



Eskinder Mesfin Cherient

PMP/PRINCE2/MCSE/ITil-E/CISSP/CCNP/CISA

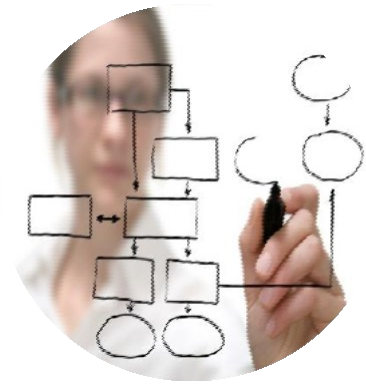
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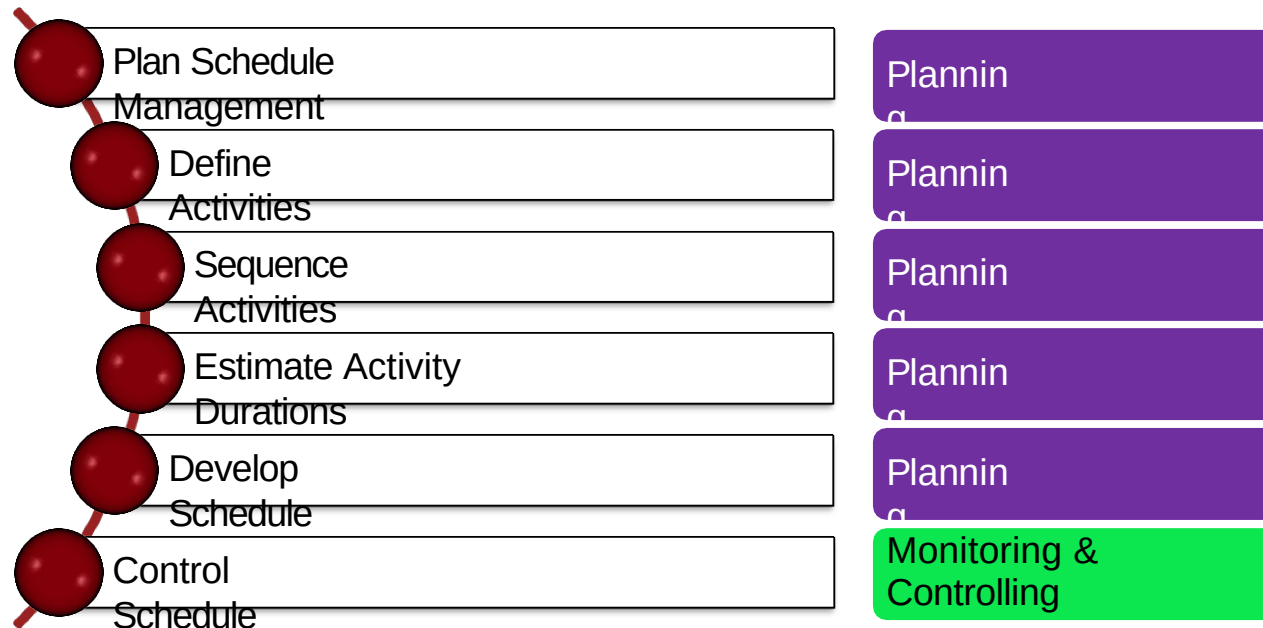
Lecture Five

Project Schedule Management

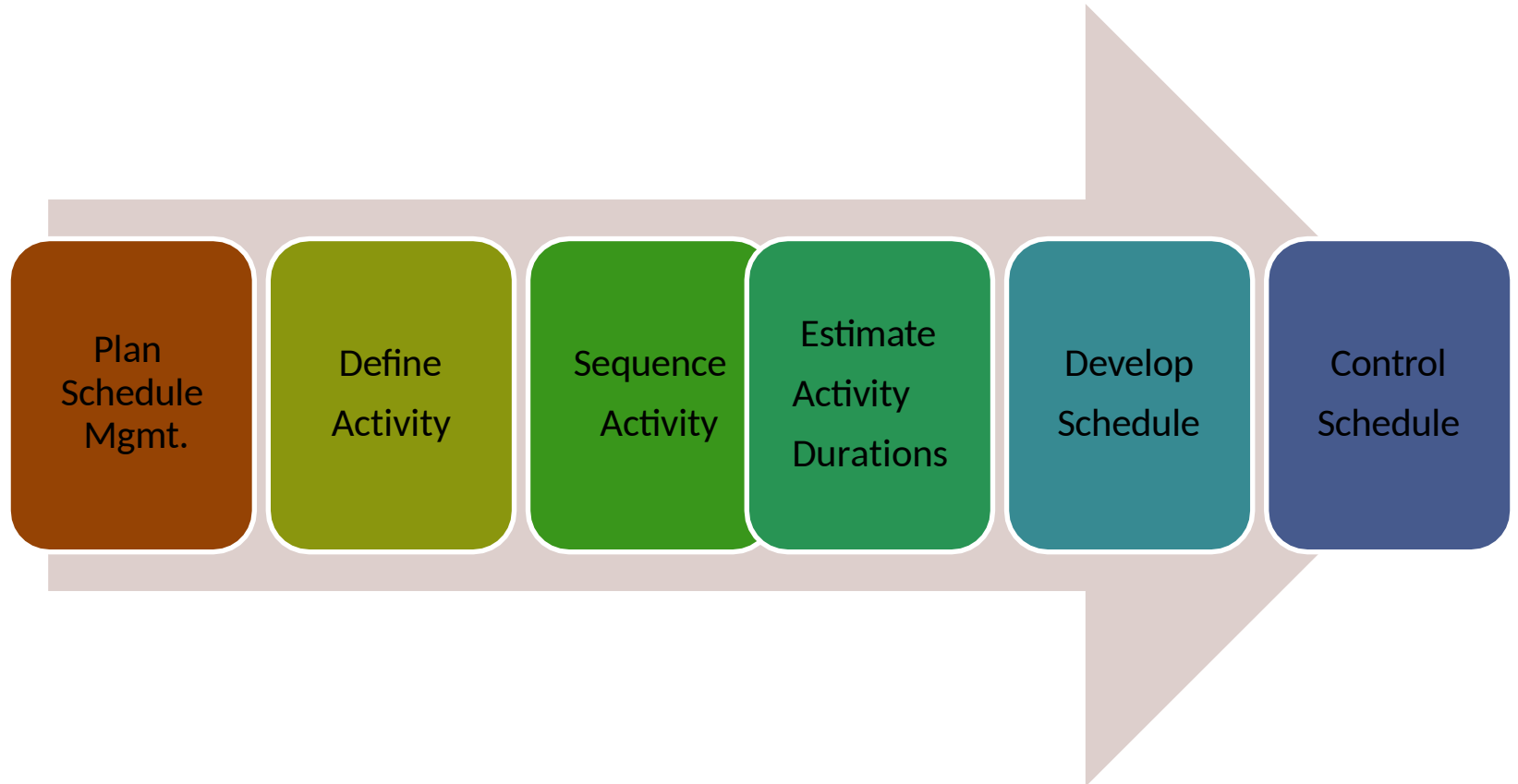
Quick Re- cap



Project Schedule Management



Project Schedule Management



Project Schedule Management

Project Schedule Management includes the processes required to manage the timely completion of the project

Plan Schedule Management



Definition

The process of establishing the policies, procedures, and documentation for **planning, developing, managing, executing, and controlling the project schedule**

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Plan Schedule Management



ITTO

Inputs

1. Project charter
2. Project management plan
3. Enterprise Environmental Factors
4. Organizational Process Assets

Tools & Techniques

1. Expert judgment
2. Data Analysis
3. Meetings

Output

1. Schedule management plan

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Plan Schedule Management



ITTO

Inputs

1. Project charter

2. Project management plan

3. Enterprise Environmental Factors

4. Organizational Process Assets

1. Scope management plan
2. Development approach

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Define Activities



Definition

The process of **identifying** and **documenting** the **specific actions** to be performed to produce the project deliverables.

Plan Schedule
Management

Define
Activities

Sequenc
e
Activities

Estimate Activity
Durations

Develop
Schedul
e

Control
Schedul
e

Define Activities



Notes

- Define Activities process will identify the deliverables at the lowest level (are called Work Package) in the Work Breakdown Structure (WBS)
- Project work packages are decomposed into smaller components, are called schedule activities.
- These schedule activities provide a basis for estimating, scheduling, executing, and monitoring and controlling the project work

