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MS. SHWETA TIWARI
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PREPARED FOR

Engineering Students

All Engineering College

PREPARED BY

SHWETA TIWARI

Guest Faculty

UNIT-3

SPM

SOFTWARE PROJECT MANAGEMENT

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By SHWETA TIWARI

SOFTWARE PROJECT MANAGEMENT

UNIT III –ACTIVITY PLANNING AND RISK MANAGEMENT

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3.1 Objectives of Activity Planning

3.1.1 What is Planning

Plans are nothing but planning is everything. Planning is a continuous process of refinement done during development.

A detailed plan has to include the schedule of the project consisting of the start and the completion time of every activity defined. The actual achievement can be measured using the detailed plan.

Planning process ensures that necessary resources needed at different stages are precisely available at requirement.

Planning also produces a cash flow forecasting that indicates when the expenditure and the income takes place in the process.

First of all, a plan must contain the start and completion of every activity that produces deliverables and must be clearly visible in ensuring that the products of each activity are delivered on time.

Every stage of the development plan must strive to achieve the objectives as the project moves from one to another.

A plan must be defined with a set of targets that are achieved which can be measured. At the same instance, when target dates are not achievable the plan must be effectively modified to focus on the target.

3.1.2 Elements of Detailed Planned Activity

Along with factors described with activity planning, the following elements play a very important role in achieving the target.

The elements of a detailed planned activity are:

- Feasibility assessment
- Allocation of resources
- Estimation of costs

- Project coordination
- Personal encouragement

Feasibility assessment

Feasibility assessment talks about a very early stage describing whether it is feasible for the project to exist within the specified time constraint.

A detailed plan will help in forecasting the project as it progresses from one stage to other stages of activities.

The feasibility factor also lies in the availability of resources that includes specialized staff to carry out the activities.

Allocation of resources

The best way to allocate resources to the project depends on the availability factor. The project plan must analyze the available resources and the timescales for each and every activity.

Additional usage of resources more than the stipulated time scale will result in slacking the progress of the project.

Estimation of costs

The project plan must provide solutions to the following questions:

- What is the total expenditure?
- How much will the project cost?
- What are the various estimating factors involved in the development process?

These can be answered only when a detailed estimation of costs and timing is defined.

Project coordination

Interaction and communication plays a vital role in handling complex projects. Effective team management must be established to carry out the activities in a well-coordinated manner.

In particular, the availability of staff for a set of integrated project schedules must be carefully allocated with no period of idleness.

Personal encouragement

Staff involved in the development process must be motivated in an effective way so that they achieve the target without any delay.

The targets provided to the staff are monitored and personal encouragement must be given to individual staff if they achieve the target on time.

Activity planning helps in completing the project in minimum time with a nominal cost with the help of project schedules.

To shorten the time limit, activities can be carried out in parallel based on the conditions defined for obtaining resources.

Project scheduling activities include the extension of time scale provided with constraints that can be relaxed to have effective usage.

3.2 Project Schedules

Stages of Project Schedules

Every project must be developed with a plan showing the start and end of the activity along with the availability of resources for each activity.

A project schedule is established based on the constraints defined for each activity.

There are four stages involved in the creation of project schedule:

- First stage of project schedule provides solutions to the questions like:
  - What activities have to be carried out?
  - What is the sequence of order in which each activity has to be handled?
- The next stage involves the risk factors that affect each activity like:
  - Can risk occur in this activity?
  - How does a particular activity handle the risk?
  - What are the potential problems that can arise in risk handling?
- Third stage of project schedule deals with allocation of resources:
  - How are resources allocated to specific activities?
  - What is the expected availability of resources?
  - What are the constraints defined for allocating a particular resource?
- The final stage includes the schedule production:
  - What are the planned start and end dates for each activity?
  - What are the resources allocated to each activity?
  - Explain the detailed project schedule?

3.3 Activities

Project and its activities must be clearly defined to achieve the target. An activity plan will contain the following factors:

- A project is basically, composed of a number of interrelated activities.
- The initiation of a project happens only if atleast one activity is ready to start.
- An activity is clearly defined with its start and end point that produce good deliverables.
- Activity requiring resources must be analyzed well in advance and made available during the execution.
- Some activities would depend on other activities for them to complete.
- A project can attain its completion only when all activities have been completed.

3.3.1 Approaches to Identify Activities

The various approaches used in identifying activities are:

- Activity-based approach
- Product-based approach
- Hybrid approach

Activity-based approach

In the activity-based approach, all the activities are listed and created for the project. This is achieved by a brainstorming session where the entire project team analyzes the various activities needed a0t different stages with the help of similar projects. This approach usually generates the list of activities using a work breakdown structure (WBS).

WBS helps in identifying the lowest level of effort i.e. the task required to complete a project by breaking down into lower sets of tasks.

