

# Schedule

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INF60016

Project Management for Research

Swinburne Research

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# Learning Outcomes

- Defining project time management and schedule;
- Explaining the process of developing a schedule;
- Developing an effective project schedule such as: Gantt Chart, Network Diagram;
- Utilizing a digital schedule;
- Estimating research project dollar value in nutshell.

\* Acknowledgment- the lecture content is partially inspired by materials on strategic project management and project management for business development by Swinburne business school.



# Project Time Management



Time, cost and scope make the constraint triangle of project management. The quality factor has been always on debate to be an active element on this triangle.

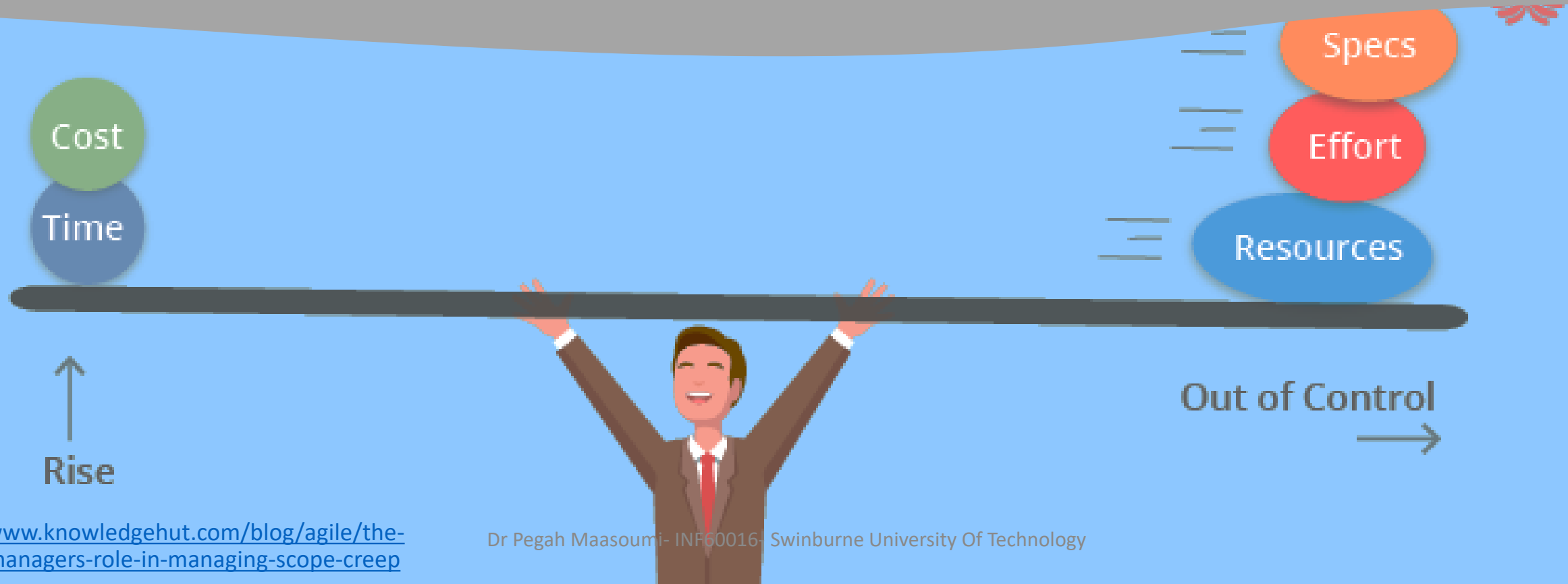
Time management is the process required to ensure timely completion of the project.

# Schedule

Provides the basis for project time management.

It is the process of allocating resources to a set of activities and when they should be completed successfully to present deliverables to stakeholders.

It highlights the critical activities, and shows the effect of any delay and flaw in project timeline.

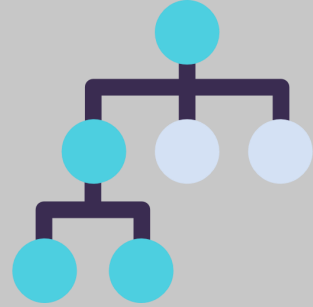




# Developing A Schedule requires the steps below:



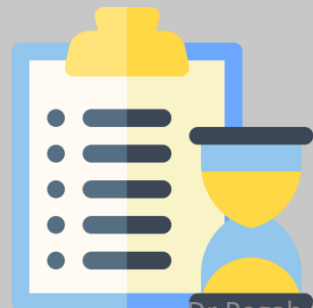
Defined Deliverables  
(scope)