Plan Schedule
Management

Define
Activities

Sequence
Activities

Estimate Activity
Durations

Develop
Schedule

Control
Schedule

Define Activities



ITTO

Inputs

1. Project management plan
2. Enterprise Environmental Factors
3. Organizational Process Assets

Tools & Techniques

1. Expert judgment
2. Decomposition
3. Rolling wave planning
4. Meetings

Output

1. Activity list
2. Activity attributes
3. Milestone list
4. Change requests
5. Project management plan updates

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Define Activities



ITTO

Inputs

1. Project management plan

2. Enterprise Environmental Factors
3. Organizational Process Assets

1. Schedule management plan
2. Scope baseline

Plan Schedule Management

Define Activities

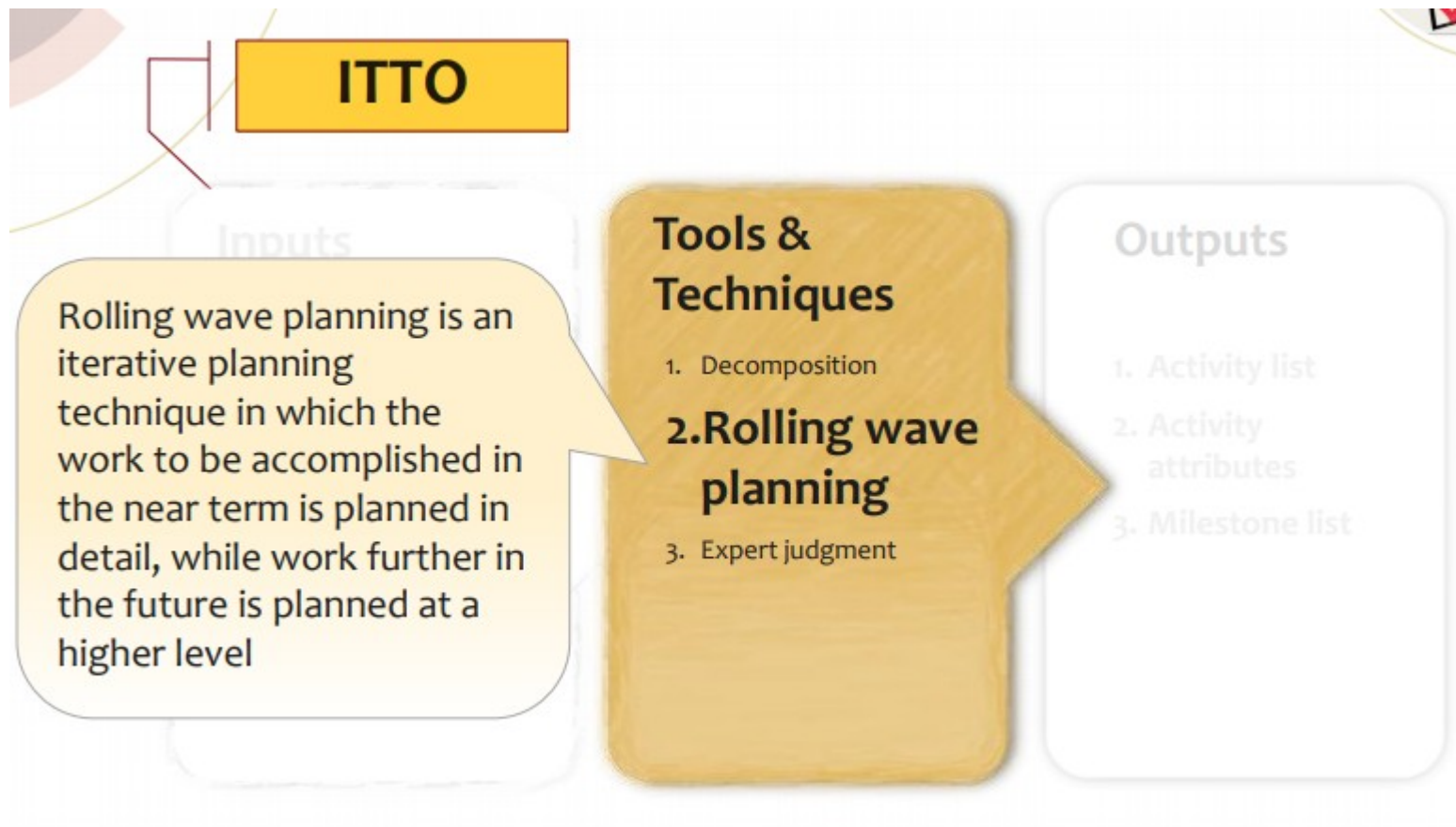
Sequence Activities

Estimate Activity Durations

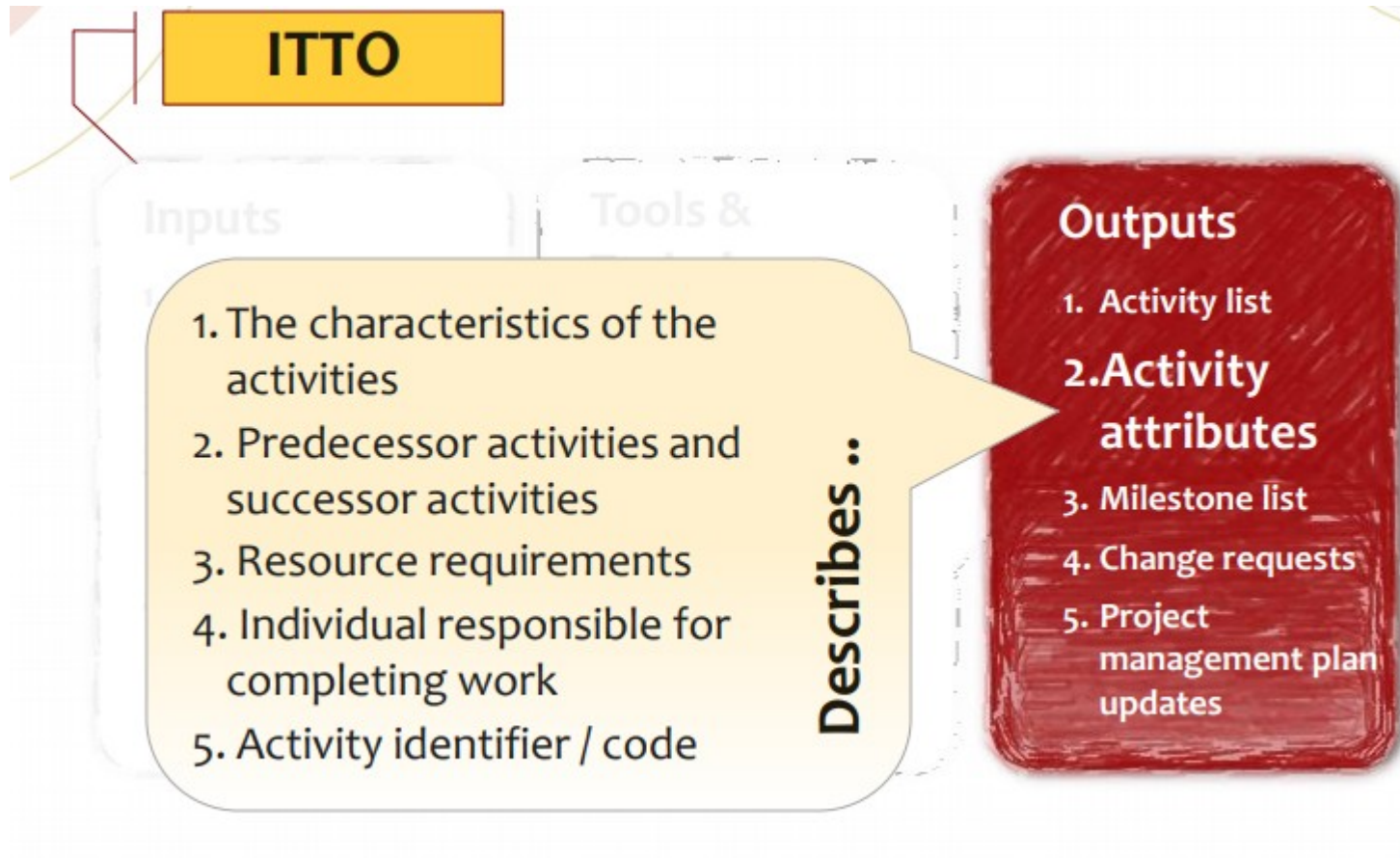
Develop Schedule

Control Schedule

Rolling Wave Planning



Activity Attributes



Sequence Activities



Definition

The process of identifying and documenting **relationships** among the project activities

Plan Schedule
Management

Define
Activities

Sequenc
e
Activities

Estimate Activity
Durations

Develop
Schedul
e

Control
Schedul
e

Sequence Activities



Notes

- Activity sequencing is performed by project team, it is not a solo activity
- Sequencing can be done using PMIS or manually and can also be in combination

Plan Schedule
Management

Define
Activities

Sequenc
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Activities

Estimate Activity
Durations

Develop
Schedul
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Control
Schedul
e

Sequence Activities



ITTO

Inputs

1. Project management plan
2. Project documents
3. Enterprise environmental factors
4. Organizational process assets

Tools & Techniques

1. Precedence diagramming method (PDM)
2. Dependency determination
3. Leads and lags
4. Project management information system

Outputs

1. Project schedule network diagrams
2. Project documents update

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Sequence Activities



ITTO

Inputs

1. Project management plan
2. Project documents
3. Enterprise environmental factors
4. Organizational process assets

1. Schedule management plan

2. Scope baseline

1. Activity attributes
2. Activity list
3. Assumption log
4. Milestone list

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Sequence Activities



Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

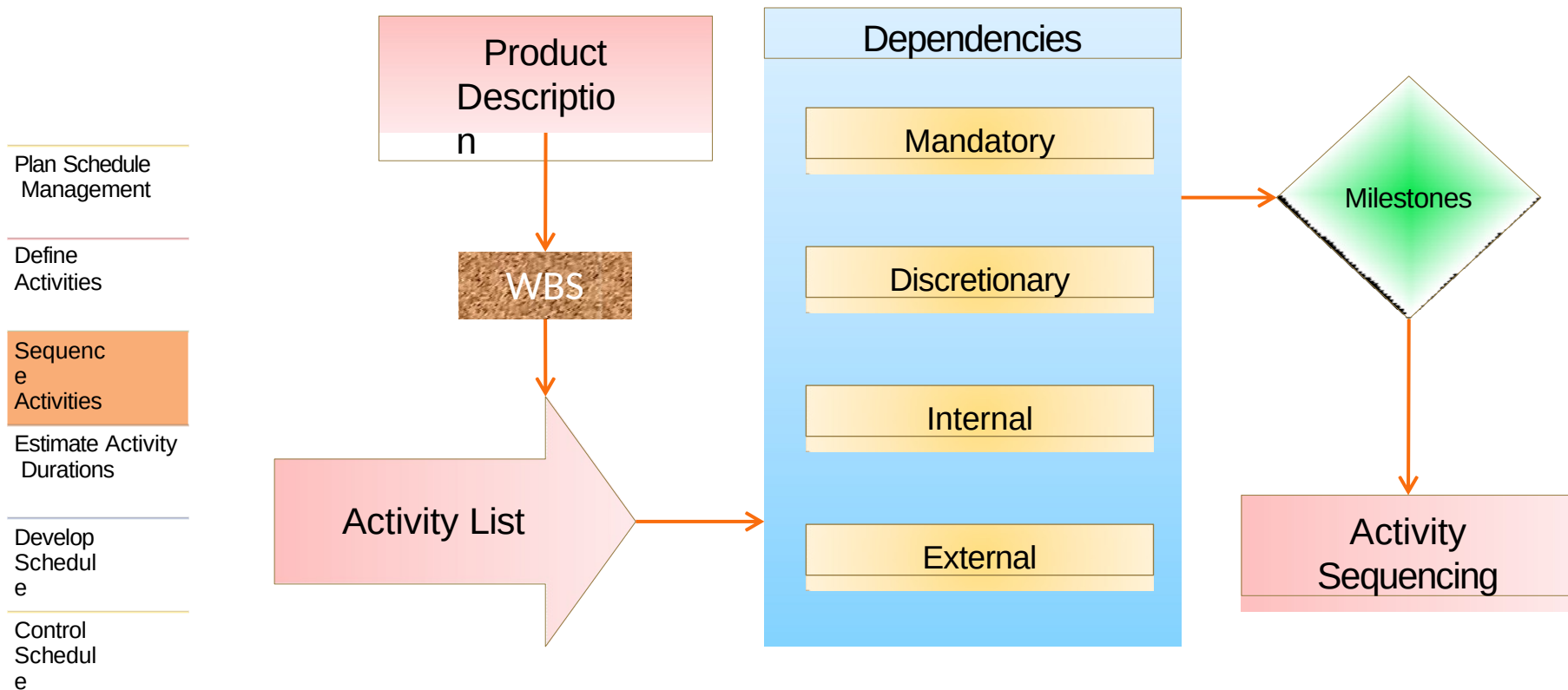
Control Schedule

1. Activity attributes
2. Activity list
3. Assumption log
4. Milestone list

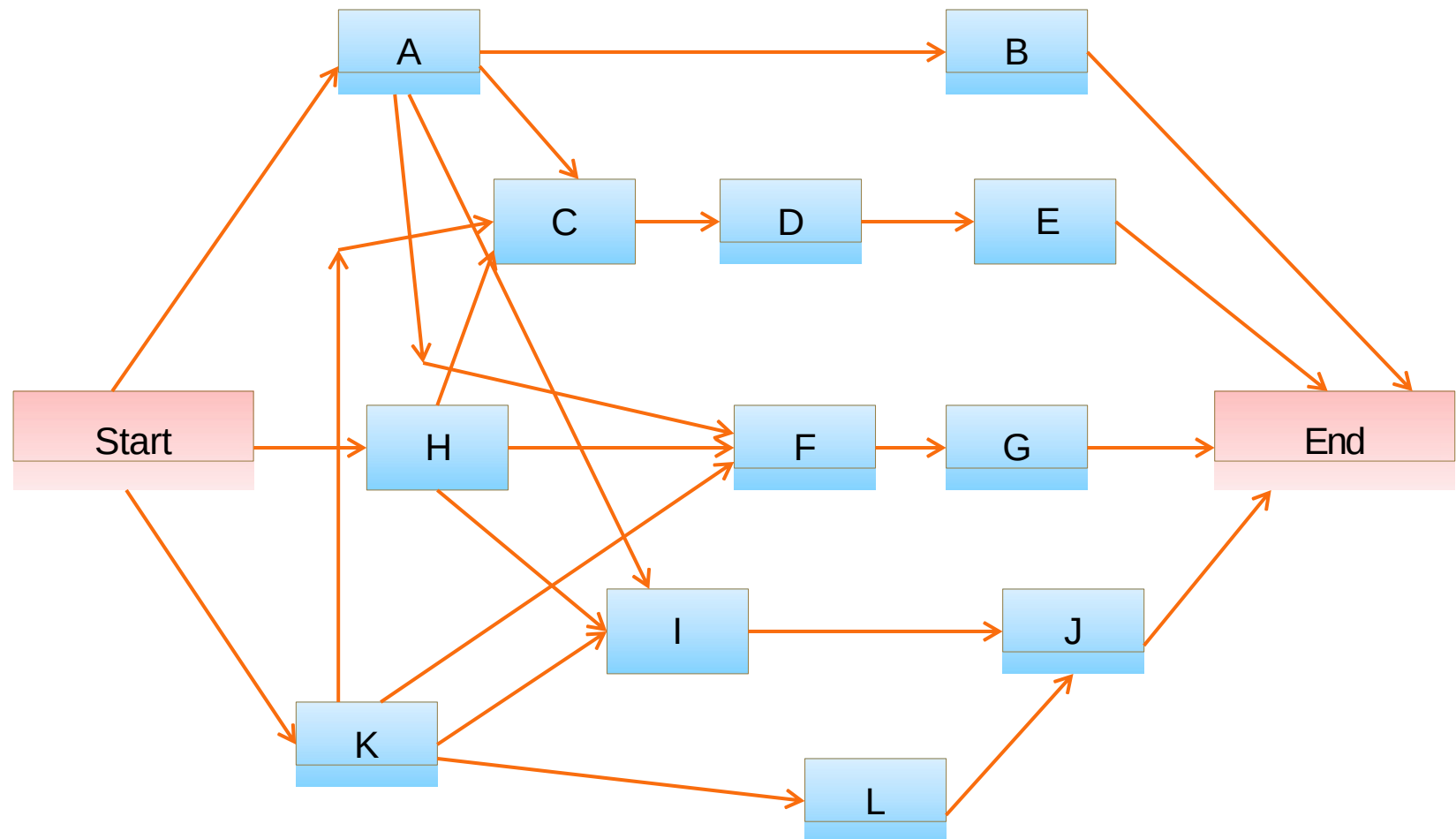
Outputs

1. Project schedule network diagrams
2. Project documents update

Sequence Activities



Precedence Diagramming Method



Precedence Diagramming Method



PDM

- Precedence diagrams use **boxes** or rectangles to represent the activities, which are called **NODES**
- The Nodes are connected with **arrows** showing the dependencies between activities
- This method is also called Activity On Node (AON)

Plan Schedule
Management

Define
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Precedence Diagramming Method



