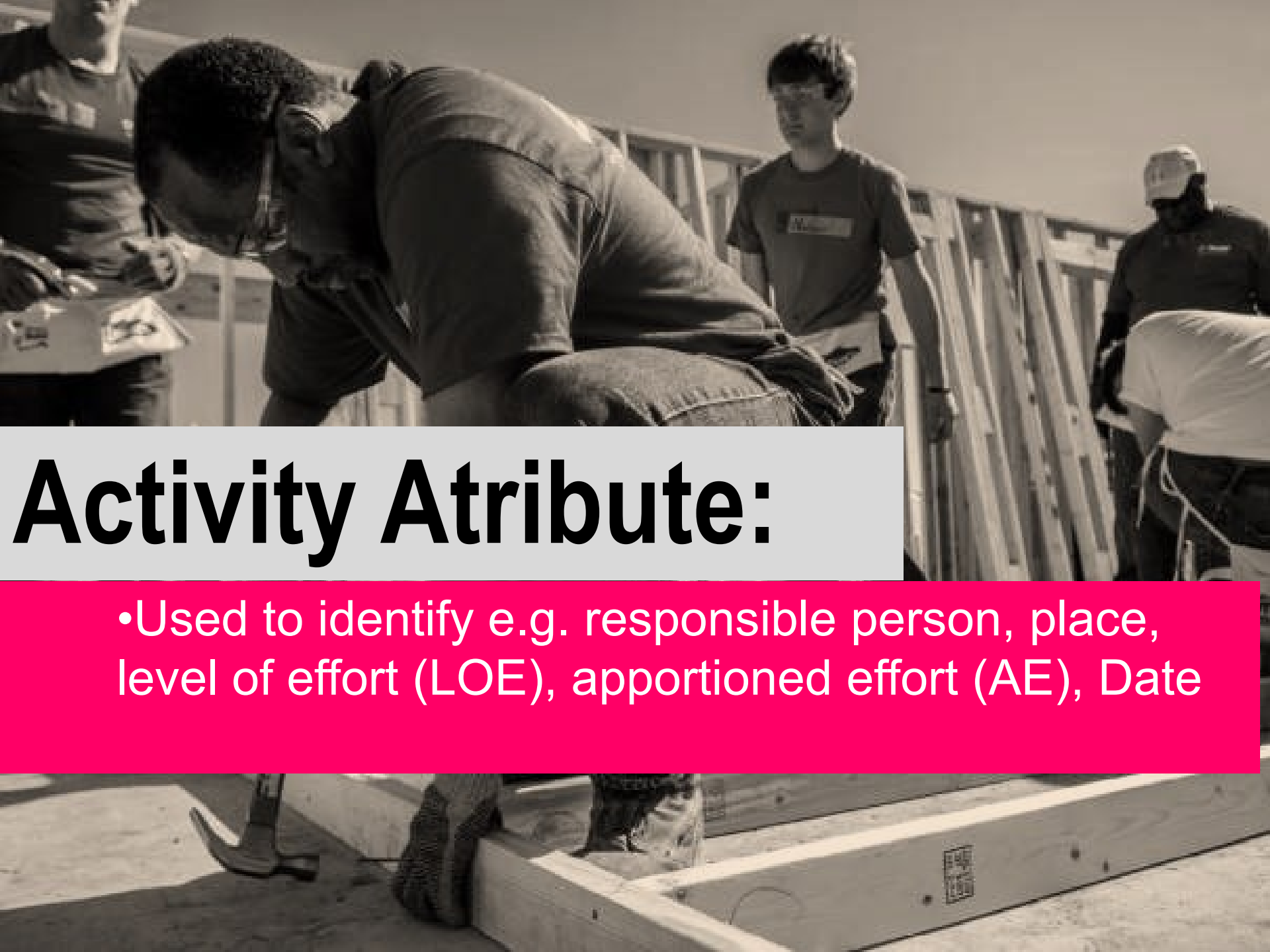
# DEFINE ACTIVITY


Inputs
1.Schedule management plan
2.Scope baseline
3.EEF
4.OPA
Tools & Techniques
1.Decompositions
2.Rolling wave planning
3.Expert judgment
Outputs
1.Activity list
2.Activity attributes
3.Milestone list

**Rolling Wave Planning:** similar to decomposition method but only prioritize the easiest and well defined work package ot activity




cake
preparation
execution
Garnish
delivery
purchase
measure
pre heat
put into mold
bake
put cake

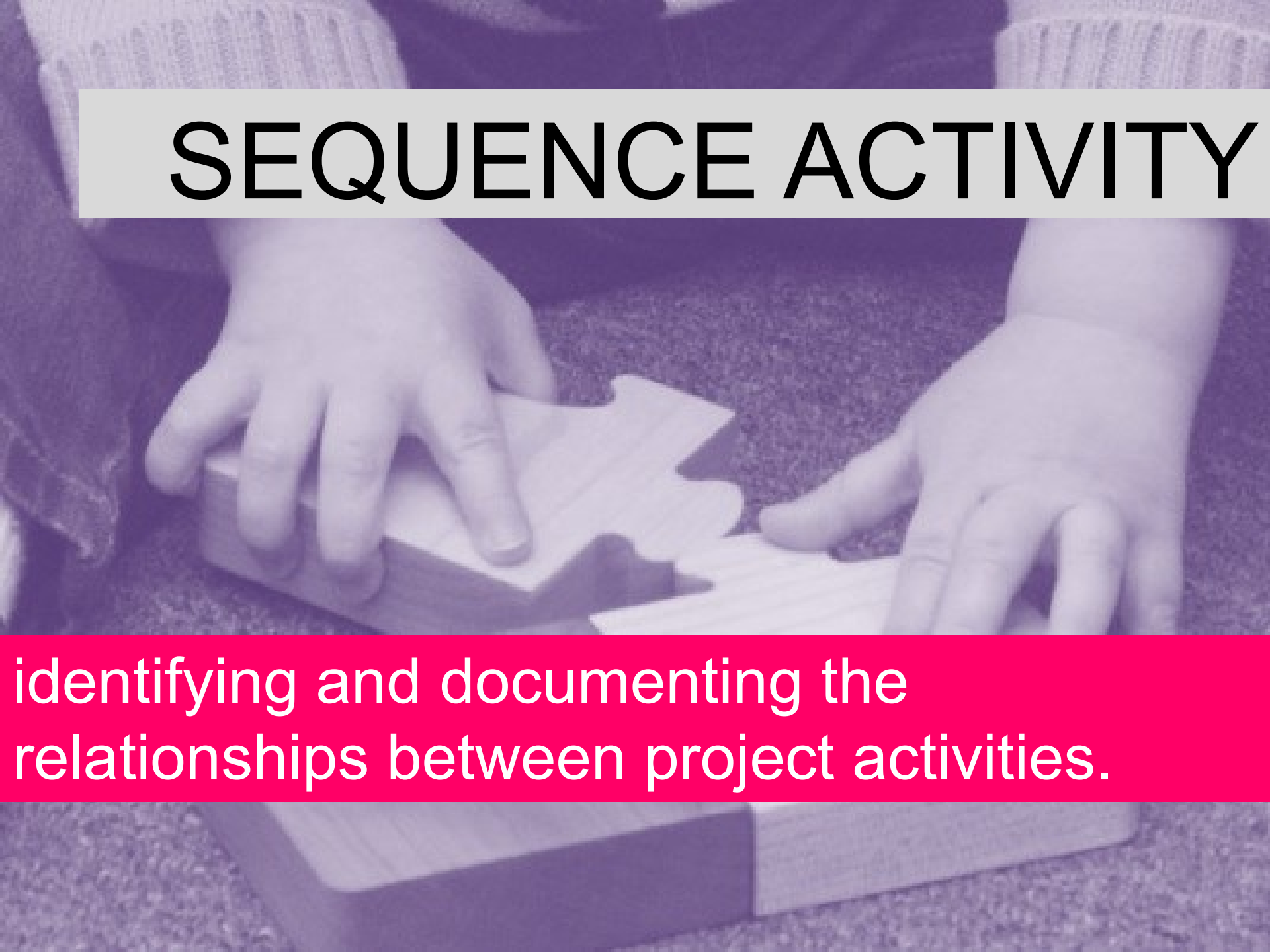


# Activity Atribute:

- Used to identify e.g. responsible person, place, level of effort (LOE), apportioned effort (AE), Date

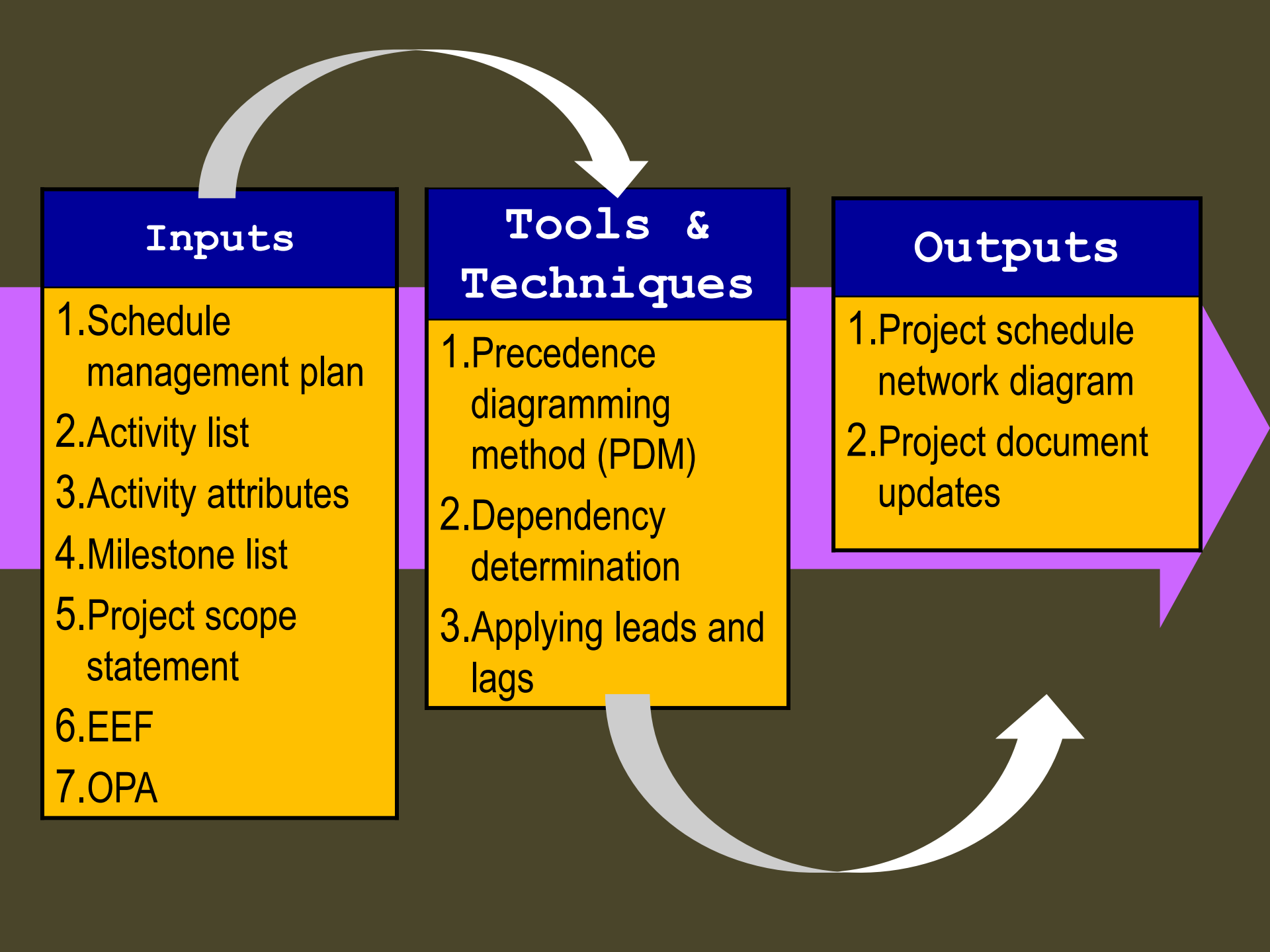
# Milestone

- a **significant point** or event in the project.
- Not a work activity
- **No duration**
- **Checkpoint**



# SEQUENCE ACTIVITY

identifying and documenting the relationships between project activities.


