

SPM

Project Time Management

Day 6: Project Time Management

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Last Class We Discussed

- What is Project Scope Management ?
- Project Scope Management Processes
- Defining scope management
- Collecting requirements
- Defining scope
- Creating WBS
- Validating scope
- Controlling scope
- Guidelines/Case studies



Today's Learning Objectives

- What is Project Time Management ?
- Project Time Management Processes
- Myers-Briggs Personality Type Indicators
- Network Diagrams - ADM & PDM
- Task Dependencies
- SMART Criteria
- Determining Critical Path
- PERT
- Agile and Time Management



Importance of Time Management

- ⇒ **Time** has the least amount of flexibility i.e. It keeps on passing no matter what happens on a project.
- ⇒ Schedule issues are the main reason for conflicts on projects, especially during the second half of the projects
- ⇒ **Meeting deadline** is often one of the biggest challenges for Project Managers.
- ⇒ One dimension of **Myers-Briggs Type Indicator** focuses on people's attitudes towards structure and deadline.

PERSONALITY TYPES KEY



Extroverts

Extroverts are energized by people, enjoy a variety of tasks, a quick pace, and are good at multitasking.



Sensors

Sensors are realistic people who like to focus on the facts and details. They apply common sense and past experience to find practical solutions to problems.



Thinkers

Thinkers tend to make their decisions using logical analysis, objectively weigh pros and cons, and value honesty, consistency, and fairness.



Judgers

Judgers tend to be organized and prepared, like to make and stick to plans, and are comfortable following most rules.



Introverts

Introverts often like working alone or in small groups, prefer a more deliberate pace, and like to focus on one task at a time.



Intuitives

Intuitives prefer to focus on possibilities and the big picture, easily see patterns, value innovation, and seek creative solutions to problems.



Feelers

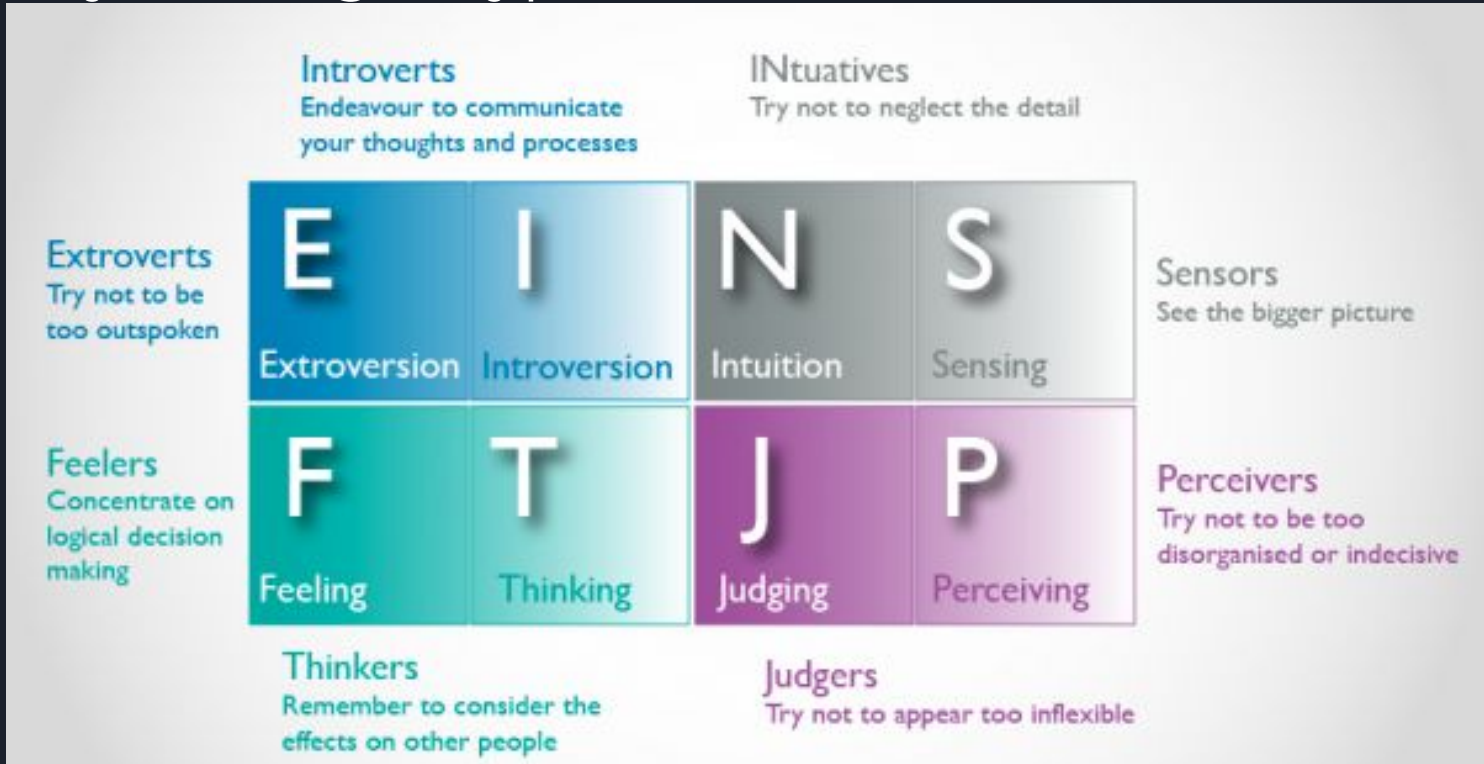
Feelers tend to be sensitive and cooperative, and decide based on their own personal values and how others will be affected by their actions.