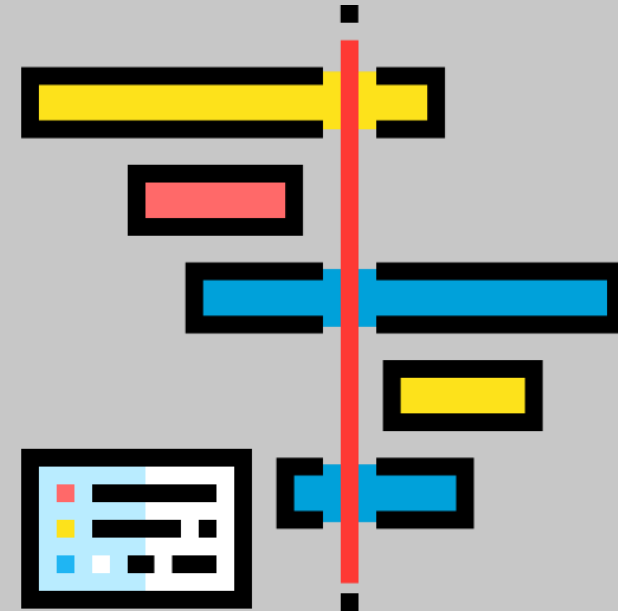
1- Define activities



2- Sequence activities

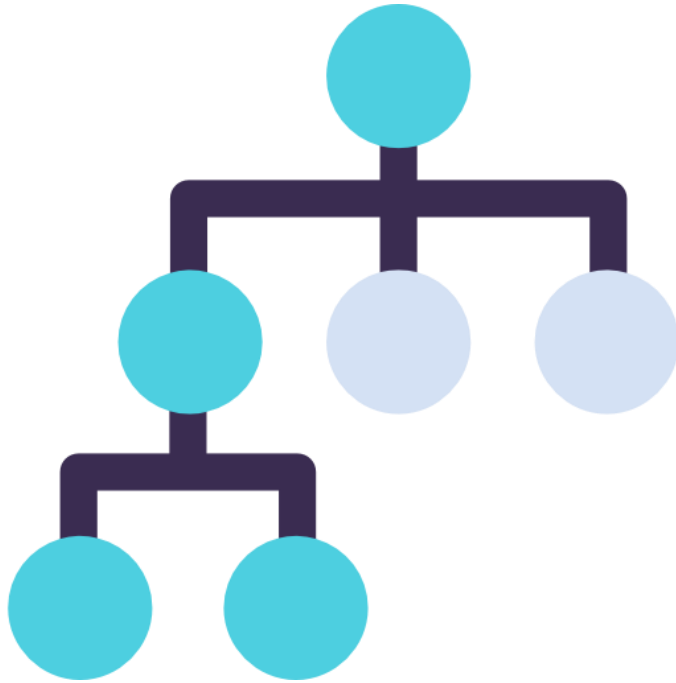


3- Estimate activities'  
duration and resources



4- Develop schedule

# 1- Define Activities



Activity definition is the process of identifying the specific activities and resources that must be performed and existed to produce various project deliverables.

**Work Breakdown Structure** or WBS is a deliverable- oriented grouping tool that defines the total scope of the project. WBS is the foundation document that is used for planning and managing project schedules, costs, resources and changes.

# Activity Definition Principles

- Include activity name and a short description;
- Clearly state people and organizations involved;
- Not too detailed, it describes the work to be done and not how to do the work;
- Not too big, an activity is greater than 8 hours and less than 80 hours;
- Continues from start to the end;
- Obvious completion and unambiguous work scope.

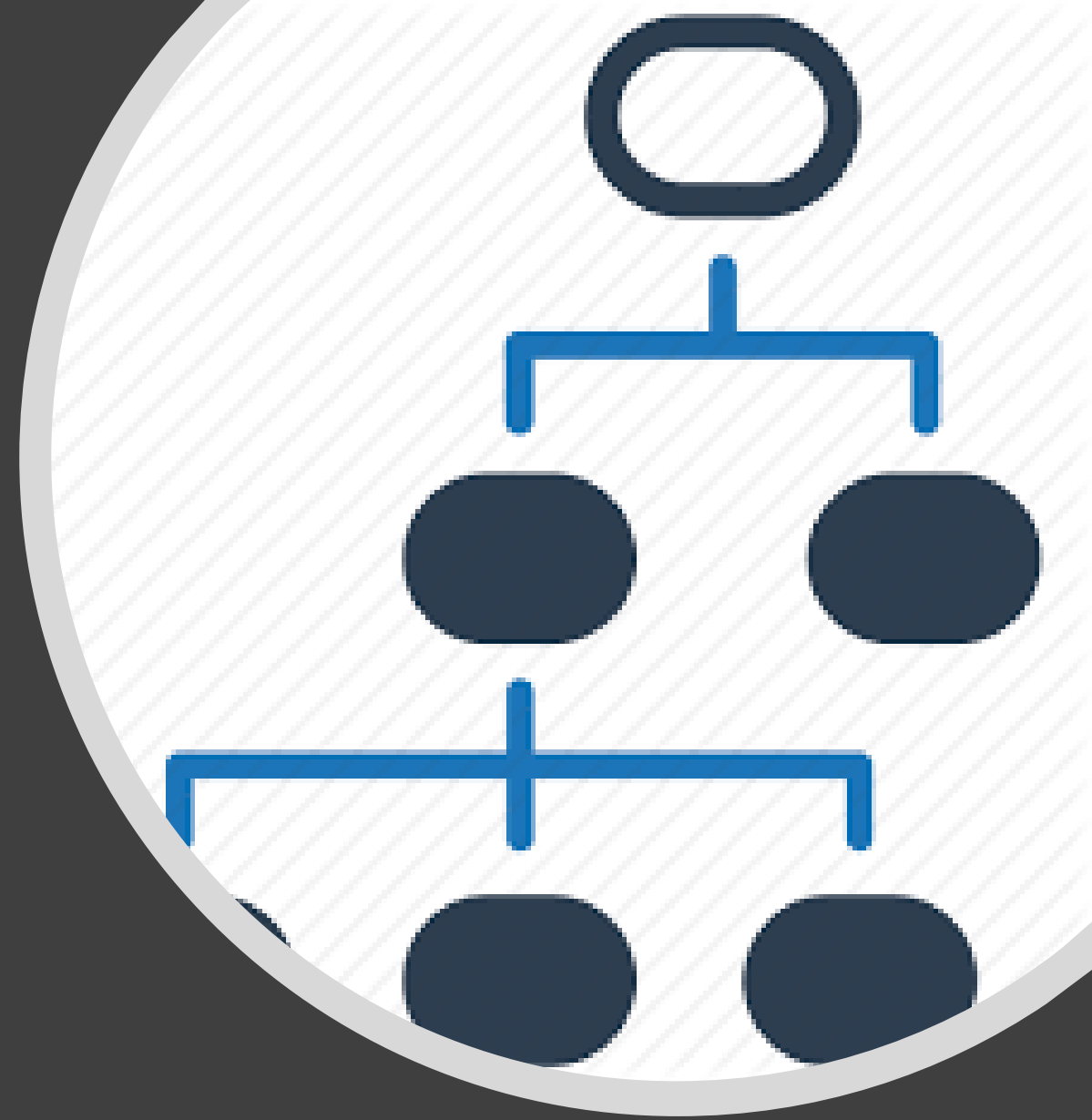
## Examples-

*'start working in the lab'* – not good as it is ambiguous

*'complete induction to use the lab'* – good activity



Work Breakdown Structure (WBS) can provide a preliminary data to define activities. However developing a precise schedule requires expert judgment, analytical observation of similar research projects, and bureaucratic data.