Inputs
1.Schedule management plan
2.Activity list
3.Activity attributes
4.Milestone list
5.Project scope statement
6.EEF
7.OPA
Tools & Techniques
1.Precedence diagramming method (PDM)
2.Dependency determination
3.Applying leads and lags
Outputs
1.Project schedule network diagram
2.Project document updates

# Precede Diagramming Method (PDM)

Method used in **Critical Path Methodology(CPM)**

**Activity on Node**

**No dummy activities**

Logical relationship

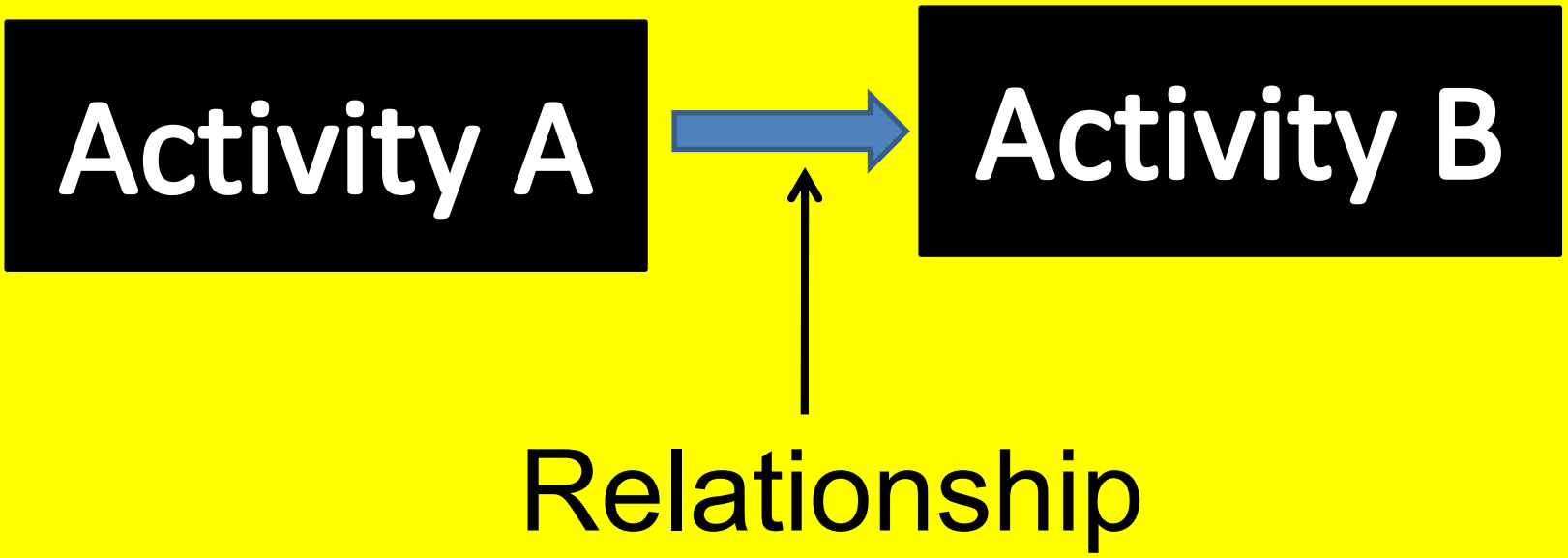
# Logical Relationship in PDM

Finish to start

Start to Finish

Finish to Finish

Start to Start


Activity A
Activity B
Relationship

# Finish to start

"You have to make a dough first for baking process"

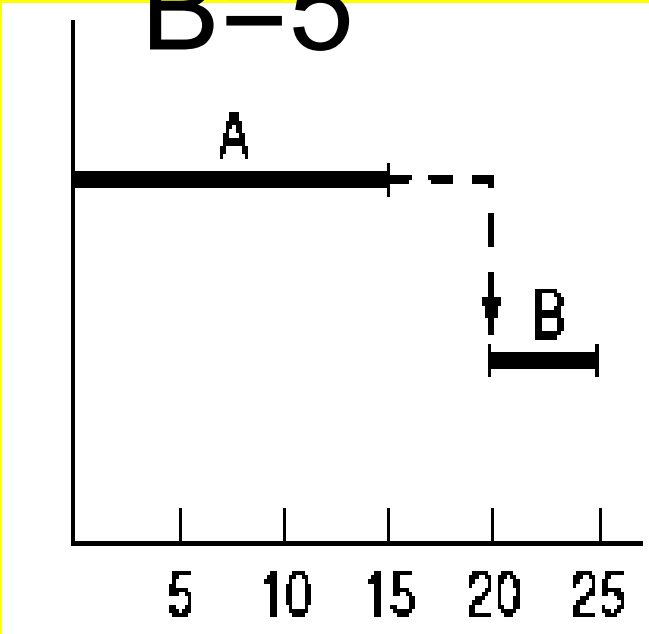
# Finish to start

FS=5

**Activity A** → **Activity B**

A=15

B=5



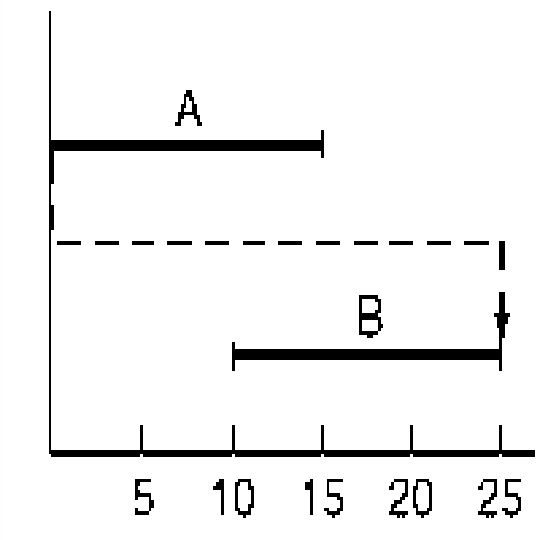
# Start to Finish

"start campaign while the former leader waiting the end of his period"

# Start to Finish

A=15 SF=25 B=15

**Activity A** **Activity B**

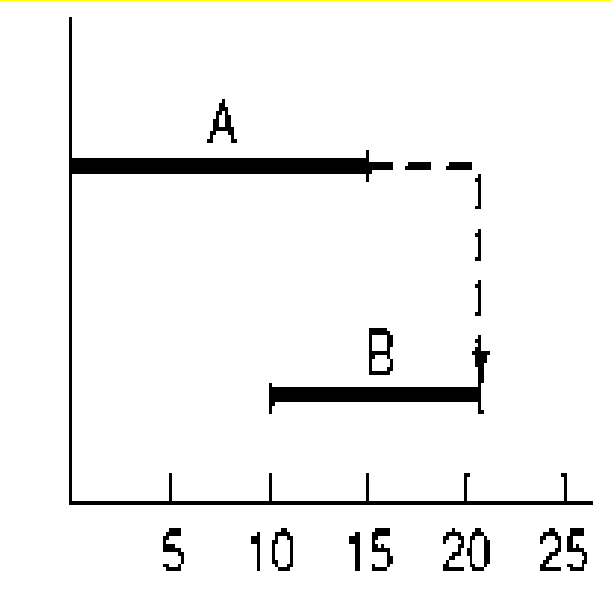


“Paint parking line while lay asphalt”

# Finish to Finish

A=15 FF=5 B=10

**Activity A** **Activity B**



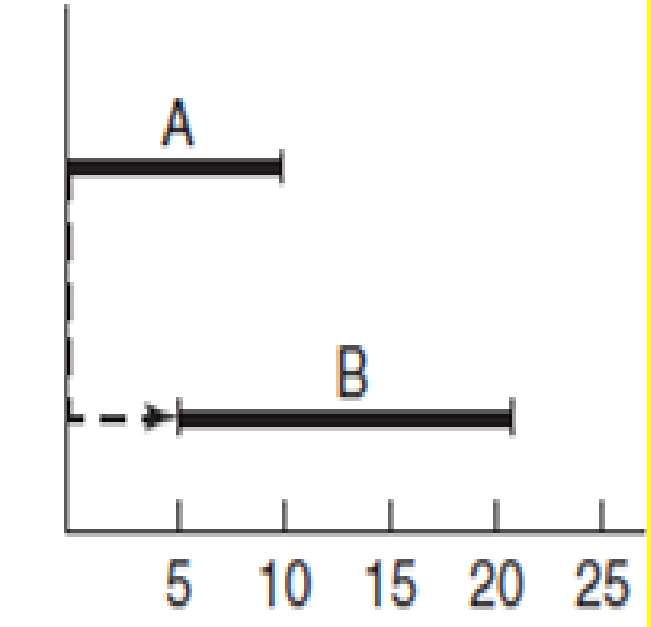
# Start to start

"Furniture move in while employee move in as soon"

# Start to Start

A=10 SS=5 B=15

**Activity A** **Activity B**



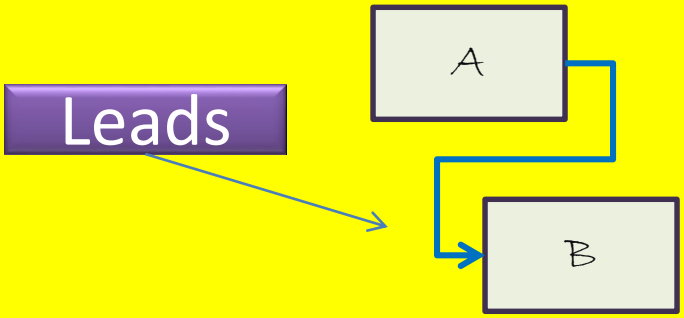
# Applying Leads and Lag

- **support realistic and achievable** project schedule.
- Each activity is connected at least to one **predecessor** and one **successor** except the start and the end.

# Applying Leads

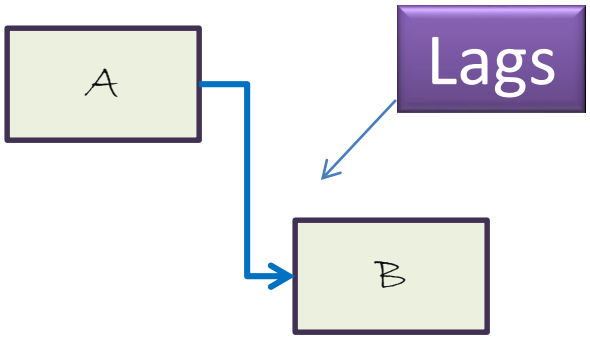
Start an activity **before the predecessor activity is complete.**

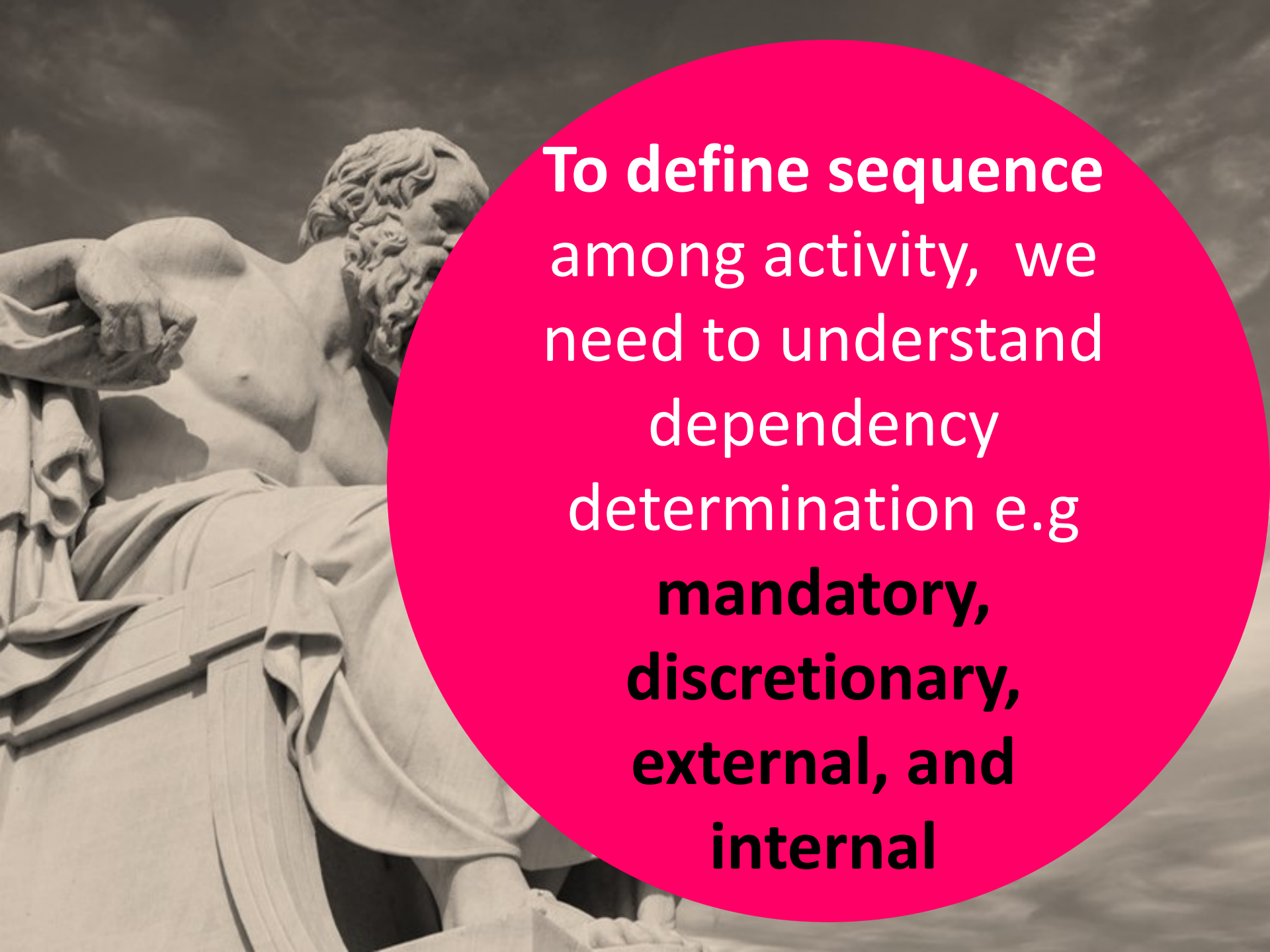
predecessor Successor



# Applying Lags

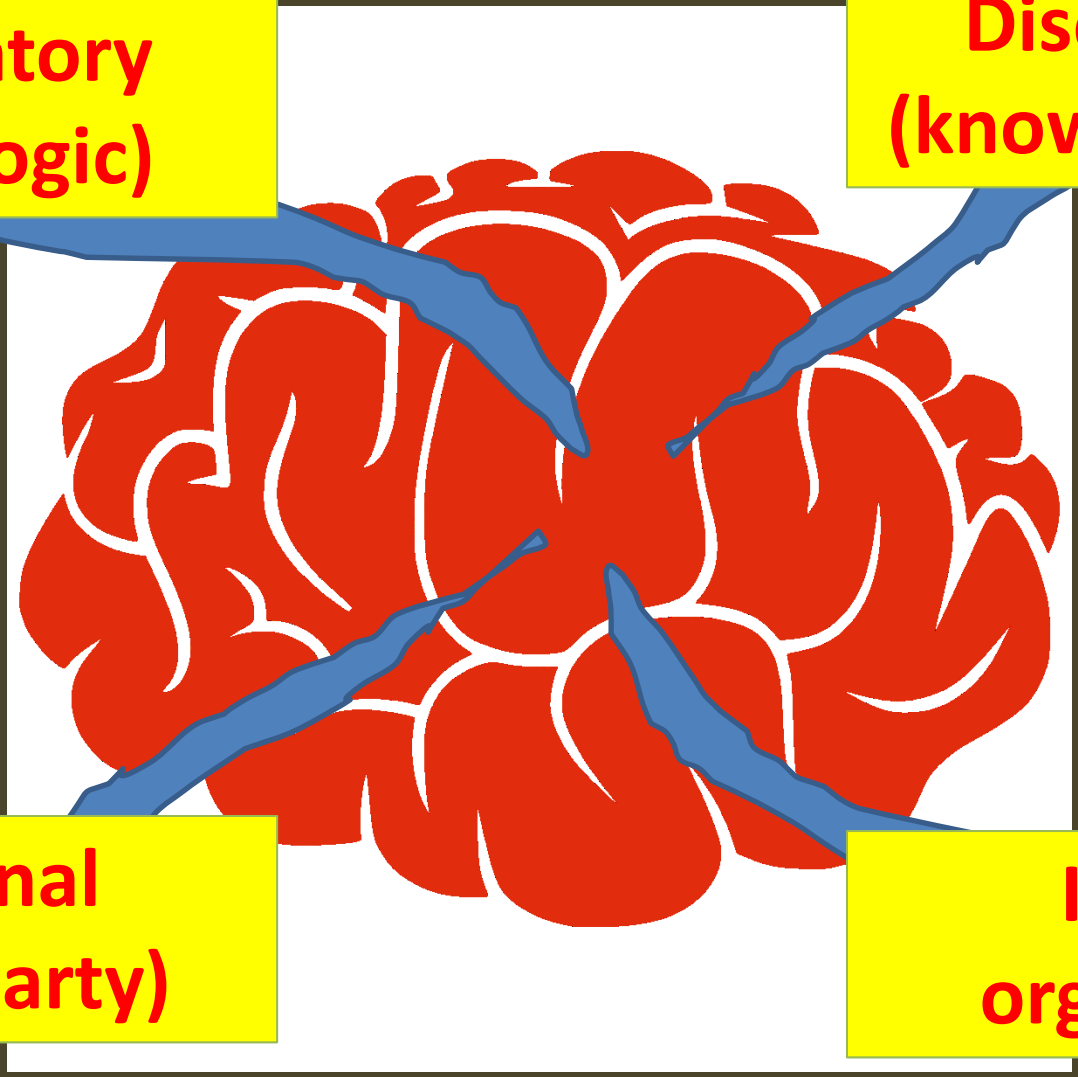
**“Inserted waiting time between activities”**