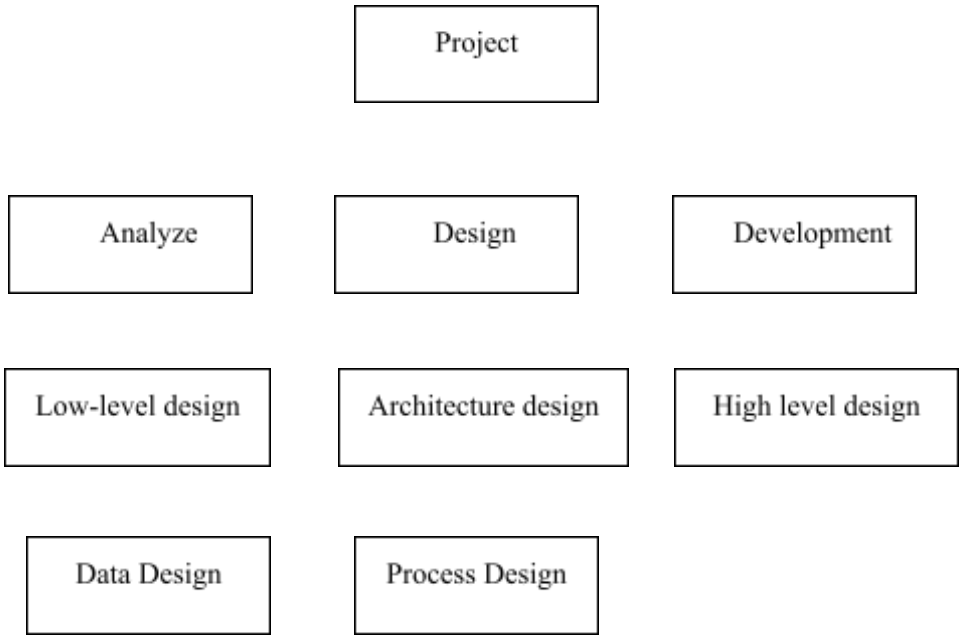


Figure - Activity-based approach Work Breakdown Structure

Task defined at the lower level includes everything that is required to complete the task at the higher level.

The work breakdown structure provides an in-depth knowledge about the lowest level of activity that has to be completed.

WBS is a refined structure that clearly defines the milestones that has to be achieved in accomplishing a specific task.

The ordering of sequence of activities can also be done in this approach by defining those activities that have to be completed for others to start.

In a purely activity-based approach, activities are identified and defined in five levels:

- **Level 1 :** Project – goals, objectives defined
- **Level 2:** Deliverables – software, manuals, training
- **Level 3 :** Components – work items, modules, tests
- **Level 4 :** Work-packages – major work items, related tasks
- **Level 5 :** Tasks – responsibility of an individual in accomplishing it

Product-based approach

The product-based approach produces a product breakdown structure along with a product flow diagram.

The approach accepts the products as inputs which are transformed into an ordered list of activities.

The Product Flow Diagram does not leave out any activity from its ordered list and adopts a methodology which clearly specifies what are the products required and what are the activities required to produce the product.

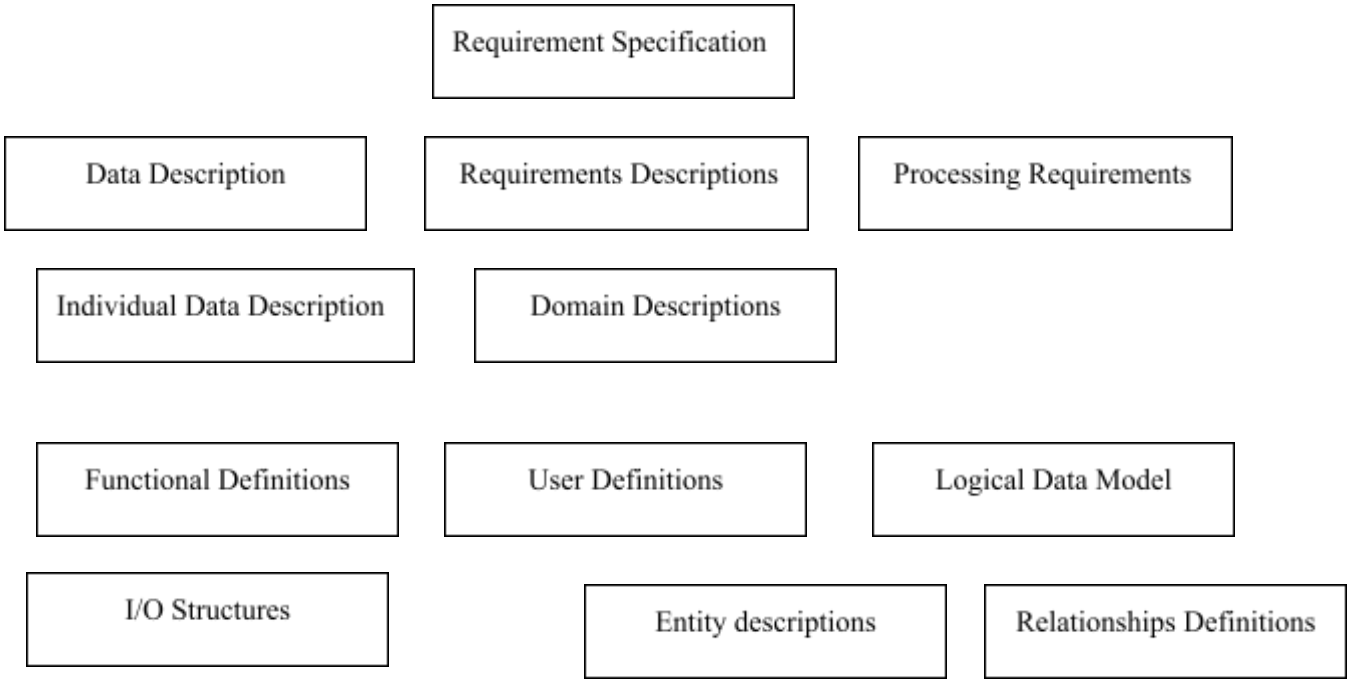


Figure - SSADM Product Breakdown Structure

Using Structured Systems Analysis and Design Method (SSADM), a generic activity network can be derived for a project-specific product breakdown structure.

The development of a PFD indicates the sequence of activities of the activity network.

Hybrid approach

WBS deals with a list of final deliverables whereas PBS deals in producing the products using the product flow diagram.

Hybrid approach combines both the activity-based and product-based approach to structure both activities and products.

Structuring of product-based or activity-based approaches depend on the nature of the project type.