Example



PDM of a house painting project

Plan Schedule Management

Define Activities

Sequence Activities

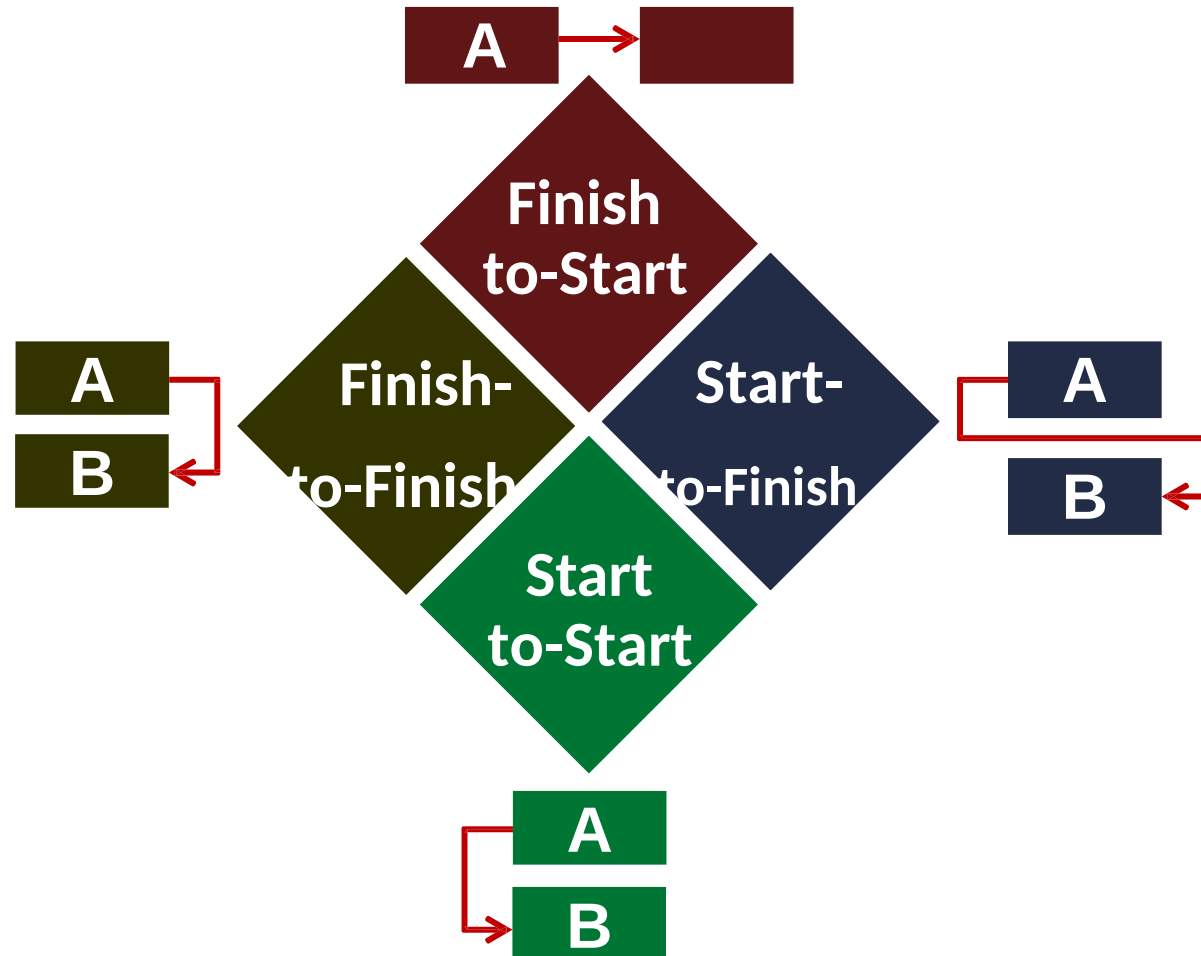
Estimate Activity Durations

Develop Schedule

Control Schedule

PD M

- The precedence diagramming method has four logical relationships/dependencies



PD M

- The precedence diagramming method has four logical relationships/dependencies



**Finish
to-Start**

Example:
Foundation dug (FS)
Concrete done



1. Most frequently used
2. Describes that the independent activity must finish before the dependent activity can start
3. Most often used logical relationship start before A is finished

Plan Schedule
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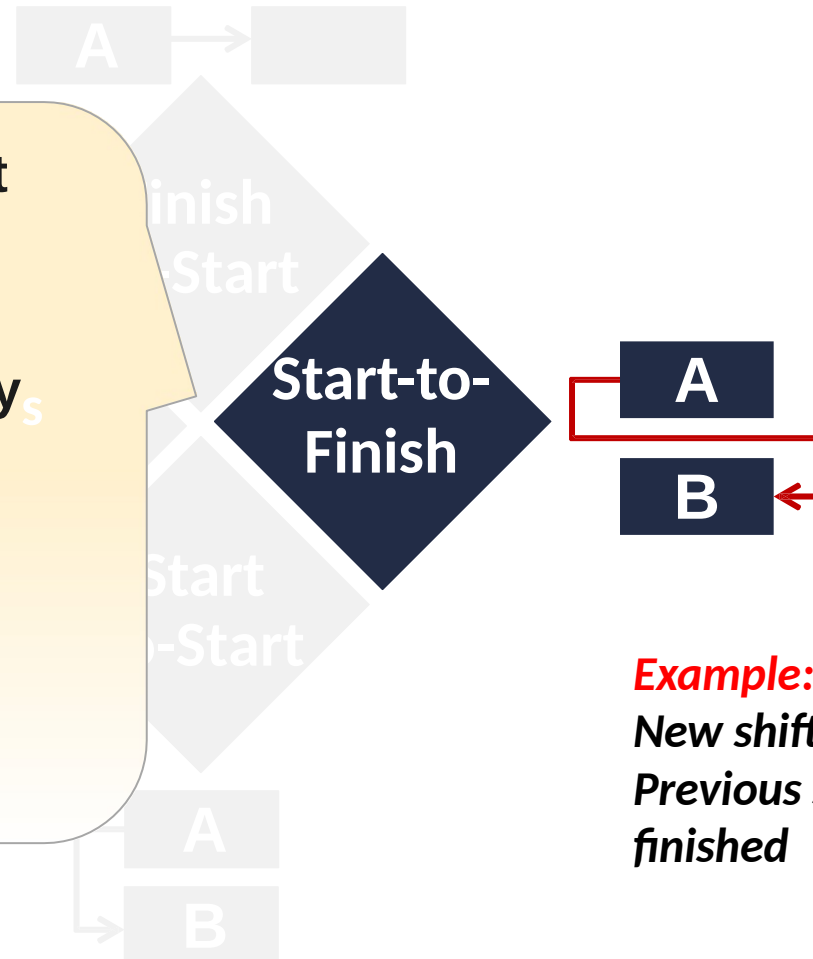
Develop
Schedule

Control
Schedule

PD M

- The precedence diagramming method has four logical relationships/dependencies

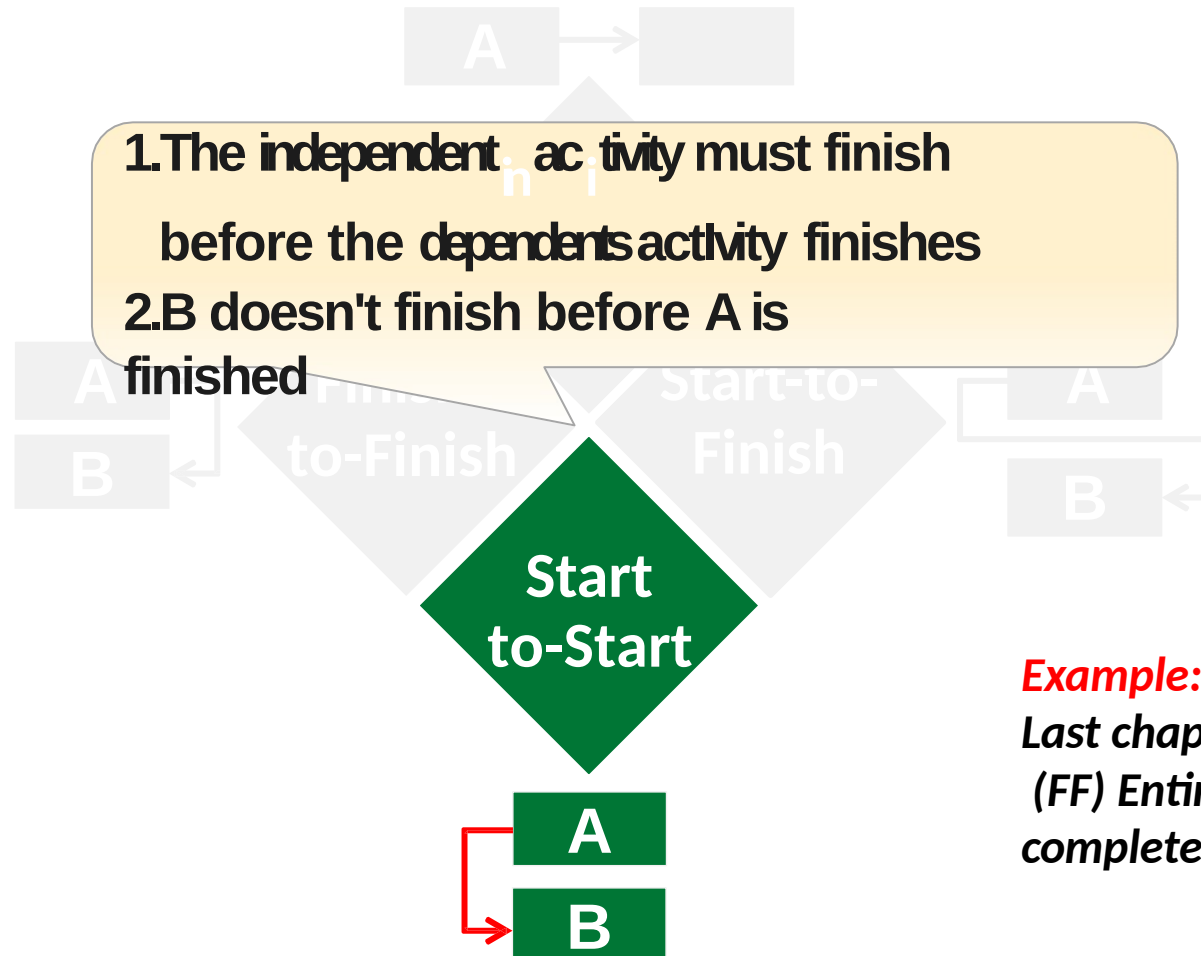
1. The independent activity must start before the dependent activity can
2. This logical relationship is seldom used
3. B doesn't finish before A starts



Example:
*New shift started (SF)
Previous shift finished*

PD M

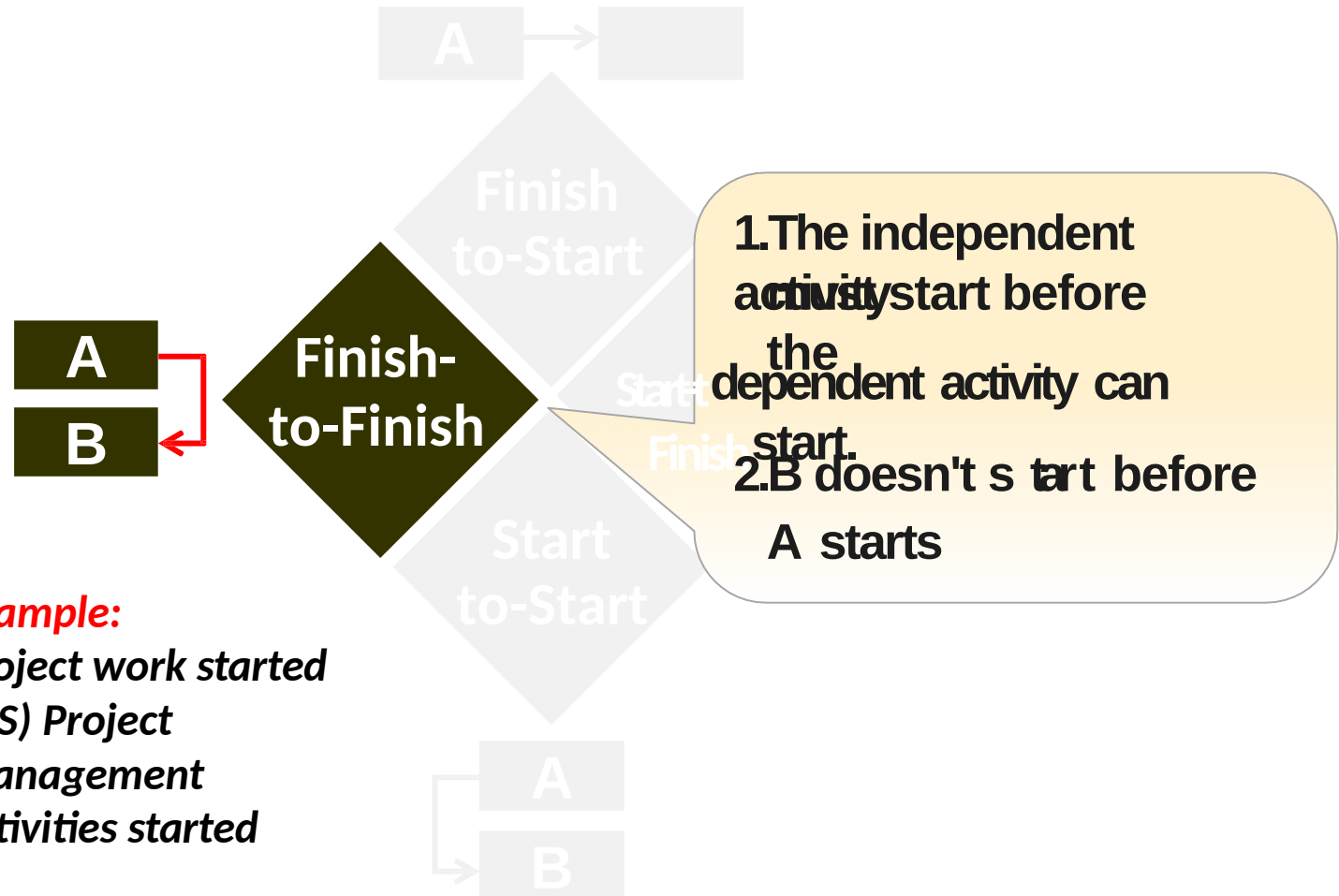
- The precedence diagramming method has four logical relationships/dependencies