Perceivers

Perceivers prefer to keep their options open, like to be able to act spontaneously, and like to be flexible with making plans.

Myers-Briggs Type Indicators



What's Your Personality Type?

Use the questions on the outside of the chart to determine the four letters of your Myers-Briggs type.
For each pair of letters, choose the side that seems most natural to you, even if you don't agree with every description.

1. Are you outwardly or inwardly focused? If you:

- Could be described as talkative, outgoing
- Like to be in a fast-paced environment
- Tend to work out ideas with others, think out loud
- Enjoy being the center of attention

then you prefer

E
Extraversion

- Could be described as reserved, private
- Prefer a slower pace with time for contemplation
- Tend to think things through inside your head
- Would rather observe than be the center of attention

then you prefer

I
Introversion

2. How do you prefer to take in information? If you:

- Focus on the reality of how things are
- Pay attention to concrete facts and details
- Prefer ideas that have practical applications
- Like to describe things in a specific, literal way

then you prefer

S
Sensing

- Imagine the possibilities of how things could be
- Notice the big picture, see how everything connects
- Enjoy ideas and concepts for their own sake
- Like to describe things in a figurative, poetic way

then you prefer

N
Intuition

ISTJ

Responsible, sincere, analytical, reserved, realistic, systematic. Hardworking and trustworthy with sound practical judgment.

ISFJ

Warm, considerate, gentle, responsible, pragmatic, thorough. Devoted caretakers who enjoy being helpful to others.

INFP

Idealistic, organized, insightful, dependable, compassionate, gentle. Seek harmony and cooperation, enjoy intellectual stimulation.

INTJ

Innovative, independent, strategic, logical, reserved, insightful. Driven by their own original ideas to achieve improvements.

ISTP

Action-oriented, logical, analytical, spontaneous, reserved, independent. Enjoy adventure, skilled at understanding how mechanical things work.

ISFP

Gentle, sensitive, nurturing, helpful, flexible, realistic. Seek to create a personal environment that is both beautiful and practical.

INFP

Sensitive, creative, idealistic, perceptive, caring, loyal. Value inner harmony and personal growth, focus on dreams and possibilities.

INTP

Intellectual, logical, precise, reserved, flexible, imaginative. Original thinkers who enjoy speculation and creative problem solving.

ESTP

Outgoing, realistic, action-oriented, curious, versatile, spontaneous. Pragmatic problem solvers and skillful negotiators.

ESFP

Playful, enthusiastic, friendly, spontaneous, tactful, flexible. Have strong common sense, enjoy helping people in tangible ways.

ENFP

Enthusiastic, creative, spontaneous, optimistic, supportive, playful. Value inspiration, enjoy starting new projects, see potential in others.

ENTP

Inventive, enthusiastic, strategic, enterprising, inquisitive, versatile. Enjoy new ideas and challenges, value inspiration.

ESTJ

Efficient, outgoing, analytical, systematic, dependable, realistic. Like to run the show and get things done in an orderly fashion.

ESFJ

Friendly, outgoing, reliable, conscientious, organized, practical. Seek to be helpful and please others, enjoy being active and productive.

ENFJ

Caring, enthusiastic, idealistic, organized, diplomatic, responsible. Skilled communicators who value connection with people.

ENTJ

Strategic, logical, efficient, outgoing, ambitious, independent. Effective organizers of people and long-range planners.

3. How do you prefer to make decisions? If you:

- Make decisions in an impersonal way, using logical reasoning
- Value justice, fairness
- Enjoy finding the flaws in an argument
- Could be described as reasonable, level-headed

then you prefer

T
Thinking

- Base your decisions on personal values and how your actions affect others
- Value harmony, forgiveness
- Like to please others and point out the best in people
- Could be described as warm, empathetic

then you prefer

F
Feeling

4. How do you prefer to live your outer life? If you:

- Prefer to have matters settled
- Think rules and deadlines should be respected
- Prefer to have detailed, step-by-step instructions
- Make plans, want to know what you're getting into

then you prefer

J
Judging

- Prefer to leave your options open
- See rules and deadlines as flexible
- Like to improvise and make things up as you go
- Are spontaneous, enjoy surprises and new situations

then you prefer

P
Perceiving



Case Studies

The 2004 Athens Summer Olympic Games as well as 2014 Sochi Winter Olympic Games were two cases where they failed to implement proper planning and scheduling compared to the 2002 Salt Lake City Winter Olympic Games Events.

Many articles before the opening ceremonies predicted that the facilities would not be ready in time. The Greeks however made fun of the critics by having construction workers pretend to work as ceremonies began on time. But the games budget overflowed more than twice the planned budget.

The 2014 Winter Olympic Games in Sochi, Russia, also suffered even greater financial loss and were one of the most expensive Olympic Events in history.