**To define sequence** among activity, we need to understand dependency determination e.g **mandatory, discretionary, external, and internal**

Mandatory
(hard logic)

Discretionary
(knowledge base)



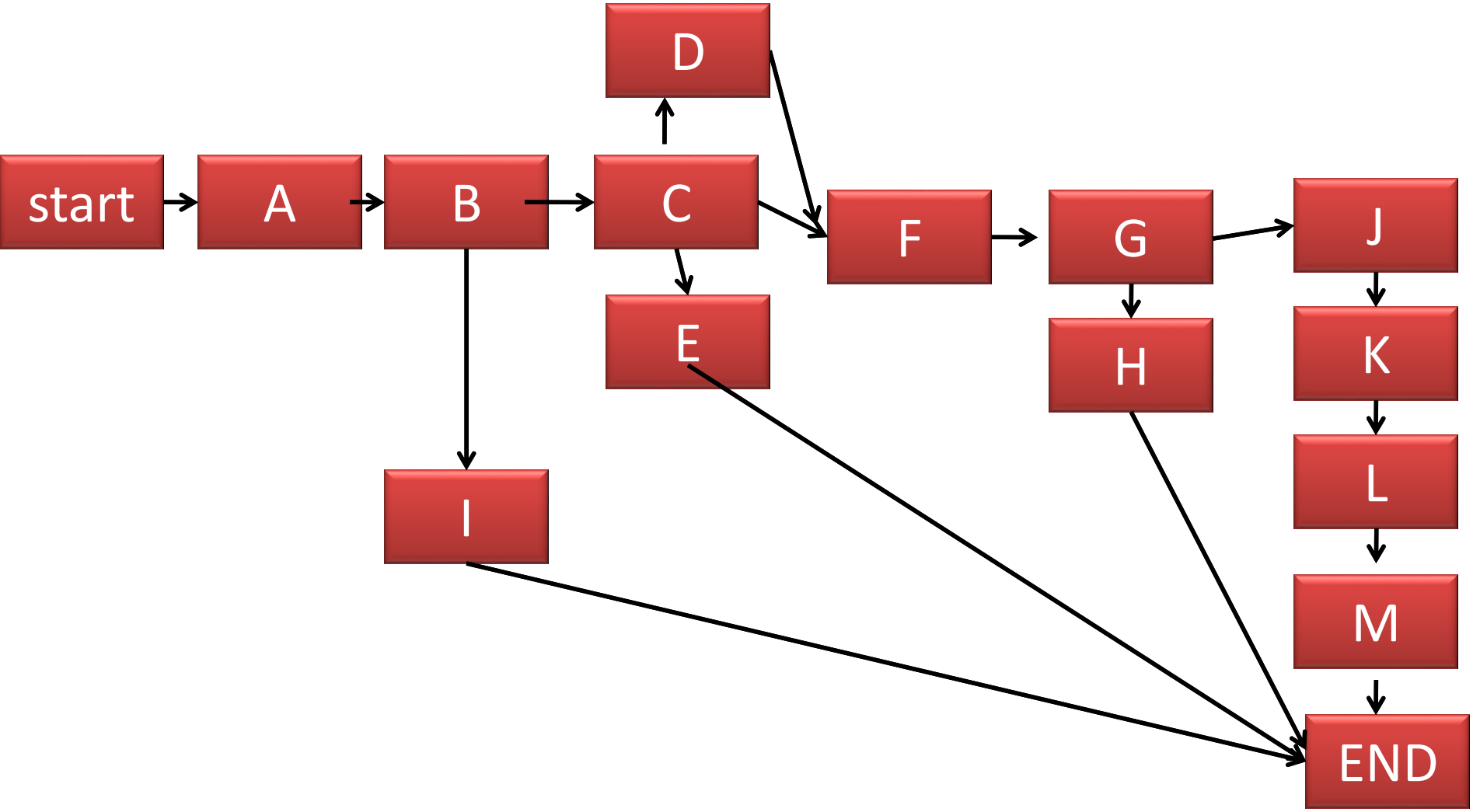
External
(third party)

Internal
organization

# Dependency Determination

# Example: The activity List and the sequence

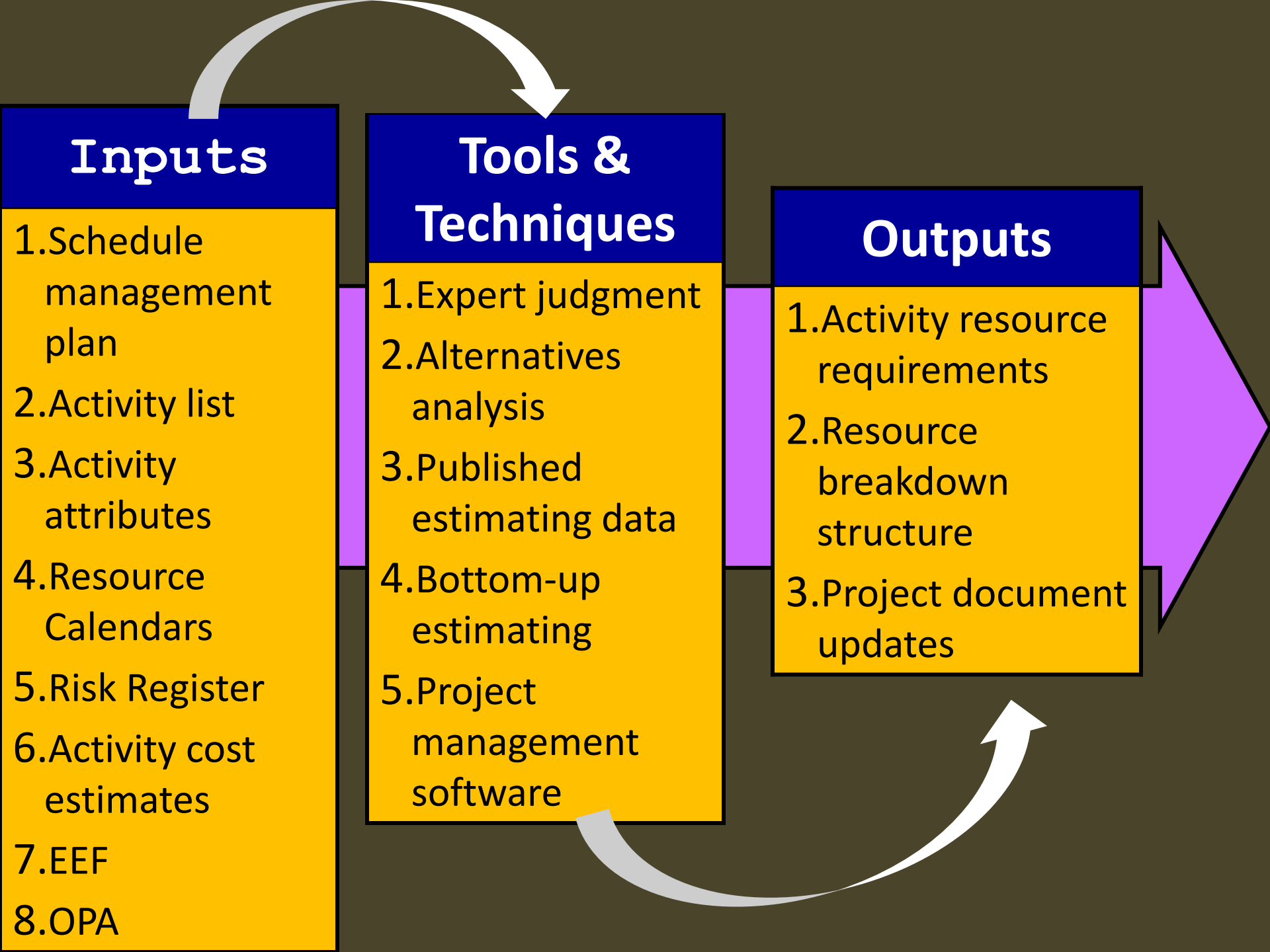
| ID | activity | predecessor |
|---|---|---|
| A | Purchase the material | - |
| B | Measure the ingredients | A |
| C | Mixing | B |
| D | Pre heat the oven | C |
| E | Put the batter into mold | C |
| F | Bake the cake | C,D |
| G | Put the cake in the plate | F |
| H | Cut the unnecessary side of the cake | G |
| I | Mix the cream | B |
| J | Garnish the cake | G |
| K | Put the cake into fridge | J |
| L | Package the cake | K |
| M | Delivery the cake | L |




# Example: The Network Diagram (PDM)

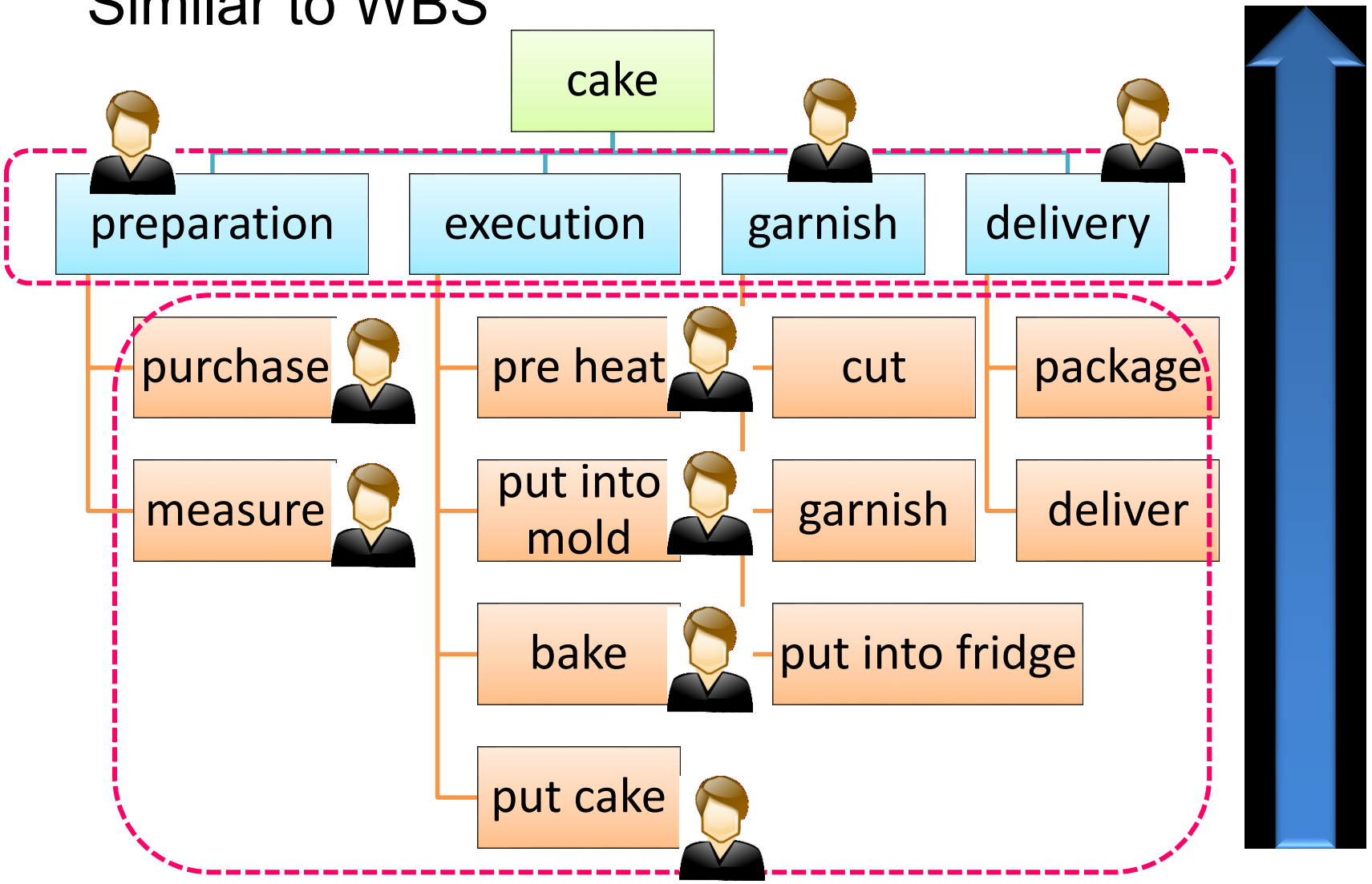
# Estimate ACTIVITY Resource

estimating how many resources— people, equipment, and materials


Inputs
1.Schedule management plan
2.Activity list
3.Activity attributes
4.Resource Calendars
5.Risk Register
6.Activity cost estimates
7.EEF
8.OPA
Tools & Techniques
1.Expert judgment
2.Alternatives analysis
3.Published estimating data
4.Bottom-up estimating
5.Project management software
Outputs
1.Activity resource requirements
2.Resource breakdown structure
3.Project document updates