Example:
*Last chapter written
(FF) Entire book
completed*

PD M

- The precedence diagramming method has four logical relationships/dependencies



Determining Dependencies



➤ Dependencies are relationships between the activities in which one activity is dependent on another to complete an action

1. Mandatory Dependency

- Also known as **hard logic** or hard dependencies.
- The nature of the work dictates the order in which the activities should be performed
- Involves physical limitations

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Determining Dependencies



- Dependencies are relationships between the activities in which one activity is dependent on another to complete an action

2. Discretionary Dependency

- Also known as **preferred logic** or soft logic or preferential logic.
- Defined by project management team
- Process / procedure driven or best practices techniques

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Determinin g Dependenc ies



- Dependencies are relationships between the activities in which one activity is dependent on another to complete an action

3. Internal Dependenc y

- Internal to the project

Plan Schedule
Management

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Activities

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Schedul
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Determinin g Dependenc ies



- Dependencies are relationships between the activities in which one activity is dependent on another to complete an action

4. External Dependenc y

- External to the project
- An external activity which is non-project activity has an impact on project activities

Plan Schedule
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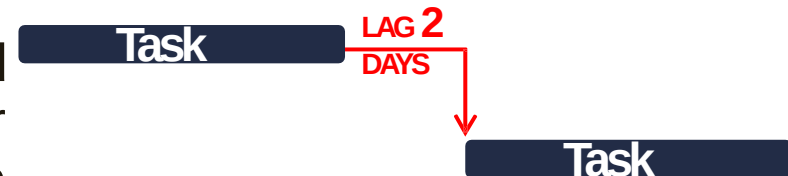
Control
Schedul
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Applying Leads and Lags



1. Lag

- delay successor activities and require Schedule added either to the start date or to the finish date of the activity scheduled



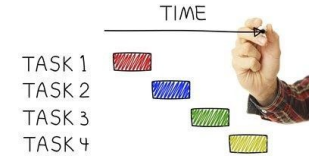
Leads and lags are determined by project management team

2.

- **Lead** the successor activities and require Schedule to be subtracted from the start date or the finish date of the activity scheduled



Estimate Activity Durations



Definition

The process of estimating the **number of work periods needed** to complete individual activities with estimated resources.

Plan Schedule
Management

Define
Activities

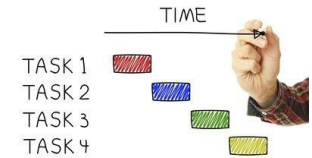
Sequenc
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Activities

Estimate Activity
Durations

Develop
Schedul
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Control
Schedul
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Estimate Activity Durations



ITTO

Input

- 1. Project management plan
- 2. Projects documents
- 3. EEF
- 4. OPA

Tools & Techniques

- 1. Expert judgment
- 2. Analogous estimating
- 3. Parametric estimating
- 4. Three-point estimating
- 5. Bottom-up estimating
- 6. Data analysis

Outputs

- 1. Duration estimates
- 2. Basis of estimates
- 3. Project documents updates

Plan Schedule Management

Define Activities

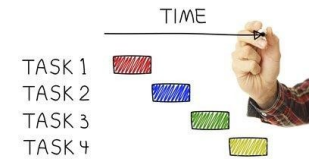
Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Estimate Activity Durations



ITTO

Tools & Techniques

1. Expert judgment

2. Analogous estimating

3. Parametric estimating
4. Three-point estimating
5. Bottom-up estimating
6. Data analysis
7. Decision making
8. Meetings

- Analogous estimating is a technique for estimating the duration or cost of an activity or a project using historical data from a similar activity or project
- Analogous estimating is generally less costly and less time-consuming than other techniques, but it is also less accurate

1. Also called Top-down estimating
2. Most useful when the previous similar activities to activities being estimated
3. Is used to estimate total project duration
4. Useful in the early stages of project

Plan Schedule Management

Define Activities

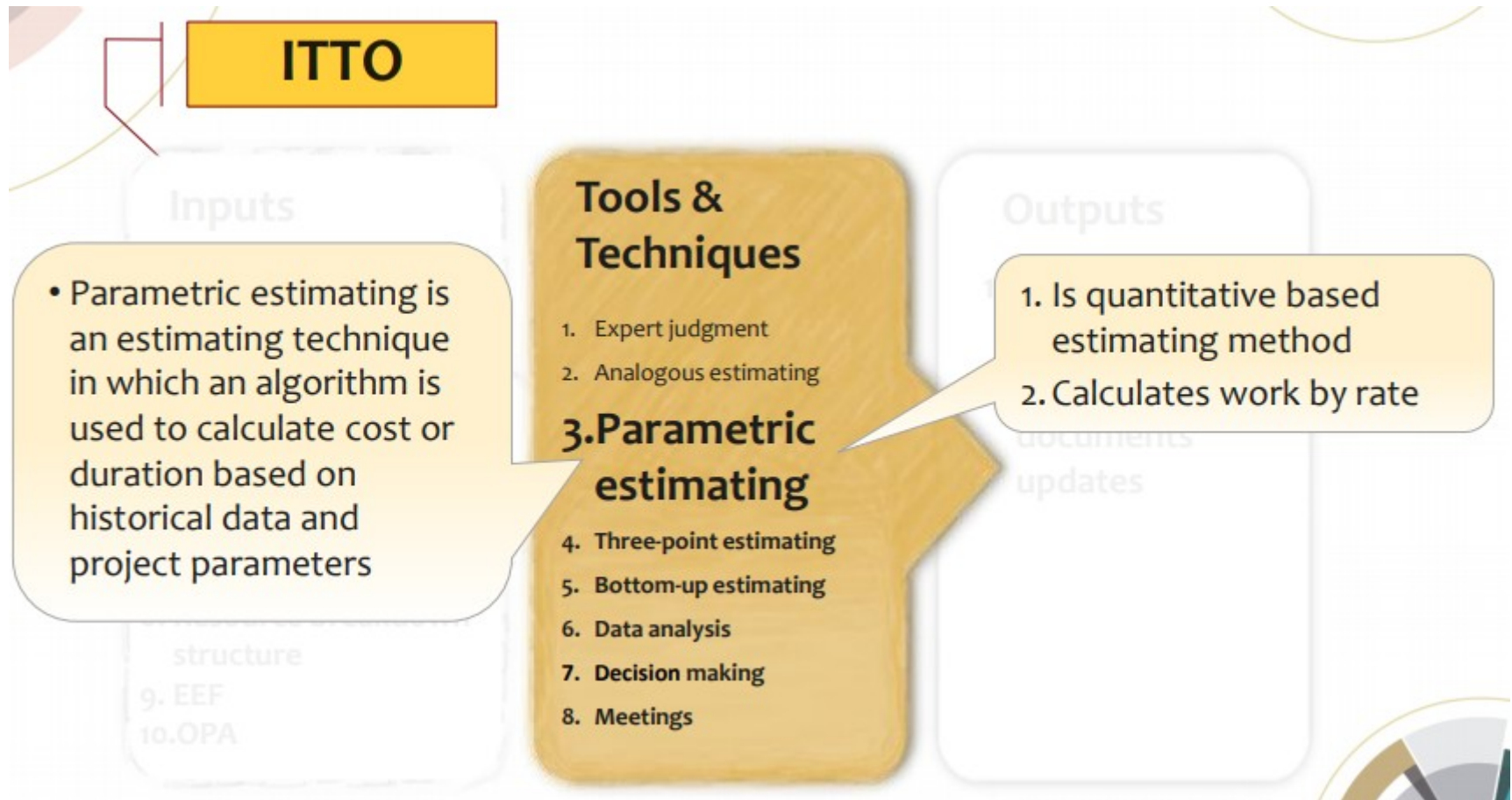
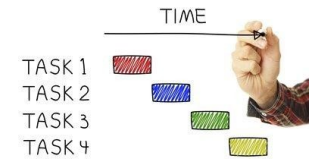
Sequence Activities

Estimate Activity Durations

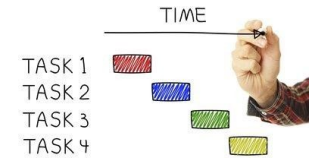
Develop Schedule

Control Schedule

Estimate Activity Durations



Estimate Activity Durations



ITTO

1. Is also known as **Program Evaluation & Review Technique (PERT)**
2. Uses three estimates to calculate average
3. The three estimates are
 - Most likely (**tM**)
 - Optimistic (**tO**)
 - Pessimistic (**tP**)

Tools & Techniques

1. Expert judgment
2. Analogous estimating
3. Parametric estimating
- 4. Three-point estimating**
5. Bottom-up estimating
6. Data analysis
7. Decision making
8. Meetings

Outputs

The estimate is
$$(O+4*M+P)/6$$

Project documents updates

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Develop Schedule



Definition

The process of **analyzing activity sequences, durations, resource requirements, and schedule constraints** to create the project schedule model for project execution and monitoring and controlling.

Plan Schedule
Management

Define
Activities

Sequenc
e
Activities

Estimate Activity
Durations

Develop
Schedul
e

Control
Schedul
e

Develop Schedule



ITTO

Inputs

1. Project management plan
2. Project documents
3. Agreements
4. Enterprise environmental factors
5. Organizational process assets

Tools & Techniques

1. Schedule network analysis
2. Critical path method
3. Resource optimization
4. Data analysis
5. Leads and lags
6. Schedule compression
7. Project management information system
8. Agile release train

Outputs

1. Schedule baseline
2. Project schedule
3. Schedule data
4. Project calendars
5. Change requests
6. Project management plan updates
7. Project documents updates

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Develop Schedule



ITTO

Inputs

1. Project management plan

- Schedule management plan
- Scope baseline

2. Project documents

3. Agreements
4. Enterprise environmental factors
5. Organizational process assets

- Activity attributes
- Activity list
- Assumption log
- Basis of estimates
- Duration estimates
- Lessons learned register
- Milestone list
- Project schedule network diagrams
- Project team assignments
- Resource calendars
- Resource requirements
- Risk register

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Critical Path Method (CPM)



ITTO

Tools & Techniques

1. Schedule network analysis

2. Critical path method

3. Resource optimization
4. Data analysis
5. Leads and lags
6. Schedule compression
7. Project management information system
8. Agile release planning

1. Is a schedule network analysis technique. It determines the amount of float, or schedule flexibility for each of the network paths by calculating the earliest start date, earliest finish date, latest start date, and latest finish date for each activity.