# Data Collection

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- What are the deliverables?
- What are the milestones, and deadlines?
- What is the acceptance criteria? such as: thesis requirement, number of papers and presentations;
- What documents to submit?
- What inductions, training, courses to complete?
- What are your stakeholders expectations?
- What are the required meetings and reports?
- What are the approvals to obtain?
- What are the quality standards for your deliverables?
- What is your personal life events or special circumstances?





# Where to collect this data from?

- Talking to stakeholders, such as supervisory meeting;
- University's calendar and website;
- You research peers (specially the ones ahead of you);
- Your personal circumstances such as family or work;
- Previous users of equipment and labs;
- Research methodology units;

# WBS- Level Details

**Level 1-** Final deliverables , Largest Elements (Big Picture);

**Level 2-** Major sub sections such as major milestones;

**Level 3-** More definable components of the level 2 subsections. At this level, you should have the resources needed including time to accomplish that unit.

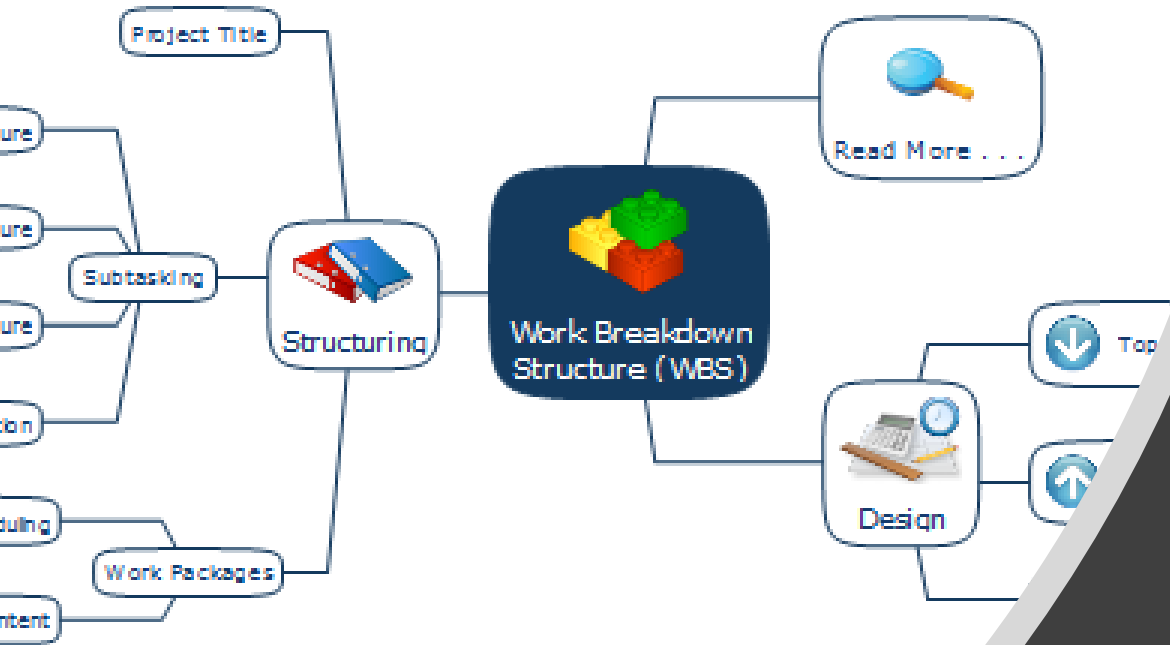
*WBS can be up to 6 level , but for us 3-4 is enough!*



# WBS Principles

- Each task should appear once as a WBS unit;
- The work content of a WBS item is the sum of WBS items below it;
- According to your data collection;
- Flexible tool to accommodate changes ;
- S.M.A.R.T define of the WBS units:
  - ❖ Specific- know the exact outcome;
  - ❖ Measurable- monitor the progress;
  - ❖ Attainable- have resource and ability;
  - ❖ Relevant- related to the overall project;
  - ❖ Timely- when will be complete.

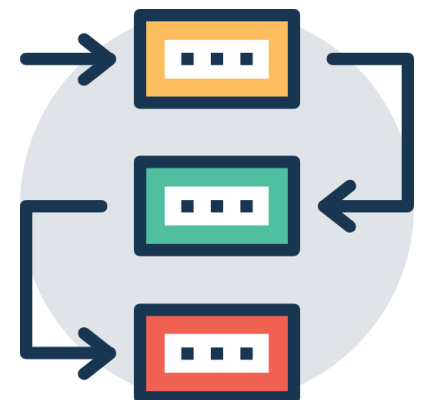
# There are many different approaches to develop your WBS...



1. **Analogy approach**- review similar project and tailor;
2. **Top-down approach**- start with the largest and break down;
3. **Bottom-up approach**- start with specific task and roll them up;
4. **Mind mapping approach**- start from a core idea, branch out to structure activities, thoughts and ideas.

## 2- Sequence Activities

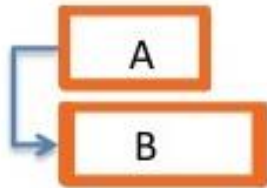
Sequencing Activities is the process of identifying and determining relationships and dependencies among the project activities. This process will finalize the flow of a project. The key benefit of this process is that it defines the logical sequence of work to obtain the greatest efficiency given all project constraints.