- Information Technology Project Management, Eighth Edition 2016



Project Time Management Processes

1. **Planning Schedule:** Determining policies, procedures, and documentation for plan, execution and control of the schedule.
2. **Defining activities:** identifying specific activities that team members and stakeholders must perform to produce the project deliverables
3. **Sequencing activities:** identifying/documenting relationships between project activities.
4. **Estimating activity resources:** estimating how many resources a project team should use to perform project activities.
5. **Estimating activity durations:** estimating no. of work periods that are needed to complete individual activities
6. **Developing the schedule:** analyzing activity sequences, activity resource estimates and activity duration estimates
7. **Controlling the schedule:** controlling and managing changes to the project schedule.

PROJECT TIME MANAGEMENT

Overview of a Project's Time Management Processes



Project Time Management Summarized

Planning

Process: **Plan schedule management**

Outputs: Schedule management plan

Process: **Define activities**

Outputs: Activity list, activity attributes, milestone list, project management plan updates

Process: **Sequence activities**

Outputs: Project schedule network diagrams, project documents updates

Process: **Estimate activity resources**

Outputs: Activity resource requirements, resource breakdown structure, project documents updates

Process: **Estimate activity durations**

Outputs: Activity duration estimates, project documents updates

Process: **Develop schedule**

Outputs: Schedule baseline, project schedule, schedule data, project calendars, project management plan updates, project documents updates

Monitoring and Controlling

Process: **Control schedule**

Outputs: Work performance information, schedule forecasts, change requests, project management plan updates, project documents updates, organizational process assets updates

Project Start

Project Finish



1) Planning Schedule Management

Use expert judgement, analytical techniques and meetings to develop the schedule management plan

Schedule Management Plan includes:

- Project schedule model development
- Schedule Methodology
- Level of accuracy and units of measure
- Control Thresholds
- Rules of performance measurement
- Reporting formats
- Process descriptions



2) Defining activities

An **activity** or **task** is an element of work normally found on the work breakdown structure (WBS) that has an **expected duration**, a cost and resource requirements.

Activity definition involves developing a more detailed WBS and supporting explanations to understand all the work to be done so you can **develop realistic cost and duration estimates**.

Activity List: is tabulation of activities. It includes activity name, activity identifier/number and brief description of the activity.

Activity attributes: more information such as predecessors, successors, logical relationships, leads and lags, resource requirements, constraints, imposed dates, and assumptions related to the activity.

Milestones: significant event that normally has no duration and often takes several activities to be achieved. Useful for setting schedule goals and monitoring progress.



Case Study - What went wrong ?

Project TRILOGY: US Federal Bureau of Investigation(FBI) undertook this project. It was a “disastrous, unbelievably expensive piece of vaporware, which was more than four years in the (un)making. The system was supposed to enable FBI agents to integrate intelligence from isolated information silos within the Bureau”*.

In May 2006, the Government Accounting Agency said that the TRILOGY project failed at its core mission of improving the FBI’s investigative abilities and was plagued with missed milestones and escalating costs. This system was later replaced in 2007 by a project named SENTINEL.

During test exercise in 2011, Sentinel experienced two outages and FBI determined that the current hardware structure was inadequate. In 2014, the system still wasn't working well.

- *Roberts, Paul, “Frustrated contractor sentenced for hacking FBI to speed deployment”, Infoworld Tech Watch July 6, 2006.



3) Sequencing Activities

- Involves reviewing activities and determining dependencies. A dependency or relationship is the sequencing of project activities or tasks.
- Dependencies need to be identified in order to use critical path analysis.
 - **Mandatory dependencies** - inherent in nature of work being performed. Eg: Code cannot be tested until it is written.
 - **Discretionary dependencies** - Referred to as soft logic and defined by project team. Eg: a team waiting for client to sign off all requirements before beginning work.
 - **External dependencies** - involves relationship between project and non project activities. Eg: installation of OS and softwares may depend on computer hardware supplier.



Network Diagrams

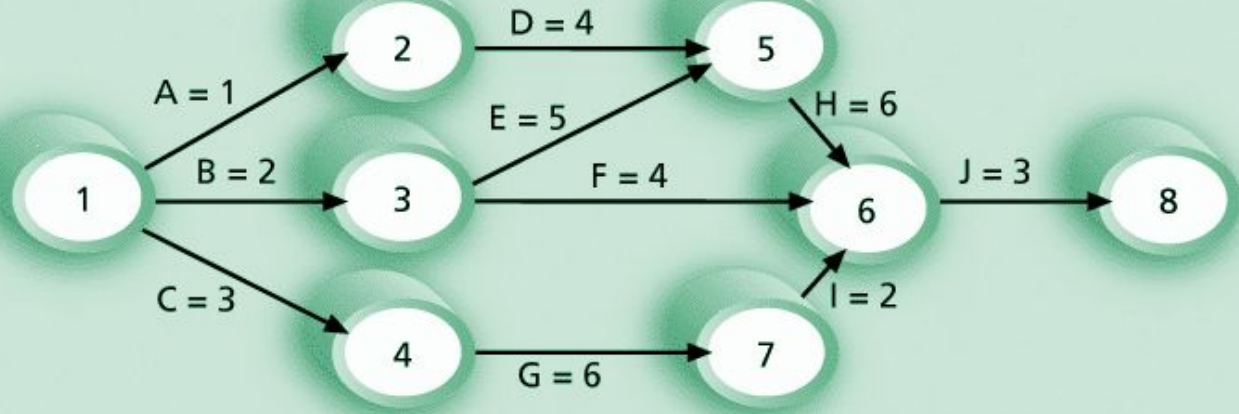
Network Diagrams are the preferred technique for showing activity sequencing

A network diagram is a schematic display of logical relationships among, or sequencing of, project activities.