# Bottom up estimating

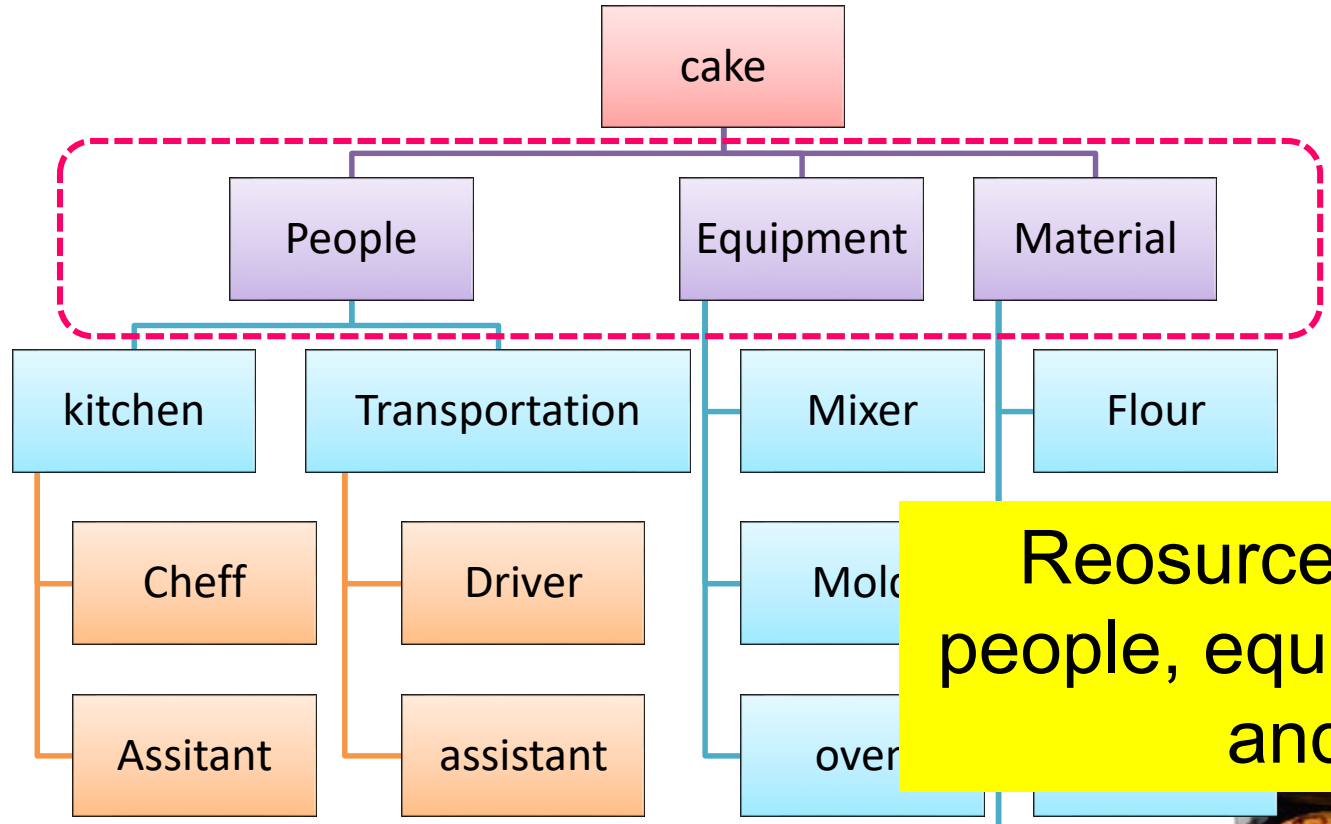
Similar to WBS



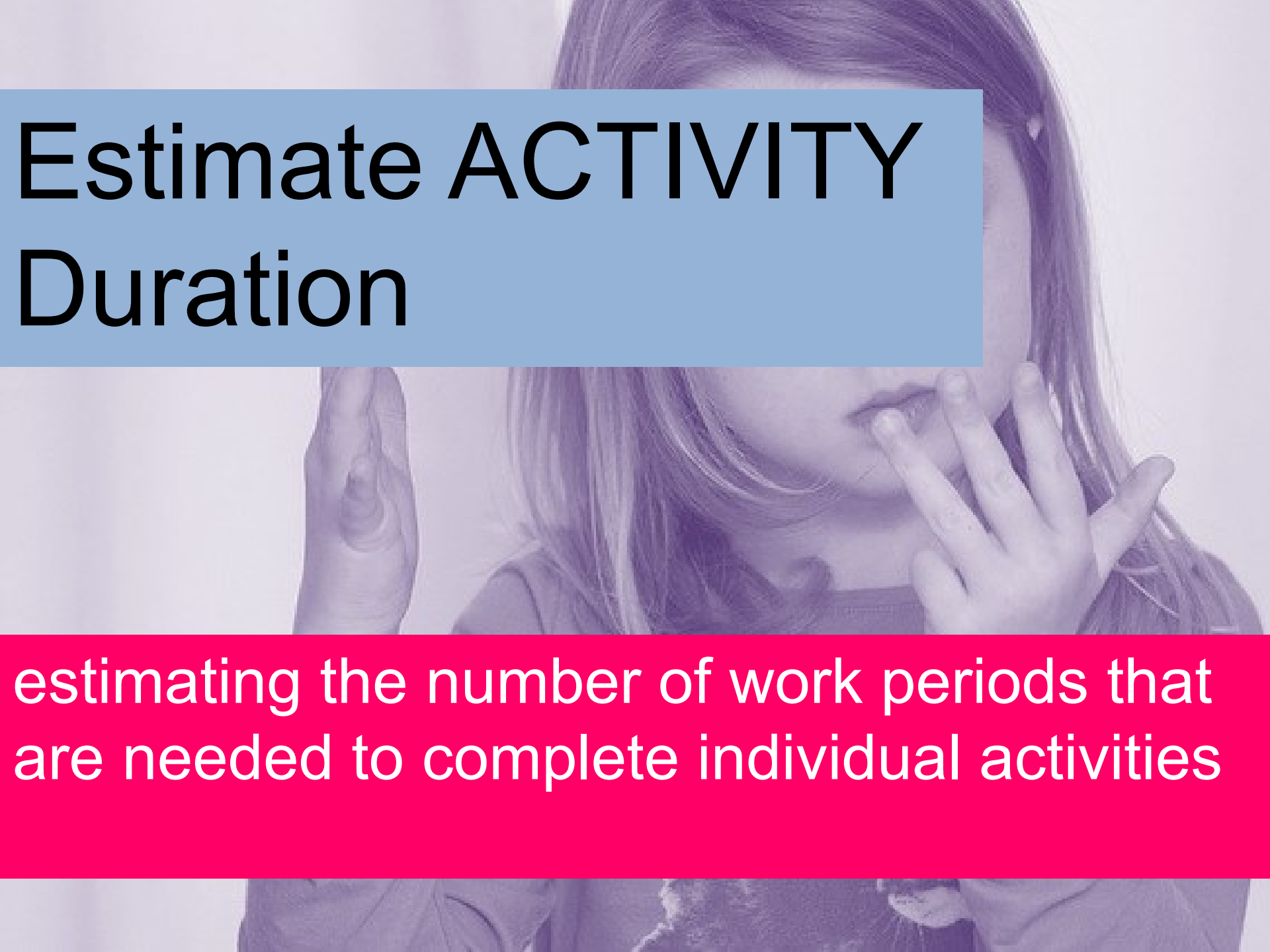
# Activity Resource Requirement

| ID | Activity | predecessor | Resource (man) | duration (minute) |
|---|---|---|---|---|
| A | Purchase the material | - | 2 | 30 |
| B | Measure the ingredients | A | 2 | 15 |
| C | Mixing | B | 1 | 15 |
| D | Pre heat the oven | C | 1 | 10 |
| E | Put the batter into mold | C | 1 | 5 |
| F | Bake the cake | C,D | 1 | 120 |

# Resource Breakdown Structure

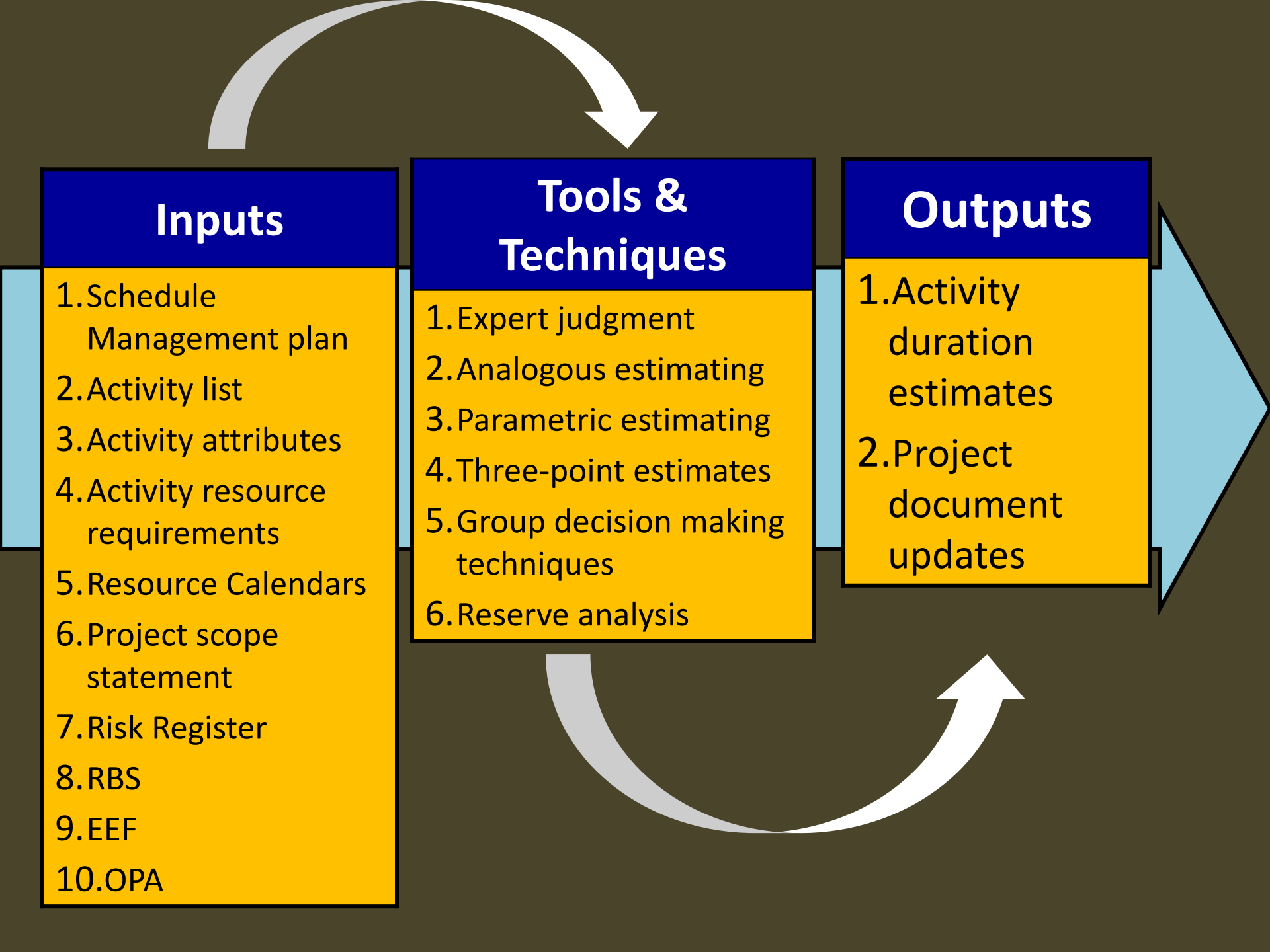



Reosource categorized by people, equipment (machine), and material



# Estimate ACTIVITY Duration

estimating the number of work periods that are needed to complete individual activities

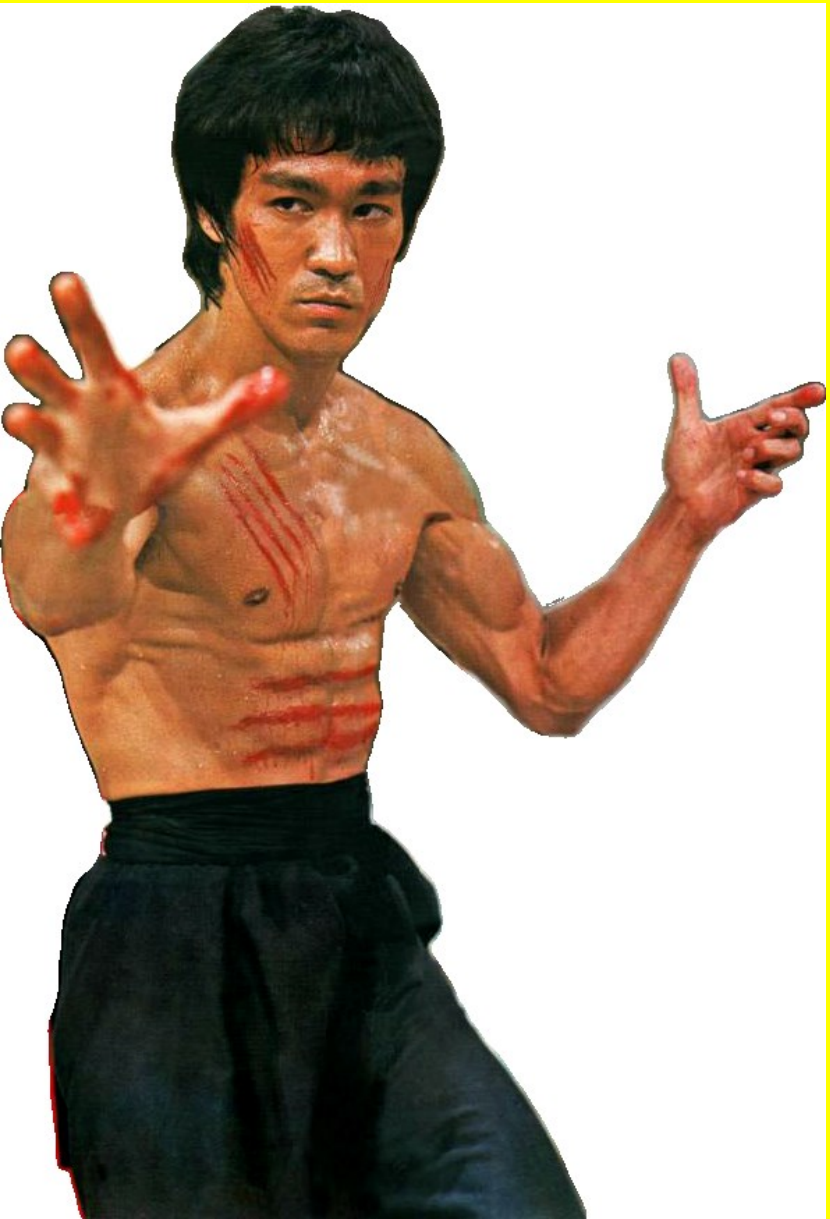

Inputs
1. Schedule Management plan
2. Activity list
3. Activity attributes
4. Activity resource requirements
5. Resource Calendars
6. Project scope statement
7. Risk Register
8. RBS
9. EEF
10. OPA
Tools & Techniques
1. Expert judgment
2. Analogous estimating
3. Parametric estimating
4. Three-point estimates
5. Group decision making techniques
6. Reserve analysis
Outputs
1. Activity duration estimates
2. Project document updates