2. The **Critical Path** is the path with the **longest duration and will always have ZERO float.**

3. It relies on sequential networks and on a single duration estimate for each activity

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Critical Path Method (CPM)



ITTO

- On any network path, the positive difference between early and late start / finish dates is called as “**Total Float Schedule**” or “**Slack Schedule**”
- Any project activity with a float Schedule is equal to zero, is on **Critical Path**
- The network path having all critical path tasks is called is **Critical Path**

Tools & Techniques

1. Schedule network analysis
2. **Critical path method**
3. Resource optimization
4. Data analysis
5. Leads and lags
6. Schedule compression
7. Project management information system
8. Agile release planning

Free Float

Total Schedule an activity can be delayed without delaying the early start of any successor activities

Project Slack

The total Schedule the project can be delayed without passing the customer-expected completion date

Plan Schedule Management

Define Activities

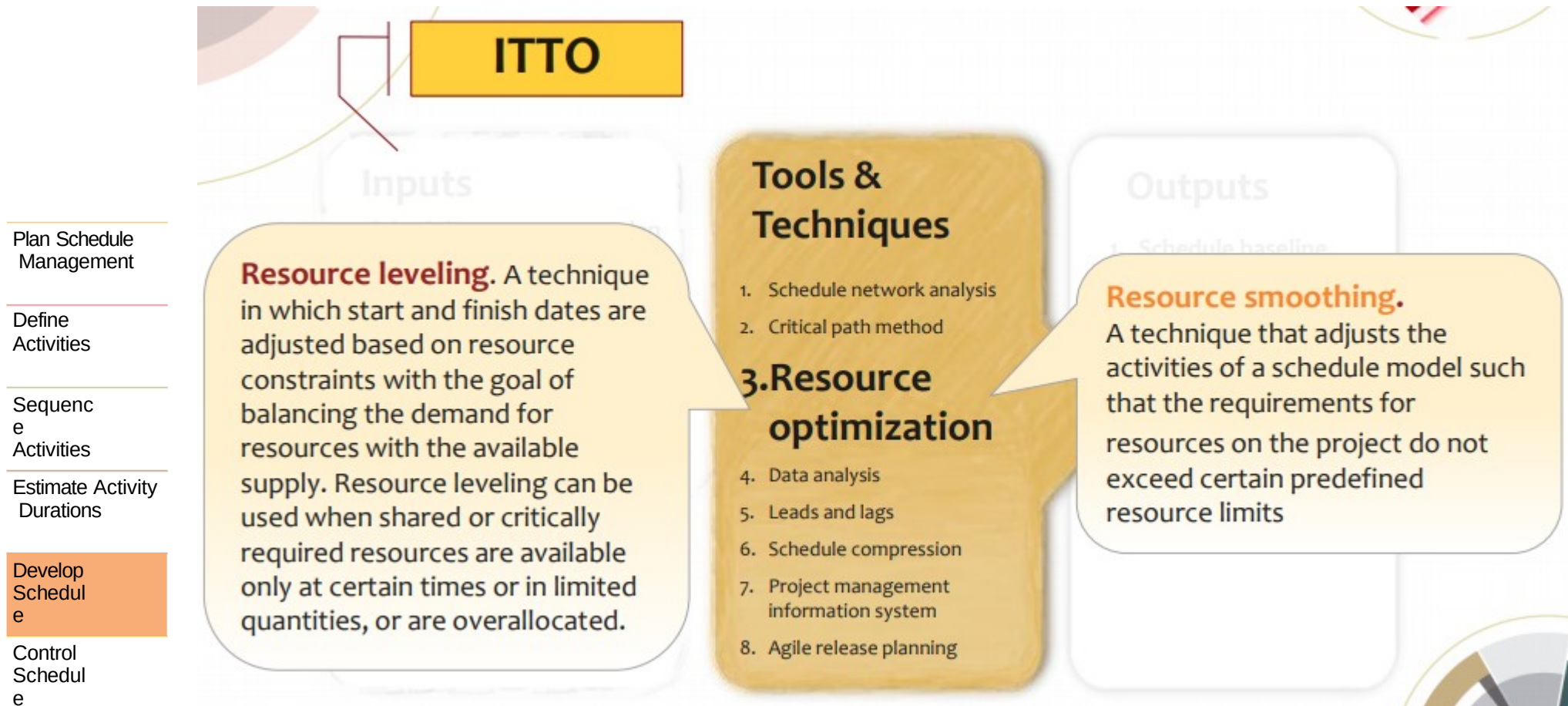
Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

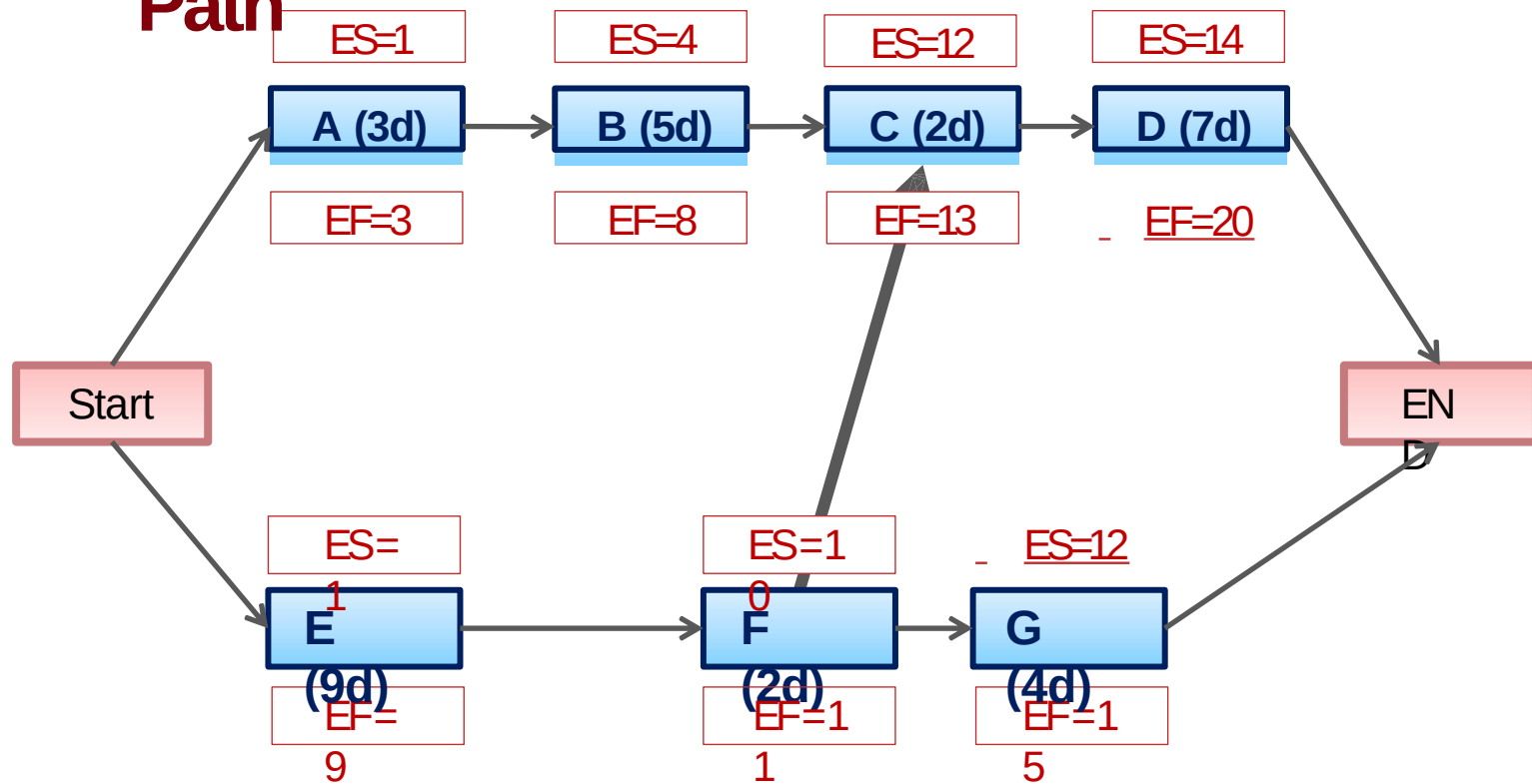
Critical Path Method (CPM)



Critical Path Method (CPM)



Forward Path



Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

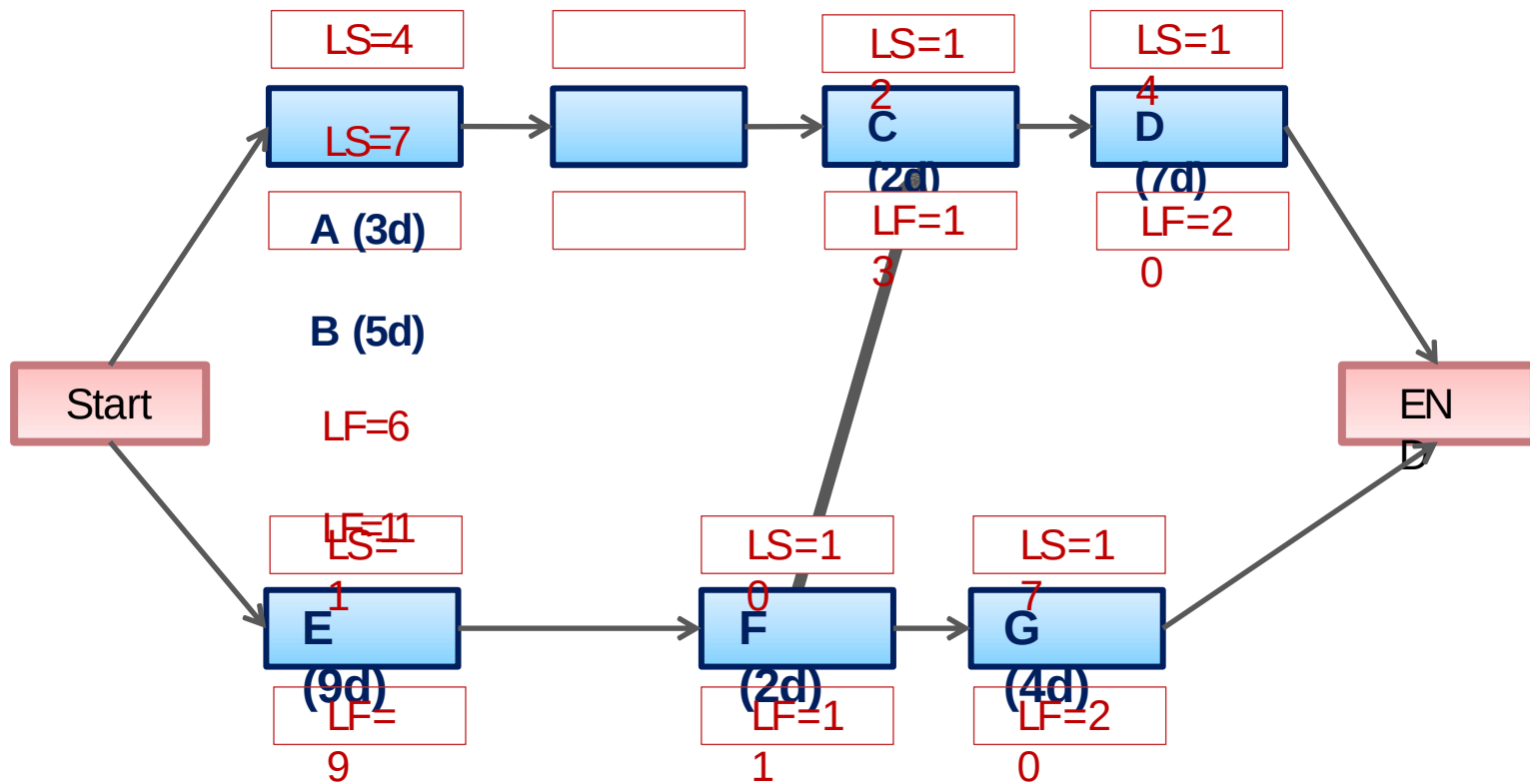
Develop Schedule

Control Schedule

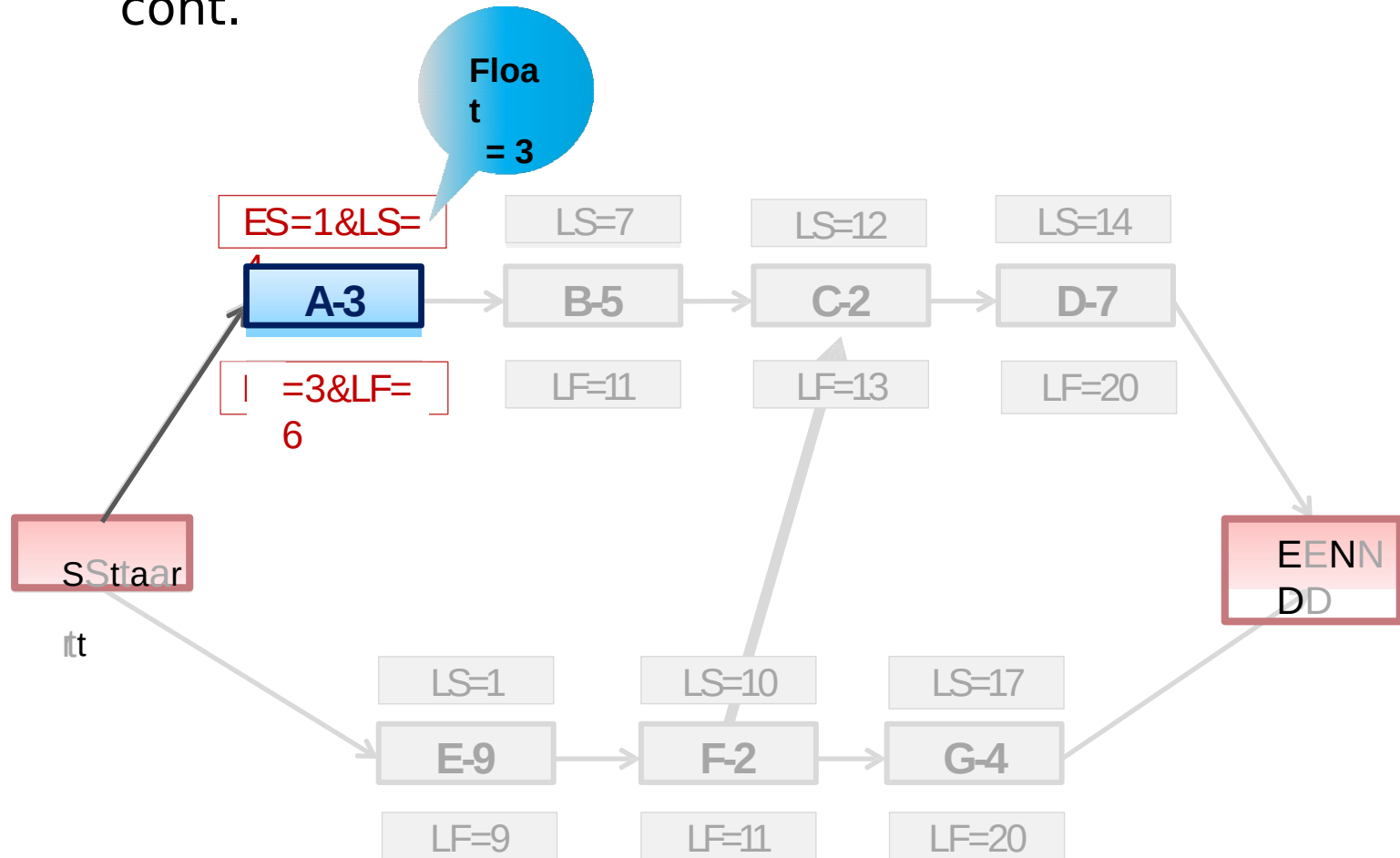
Critical Path Method (CPM)