Network Diagrams are of two main formats, which are:

- Arrow diagramming method, and
- Precedence diagramming method

Network Diagram for Project X - Arrow Diagram



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



Arrow Diagramming Method (ADM)

Also known as Activity-on-arrow (AOA) network diagrams. Activities are represented by arrows. Nodes and circles are starting and ending points of activities. It can only show finish-to-start dependencies.

PROCESS of creating/drawing ADM:

1. Find all activities that start at Node 1. Draw finish nodes and draw arrows. Put activity letter or name and duration estimated on associated arrow.
2. Continue working from left to right. Look for bursts and merges. **Bursts** occur when single node is followed by two or more activities. **Merge** occurs when multiple node precede a single node.
3. Continue drawing, until all activities are included on the diagram that have dependencies
4. As a rule of thumb, all arrowheads should face toward the right and no arrows should cross on an AOA network diagram



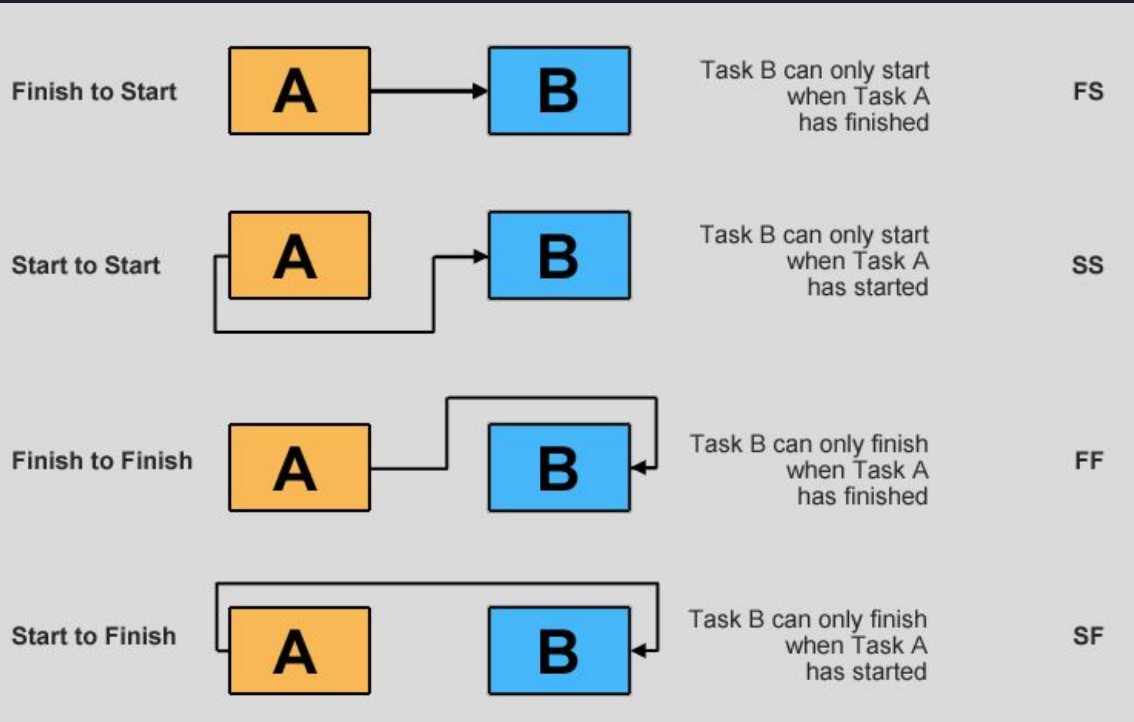
Precedence Diagramming Method (PDM)

- Activities are represented by boxes
- Arrows show relationships between activities
- More popular than ADM method and used by project management software
- Better at showing different types of dependencies

Next Slide showcases Task Dependency Types and sample PDM:

You link tasks by defining dependency between their finish and start dates. For example, the “Contact caterers” task must finish before the start of the “Determine Menus” Task . There are 4 kinds of task dependencies in a Project.

Task Dependency Types





Examples of Dependency Types

Finish to Start: From activity must finish before to activity can start. Eg: User Training cannot be provided before software development is completed. This is the most common type of dependency in an AOA network diagram.

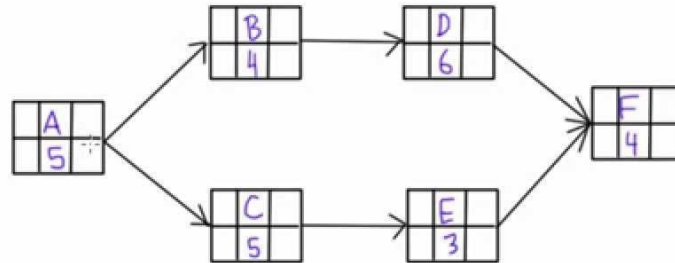
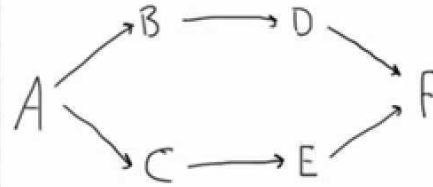
Start to Start: From cannot start until To activity is started. Eg: tasks needed to be done after a software/web app goes live.