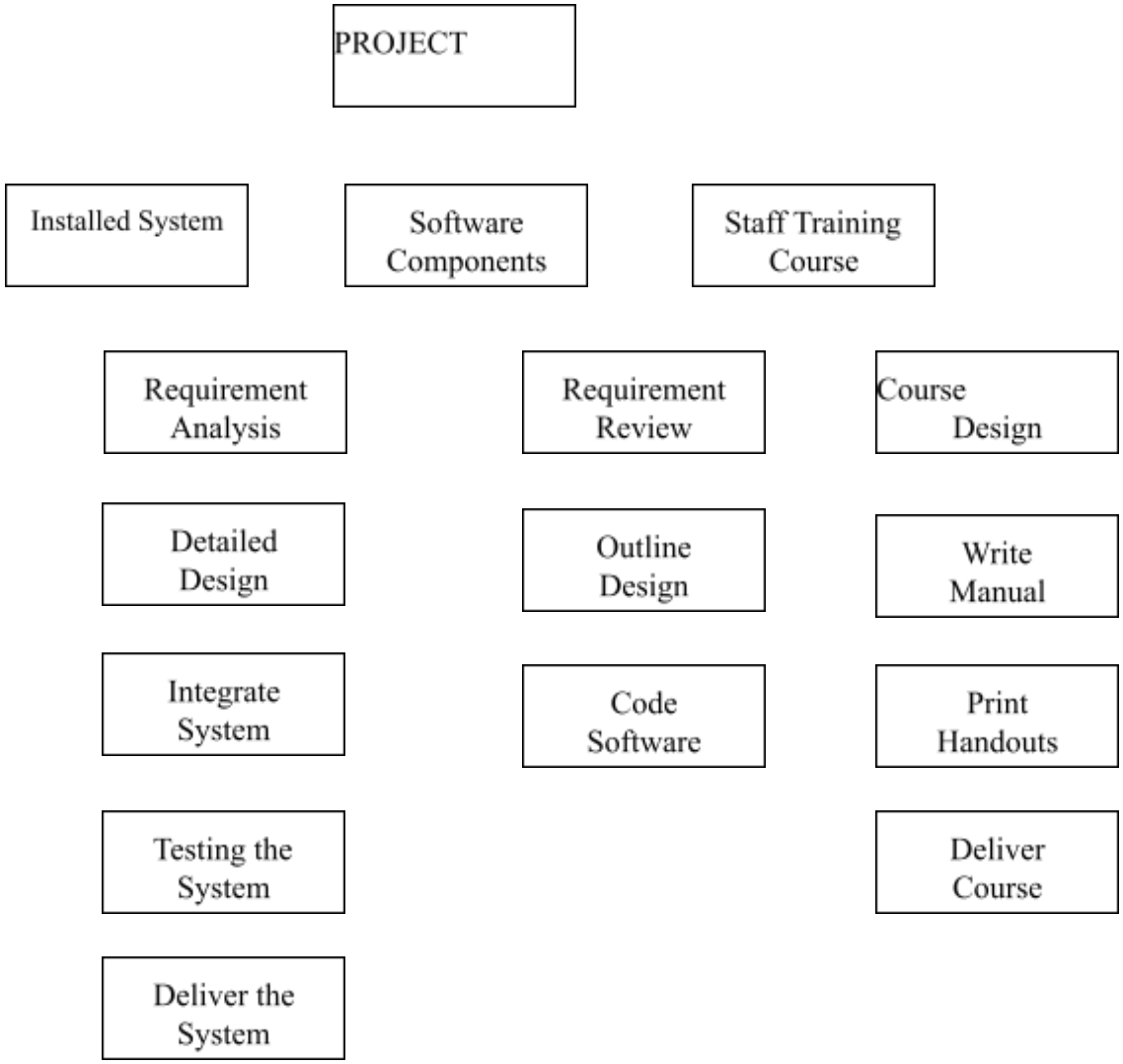


Figure - Hybrid Approach combining Activities and Products

3.4 Sequencing and Scheduling

Scheduling is required for every activity that is planned along with the resources and can be represented using a bar chart.

The chart describes the nature of the development process and the resources available for completing the specified activities.

Weeks / Person	1	2	3	4	5	6	7	8	9	10	11	12
Requirements	■											
Design Module1		■										
Design Module2			■									
Design Module 3				■								
Code Module1			■	■	■							
Code Module2						■	■	■				
Code Module 3				■	■	■	■					
Integration									■			
System Acceptance										■	■	■

Figure - Bar chart representing Scheduling

The chart defines two factors: sequencing of tasks and the schedule of the task.Scheduling includes the staff availability and the activities allocated to them.

Combining sequencing – scheduling approach is suitable only for smaller projects and needs to be separated for complex projects as individual processes.

In case of larger projects, the logical relationship between the activities are grouped together and then scheduled for resources.

3.5 Network Planning Models

Framing a Network Model

A network model can be formulated for the project scheduling techniques for the activities and their relationships as a graph.

Most frequently used techniques are the Program Evaluation Review Technique (PERT) and the Critical Path Method.

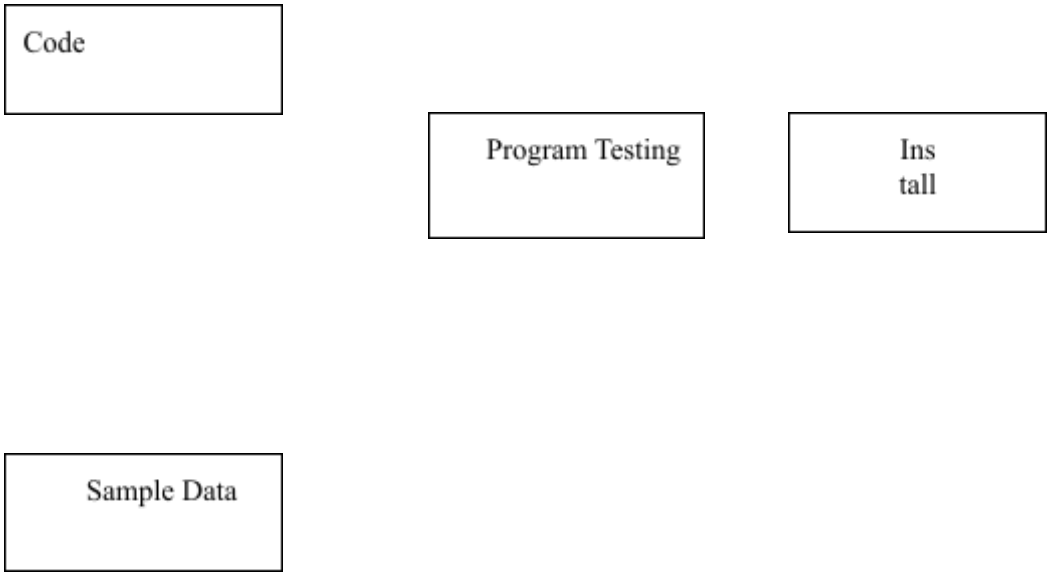
An activity-on-arrow (AOA) approach can be used to visualize the project as a network in which activities are shown as arrows joining the circles. Each node represents either the start or the end of an activity or a set of activities. This network can also be called a precedence network.