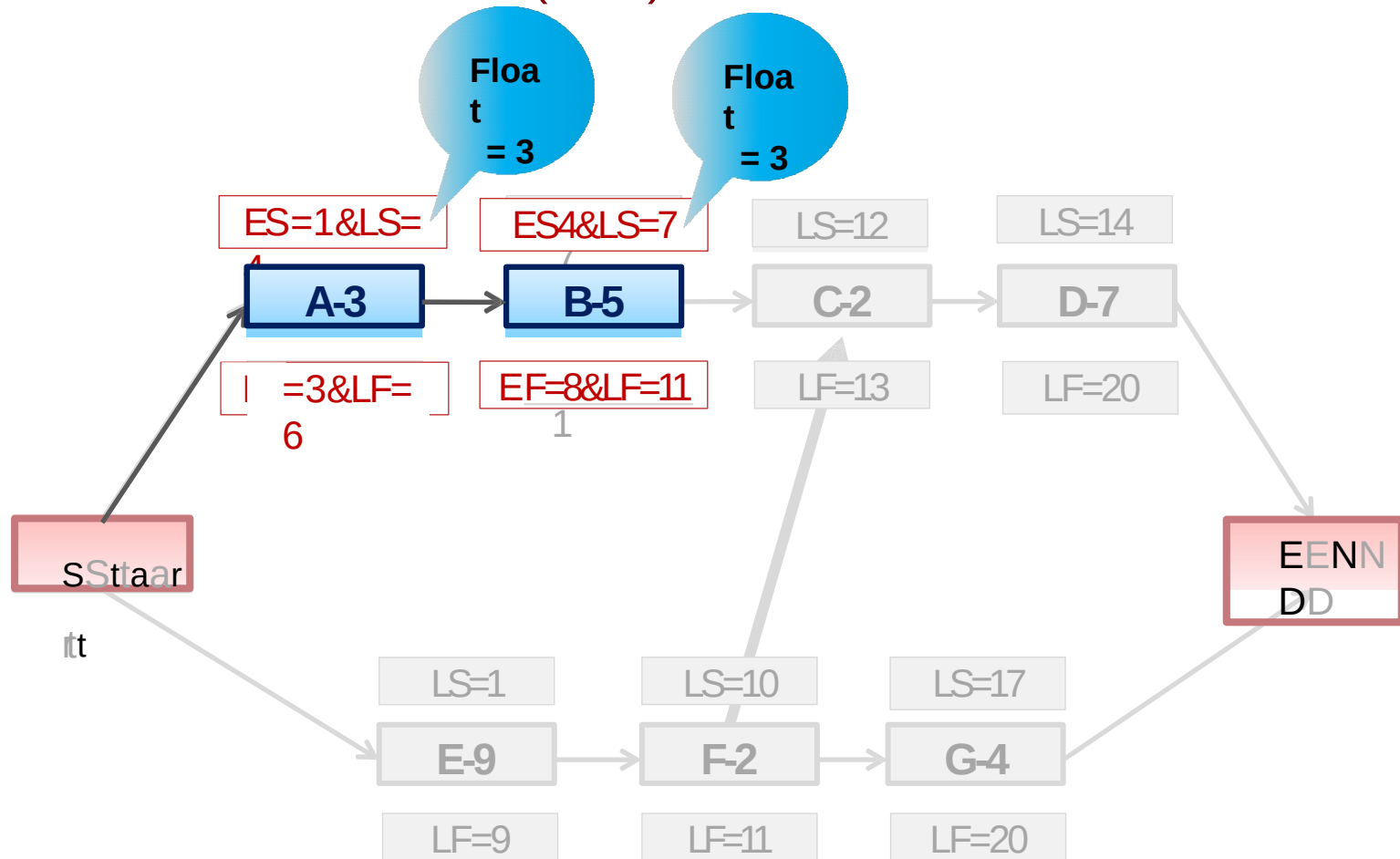
Backward Path



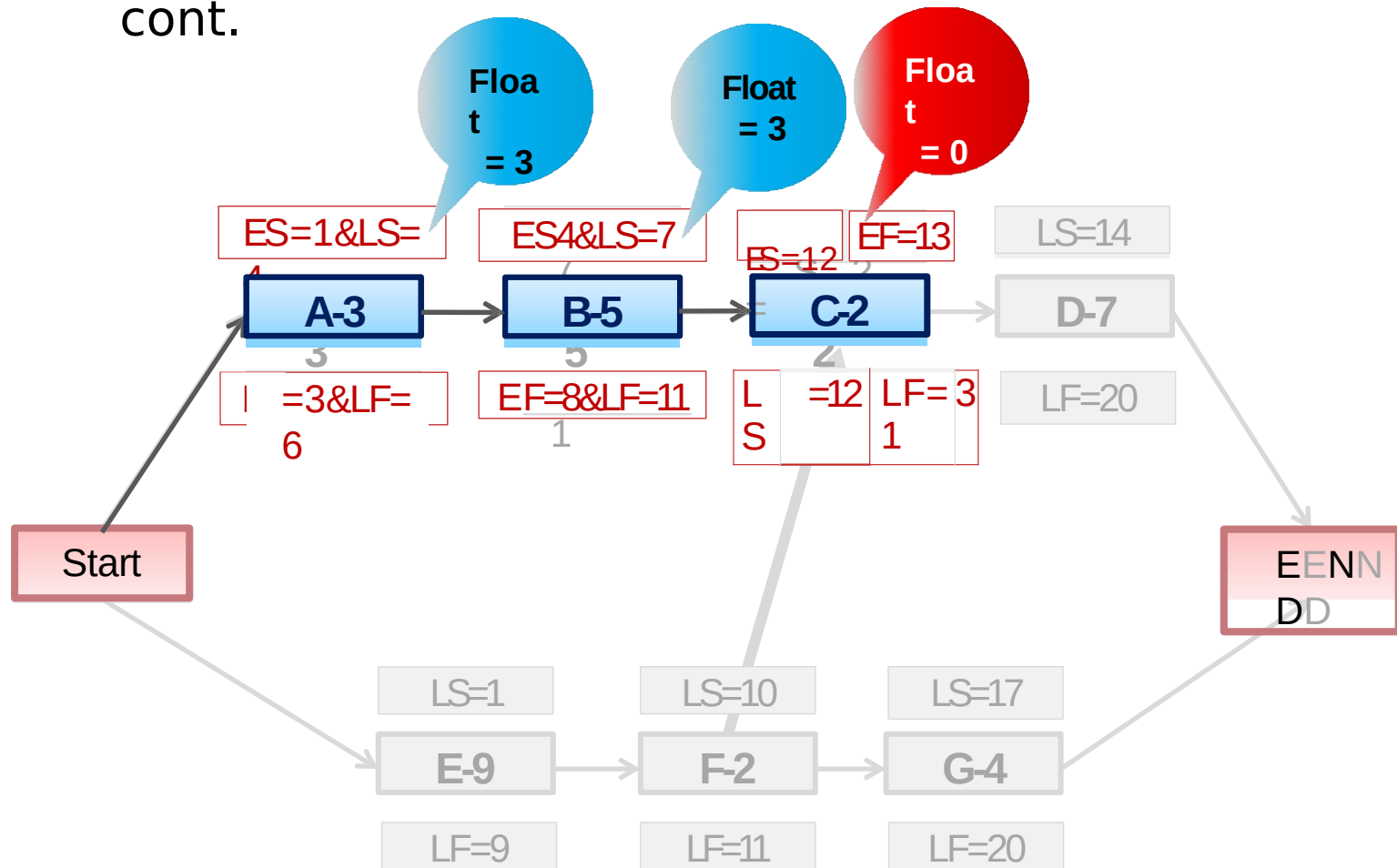
Critical Path Method (CPM) – cont.



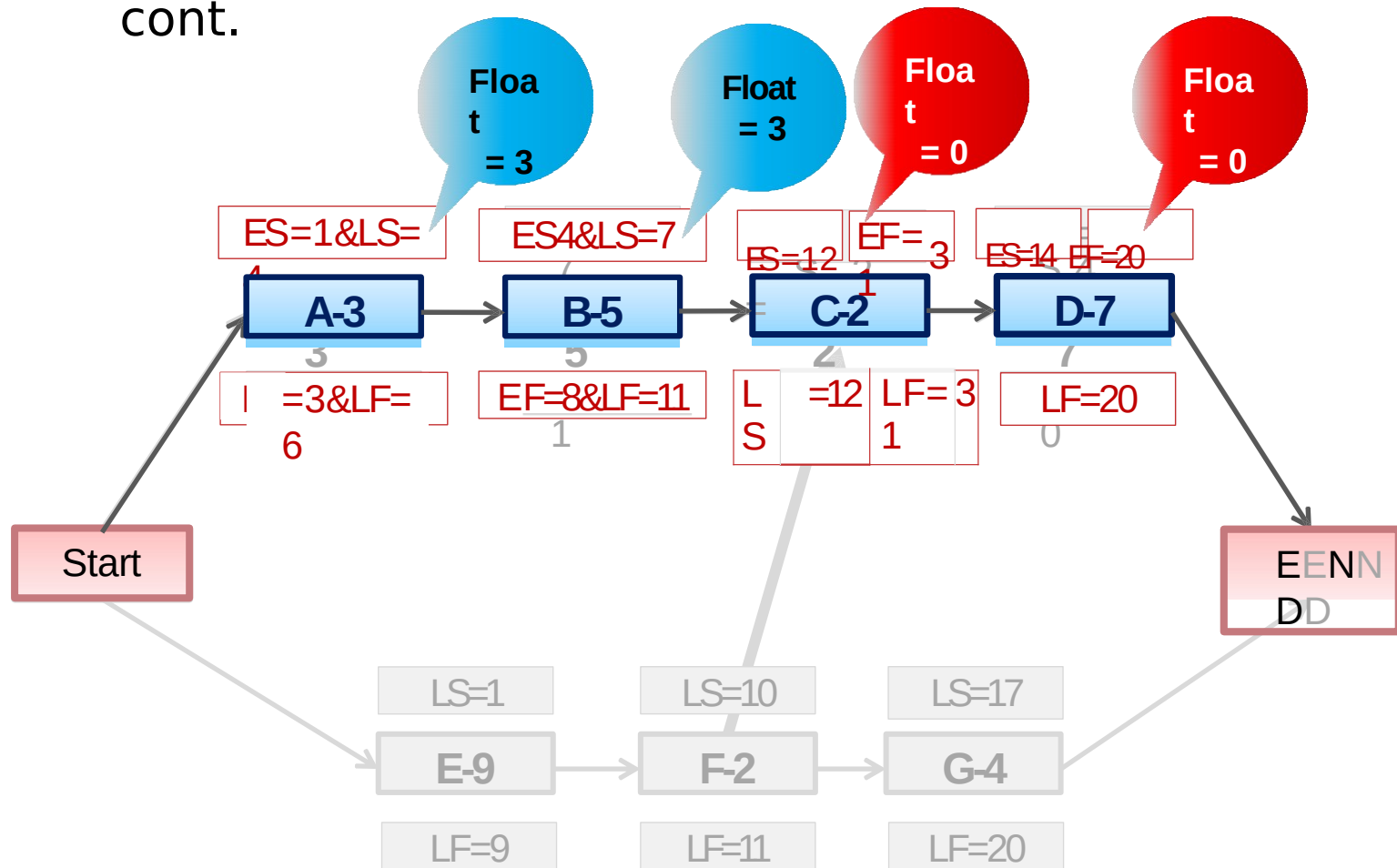
Critical Path Method (CPM) – cont.