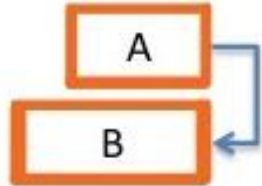




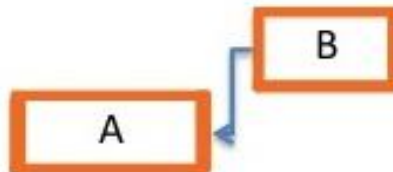
Task **B** cannot start until task **A** finishes



Task **B** cannot start until task **A** starts



Task **B** cannot finish until task **A** finishes



Task **B** cannot finish until task **A** starts

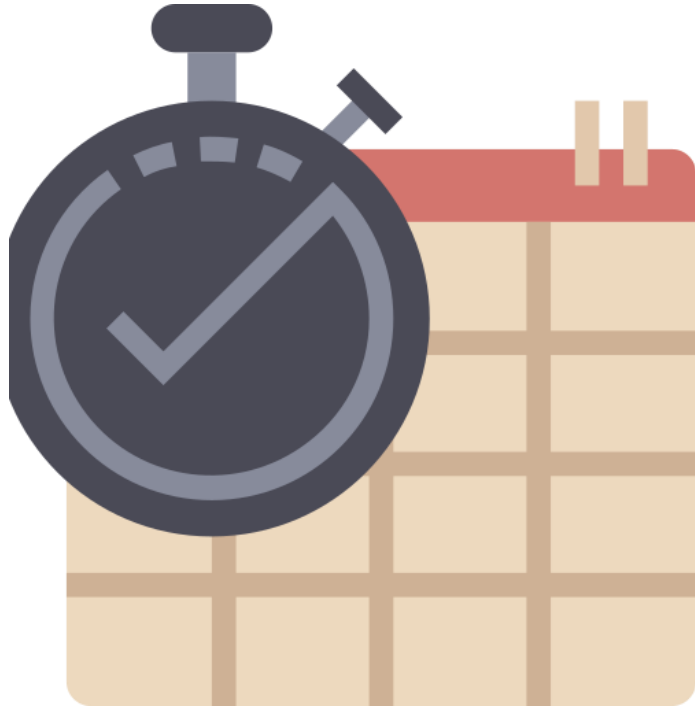
# Dependency Types



# The Agile Way

Where the uncertainty is high, agile method could be more beneficial way of sequencing. On Agile method, the sequencing is performed at a high level for the entire project and for the project deliverables. Then when the time comes, the sequence will be developed with detailed activities and tasks for future (secondary) deliverables.

## 3.1- Estimate Activities' duration



The schedule is not effective until it has the duration time for each activity. This time is estimated based on the actual amount of time to complete the activity plus elapsed time (an extra margin).

The time frame should be created by consultant with stakeholders such as supervisors, collaborators, sponsors, participants, equipment managers, etc.

# Time Estimation Techniques

1. **Expert Judgment:** based on the judgment of expert(s), ex- supervisors , lab managers;
2. **Analogous Analysis:** based on similar tasks and projects;
3. **Parametric Estimate:** calculated by quantity of work, ex- 1 hour for each survey, a week for 40;
4. **Bottom Up:** estimate each sub-task and combine for the activity;
5. **Top Down:** allocate time to each task based on total activity time;
6. **Three Point Estimate ( PERT Technique)**



# Program Evaluation Review Technique (PERT)

## Three Point Estimation

The PERT is a network analysis technique to estimate project duration when there is a high uncertainty about the individual activity duration estimates. PERT uses probabilistic time estimates. The estimate includes an optimistic, most likely, and pessimistic time duration.

$$PERT = \frac{\text{Optimistic time} + 4 \times \text{most likely time} + \text{pessimistic time}}{6}$$

### ***Ex- interviews***

Optimistic = 8 days

Most likely = 10 days

Pessimistic = 24 days

**PERT Estimate = 12 days**

## 3.2- Estimating the resources...

Involves determining the type and quantity of resources needed to complete an activity and when they will be needed.

Examples :

- Participants;
- Existing data from organisations;
- Observatory time;
- Materials and consumables;
- Analysing and coding techniques;
- Super computers;
- Etc.

*All resources contribute to the dollar value of the research.*



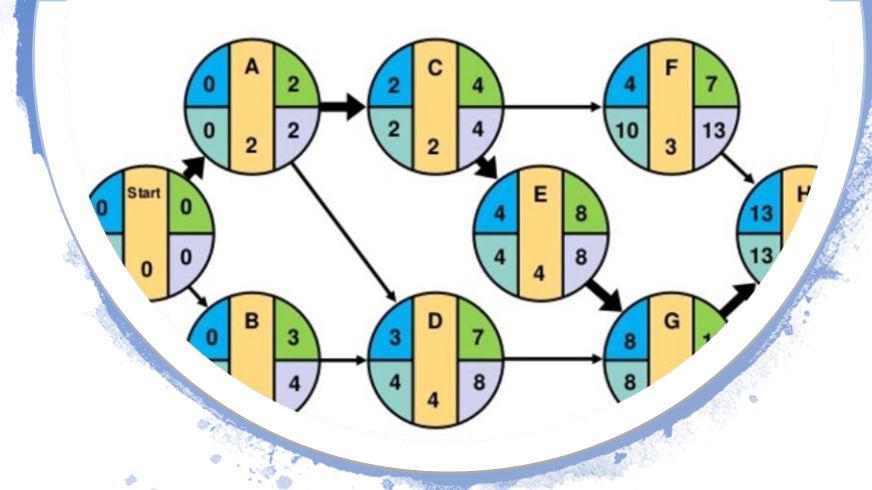


# 4- Develop Schedule

Creating a realistic project schedule provides a basis for monitoring project progress.

There are various graphical formats to map schedule visually, Such as:

- **Gantt Chart**
- **Network Diagram**



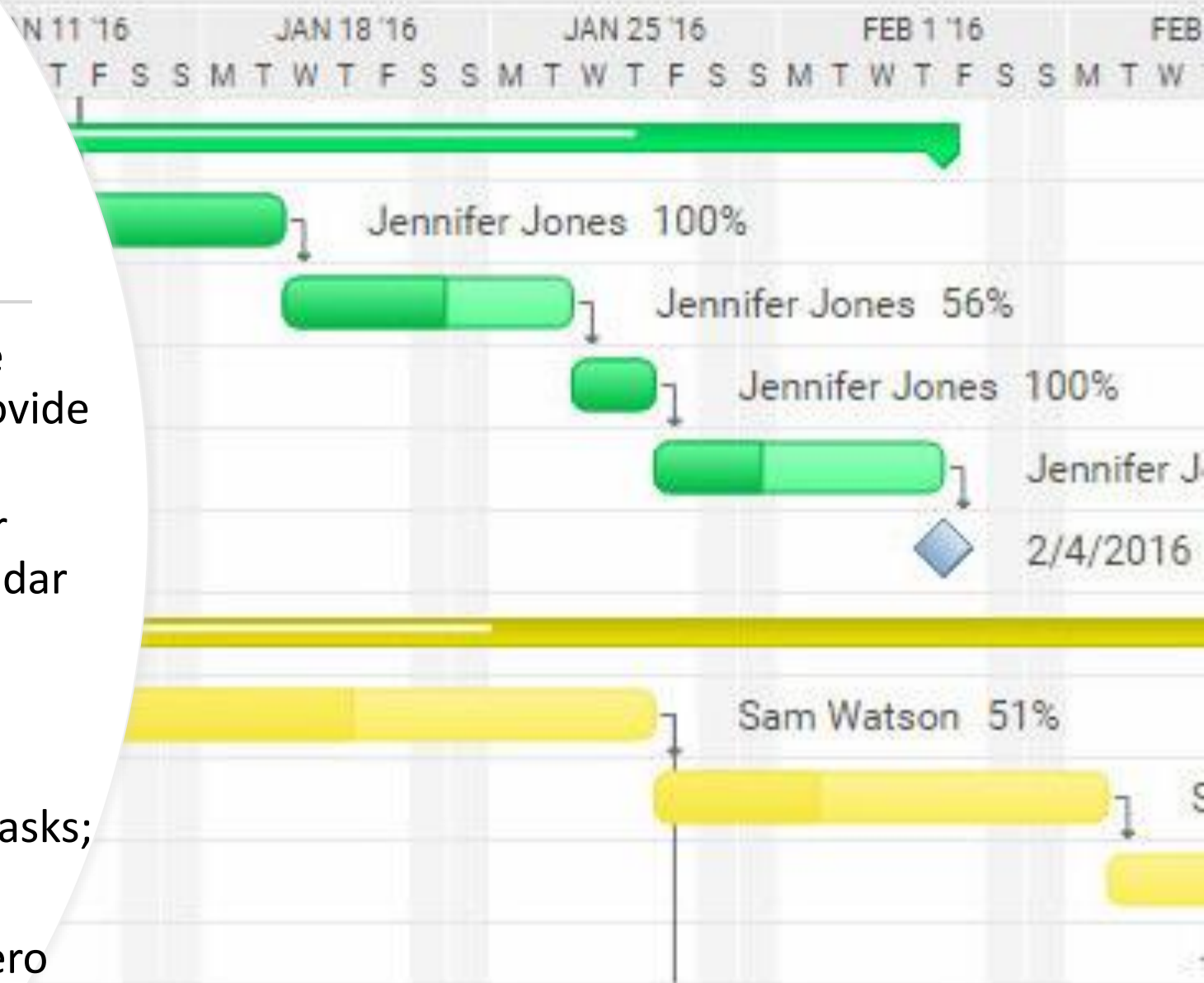
# Gantt Chart...

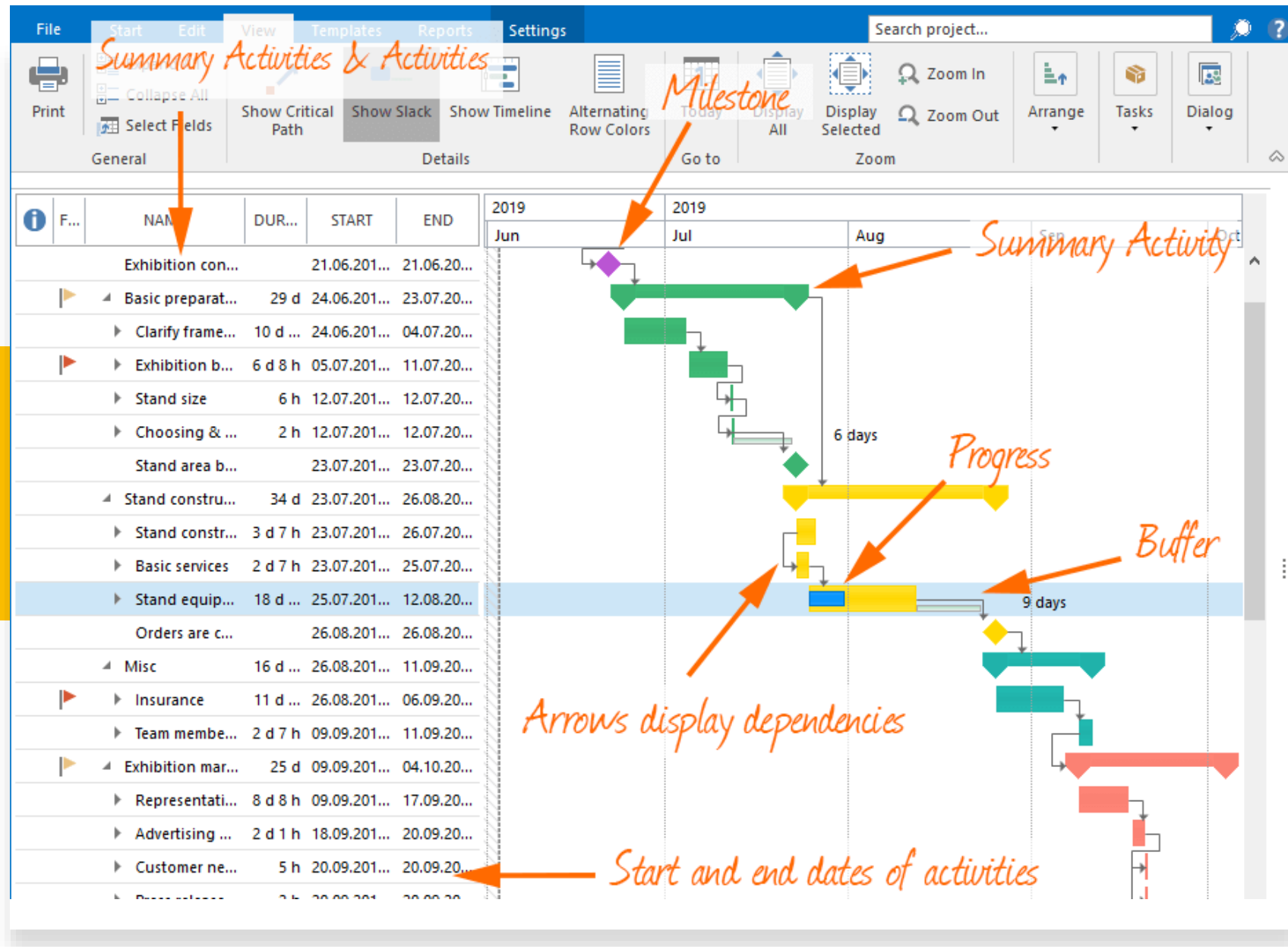
Also known as **Bar chart** or **Timeline** is the oldest and most widely used format to provide project schedule information.