An activity-on-node (AON) approach represents nodes as activities and the link between the nodes denote the precedence requirements.

Constructing Precedence Networks

There are some conventions used in the construction of precedence networks.

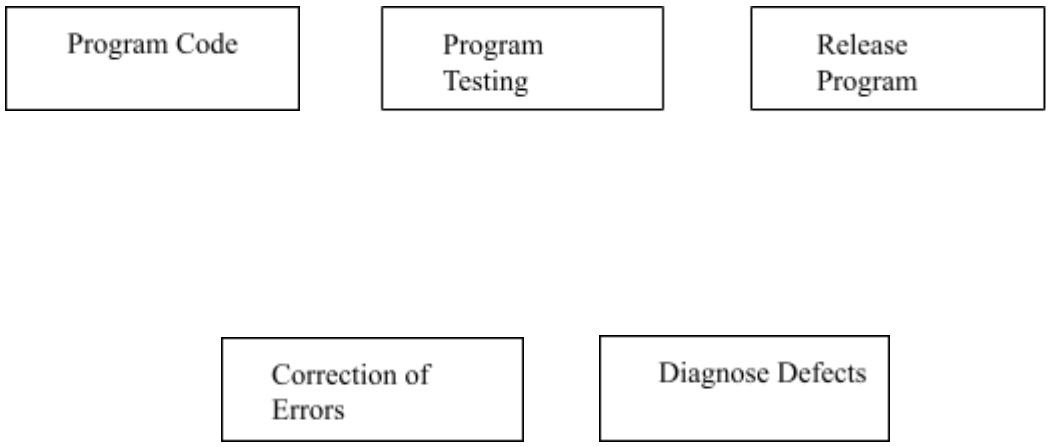
- **Only one start node and one end node must be defined for a project network:** There cannot be more than one start node for any project network and usually the duration of the start node is zero. Similarly, the completion of the project can be viewed by only one end node when the final activity is finished. If more than one start node or end node exists, it leads to confusion and uncertainty.
- **Every node must have duration:** Any node that represents an activity must be provided with the duration for its execution. Here, the activities must be carried out in the sequenced order defined in the project schedule.
- **Links do not have duration:** The relationship between activities are represented through links and generally does not have any duration for the establishment of creating it.
- **Subsequent preceding activities are precedents:** Precedents are the successors of any preceding activity which are found out by the relationships defined.



Precedence Network

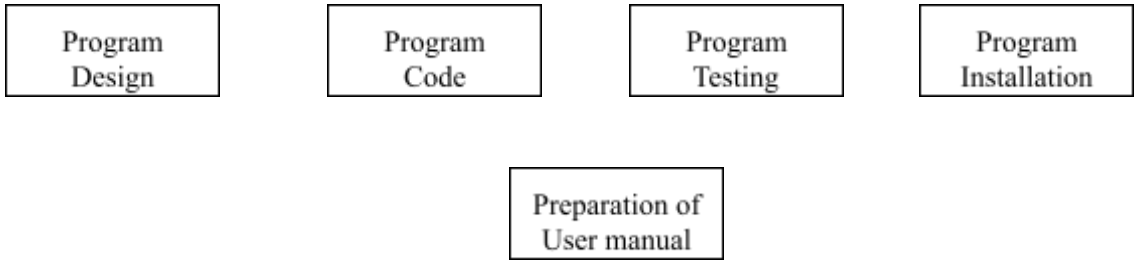
- **Flow of activities:**Activities are always started from the left most one and precedes in the forward direction. Usually, networks are drawn from left to right. Arrows can be drawn to show the flow of direction.
- **Loop free network:** Activity network must not contain any loop and if any loop exists, it results in error in the network. But certain processes can be iterative in the development and such activities involved in the iterative process should not be visually seen in the network. All network planning applications have the criteria

of finding the loops and generate errors for both small and complex projects.

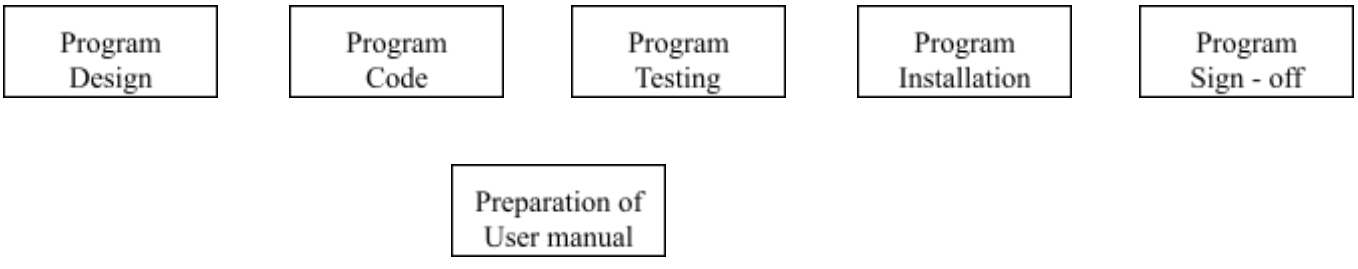


Loop representing impossible sequence

- **Dangle-free network:**Dangling activities are never shown in the network. This leads to errors in subsequent analysis of the development process. For example, an activity named “Prepare User Manual” should not be defined in the network as a non-connectivity activity, instead must be defined before the installation of the software.