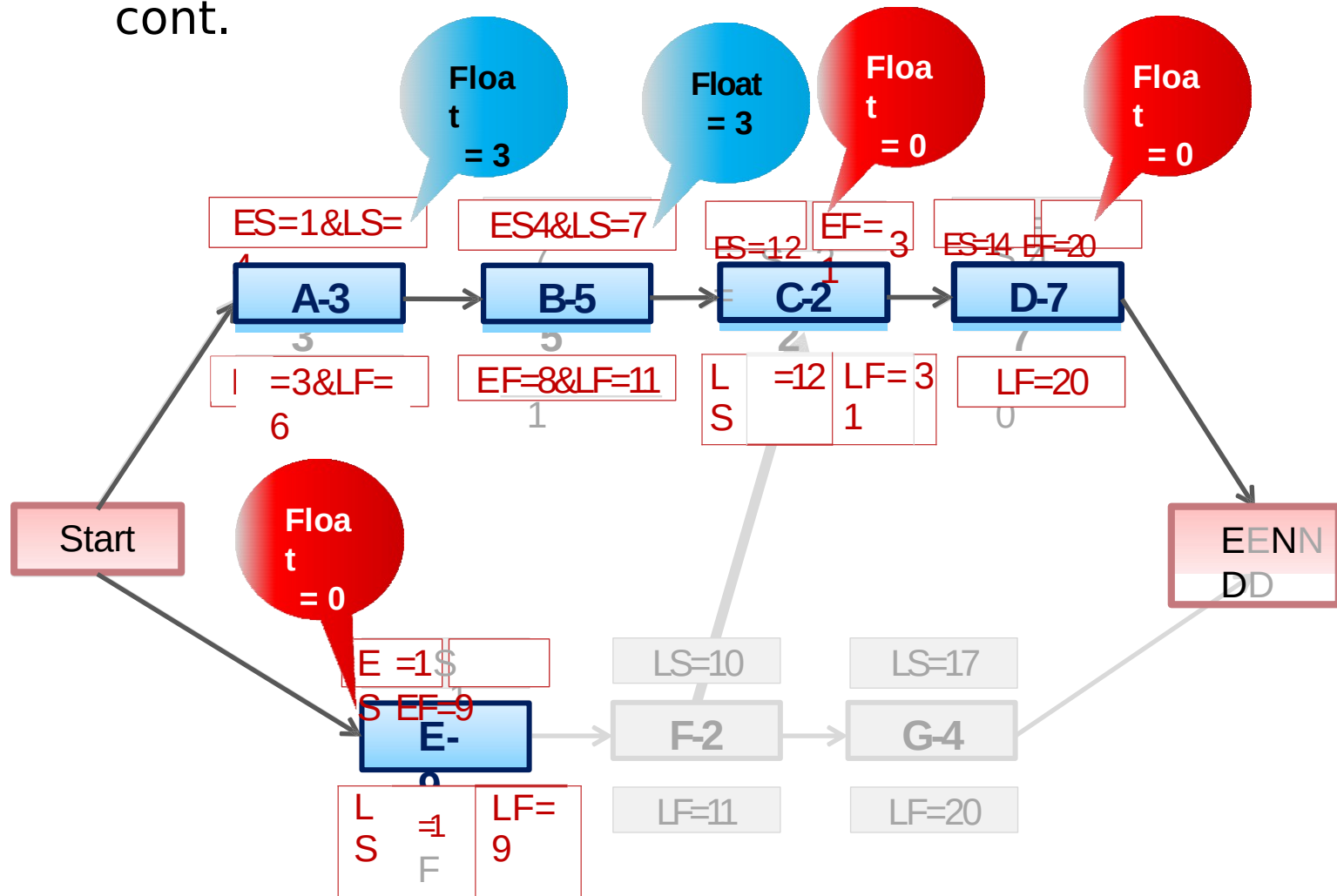
Critical Path Method (CPM) – cont.



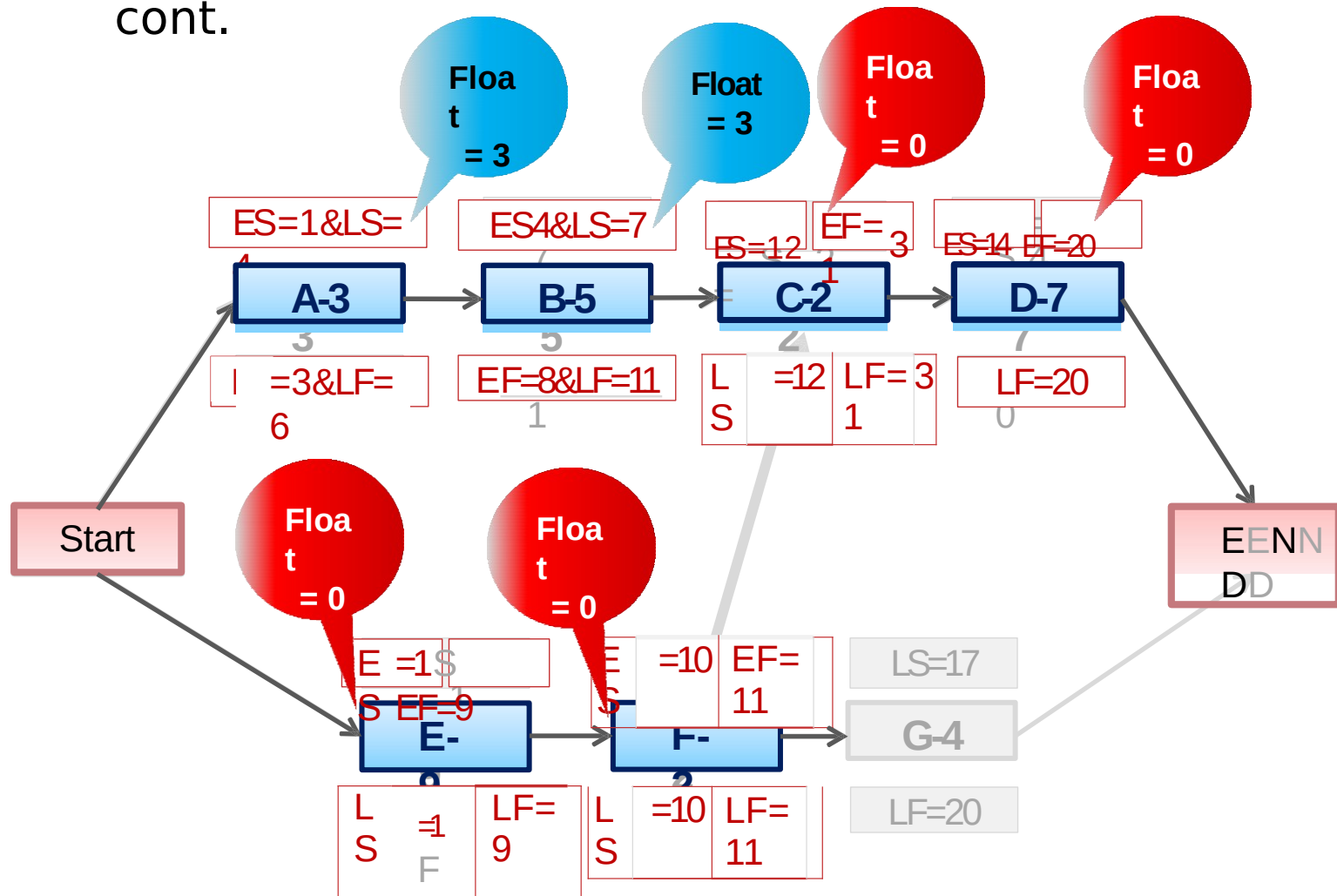
Critical Path Method (CPM) – cont.



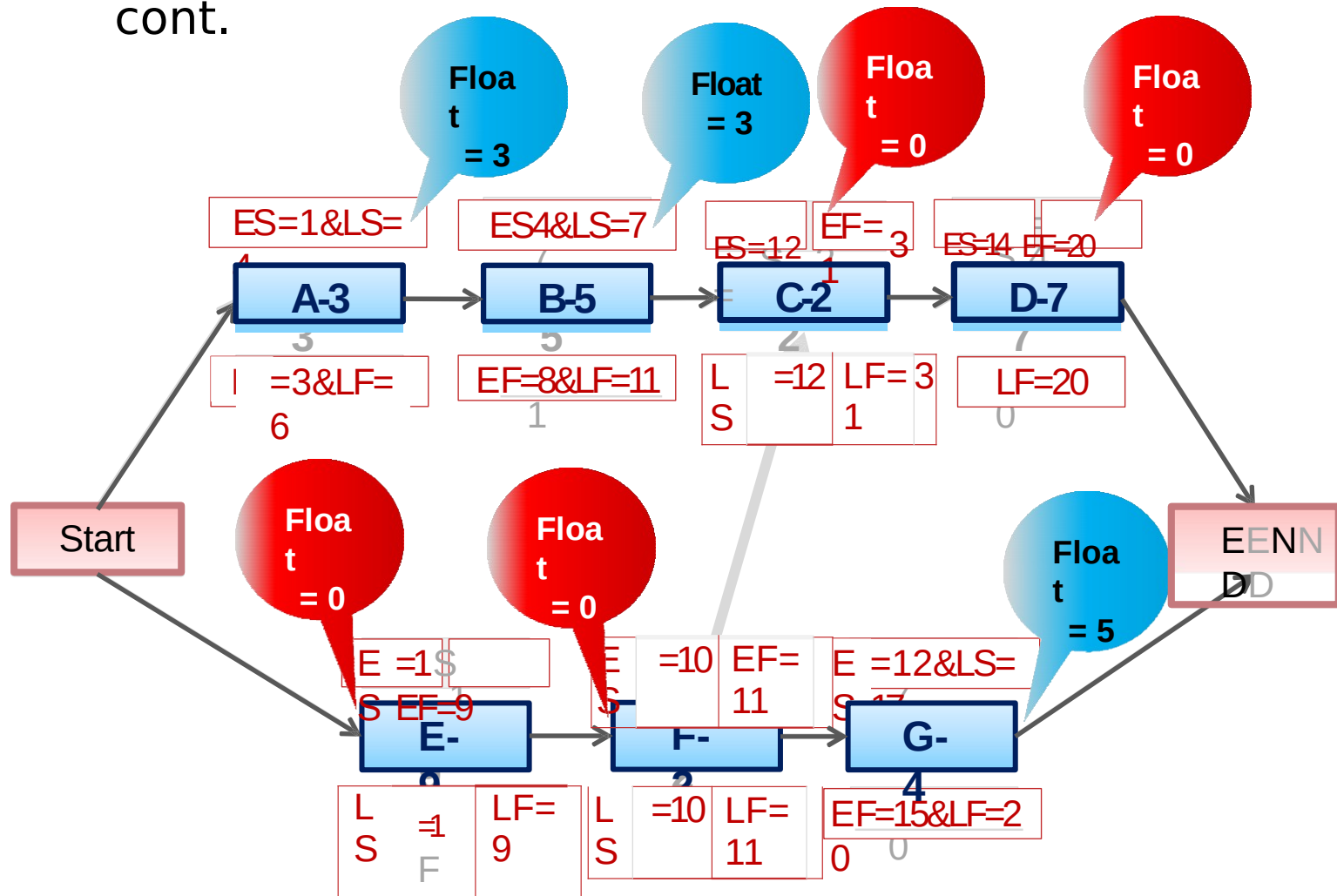
Critical Path Method (CPM) – cont.



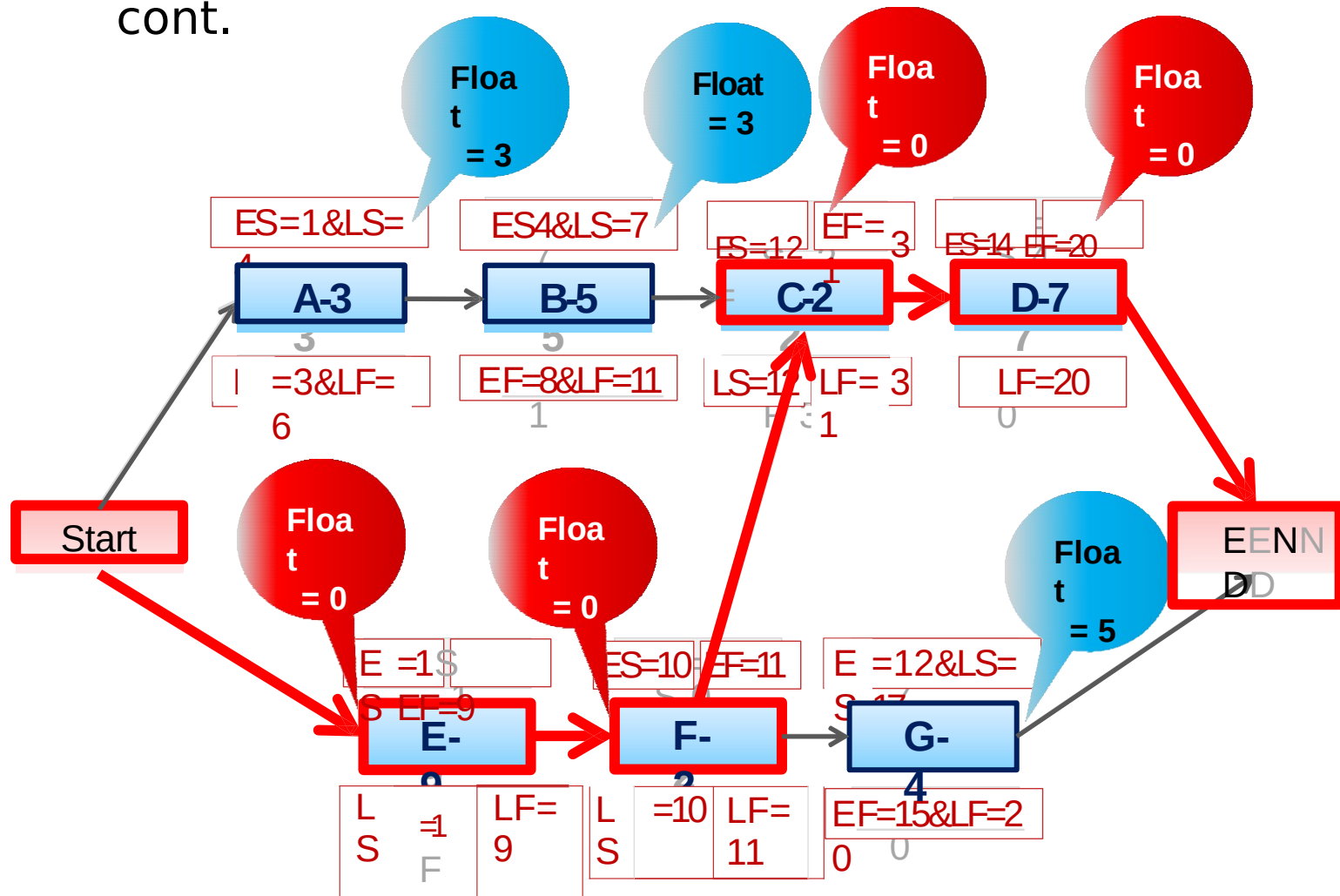
Critical Path Method (CPM) – cont.