**Effort** is the **number of workdays** or work hours required to **complete a task**

**Duration** includes **the actual amount of time** worked on an activity ***plus*** **elapsed time**

# EFFORT VS DURATION

# Analogous Estimate



Use actual duration of previous activity **(historical)** that has similarity

Master, high skill
Great experience

# Parametric estimate

=

RP. 100.000

=

RP. 200.000

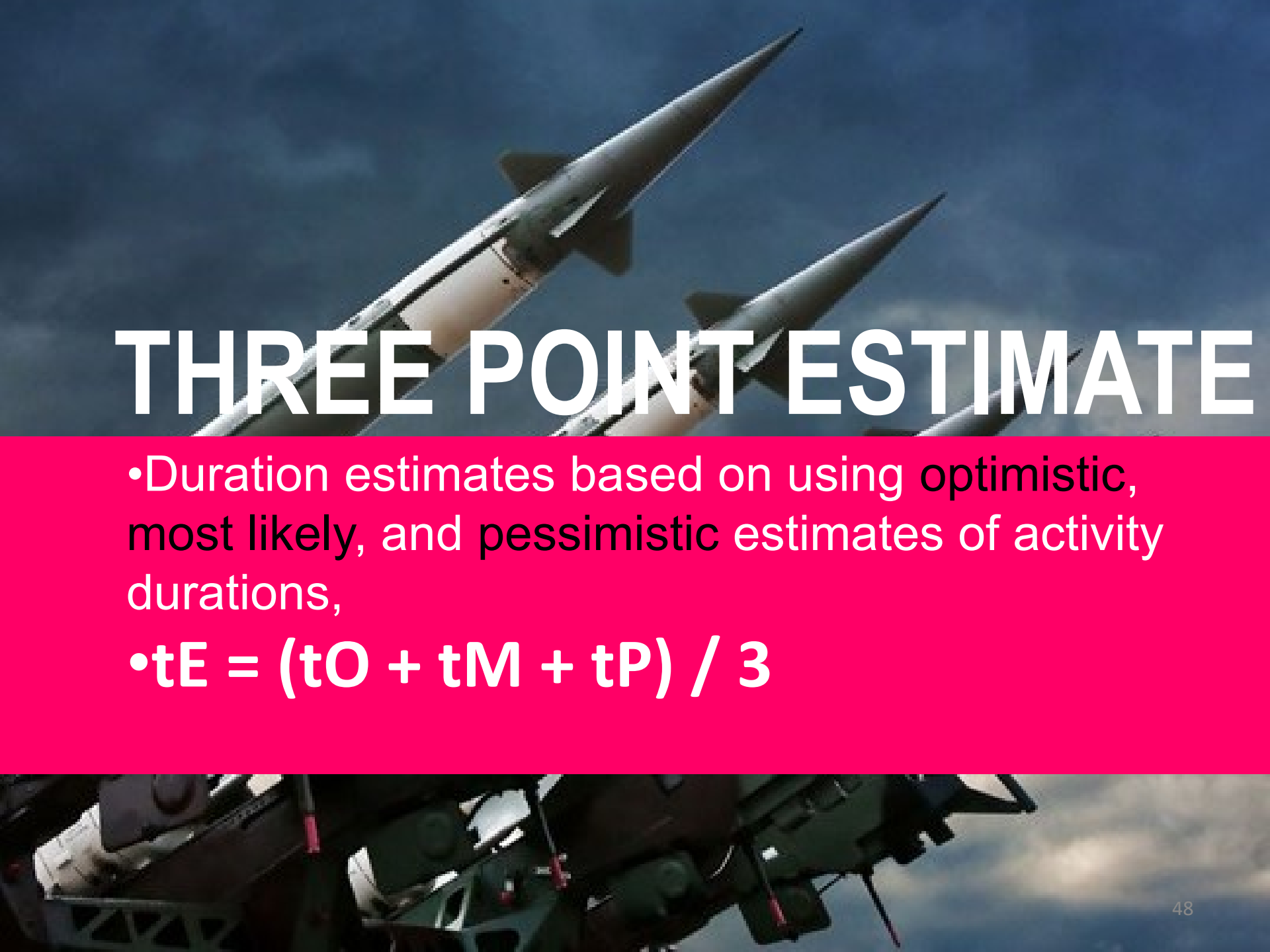
Use statistical relationship or math analysis between historical data and other variables

# Reserves Analysis

# Reserves Analysis

# Reserves Analysis

Analyze which the highest risky activity
And give them reserve time, not too tight!



# THREE POINT ESTIMATE

- Duration estimates based on using optimistic, most likely, and pessimistic estimates of activity durations,
- **tE = (tO + tM + tP) / 3**

# PERT

- uses probabilistic TIME & COST estimates
- **tE = (tO + 4tM + tP) / 6**

Expected

$$\frac{P+4M+O}{6}$$

Standard Deviation

$$\frac{P-O}{6}$$

Variance

$$\left[\frac{P-O}{6}\right]^2$$

$$SD = \sqrt{\sum \text{variance}}$$

# Developing Schedule

analyzing activity sequences, activity resource estimates, and activity duration estimates

## Inputs

1. **Schedule Management plan**
2. **Activity list**
3. **Activity attributes**
4. **Project schedule network** diagram
5. **Activity resource requirements**
6. **Resource Calendars**
7. **Activity duration estimates**
8. **Project scope statement**
9. **Risk Register**
10. **Project Staff asignment**
11. **Resource Breakdown structure**
12. EEF
13. OPA

## Tools & Techniques

1. Schedule network analysis
2. Critical path method
3. Critical chain method
4. Resource optimization tehcniques
5. Modeling tehcniques
6. Applying leads and lags
7. Schedule compression
8. Scheduling tool

## Outputs

1. Project schedule
2. Schedule baseline
3. Schedule data
4. Project Calendar
5. Project Management Plan update
6. Project document updates

# GANTT CHART

Symbols include:

- **Black diamonds: milestones**
- **Thick black bars: summary tasks**
- **Lighter horizontal bars: durations of tasks**
- **Arrows: dependencies between tasks**

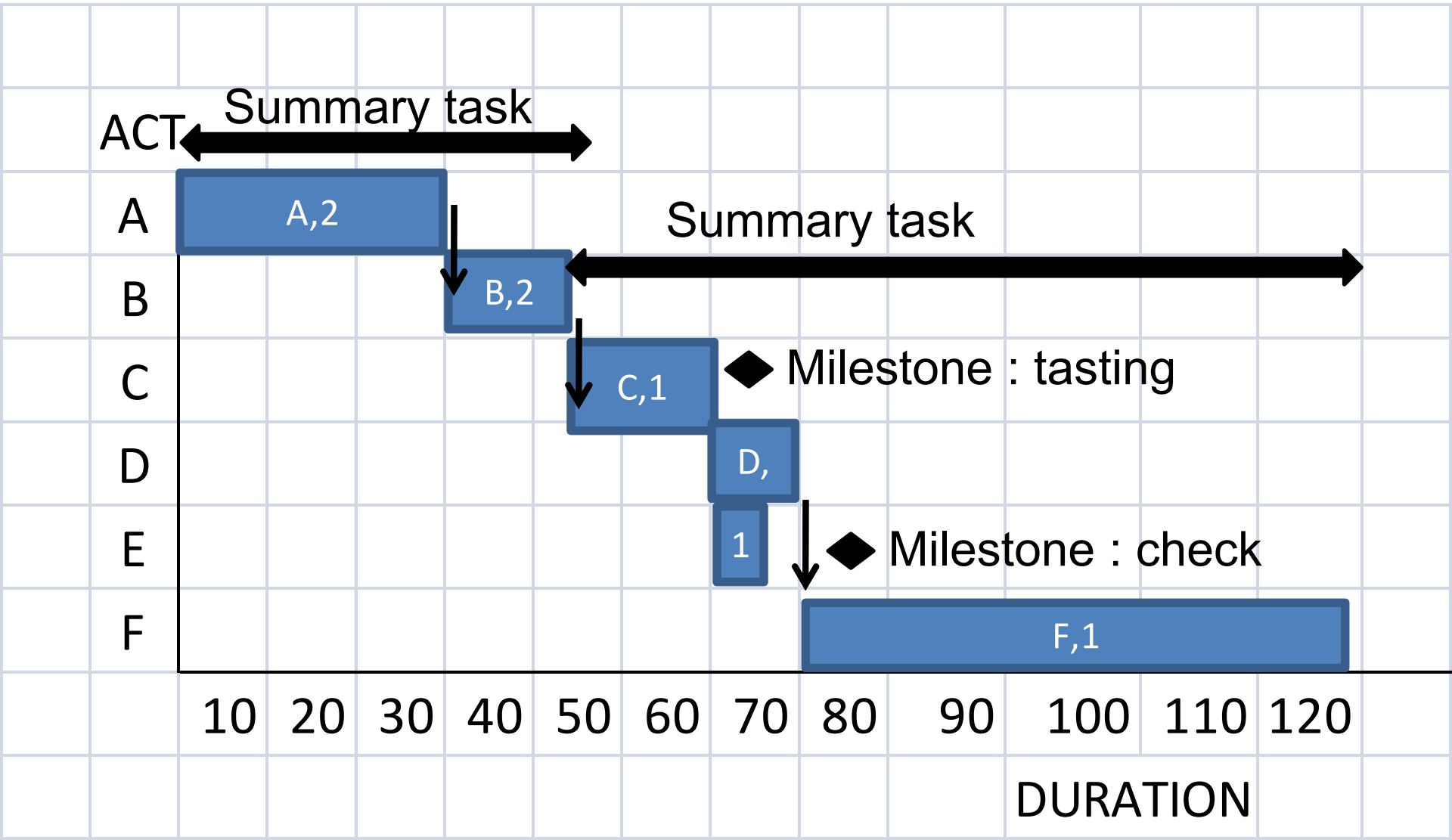
# Resource Calendar

Information (skill, location, etc) in **which resource** are potentially **available.**

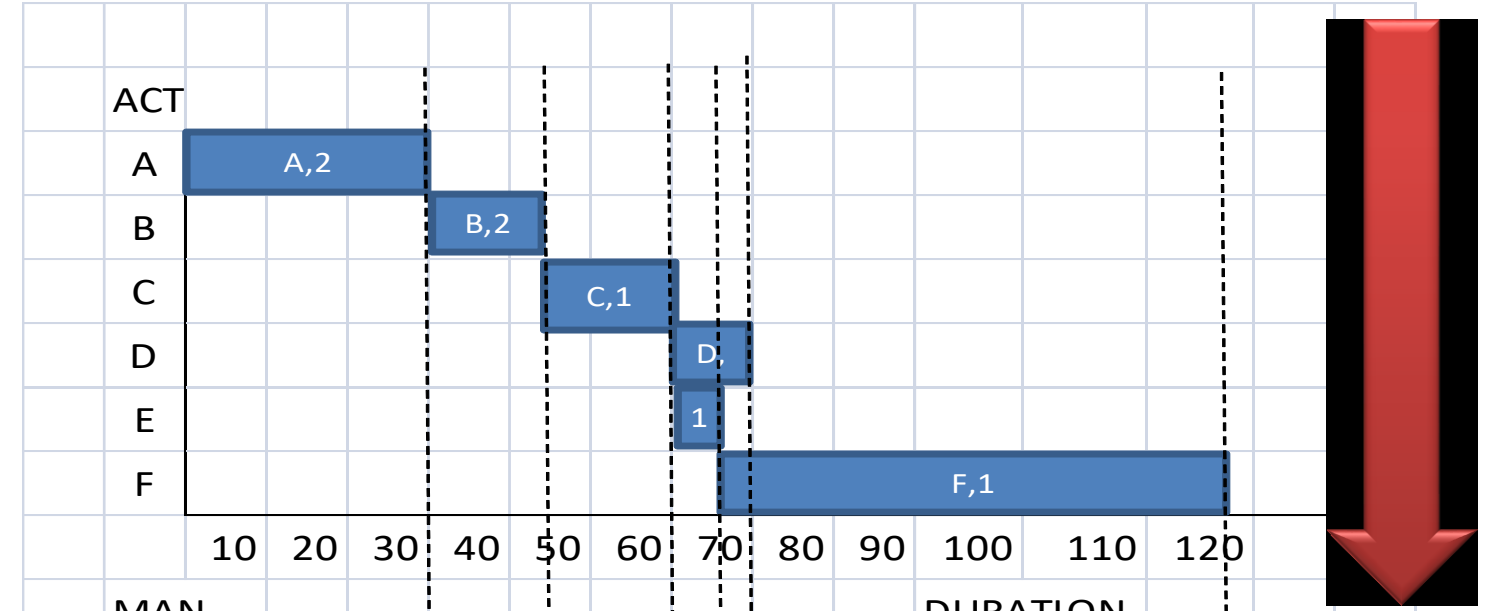
| ID | Activity | predecessor | Resource (man) | duration (minute) |
|---|---|---|---|---|
| A | Purchase the material | - | 2 | 30 |
| B | Measure the ingredients | A | 2 | 15 |
| C | Mixing | B | 1 | 15 |
| D | Pre heat the oven | C | 1 | 10 |
| E | Put the batter into mold | C | 1 | 5 |
| F | Bake the cake | C,D | 1 | 120 |