Activity network representing a Dangle



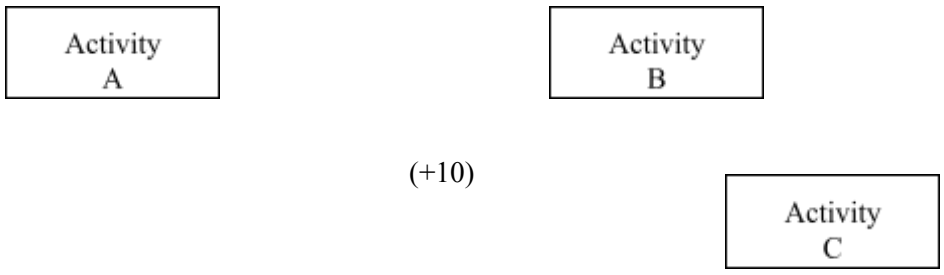
Modified Activity network with Dangle-free

Lagged and Hammock activities

The start or finish of one or more activities is slipped-out (lagged) or pulled-up(led) by a certain period.

A time lag is represented for activities that occur in parallel when time exceeds and the duration is shown on the linking arrow.

Usually, a lag is indicated with a positive number and a lead uses a negative number added to the start or finish time of their connected activities.



Lag and Lead Activities

Here, activity B cannot start until activity A is finished. At the same time, activity C cannot be started until 10 days after activity A is finished.

Hammock activities have zero duration and are assumed to start at the same time for each activity and end at the same time for the last one. These activities normally represent overhead costs and resources that occur at regular intervals over the set of activities.

3.6 Forward Pass & Backward Pass Techniques

The logical network model represents the inter-relationships between the activities and is used in estimating the duration of the activity.

Critical Path Method ensures that the planned project must be completed as quickly as possible. It also governs those activities that have delay in execution which can affect the overall project schedule.

The critical path method analyses the precedence of activities to predict the total project duration.

The focus is based on the slack, free float and path float available between the activities.The method calculates which sequence of activities has the least amount of schedule flexibility.

CPM analysis starts with a WBS that has single point estimates for each activity and uses the precedence diagramming method to relate the precedence in the network.

With the network drawn, two-pass analysis can be performed through the network of activities and calculate the node quantities for each activity.

Forward Pass

Forward pass is used to calculate the earliest dates on which each activity may be started and completed.

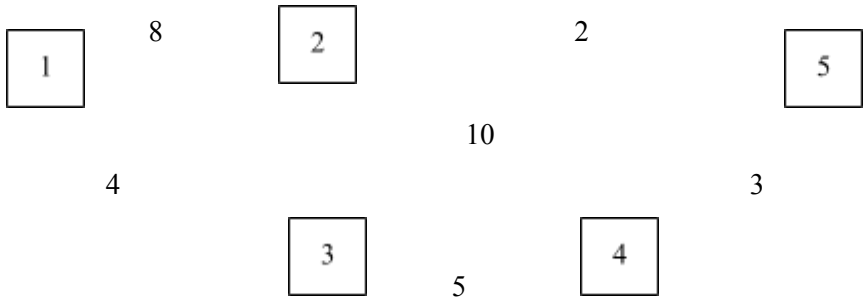
The steps involved in forward pass are:

- Start at the start node
- Compute the top pair of numbers
- Always add the duration to the connecting node's earliest finish time.

For example, given the following data,

Activity :	**1-2**	**1-3**	**2-4**	**2-5**	**3-4**	**4-5**
Duration :	**8**	**4**	**10**	**2**	**5**	**3**

The network is drawn below:



Backward Pass

Backward pass is used to calculate the latest dates at which each activity may be started and completed without delaying the end date of the project..

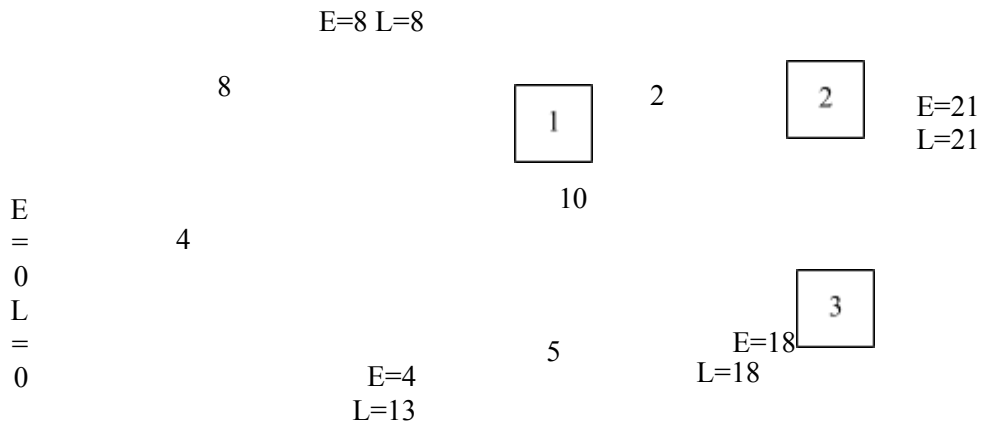
The steps involved in backward pass are:

- Start at the end node
- Compute the bottom pair of numbers

- Always subtract the duration from the connecting node's earliest start time.

Considering the above example and representing network diagram with both the passes:

The network with the earliest and latest occurrence of events is drawn below:



Network diagram with earliest and latest time

3.7 Critical Path Method

The critical path is a single path that defines the duration of the project.

Activity float is a measure which calculates the difference between the activity's earliest start date and the latest start date.

An activity with a float value to be zero is called critical because delay in carrying out the activity will affect the project completion date.

Free float is the delay time taken by single activities that do not affect other activities whereas an interfering float represents how much the activity can be delayed without affecting the end date.

At Least one path exists in the network joining the critical activities which forms the critical path of the network.

Critical path must be established because monitoring critical activities have a greater impact on the completion of the project and it shortens the overall duration of the project.

