GSOE9820 – Engineering Project Management

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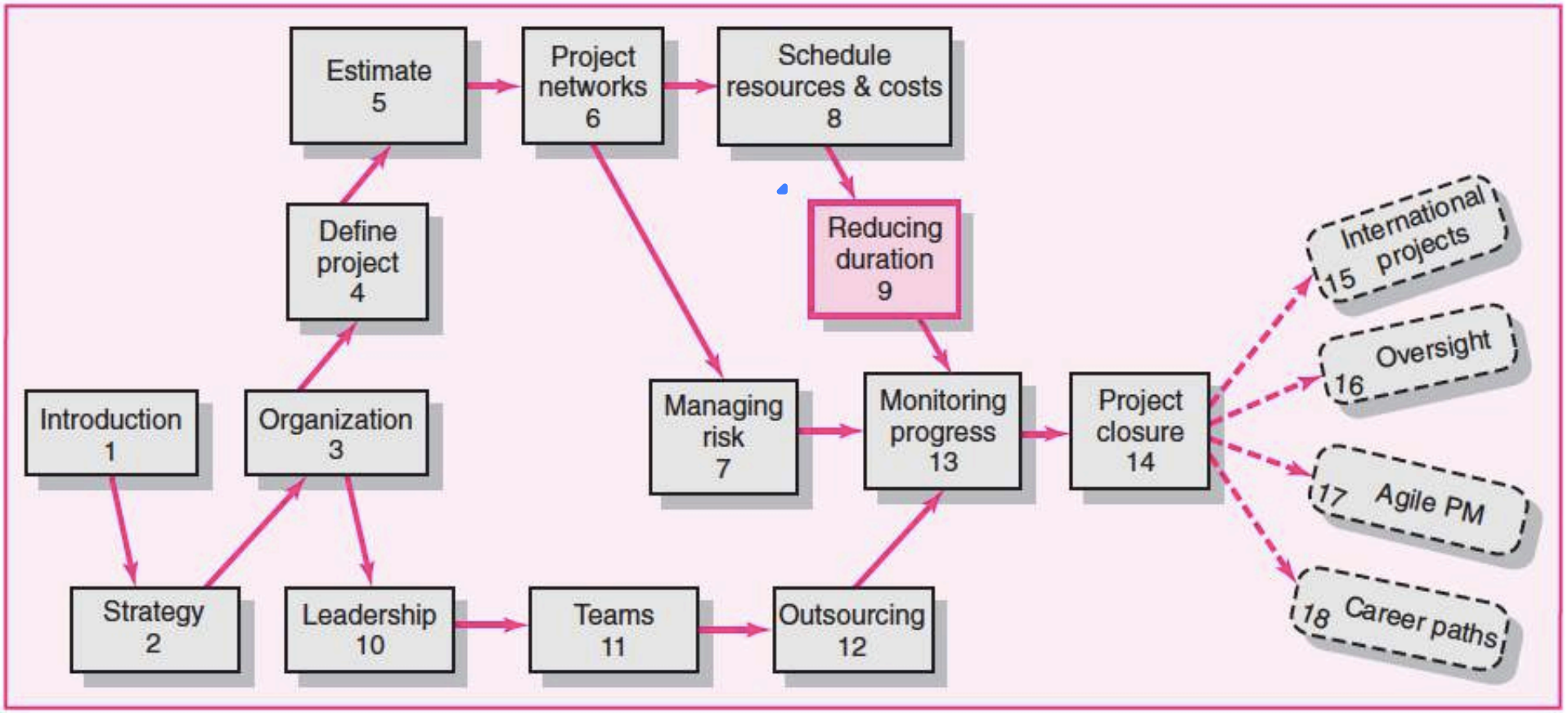
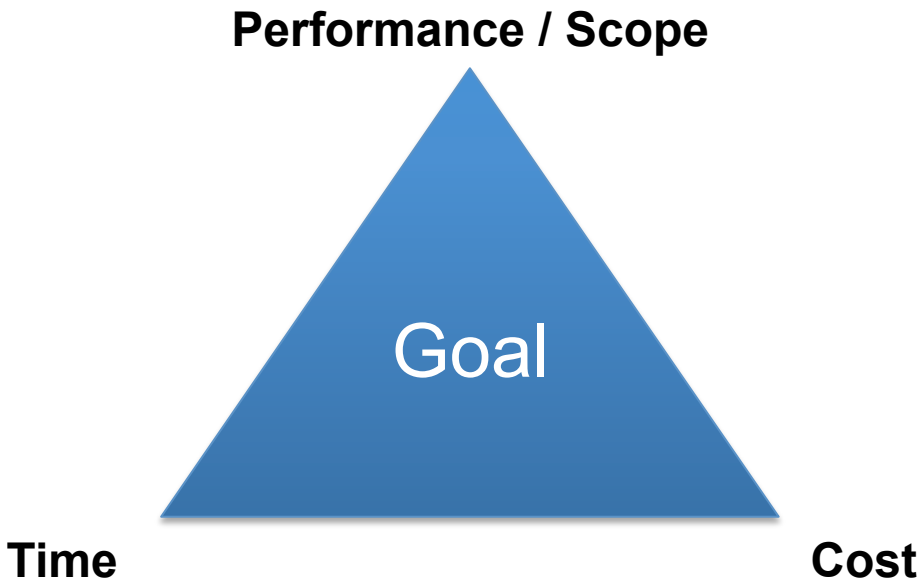
Week 8 - Part I
Reducing Project Duration