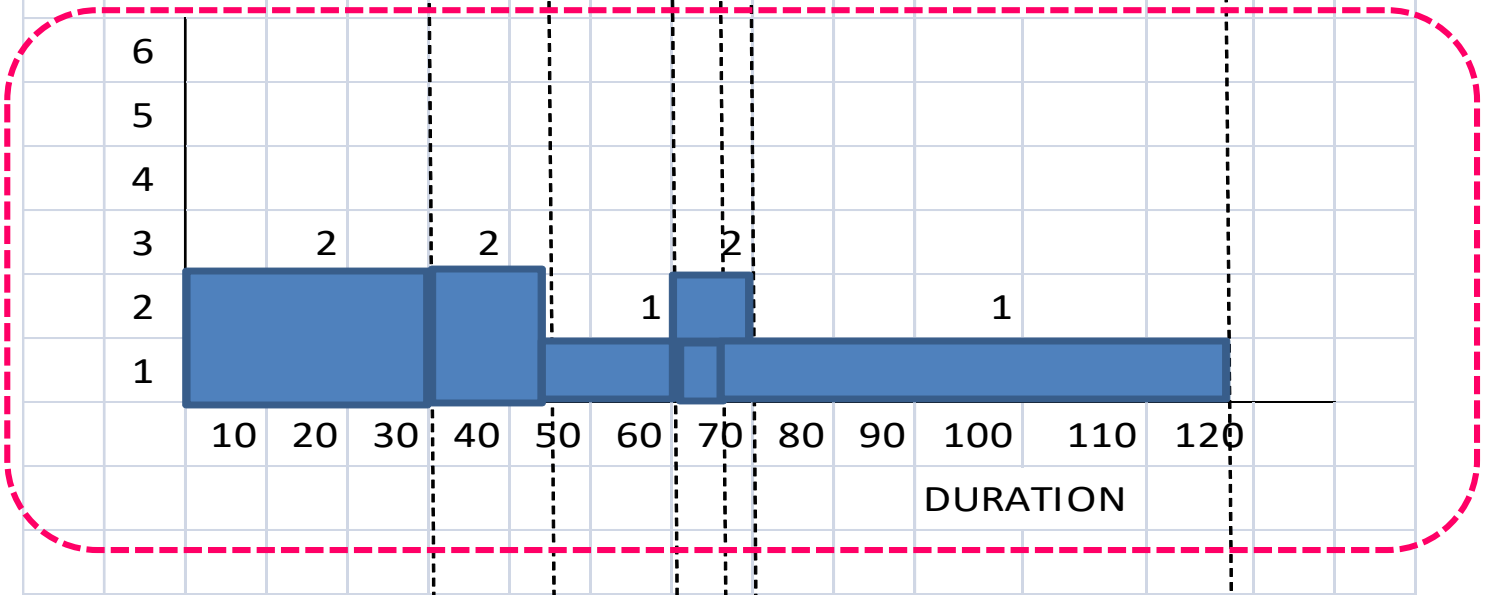
# Resource Calendar

Plot into Gant Chart format

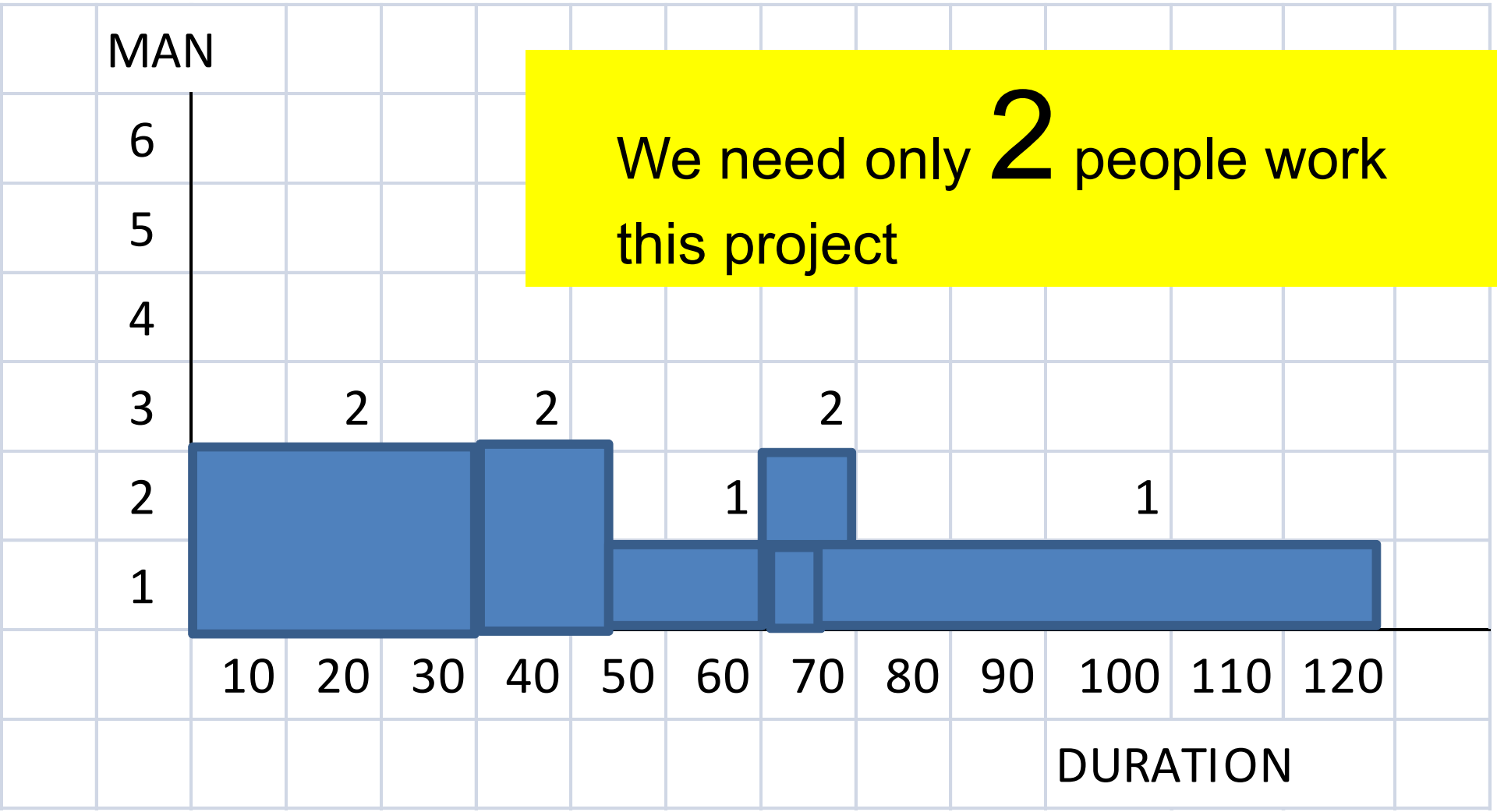


# Resource Calendar



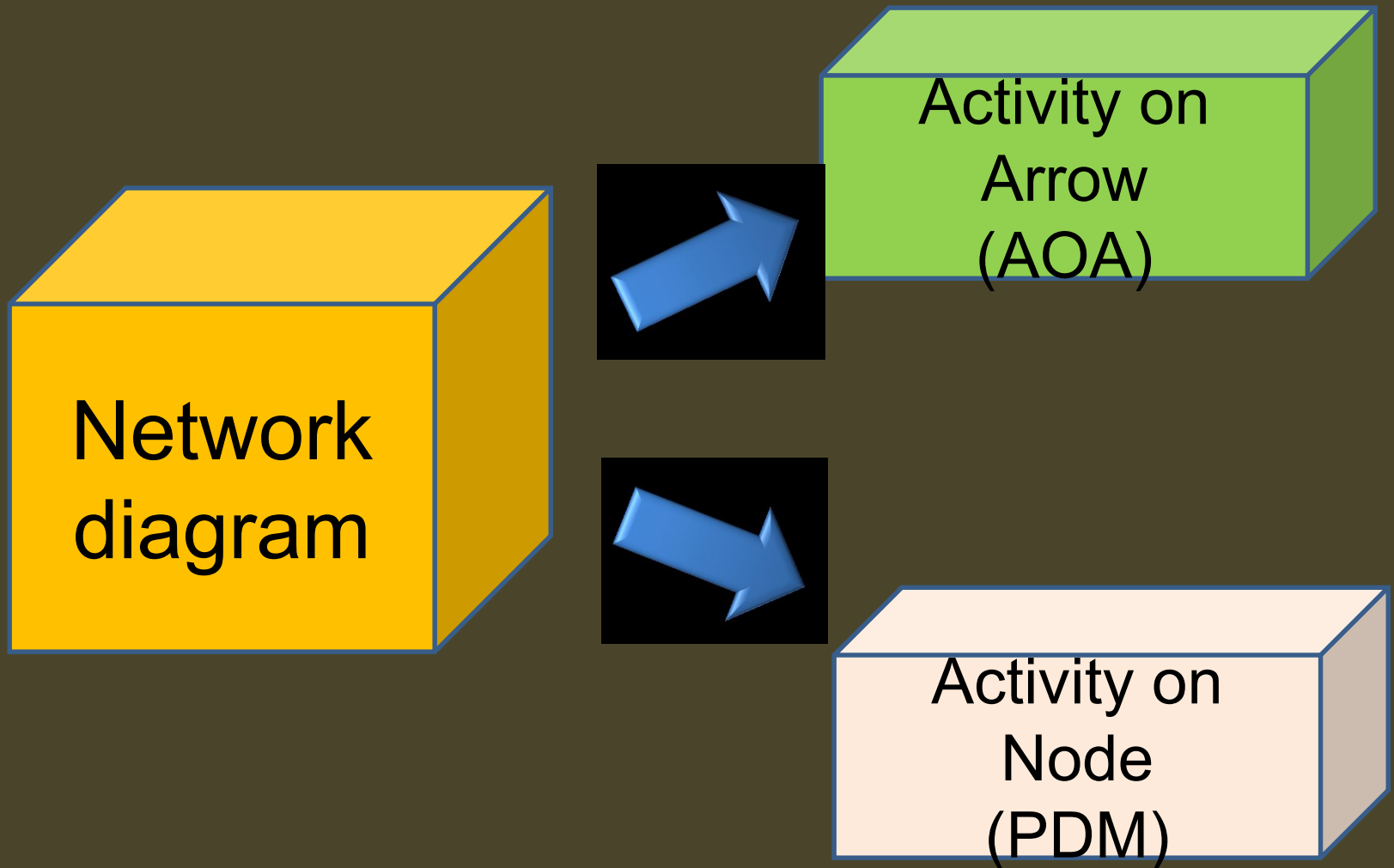
# Resource Calendar



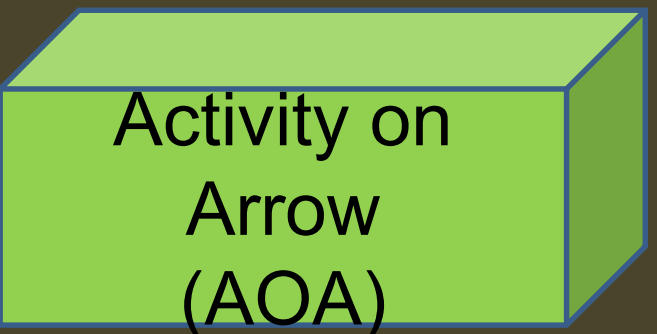
# Adding Milestones to Gantt Charts

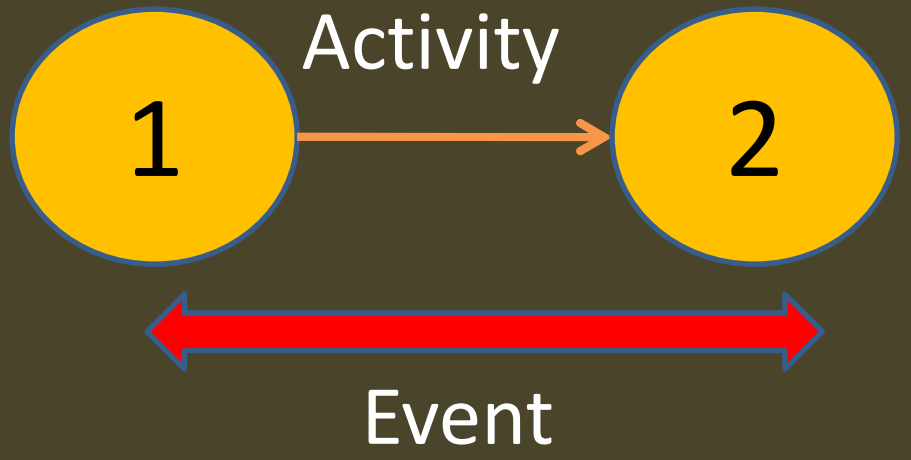
- Many people like to focus on meeting milestones, especially for **large projects**
- emphasize **important** events or **accomplishments** on projects
- ZERO DURATION