For the same example, the critical path and the activity float is calculated as:

Activity	Duration Days	Earliest		Latest		Activity Float / Total Float
		Start ES	Finish EF EF = ES + t_{ij}	Start LS LS = LF - t_{ij}	Finish LF	
1 – 2	8	0	8	0	8	0
1 - 3	4	0	4	9	13	9
2 - 4	10	8	18	8	18	0
2 - 5	2	8	10	19	21	11
3 – 4	5	4	9	13	18	9
4 - 5	3	18	21	18	21	0

The critical path is 1 2 4 5 and all the activities in the critical path are termed as critical activities.

Rules and Conventions

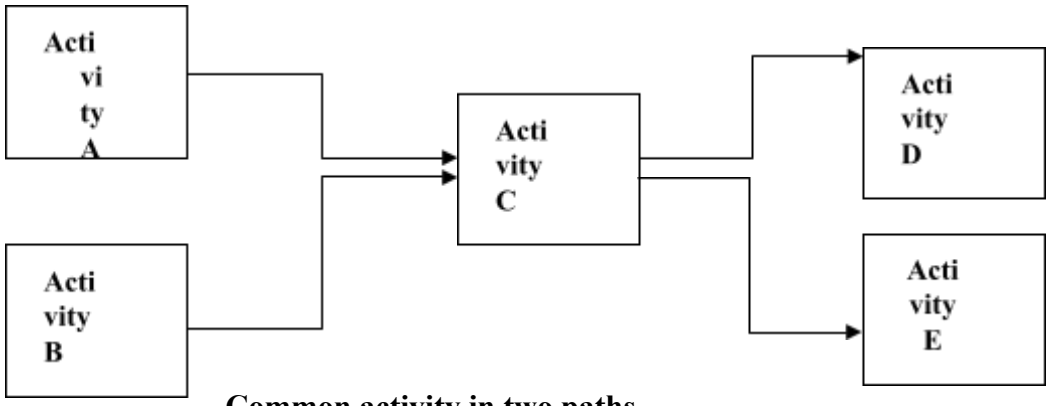
The following rules apply for the activity–on–arrow network. They are

- The project must have only one start node and only one end node.
- The link between nodes represents the duration but the nodes do not have any duration.
- The nodes are numbered sequentially and the arrows move only from left to right.
- The activity-on-arrow network should not contain any loop or dangle.

Dummy Activities

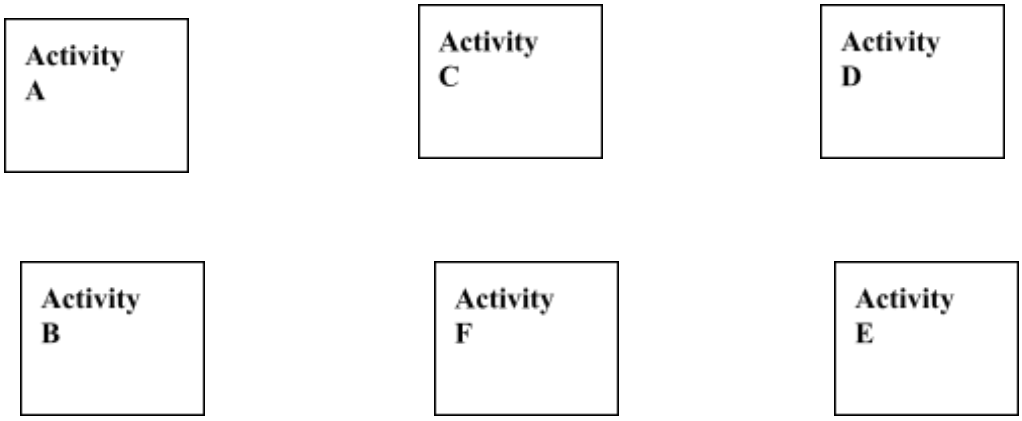
When there are two different paths having the common activity then, it can be represented using dummy activity.

The model below describes a situation where the third node is a common event.



Common activity in two paths

The problem can be solved by introducing a dummy activity for the third node as shown below where activity F is included as a dummy activity.



Dummy activity supporting the common paths

The paths are separated and made as independent paths by dotted lines in the network diagram.

Dummy activities have zero duration and do not use any resources.

These problems can be overcome by representing the network with activity-on-node.

An activity-on-node is illustrated below:

Lagged Activities and Labeling Activities

Lagged activities can be represented using ladder technique when activities are done in parallel.

The start or finish of one or more activities is slipped-out (lagged) or pulled-up(led) by a certain period.

A time lag is represented for activities that occur in parallel when time exceeds and the duration is shown on the linking arrow.

The lagged activity must be completed before the subsequent activity is started.

There are many conventions used in labeling the activity. Information present on the network diagram describes the specific activity and the related details are separately maintained in a different table.

Network Analysis

Network analysis is similar to activity-on-node and can be done in two passes.

Forward pass calculates the earliest dates of events and activities. Events are recorded on the network diagram and activities in the activity table.

Backward pass calculates the latest date for an event is the latest start date for all activities that arise from the event. When there are multiple activities happening, the earliest of the latest start dates for those activities are considered.

The critical path is the longest path through the network but slack is used in identifying the path.

Slack measures the difference between the earliest date and the latest date for an event without affecting the end date of the project. The nodes that form the critical path will have zero slack.

3.8 Framework in Risk Management

Risks are uncertain events that happen in the development process. Basically, risks have to be identified, analyzed and prevented from occurring in the project.

The framework for dealing with risk are

- Risk identification
- Risk assessment
- Risk planning
- Risk monitoring

3.8.1 Risk Identification

Identification of risks involves the following techniques namely,

- Brainstorming
- Checklists
- Casual mapping

All stakeholders identified in the project are brought together to have a brainstorming session before the project commences.

These stakeholders identify the various features of the project and analyze the problems that can arise in due course.

The outcome of the discussions of these sessions is beneficial in viewpoint of the development process because almost all kinds of risks that the project will face are analyzed.