Course Roadmap



Triple Constraint Model



Reasons for reducing duration

- Time-to-market pressures
- Unforeseen delays
- Incentive contracts (bonuses for early completion)
- Imposed deadlines and contract commitments
- Overhead and public goodwill costs
- Pressure to move resources to other projects

Options for accelerating completion

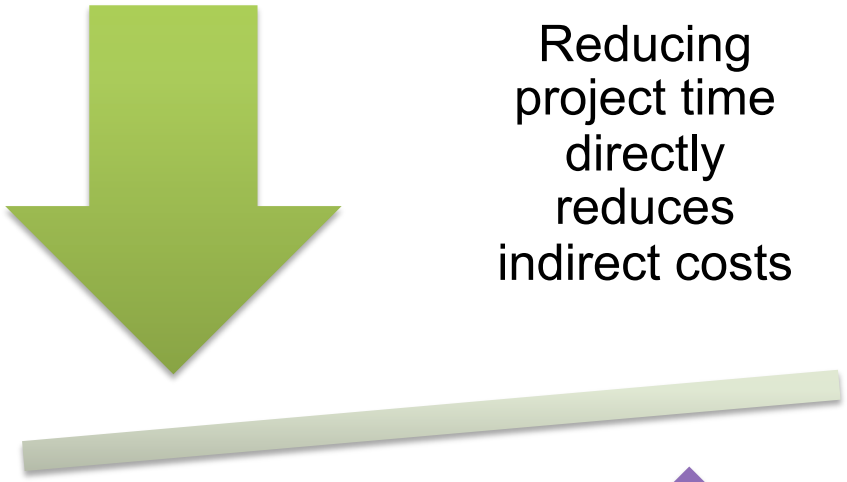
When resources are **not** constrained

- Adding resources
- Outsourcing project work
- Scheduling overtime
- Establishing a core project team
- Do it twice—fast and then correctly

When resources are constrained

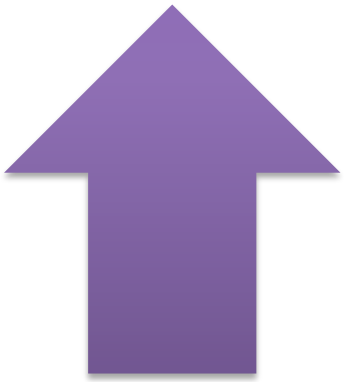
- Fast-tracking
- Critical chain
- Reducing project scope
- Compromise quality

Consequences of reducing time



Reducing project time directly reduces indirect costs

Shortening activities increases direct costs



Types of project costs

Direct costs

- Costs that are clearly chargeable to a specific work package
- E.g. labour, materials, equipment and other

Direct (project) overhead costs

- Costs incurred that are directly tied to an identifiable project deliverable or work package
- E.g. salary, rents, supplies, specialised machinery

Indirect (general and administrative) overhead costs

- Organisation costs indirectly linked to a specific package that are apportioned to the project
- Costs that cannot be associated with any particular work package or project activity. E.g. supervision, administration, consultants and interest

Critical path

The ***Critical path*** is:

- the **longest path** through the activity network that allows for the completion of all activities;
- the **shortest expected time** in which the entire project can be completed.

“Crashing” strategy

Look first to reducing activities on the critical path to shorten overall duration of the project.