Gantt chart lists project activities and their tasks with a start and finish date in a calendar view format.

Structure of a Gantt chart includes:

- Thick bar for each activity;
- Thinner horizontal bars for activities' tasks;
- Dependencies arrows between tasks;
- Milestone diamonds illustrated by a zero duration task.



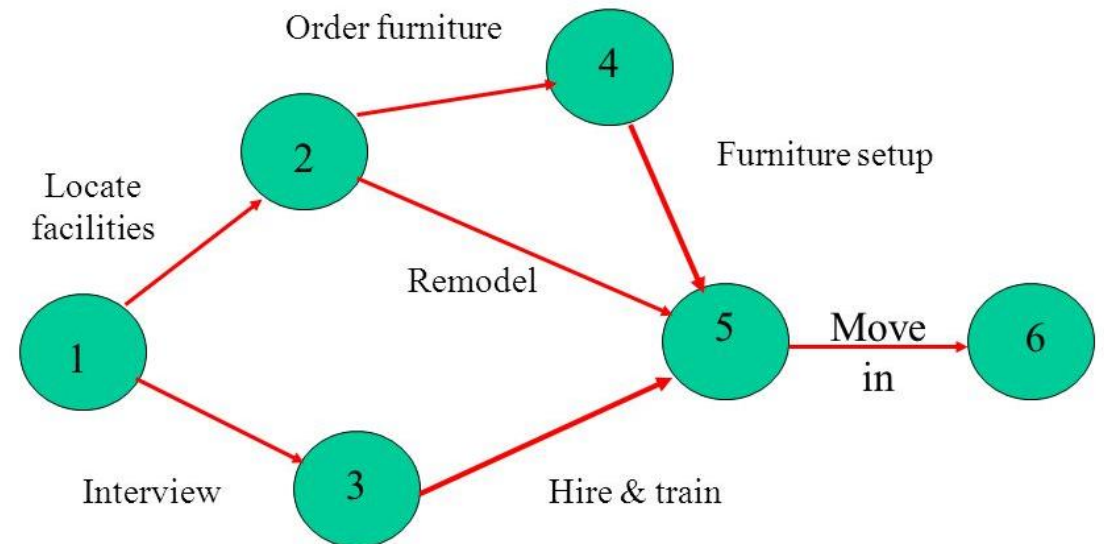


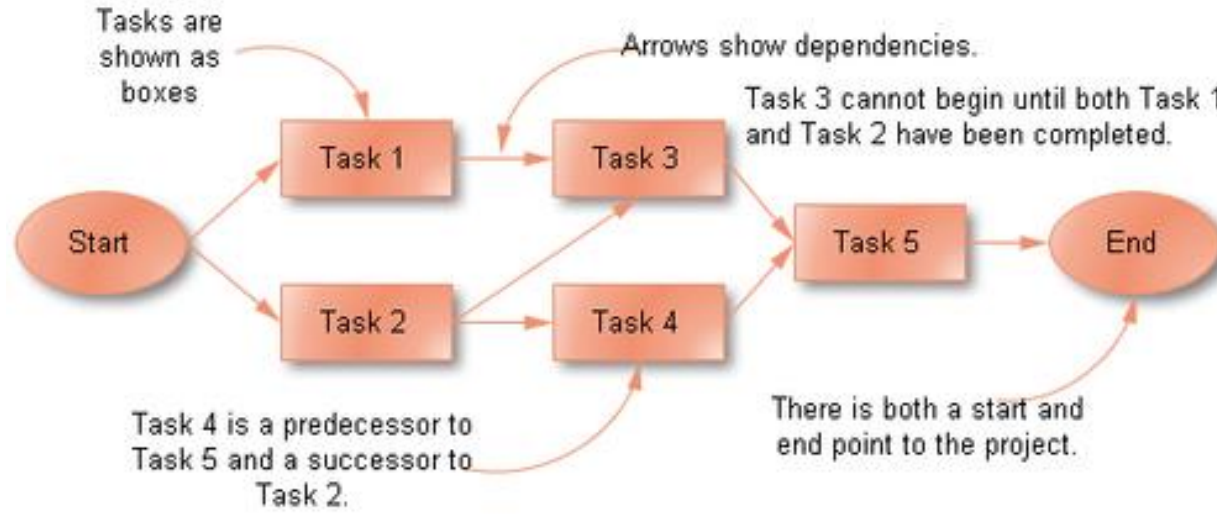
# Gantt Chart Sample

# Network Diagram...

Is a schematic display of the logical relationships among project's activities, therefore offers a greater dependency visibility.

It includes the duration for each of the activities which illustrates the impact of delay using the Critical Path analysis.