Checklists are those risks that occur frequently in software development projects. These risks contain a list of specialized software development risks that occur.

Every stakeholder must undergo a thorough checking of this list and find out the kind of risk that can happen in their projects.

Project managers will have a separate list of risks solely associated with the software process. Any new kind of risks that happen in any of the projects can be added on to the organizational risk list.

Casual mapping can be represented as a cognitive map that describes the causes and effects that influence the outcomes in the activity development. The outcome can be a negative or a positive influence depending on the particular factor. For example, high staff turnover can be a positive factor but unstable requirements have a negative impact.

Casual maps usually represent people's perspective towards the development of the project.

3.8.2 Risk Assessment

Most frequent risks that occur causes more damage to the process. Risk exposure for every risk has to be calculated with the probability of occurrence.

Risk exposure is defined by

Risk exposure = (value of damage) X (probability of occurrence)

Here the potential damage is assessed by the money value of the development process. Few risk exposure assessments are listed below:

- Requirement specification changes during coding phase
- Staff's inability to complete the task assigned affects the critical activities.
- Specification process takes much longer than expected.
- Module testing produces errors of design phase.

Managers try to produce very precise estimates of loss or they expect something to happen. It is the duty of the managers to prioritize the risk and handle them giving due importance to its existence.

The potential damage and the likelihood of risk are described by qualitative descriptors, depicts the causes and the impact of the project are shown below:

Probability level / Impact level	Risk Probability (measured in chance of happening)	Cost (above budgeted expenditure)
High	Greater than 50%	More than 30%
Significant	30 – 50%	20 – 29%
Moderate	10 – 29%	10 – 19%
Low	Less than 10%	Within 10%

Qualitative descriptors of Risk Probability and Cost with range values

A probability impact grid or summary risk profiles are described in a matrix which indicates the position of risk. The top right of the matrix denotes the tolerance line with serious risk levels.

3.8.3 Risk Planning

Risk planning involves the following factors:

- **Risk acceptance**: A risk that has already occurred according to the prioritization process cannot be avoided. Accept the risk that happens and minimizes the damage and the costs of action.
- **Risk avoidance:** Some risks that happen regularly can be categorized and avoided before it occurs.

- **Risk reduction:** Precautionary measures are taken to reduce the probability of risk. Risk reduction attempts to reduce the occurrence of risk whereas risk mitigation ensures that the risk impact is much lesser when actually occurs.
- **Risk transfer:** Certain complex risks can be transferred to other organizations where experienced professionals can carry out the possibility of its occurrence.

3.8.4 Risk Monitoring

Risk monitoring is a planned process of assessing whether the predicted risks occur or not. It also collects information of the future risk analysis and attempts to determine what has caused the particular risk.

Project manager monitors the following factors:

- General attitude of team members

RISK REGISTER RECORD

Risk ID	**Risk title**		
Owner	**Date raised**	**Status**	
Description of Risk			
Description of Impact of risk			
Recommended risk mitigation			
Probability / Impact values		**Impact**	
	Probability	**Cost**	**Duration**
	Quality		
Pre-mitigation			
Post-mitigation			
History of action			

Date	**Action**	**Actor**	**Outcome**

Risk Register Page

3.9 PERT

A PERT chart is a project management tool used to schedule, organize, and coordinate tasks within a project. PERT stands for Program Evaluation ReviewTechnique, a methodology developed by the U.S. Navy in the 1950s to manage the Polaris submarine missile program.

PERT uses time as a variable which represents the planned resource application along with performance specification. In this technique, first of all, the project is divided into activities and events. After that proper sequence is ascertained, and a network is constructed. After that time needed in each activity is calculated and the critical path (longest path connecting all the events) is determined.

- PERT is a project management technique, whereby planning, scheduling, organizing, coordinating and controlling of uncertain activities is done. CPM is a statistical technique of project management in which planning, scheduling, organizing, coordination and control of well-defined activities takes place.
- PERT is a technique of planning and control of time. Unlike CPM, which is a method to control costs and time.
- While PERT evolved as a research and development project, CPM evolved as a construction project.
- PERT is set according to events while CPM is aligned towards activities.
- A deterministic model is used in CPM. Conversely, PERT uses a probabilistic model.
- There are three times estimates in PERT i.e. optimistic time (to), most likely time (tm) pessimistic time (tp). On the other hand, there is only one estimate in CPM.
- PERT technique is best suited for a high precision time estimate, whereas CPM is appropriate for a reasonable time estimate.
- PERT deals with unpredictable activities, but CPM deals with predictable activities.
- PERT is used where the nature of the job is non-repetitive. In contrast, CPM involves the job of repetitive nature.
- There is a demarcation between critical and non-critical activities in CPM, which is not in the case of PERT.
- PERT is best for research and development projects, but CPM is for non-research

projects like construction projects.

- Crashing is a compression technique applied to CPM, to shorten the project duration, along with least additional cost. The crashing concept is not applicable to PERT.

Three estimates are produced for each activity

- *Most likely time (m)*
- *Optimistic time (a)*
- *Pessimistic (b)*

Expected time' te= (a + 4m +b) / 6
Activity standard deviation' S = (b-a)/6

Expected time: Helps to carry out a forward pass through a network similar to CPM

Activity standard deviation: Used as a ranking measure of the degree of uncertainty or risk for each activity.

Activity	Optimistic (a)	Most likely (m)	Pessimistic (b)	Expected te	Standard deviation s
A	5	6	8	6.17	0.5
B	3	4	5	4.00	0.33
C	2	3	3	2.83	0.17
D	3.5	4	5	4.08	0.25
E	1	3	4	2.83	0.5
F	8	10	15	10.50	1.17
G	2	3	4	3.00	0.33
H	2	2	2.5	2.08	0.08

3.10 Monte Carlo Simulation

A Monte Carlo method is a technique that involves using random numbers and probability to solve problems. This method is often used when the model is complex, non linear or involves more than just a couple uncertain parameters. A simulation can typically involve over 10,000 evaluations of the model, a task which in the past was only practical using supercomputers. The Monte Carlo method is just one of many methods for analyzing uncertainty propagation, where the goal is to determine how random variation, lack of knowledge, or error

affects the sensitivity, performance, or reliability of the system that is being modeled.