Process of reducing project duration to reduce project cost

Gather information about direct and indirect costs of specific project durations

Search critical activities for lowest direct-cost activities to shorten project duration

Compute total costs for specific durations and compare to benefits of reducing project time

Project Cost-Duration graph

Is a tool to quickly and logically compare the benefits of reducing project time with cost

Can be used before the project begins as well as while the project is in progress

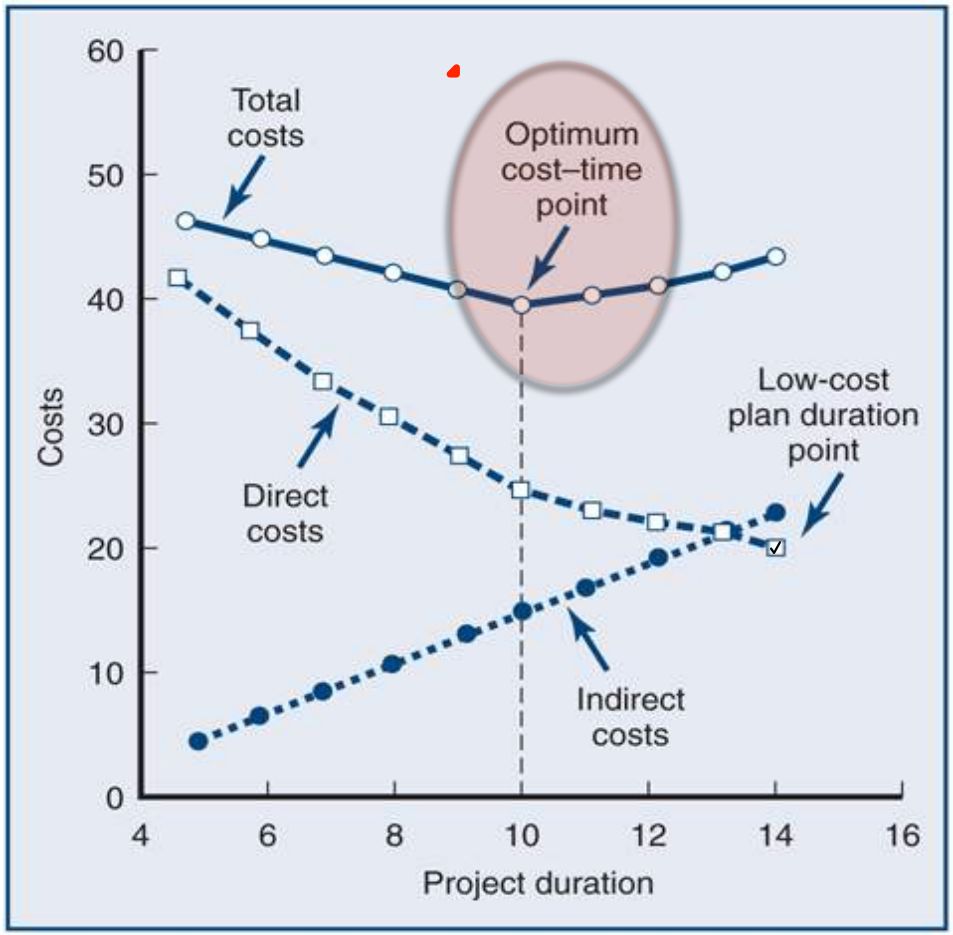
Key terms

Term	Definition
Normal time	Is the low-cost, realistic, efficient method for completing an activity under normal conditions
Crashing	Means shortening an activity
Crash time	Is the shortest possible time that an activity can realistically be completed in
Crash cost	Is the direct cost for completing an activity within the crash time
Crash point	Represents the maximum time an activity can be compressed/reduced.