Finish to Finish: From must finish before To can be finished. Eg: QA cannot finish before production finishes, although both may go parallelly.

Start to Finish: From must start before To can be finished. Rare dependency. Eg: Gathering raw materials must start for construction tasks to be finished.

Sample PDM Network Diagram

Activity	Predecessor	Duration
A	-	5
B	A	4
C	A	5
D	B	6
E	C	3
F	D,E	4



<https://www.youtube.com/watch?v=TmXBZk6y1IU>



PDM VS AOA

PDM outshines AOA diagramming method as it offers multitude of advantages:

- Most project management softwares use PDM
- PDM avoids the need to use dummy activities(with no duration/resources that are occasionally needed on AOA to show logical relationships between activities). These activities are represented with dashed lines and have zero for duration estimates.
- PDM shows different dependencies amongs tasks, whereas AOA use only finish-to-start dependencies.



4) Estimating Activity Resources

You must have good idea of quantity and type of resources assigned to each activity prior to estimating activity durations. Resources are people, equipment and materials

RESOURCE BREAKDOWN STRUCTURE: is a hierarchical structure that identifies the project's resources by category and type.

Questions to ponder on while estimating activity resources:

How difficult will activities be ?

What is organization history in relation to similar activities ?

Does it have enough assets ? Are there any policies that might affect availability of resources ?

Does it need to acquire more resources to accomplish the work? Or should Outsourcing be considered ?



5) Activity Duration Estimating

- **Duration** includes actual amount of time worked on an activity plus elapsed time.
- **Effort** is number of workdays or work hours required to complete a task
- Effort does not normally equal duration
- People doing the work should help create estimates and an expert should review them.



Three-Point Estimates

Instead of providing activity estimates as discrete number like x weeks, it's often helpful to create three point estimate.

An estimate that includes an **optimistic**, **most likely**, and **pessimistic** estimate.

For eg: 3 weeks would be Optimistic, 4 weeks most likely and 5 week pessimistic estimates.

Three point estimates are needed for PERT and Monte Carlo Simulations, which we shall study ahead.



6) Developing Schedule

- Uses results of other time management processes to determine the start date and end date of the project.
- Ultimate goal is to create a realistic project schedule that provides a basis for monitoring project progress for time dimension of the project.
- Important tools and techniques include Gantt Chart, Critical Path Analysis and Critical Chain Scheduling and PERT Analysis.