Monte Carlo simulation is categorized as a sampling method because the inputs are randomly generated from probability distributions to simulate the process of sampling from an actual population. So, we try to choose a distribution for the inputs that most closely matches data we already have, or best represents our current state of knowledge. The data generated from the simulation can be represented as probability distributions (or histograms) or converted to error bars, reliability predictions, tolerance zones, and confidence intervals.

The main steps involved in carrying out Monte Carlo Simulation for a project consisting of n activities are as follows.

Step 1: Express the project completion time in terms of the duration of the n activities (xi, i=1 to n) and their dependencies as a precedence graph, d = f(x1, x2, …xn).

Step 2: Generate a set of random inputs, xi1, xi2, ..., xin using specified probability distributions.

Step 3: Evaluate the project completion time expression and store the results in di.

Step 4: Repeat steps 2 and 3 for the specified number of times.

Step 5: Analyze the results using histograms, summary statistics, confidence intervals, etc.

3.11 Resource Allocation

Resource allocation is the assignment of available resources to various uses. In the context of an entire economy, resources can be allocated by various means, such as markets or central planning. In project management, resource allocation or resourcemanagement is the scheduling of activities and the resources required by those activities while taking into consideration both the resource availability and the project time.

The resource allocation will normally be a number of schedules, including

- Activity Schedule – including the planned start and completion dates for each activity
- Resource Schedule – showing the dates on which each resource will be required and the level of that requirement
- Cost Schedule – planned cumulative expenditure incurred by the use of resources over time

In general, resources will fall into one of seven categories:

- Labor – Members of the project team
- Equipment – Workstations and other communicating and office equipments
- Material – Items that are consumed
- Space – Office space
- Services – Some specialist services telecommunicating

- Time – Offset against the other primary resource

Identifying Resource Requirements

- What resources are required along with the expected level of demand
- Consider each activity
- Identify required resources

Scheduling Resources

- Allocating resources for one activity limits flexibility for resource allocation and scheduling of other activities

Priorities resource allocation

- Total float priority

Activities are ordered according to their total float .Those with the smallest float are assigned the highest priority

Ordered list priority

ϖ Ordered according to predefined criteria

⎫ Shortest critical path – Critical activities

⎫ Shortest non-critical activity

⎫ Non-critical activity with least float

⎫ Non-critical activities

3.12 Creation of Critical Patterns

Scheduling resources can create new critical paths. Delaying the start of an activity because of lack of resources will cause that activity to become critical if this uses up its float.

Manage the allocation of resources within programmers

The resources of an organization consist of people, materials, equipment, knowledge and time. Organizations typically have limited resources; therefore, tradeoffs on what project resources are expended and when are made every day within organizations. A resource allocation plan is an important tool in effective management of scarce resources. The timing of the need of those resources can be and should be determined within the project schedules. A resource plan, which describes the type of resource needed and the timing of that need, is critical to effective resource management. As the project schedule changes, the resource plan must also be flexible

enough to adjust as these changes occur.

Examples

Allocating resources is fairly self-explanatory. If allocating stone for building a house, the project manager must ensure that she procures enough stone to complete the project. Regarding leveling, if renting equipment, the project manager must ensure it will be used steadily rather than sporadically rented and returned. If contracting carpenters, the project manager should aim to strive to keep a set number of carpenters working at a set number of hours for the duration of the project to ensure consistency. Carpenters may have difficulty scheduling more sporadic hours into their schedule, meaning the firm might then have to contract more workers, leading to inconsistent results. Meanwhile, materials don't necessarily need to be leveled as they have been purchased rather than rented or paid by the hour.

3.13 Cost Schedules

Calculating cost is straightforward where the organization has standard cost figures for staff and other resources. Staff costs include not just salary, but also social security contributions by the employer, holiday pay etc. Timesheets are often used to record actual hours spent on each project by an individual. One issue can be how time when a staff member is allocated and available to the project, but is not actually working on the project, is dealt with. Overheads e.g. space rental, service charges etc. Some overheads might be directly attributable to the project, in other cases a percentage of departmental overheads may be allocated to project costs. Usage charges are some charges that can be on a 'pay as you go' basis e.g. telephone charges, postage, car mileage – at the planning stage an estimate of these may have to be made.

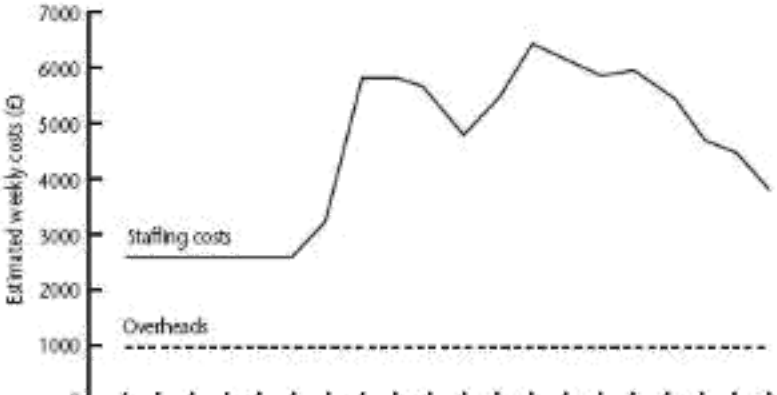
In general, costs are categorized as follows.

Staff Costs

Overheads

Usage Charges

Cost profile



This shows how much is going to be spent each week. This could be important where an organization allocates project budgets by financial year or quarter and the project straddles more than one of these financial periods

Accumulative costs

The project manager will also be concerned about planned accumulative costs. This chart can be compared to the actual cumulative costs when controlling the project to assess whether the project is likely to meet its cost targets.