Constructing a project cost–duration graph

Project Cost–Duration graph

Figure 9.1 PROJECT COST–DURATION GRAPH



Determining which activities to shorten

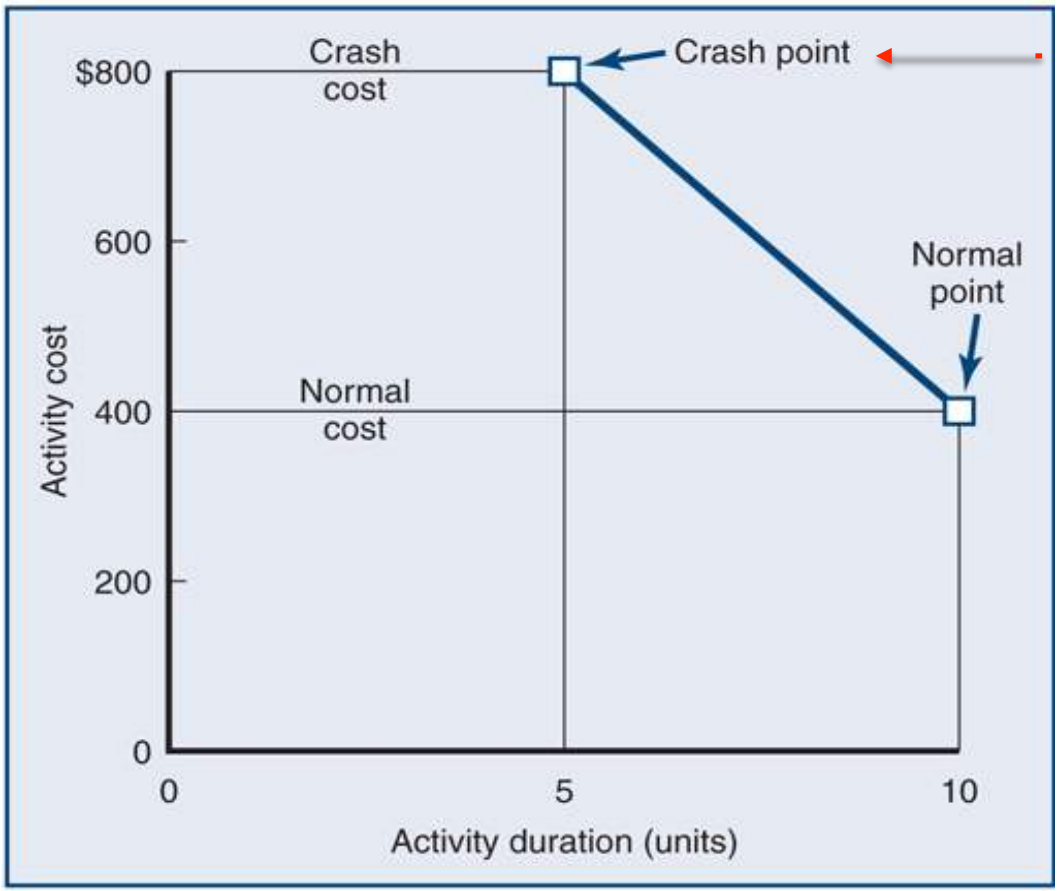
Shorten critical activities which will incur the least cost.

this could also be said as

- Shorten the critical activities with the smallest increase in cost per unit of time

Activity cost-duration graph

Figure 9.2 ACTIVITY GRAPH



Represents the maximum time that an activity can be compressed

Is the original low-cost, early-start schedule

Assumptions for activity graphs

- The cost relationship is linear
- Normal time assumes low-cost, efficient methods to complete the activity
- Crash time represents a limit—the greatest time reduction possible under realistic conditions
- Slope represents a constant cost *per unit of time*
- All accelerations must occur within the normal and crash times.

Activity Cost Slope Equation

The slope of the activity graph indicates the cost per unit of time for that activity.

$$Cost\ Slope = \frac{Rise}{Run}$$

$$Cost\ Slope = \frac{Crash\ Cost - Normal\ Cost}{Normal\ Time - Crash\ Time}$$

Impact of Project Crashing

Reducing the project duration increases the risk of being late

Project Crashing means that slack on non-critical activities will be reduced. Which means the chance of new critical paths occurring increases. Hence, the risk of the project becoming late increases.

- Reduces flexibility by using slack
- Can increase number of critical activities
- Can increase interdependencies of paths
- Makes resource scheduling tighter (critical)
- May increase costs

Practical considerations

Using the project cost–duration graph

- Great tool especially at beginning of project.
- Indirect cost is not forgotten

Crash times

- Difficult task to estimate maximum amount of crash time

Linearity assumption

- Not perfect but good enough. Reduces complexity

Choice of activities to crash need to be revisited

- Cost, Risk, Resources and Timing all need to be considered

Time reduction decisions and sensitivity

- Evaluate benefit against risk and cost before making decision

What if cost and not time is the issue?

Commonly used options for cutting costs

- reduce project scope
- have owner take on more responsibility
- outsource project activities or even the entire project
- brainstorm cost savings options (innovation)