# Schedule Network Analysis



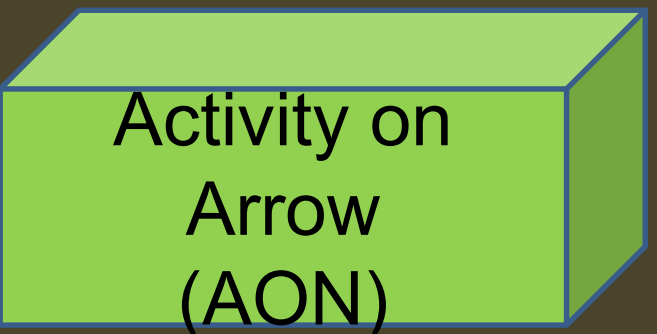
# Schedule Network Analysis

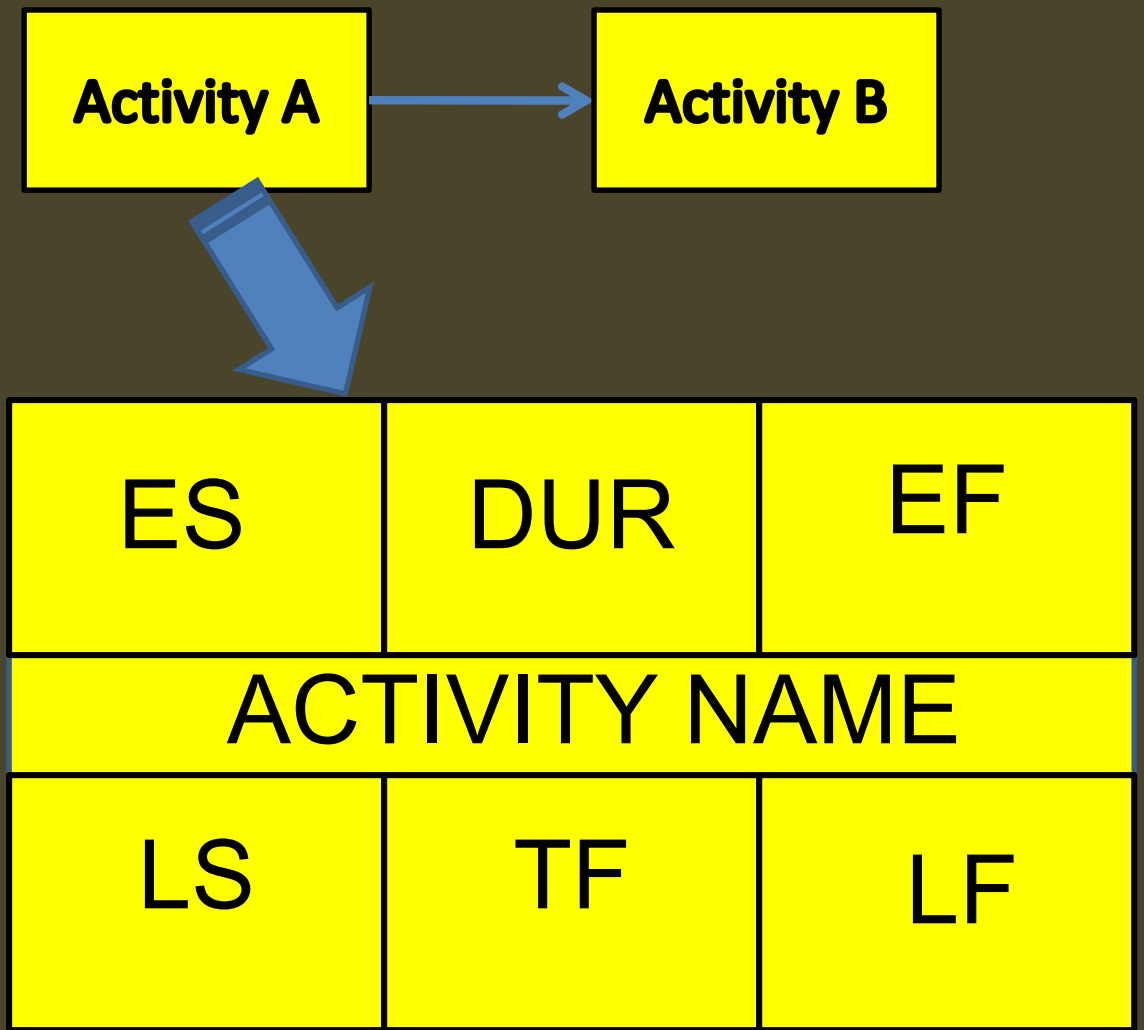


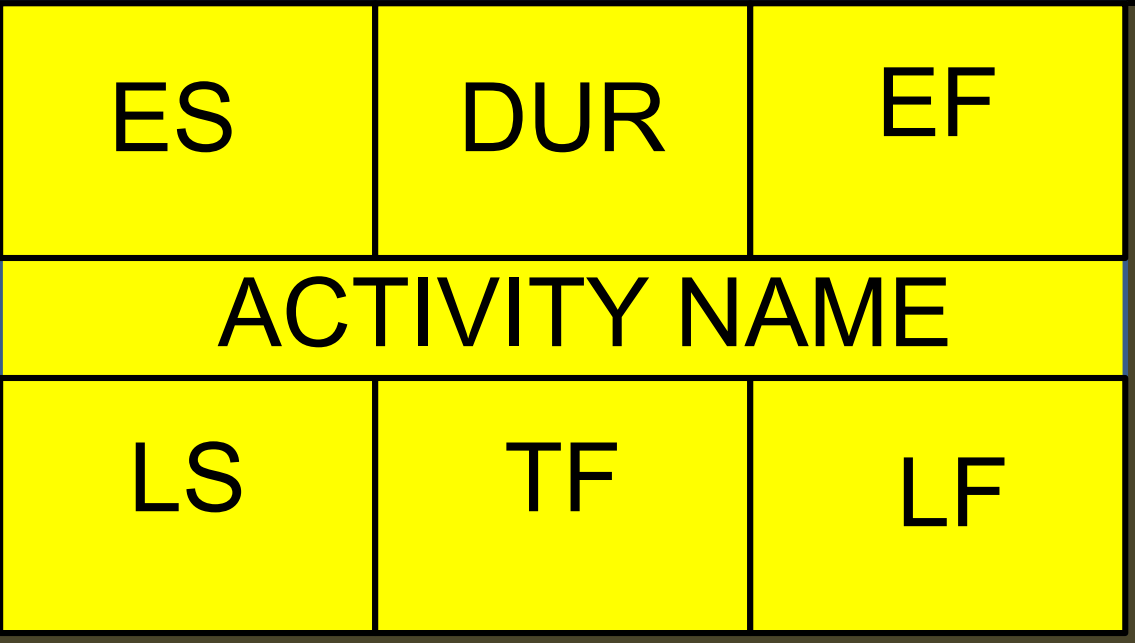

- Start and finish with only one event
- It can be merged and burst activity
- Using dummies

# AON OR PDM RULES



# AON OR PDM RULES




**EF = ES + D -1**

**LS = LF – D +1**

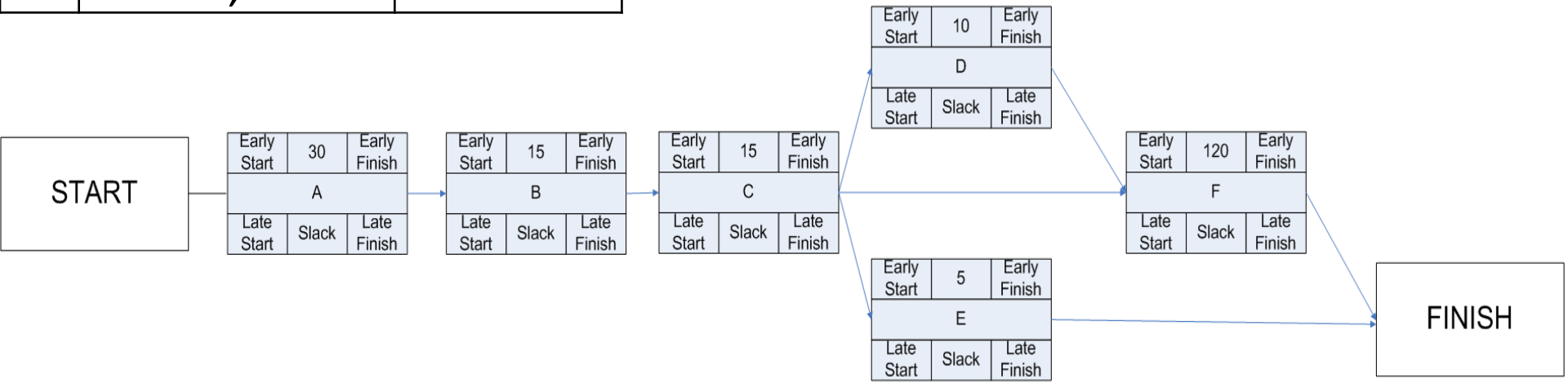
**Float (F) = LS – ES = LF – EF**

- ES= Earliest Time
- EF= Earliest Finish
- Dur= Duration
- EF= Earliest Finish
- LS= Latest Start
- LF= Latest Finish
- TF= total Float or slack (delayed time)

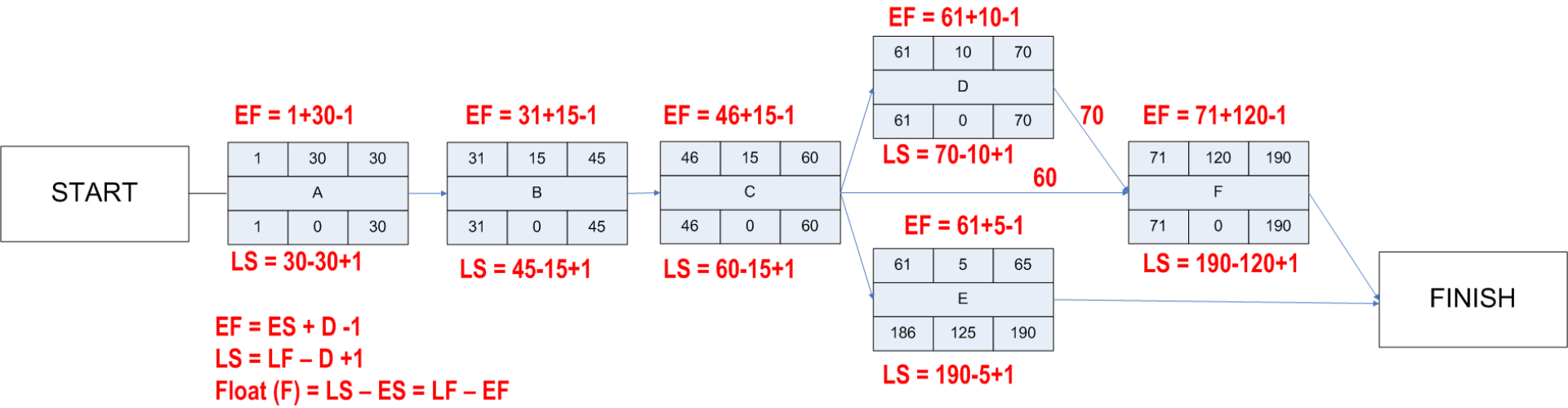
# AON OR PDM PRACTICE

| ID | predecessor | duration (minute) |
|---|---|---|
| A | - | 30 |
| B | A | 15 |
| C | B | 15 |
| D | C | 10 |
| E | C | 5 |
| F | C,D | 120 |

Draw network diagram first!



# AON OR PDM PRACTICE



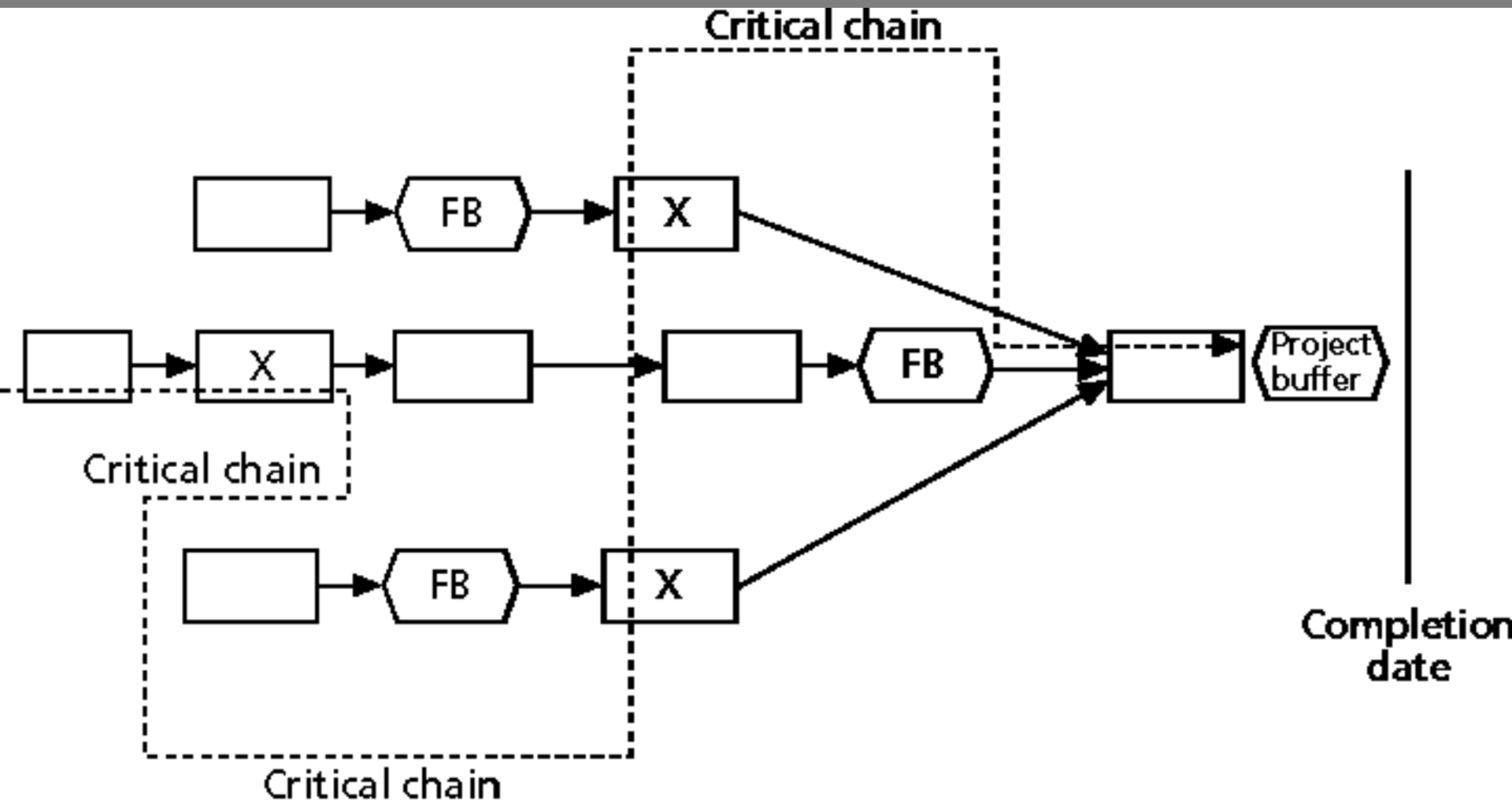
# Critical Chain Scheduling

**considers limited resources** when creating a project schedule and **includes buffers** to protect the project completion date