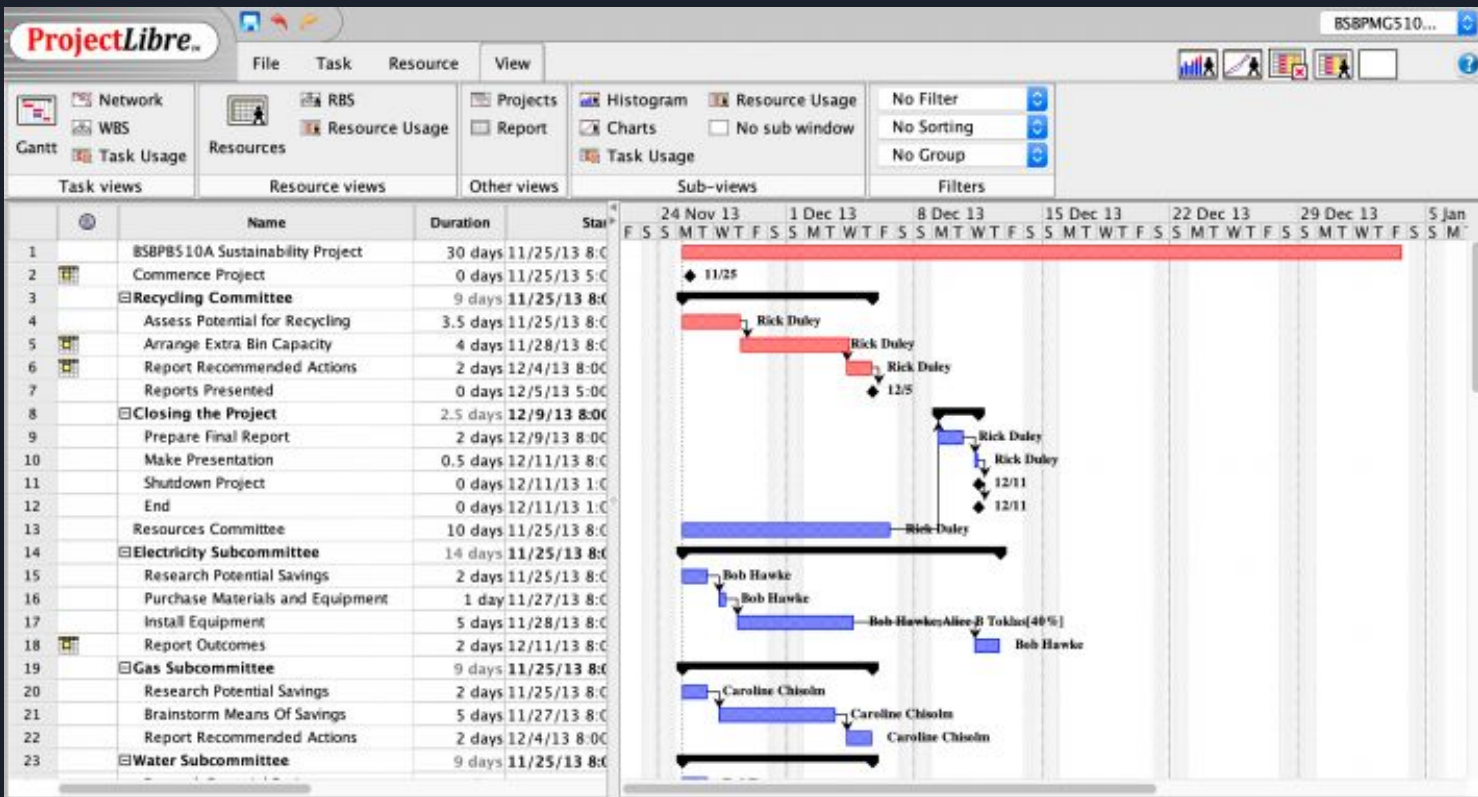


Gantt Charts

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.

Symbols used:

- A black diamond to represent Milestones.
- Thick black bars/rectangles to represent summary tasks
- Lighter horizontal bars to represent duration of tasks
- Arrow to represent dependencies between tasks



SMART Criteria for milestones



SPECIFIC

Be clear and specific so your goals are easier to achieve. This also helps you know how and where to get started!



MEASURABLE

Measurable goals can be tracked, allowing you to see your progress. They also tell you when a goal is complete.



ACTIONABLE

Are you able to take action to achieve the goal? Actionable goals ensure the steps to get there are within your control.



REALISTIC

Avoid overwhelm and unnecessary stress and frustration by making the goal realistic.



TIMEBOUND

A date helps us stay focused and motivated, inspiring us and providing something to work towards.

SMART GOALS EXPLAINED

THE COACHING
TOOLS COMPANY.COM



Critical Path Method (CPM)

CPM is a network diagramming technique used to predict total project duration.

A **critical path** for a project is the series of activities that determines the earliest time by which the project can be completed

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

Slack/Float is the amount of time an activity may be delayed without delaying a succeeding activity or the project finish date

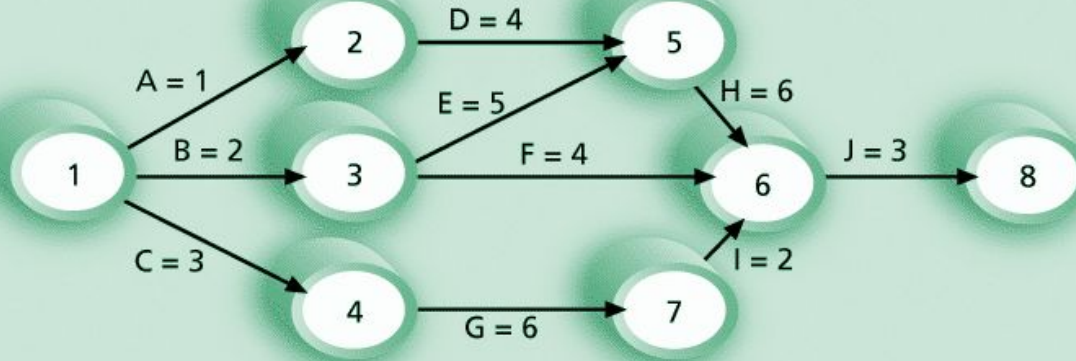


Calculating/Identifying the Critical Path

1. Develop a good network diagram
2. Add duration estimates for all activities on each path through the network diagram
3. Longest path is the critical path

If one or more activities on the critical path takes longer than planned, whole project schedule will slip unless the Project Manager takes corrective action !!

Determining Critical Path - Sample



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.



Things to consider on Critical Path

- Critical path is not the one with all critical activities. It only accounts for time.
- There can be more than one critical path if the lengths of two or more paths are the same
- The critical path can change as the project progresses.

Using CRITICAL PATH ANALYSIS to make Schedule Trade-Offs:

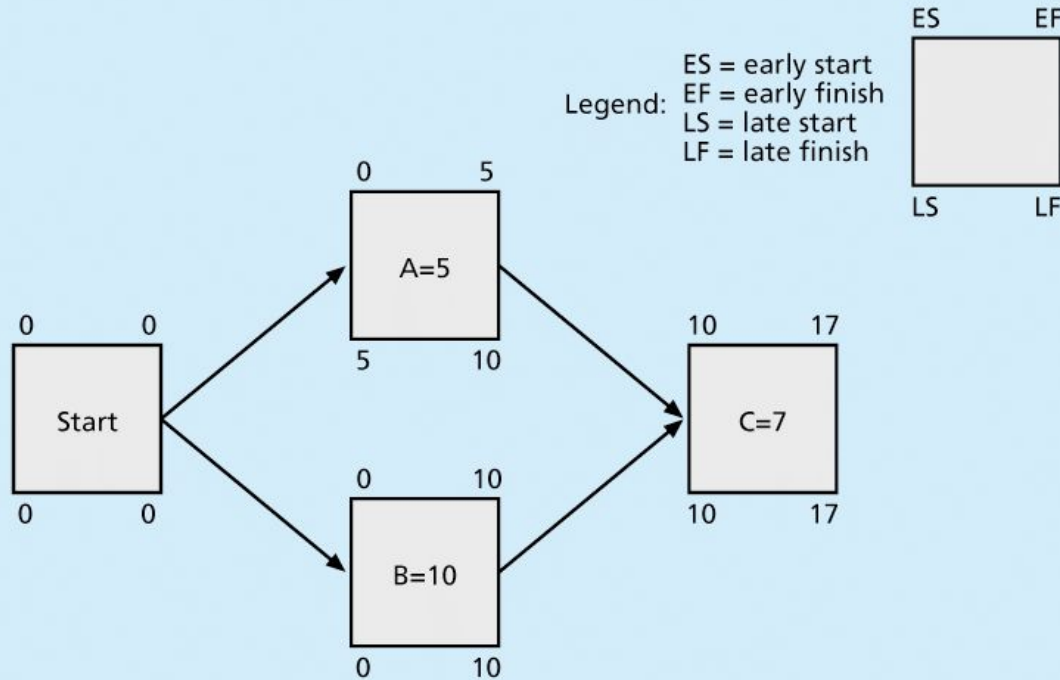
Free Slack/Float: amount of time an activity can be delayed without delaying early start of any immediately following activities