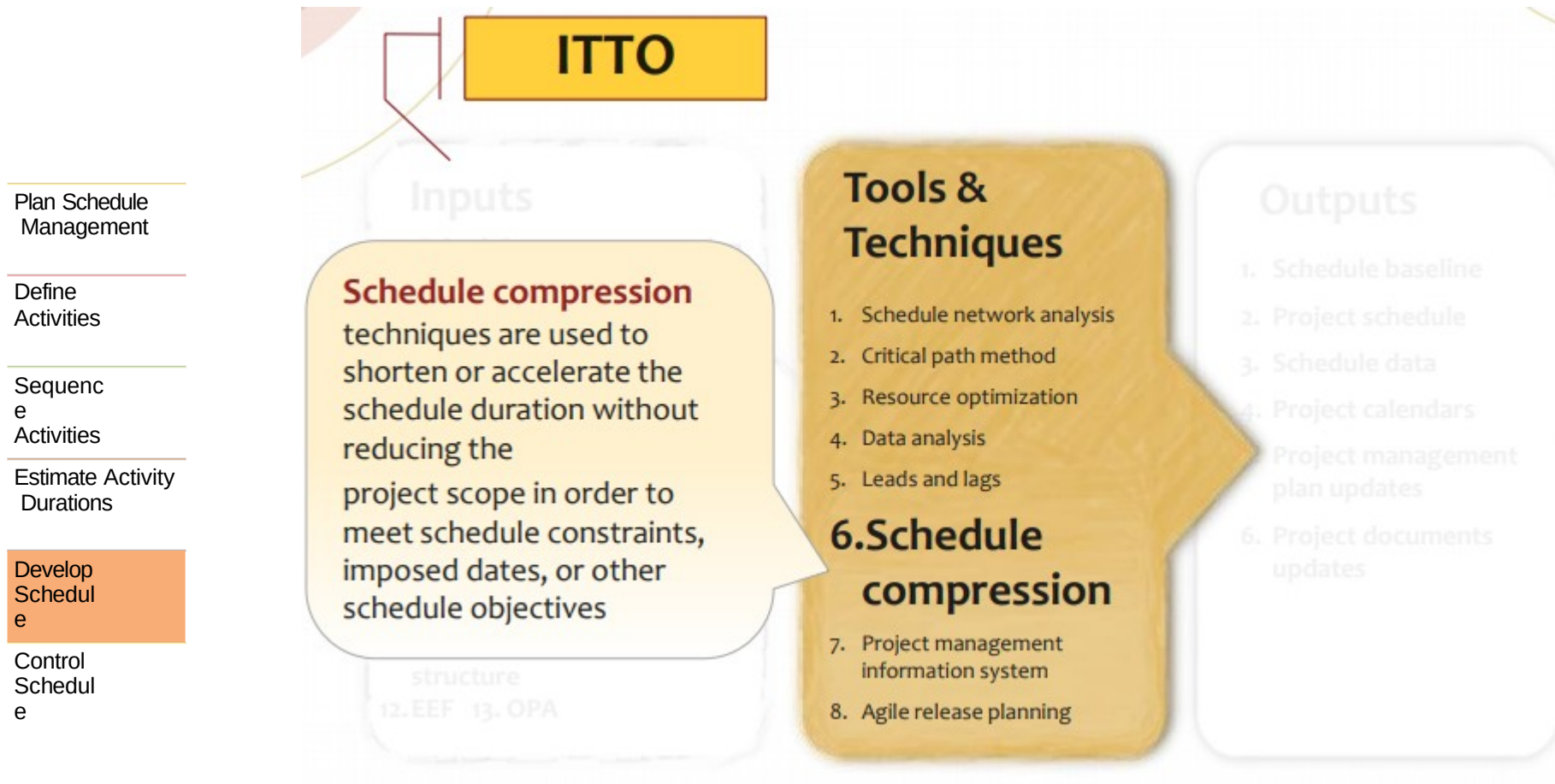
Critical Path Method (CPM) – cont.



Critical Path Method (CPM) – cont.



Schedule compression



Schedule Compression



Duration Compression

- Is a mathematical approach to scheduling
- Is to calculate how the project is done sooner

Crashing

- A technique used to shorten the schedule duration for the least incremental cost by adding resources

Fast Tracking

- A schedule compression technique in which activities or phases normally done in sequence are performed in parallel for at least a portion of their duration

Plan Schedule
Management

Define
Activities

Sequence
Activities

Estimate Activity
Durations

Develop
Schedule

Control
Schedule

Develop Schedule



ITTO

a project schedule model can be presented in tabular form, it is more often presented graphically, using one or more of the following formats

Bar charts

Milestone charts

Project schedule network diagrams

Outputs

1. Schedule baseline

2. Project schedule

3. Schedule data

4. Project calendars

5. Change requests

6. Project management plan updates

7. Project documents updates

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Develop Schedule



ITTO

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

a project calendar identifies working days and shifts that are available for scheduled activities

Outputs

1. Schedule baseline
2. Project schedule
3. Schedule data

4. Project calendar

5. Change requests
6. Project management plan updates
7. Project documents updates

Control Schedule



Definition

The process of **monitoring** the status of the project to update the project schedule and managing changes to the schedule baseline.

Plan Schedule
Management

Define
Activities

Sequenc
e
Activities

Estimate Activity
Durations

Develop
Schedul
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Control
Schedul
e

Control Schedule



Notes

- Schedule Control is concerned with
 - ✓ Determining the current status
 - ✓ Influencing the factors
 - ✓ Determining the changes occurred in schedule
 - ✓ Managing actual changes as they occur

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Control Schedule



ITTO

Inputs

1. Project management plan
2. Project documents
3. Work performance data
4. Organizational process assets

Tools & Techniques

1. Data Analysis
2. Critical path method
3. Project management information system
4. Resource optimization
5. Leads and lags
6. Schedule compression

Outputs

1. Work performance information
2. Schedule forecasts
3. Change requests
4. Project management plan updates
5. Project documents updates

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Control Schedule



ITTO

Inputs

1. Project management plan
2. Project documents

3. Work performance data
4. Organizational process assets

- Schedule management plan
- Schedule baseline
- Scope baseline
- Performance measurement baseline

- Lessons learned register
- Project calendars
- Project schedule
- Resource calendars
- Schedule data

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Control Schedule



ITTO

Tools & Techniques

1. Data Analysis

2. Critical path method
3. Project management information system
4. Resource optimization
5. Leads and lags
6. Schedule compression

- Earned value analysis
- Iteration burndown chart
- Performance reviews
- Trend analysis
- Variance analysis
- What-if scenario analysis

Plan Schedule Management

Define Activities

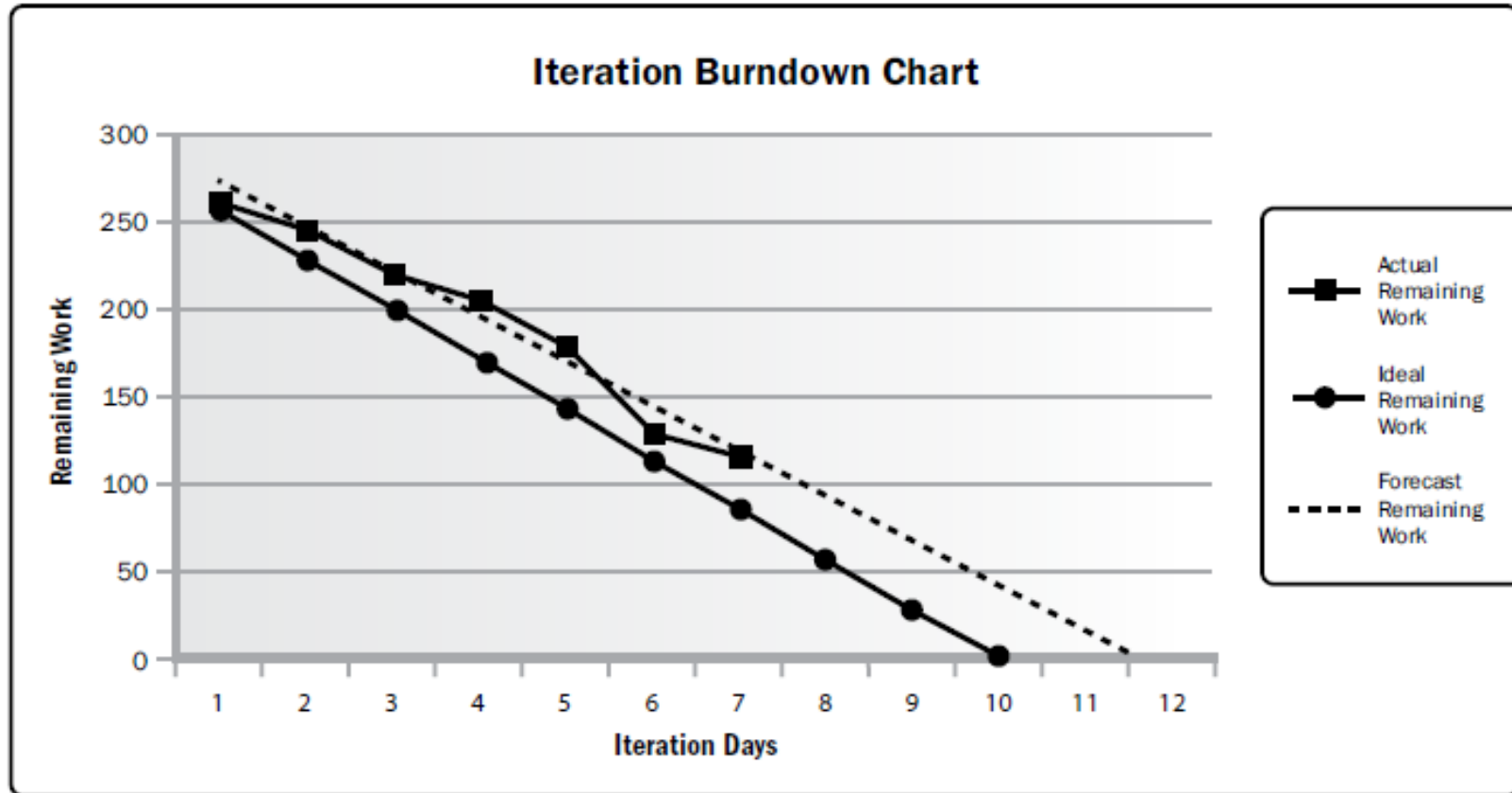
Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

Iteration burndown chart



Plan Schedule Management

Define Activities

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Control Schedule



ITTO

Plan Schedule Management

Define Activities

Sequence Activities

Estimate Activity Durations

Develop Schedule

Control Schedule

- Schedule management plan
- Schedule baseline
- Cost baseline
- Performance measurement baseline

- Assumption log
- Basis of estimates
- Lessons learned register
- Project schedule
- Resource calendars
- Risk register
- Schedule data

Output

- S**
1. Work performance information
 2. Schedule forecasts
 3. Change requests
- 4. Project management plan updates**
- 5. Project document**

Project Schedule Management



To Sum up..

- ◆ We identified the **project Schedule management knowledge area's**
- ◆ **processes**
We know how to plan schedule
- ◆ **management**
- ◆ We know how to **define Activities**
We know how to **sequence the activities**

Project Schedule Management



To Sum up..

- ◆ We know how to **estimate Activity Durations**
 - ◆ We know how to **develop**
 - ◆ **schedule**
- We know how to **control**
schedule

Questions ?