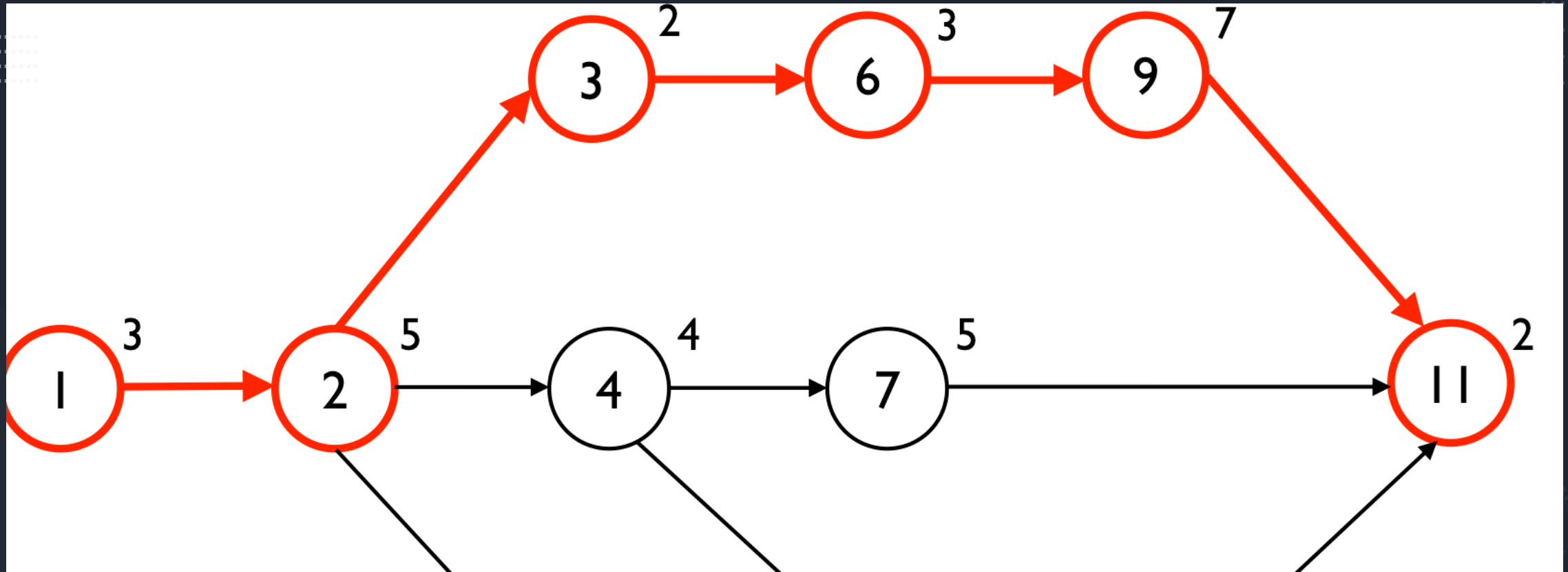




- Networks typically flow from left to right;
- An activity can not begin until all its predecessor activities are complete;
- Arrows indicates dependencies and flow and can cross over each other;
- Each activity assigned to a number which is greater than its predecessors;
- Looping is not allowed;
- Conditional statement is not allowed;

# Developing Network Diagram





# Critical Path

In network diagram, the sequence of connected, dependent activities is a **Path**.

**The Critical Path** is the longest path, that allows for the completion of all project-related activities in the shortest expected time. Delays on the critical path will delay completion of the entire project.

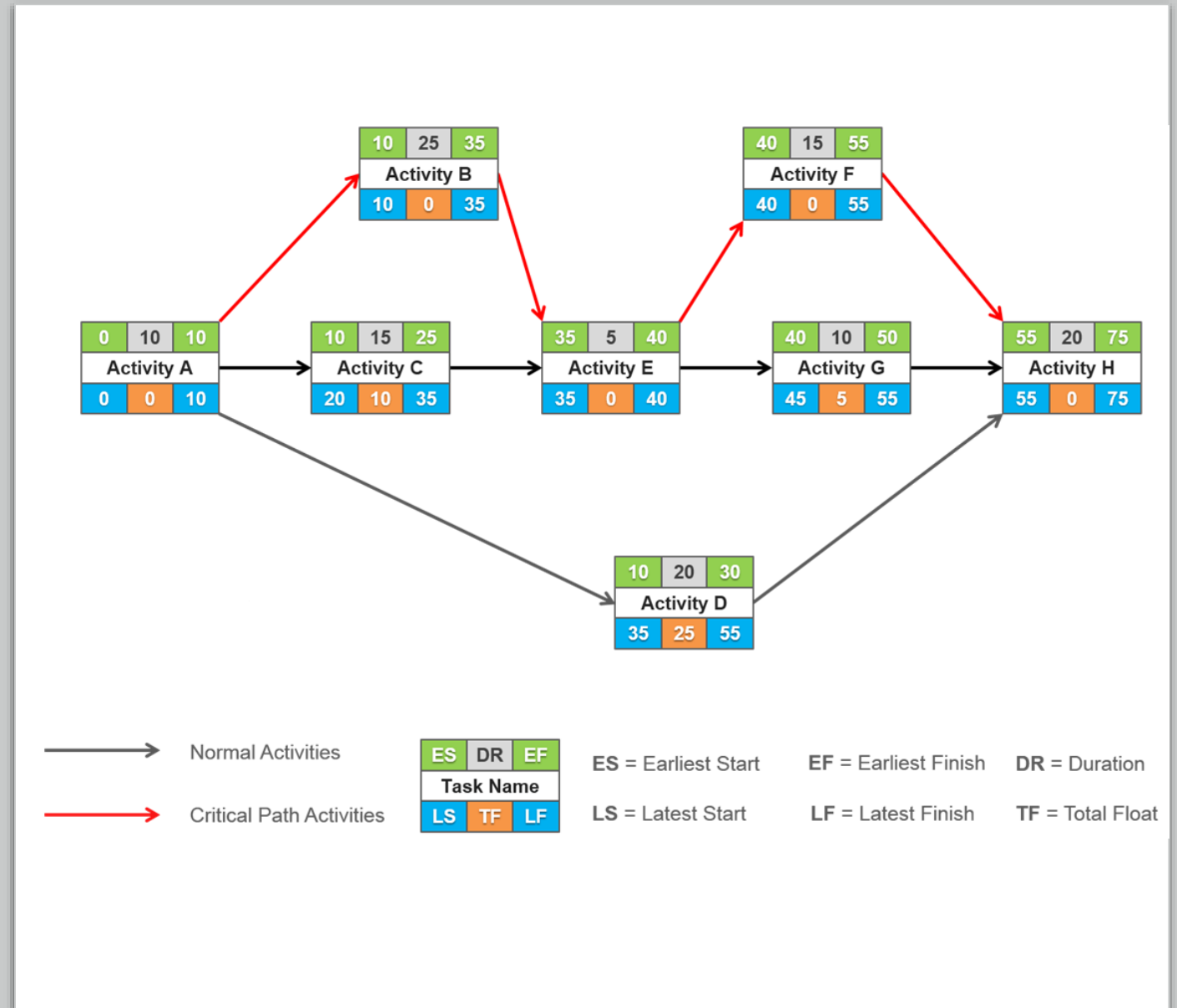


Each activity in network diagram can obtain details about the start, end, duration or delays as it is demonstrated.