Total Slack/Float: amount of time an activity may be delayed from its early start without delaying the planned project finish date

A **forward pass** through the network diagram determines early start and finish dates.

A **backward pass** determines the late start and finish dates

Calculating Early and Late Start and Finish Dates



Free and Total Float/Slack

Task Name	Start	Finish	Late Start	Late Finish	Free Slack	Total Slack
A	8/3/15	8/3/15	8/5/15	8/5/15	0d	2d
B	8/3/15	8/4/15	8/3/15	8/4/15	0d	0d
C	8/3/15	8/5/15	8/5/15	8/7/15	0d	2d
D	8/4/15	8/7/15	8/6/15	8/11/15	2d	2d
E	8/5/15	8/11/15	8/5/15	8/11/15	0d	0d
F	8/5/15	8/10/15	8/14/15	8/17/15	7d	7d
G	8/6/15	8/13/15	8/10/15	8/17/15	0d	2d
H	8/12/15	8/19/15	8/12/15	8/19/15	0d	0d
I	8/14/15	8/17/15	8/18/15	8/19/15	2d	2d
J	8/20/15	8/24/15	8/20/15	8/24/15	0d	0d



Using Critical Path to Shorten a Project Schedule

3 main techniques for shortening schedules:

- Shortening durations of critical activities/tasks by **adding more resources** or changing their scope.
- **Crashing activities** by obtaining the greatest amount of schedule compression for the least incremental cost. Main advantage of crashing is shortening time needed to finish the project while disadvantage being that it often increases total project costs.
- **Fast tracking** activities by doing them in parallel or overlapping them. It's disadvantage is that it can lengthen project schedule sometimes as starting tasks too soon may result in rework and increase project risk.



Importance of Updating Critical Path Data

- In addition to finding critical path at the beginning of a project, it is important to update the schedule with actual data.
- It is important to update project schedule information to meet time goals for a project.
- The critical path may change as you enter actual start and finish dates.
- If you know the project completion date will slip, negotiate with the project sponsor at the earliest possible.



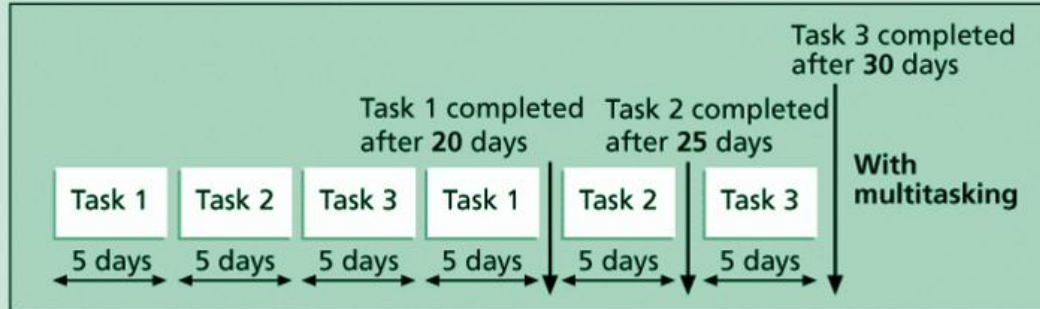
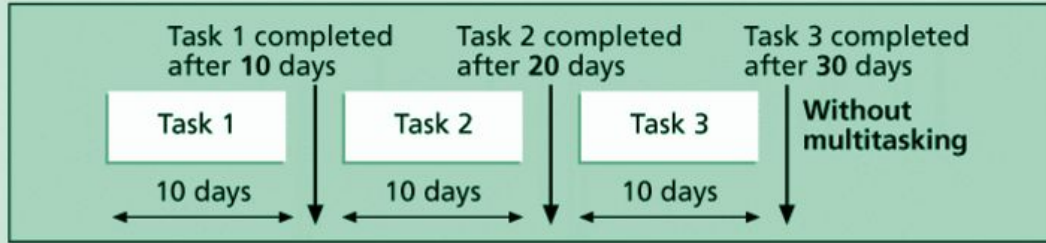
Critical Chain Scheduling

CCS is a method of scheduling **that considers limited resources** when creating a project schedule and **includes buffers to protect the project completion date**

It uses **Theory of Constraints (TOC)**, a management philosophy developed by Eliyahu M. Goldratt and introduced in his book “The Goal and Critical Chain”. It is based on the **metaphor of a chain and its weakest link**: Any complex system at any point in time often has only one aspect or constraint that limits the ability to achieve more of the system’s goal. For the system to attain any significant improvement, that constraint must be identified, and the whole system must be managed with it in mind.