# Buffers and Critical Chain

- **Project buffers** or additional time added **before the project's due date**
- **Feeding buffers** or additional time added **before tasks on the critical path**

# Example of Critical Chain Scheduling

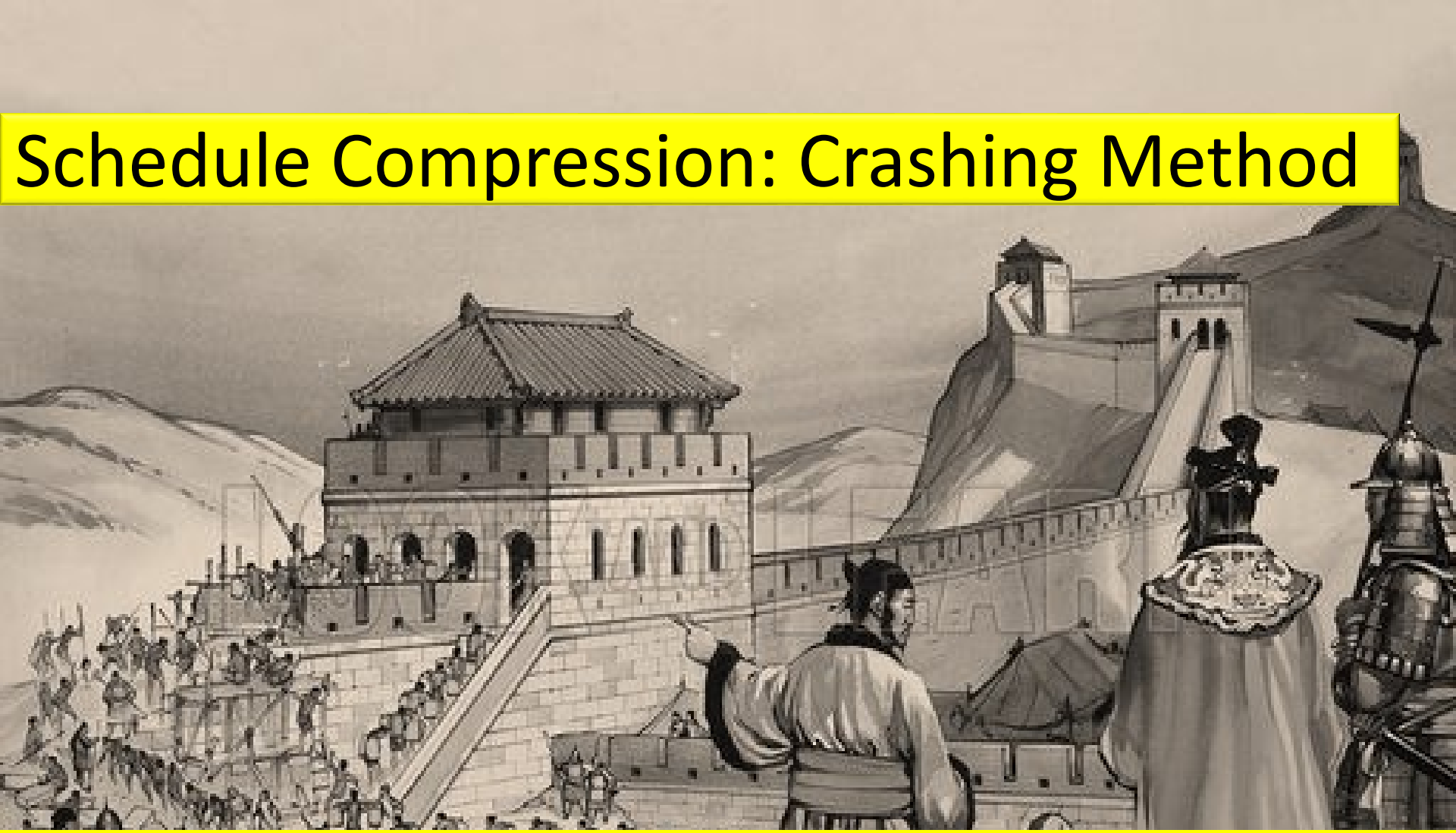



X = Tasks done by **limited resource**
FB = Feeding buffer

# Schedule Compression: Fast Tracking

- Performing critical path activities in **parallel.**
- Usually **increase risk** and requires **more attention to communication.**
- May need a **rework**.
- E.g. Design is half finished and start coding.

# Schedule Compression: Crashing Method



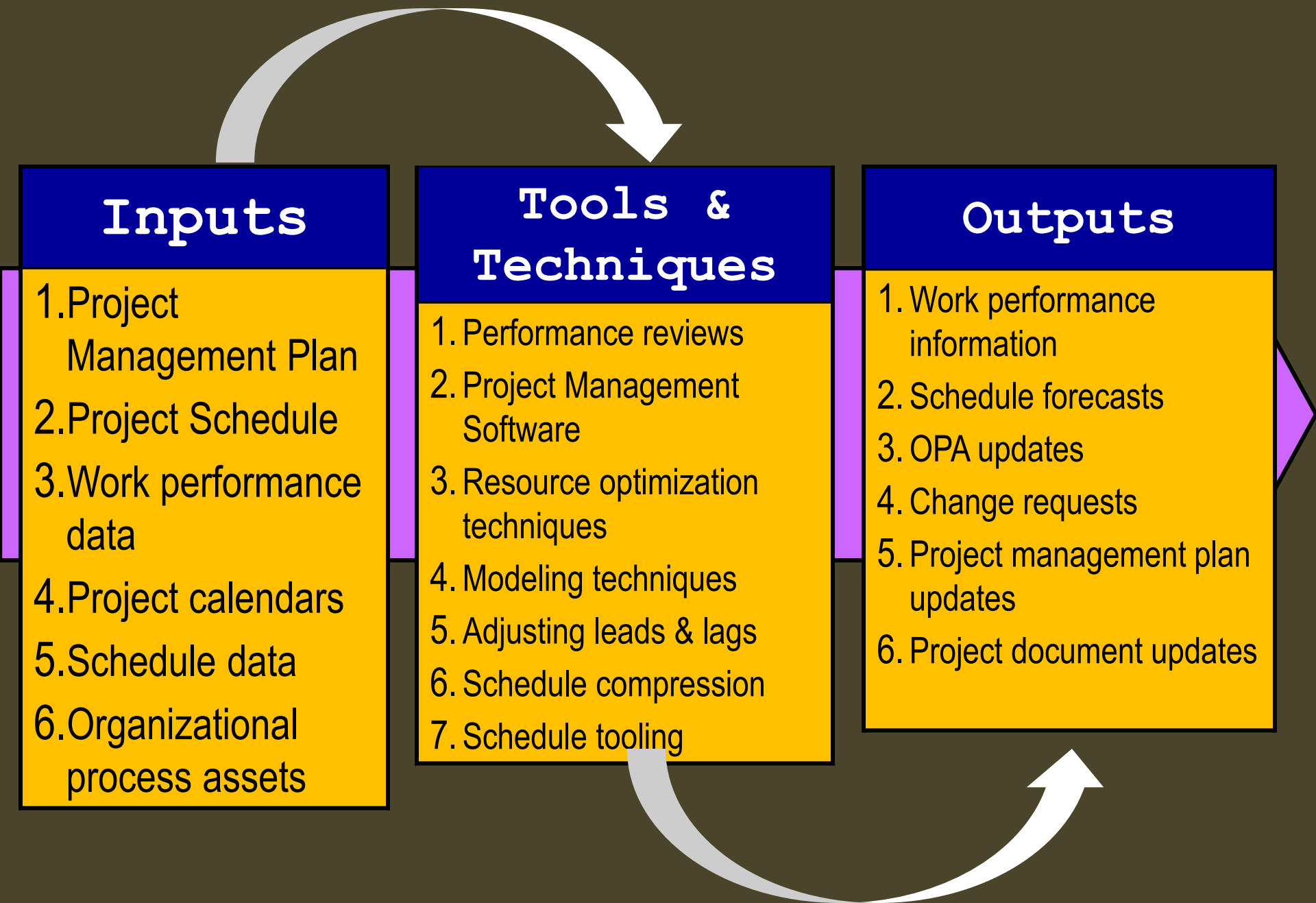
- Add more reosurces to finish the task
- Always results in **increased cost.**

# Controlling Schedule

controlling and managing changes to the project schedule

# Controlling the Schedule Goals

- know **the status** of the schedule
- **influence factors** that cause schedule changes,
- determine that the **schedule has changed**
- **manage changes** when they occur


Inputs
1. Project Management Plan
2. Project Schedule
3. Work performance data
4. Project calendars
5. Schedule data
6. Organizational process assets
Tools & Techniques
1. Performance reviews
2. Project Management Software
3. Resource optimization techniques
4. Modeling techniques
5. Adjusting leads & lags
6. Schedule compression
7. Schedule tooling
Outputs
1. Work performance information
2. Schedule forecasts
3. OPA updates
4. Change requests
5. Project management plan updates
6. Project document updates

# Schedule Control Suggestions

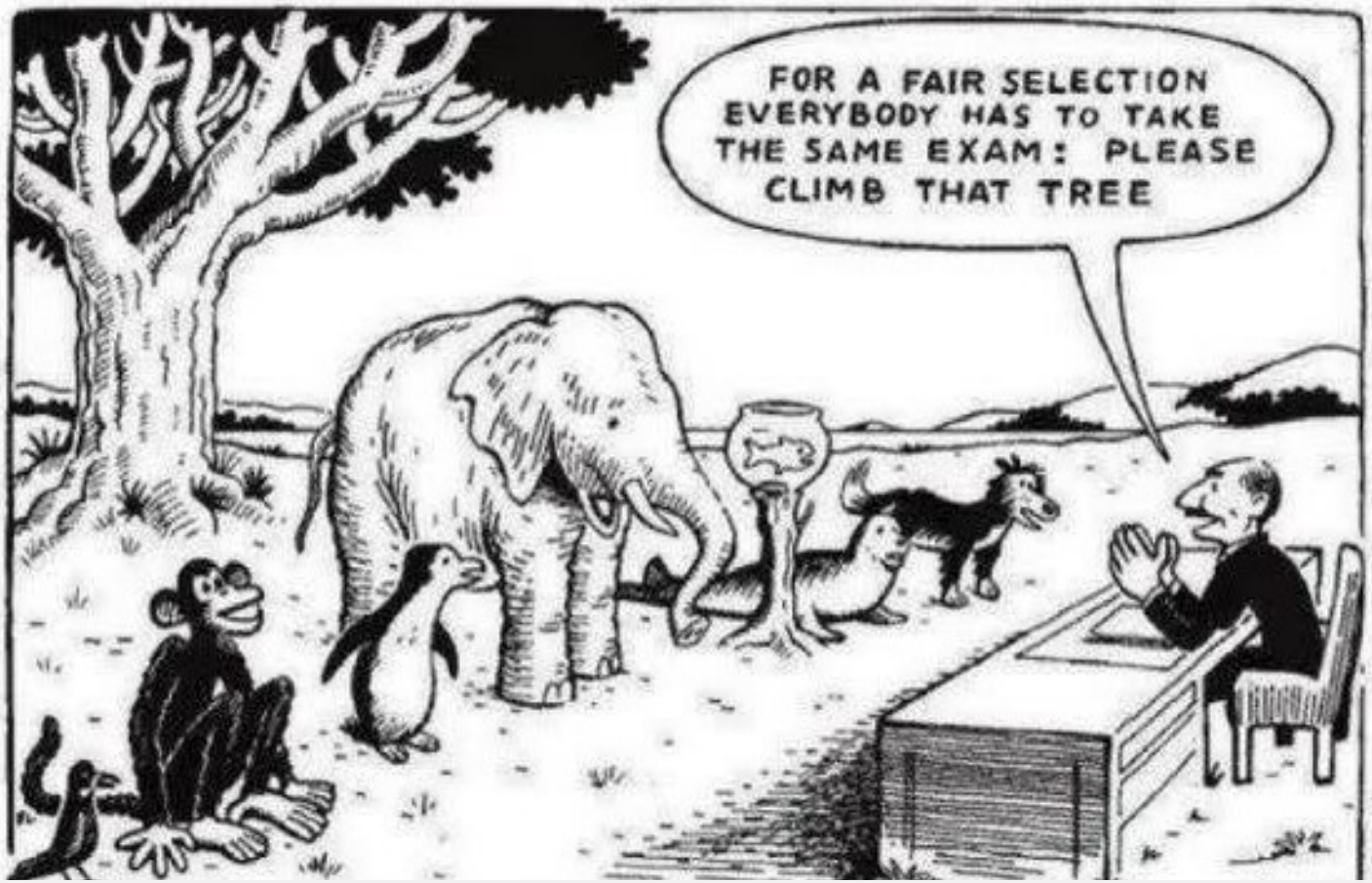
- First review the **draft schedule or estimated** completion date in the project charter
- Prepare a **more detailed schedule** with the project team
- **realistic** and **followed**
- **Alert top management** for problem

Perform reality checks on schedules:

# Schedule Control Suggestions

Allow for **contingencies**

# Schedule Control Suggestions




**Don't plan** for everyone to work at 100% capacity all the time

# Schedule Control Suggestions

Hold **progress meetings** with stakeholders and **be clear and honest** in communicating schedule issues

# Why Projects Are Often Late?

**Many project managers estimate** project duration and cost by simply adding up **most likely estimates** of activity durations and costs;

# TOP TEN REASONS I PROCRASTINATE:

1.

Create something at LiveLuvCreate.com

# **Multitask** contractor or vendor

# OVERCONFIDENCE

Always a bit risky.