**Total slack or Total Float** is the amount of time an activity may be delayed from its early start without delaying the planned project finish date.

**TF= LS- ES or LF-EF**

Critical path activities have zero slack.



# Digital Schedules

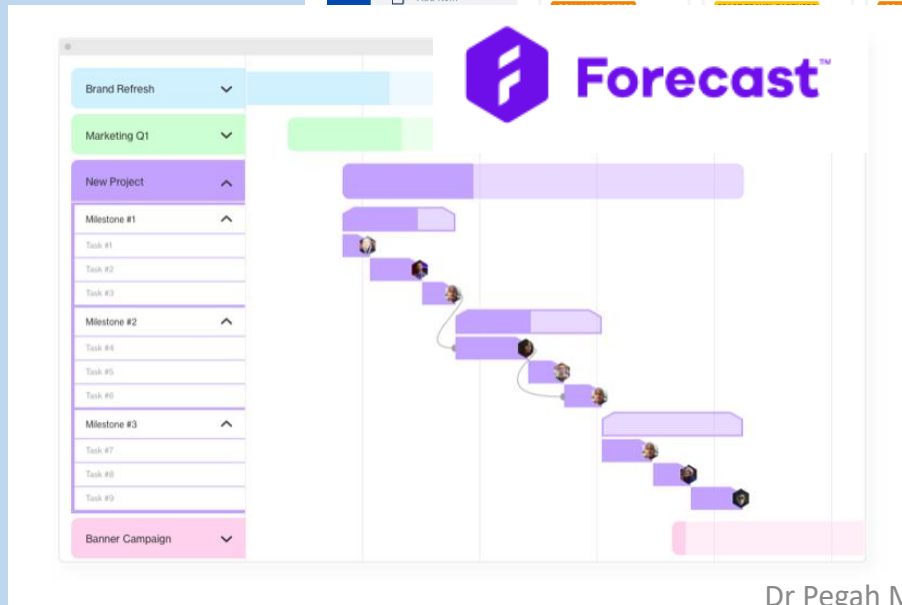
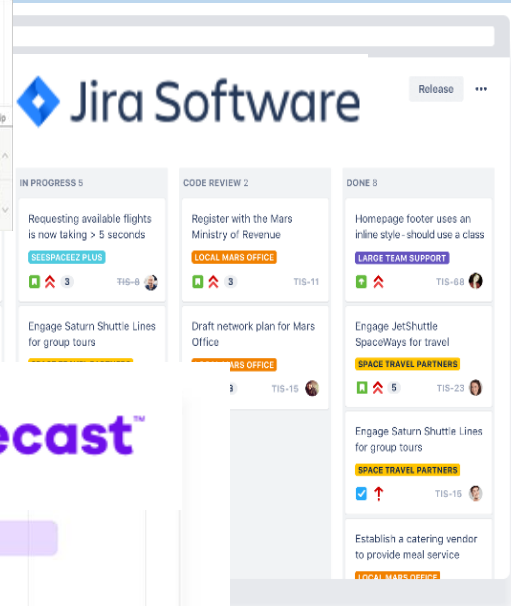
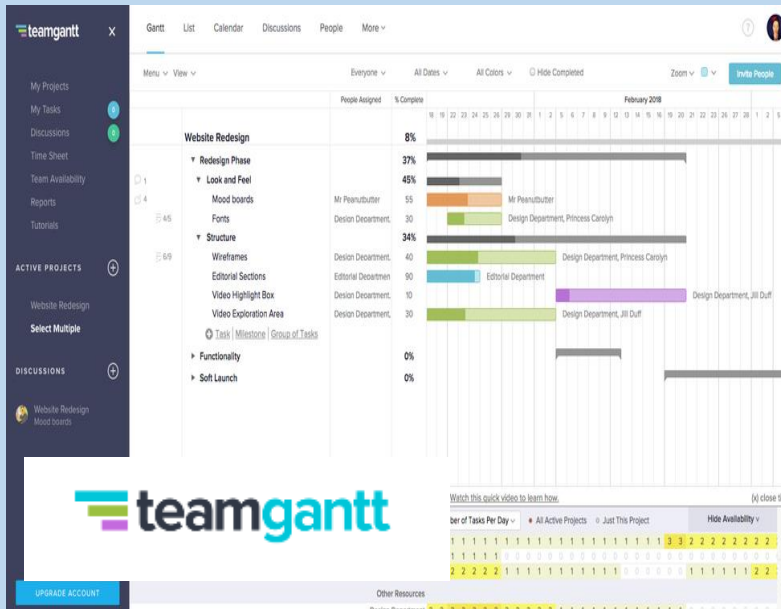
Using project management software to develop schedule comes with its own challenges and caution. It is necessary to enter all details and dependencies to have dates adjusted and correctly determine the critical path.

Here are some project management software suggestions.

<https://www.teamgantt.com/>

<https://experience.forecast.it/project-management-software>

<https://www.atlassian.com/software/jira>



# Why estimating the dollar value?

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Have a dollar value estimation of your research comes very handy when comes to collaboration with industry and organizations from outside university or patent registration.

Although we wont ask for an accurate estimation in this unit, developing an understanding of main elements of contribution is critical and an advantage to your management role.



# Estimate the dollar value of your research project

In estimating the dollar value, you need to be mindful of any resources you need to complete the project including the time and human resources. Some of these elements are listed below:

- Researcher's time;
- Supervisors' time, staff, lecturers;
- Scholarships and allowances;
- Data, Computer, software, space;
- Training, courses;
- Consumables, equipment time;
- Thesis printing, conference, etc.

Ideally,  
you should be able to:

- Develop an effective graphical schedule of your choice with a rough time estimation and resources;
- Estimate the dollar value of your research project.