It attempts to minimize multitasking when a resource works on more than one task at a time.

Multitasking example





More on Critical Chain Scheduling

It assumes that resources do not multi task or at the very least minimize multitasking.

Someone should not be assigned to two tasks simultaneously on the same project when critical chain scheduling is in effect.

Likewise, critical chain theory suggests that projects be prioritized so that people who are working on more than one project at a time know which tasks take priority.

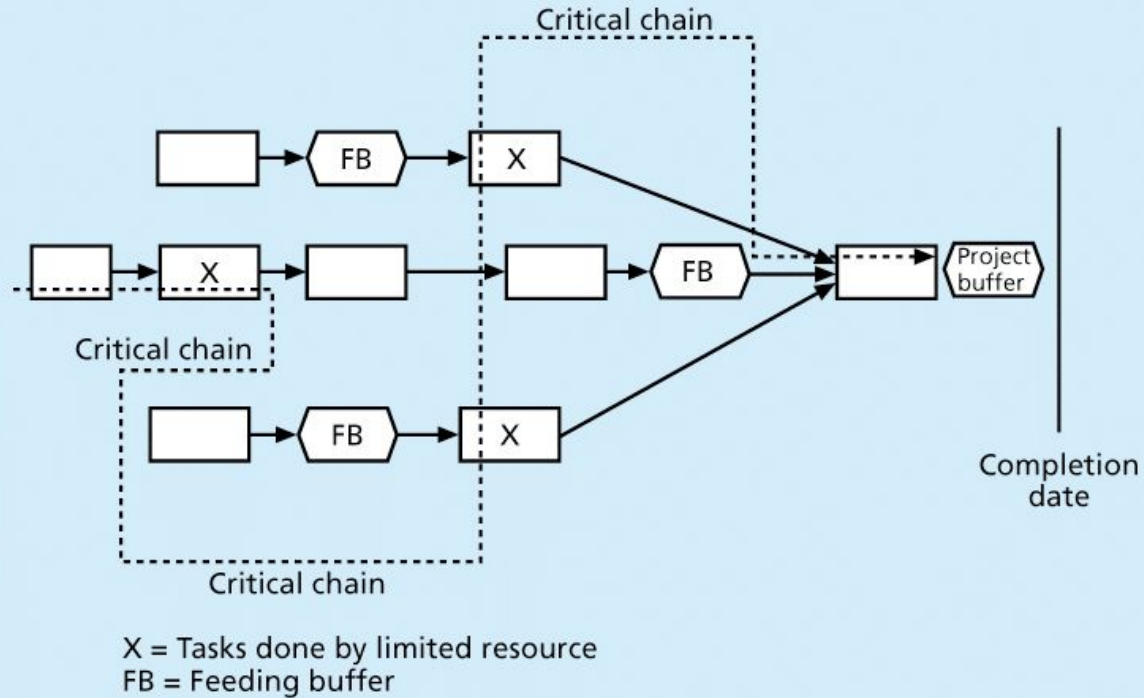
Preventing multitasking avoids resource conflicts and wasted setup time caused by shifting between multiple tasks over time.



Buffers and Critical Chain

- A buffer is additional time to complete a task
- **Murphy's Law** states that if something can go wrong, it will
- **Parkinson's Law** states that work expands to fill the time allowed
- In traditional estimates, people often add a buffer to each task
- Critical chain scheduling removes buffers from individual tasks and instead creates a project buffer or additional time added before the project's due date. It also protects tasks on critical chain from being delayed by using feeding buffers or additional time added before tasks on critical path if they are preceded by tasks not on the critical path.

Critical Chain Scheduling Example





Program Evaluation and Review Technique

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 uses **probabilistic time estimates** - Duration estimates based on using optimistic, most likely and pessimistic estimates of activity duration i.e 3 point estimates.

PERT Formula and Example:

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

▶ Example:

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

where optimistic time = 8 days

most likely time = **10 days**, and

pessimistic time = 24 days

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



Agile and Time Management

- Core Values of Manifesto for Agile Software Development are
 - Customer Collaboration over Contract Negotiation
 - Responding to change over following a plan
- Product Owner defines and prioritizes the work to be done within a sprint, so collaboration and time management are designed into the process
- Teams focus on producing a useful product in a specified timeframe with strong customer input
- Don't emphasize defining all the work before scheduling it



7) Schedule Control Suggestions

- Perform reality checks on schedules
- Allow for contingencies
- Don't plan for everyone to work at 100% capacity all the time
- Hold progress meeting with stakeholders and be clear and honest in communicating schedule issues.

TOOLS & Techniques include:

- Progress reports
- Schedule change control system
- PM software including comparison charts like the tracking Gantt chart
- Variance analysis such as analyzing float/slack
- Performance management such as Earned Value

Alert top management well in advance if there are any schedule problems !!



Working with People

Strong leadership helps projects succeed more than good PERT charts.


Project Managers should use:

- EMPOWERMENT
- INCENTIVES
- DISCIPLINE
- NEGOTIATION



References

<https://www.verywellmind.com/the-myers-briggs-type-indicator-2795583>



PS: TITLES should be finalized and well underway to report writing by now.

THANK YOU

happy weekends