

3

Activity based Scheduling

3.1 Introduction, Objectives of Activity Planning, Project Schedules

Q.1 What is activity planning ?

Ans. :

- However, a schedule outlining the beginning and end times of each

activity is also required as part of a thorough project plan. With this, we will be able to :

- Guarantee that the necessary resources will be accessible exactly when needed;

○ Avoid from conducting many activities that compete for the same resources at the same time;

- Create a detailed timetable indicating which employees handle each task;

○ Create a detailed plan that may be used to gauge real success;

- Create a forecast for timed cash flow;

○ Re-plan the project to address drift from the aim during its life.

- A plan must be expressed as a collection of objectives whose accomplishment or failure can be clearly measured in order to be effective. This is accomplished via the activity plan's provision of target start and finish dates for each activity (or a window within which each activity may be carried out).

[4 Marks]

Q.2 What are the project's objectives and goals ?

Ans. :

OR What are the objectives of activity planning ? Explain in detail.

[5 Marks]

- It is improbable that everything will proceed as planned as a project develops. Recognizing errors, determining their causes and changing the plan to mitigate their impacts make up a large portion of project management tasks. The activity plan should include a way to assess the effects of missing any of the activity goal dates and instructions on how to change the plan most efficiently to get the project back on track.

Q.2 What are the objectives of activity planning ? Explain in detail.

Ans. :

- **Feasibility assessment** : A feasibility study is only an assessment of the feasibility of a proposed plan or project. Pay attention to possible problems during project implementation. In order to determine whether the project is feasible after considering all important factors, that is, whether it is worth solving.

- **Resource allocation** : Resource allocation is the process of allocating and scheduling available resources as efficiently and economically as possible. Projects always need resources, but these resources are usually scarce. Therefore, it is the responsibility of the project manager to determine the appropriate time and allocate resources. These resources are within the project schedule. So what is the resource allocation in project management ? It is about managing and delegating resources throughout the project to ensure that it runs as evenly and successfully as possible.
- **Detailed costing** : After generating an activity plan and allocating particular resources, we will acquire extra complete estimates of prices and their timing.

- **Motivation :** Motivation to set goals and track progress against goals is an effective way to motivate employees, especially if they are initially involved in setting these goals.
- **Coordination :** The project plan offers a useful service means of communication and collaboration between teams, especially for large projects with multiple project teams. Can be used as needed, will not be affected by forced shutdown.
- The goal of activity planning and scheduling strategies is to complete the project in the shortest possible time at the lowest possible value or to fulfill an arbitrary deadline at the lowest possible value.
- A successful method to shorten the project duration is to hold activities in parallel. Obviously, we cannot complete all activities at the same time, some of which require completion of other activities to start and there may be resource constraints that limit the scope of work. However, activities planning will enable us to understand the cost of these restrictions in terms of extending the time frame and will let us understand how to reduce the time frame by relaxing these restrictions. For example, priority restrictions make it possible to start coding the program before the design is complete to ensure that we have a clear understanding of the potential impact on product quality.

Q.3 Explain the importance of project plan.

[4 Marks]

Ans. :

- Planning is a process of continuous improvement and each iteration is more detailed and precise than the previous one. Iterations after iterations, focus and the plan's objective will change.
- Throughout the feasibility study and start-up of project period, the main objective of the plan is to assess the time and risk of non-compliance with the deadline for completion or exit within the budget. Develop an action plan to ensure the availability of resources and control of cash flow.

- From the entire project to the delivery of the final product to the customer, monitoring and re-planning should continue to correct any deviations that may hinder the achievement of time or cost goals.

Q.4 What is a project ? Explain how project schedule is done in step wise. [5 Marks]

Ans. :

- A project is
 1. A particular plan or design.
 2. An anticipated undertaking
 3. An enormous undertaking
- In the case of large projects, detailed planning for subsequent stages will be postponed till the details of the necessary task is available at an earlier point in time.
- Before starting work on a project or perhaps in a bigger project phase, a project plan should be created to show the date when each activity should start and end and the amount of each resource. When a plan is improved to a level of detail it is called a project schedule.
- There are four phases to developing a project schedule.
 - The initial stage in creating a plan is deciding which activities must be completed and in what sequence they must be completed. On this basis, we can create an ideal activity plan, that is, if resources are not limited, ideally a time plan for each action can be taken. This is about making the perfect plan of activity. The activity plan is gradually created in steps 4 and 5, as shown in the Fig. Q.4.1.
 - The ideal activity plan then becomes the subject of activity risk analysis, the purpose of which is to identify potential problems that can come up with an activity plan that will almost certainly affect the allocation of resources.



2. Classify project in product-based

3. Classify source of the project in activity-based

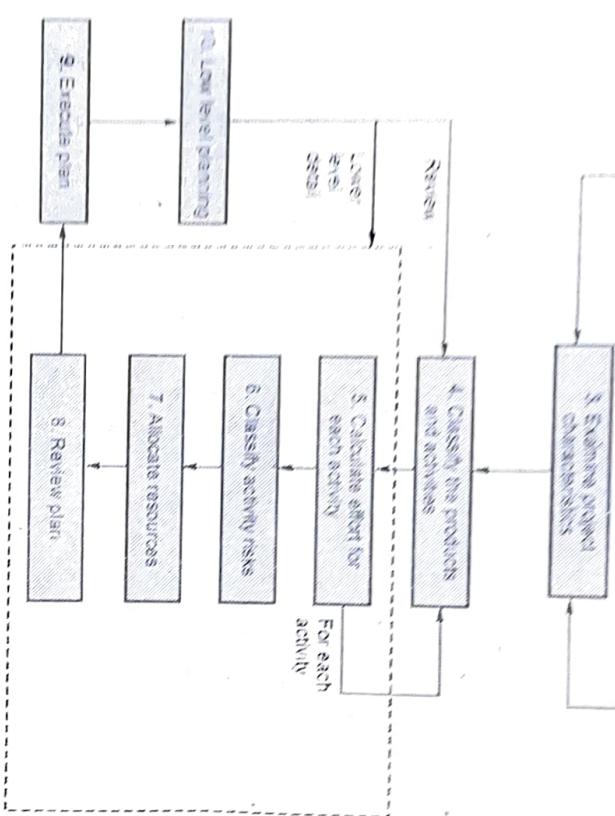


Fig. Q.4.1 : The activities are planned for step 4 and step 5

- The third phase is to allocate resources. Expected resources availability may limit how some activities can be taken and our ideal plan may need to take this into account.
- The last step is scheduling. Once resources are allocated for each activity, we can create and produce a project schedule, which contains the start and end dates of the plan and an overview of the resource requirements for each activity.

3.2 Activities : Sequencing and Scheduling, Network Planning Models, Formulating Network Model

Q.5 Write a short note on project activity.

Ans. :

- Project activities are actions taken by the project to achieve the set goals. These are very specific, practical and well-defined measures. By reading the description of the project activity, we can immediately describe the project in our mind effortlessly.
- Activities need to be defined to fulfill these standards. Any activity that does not fulfill these standards should be reviewed.

- The project consists of many interrelated activities.
- When at least one activity is ready to start, the activities can begin.
- When all activities in the project are completed, the project is complete.
- Activities should have a clearly defined starting and ending point, usually characterized by achieving tangible results.
- When an activity requires a resource, the demand for that resource should be predictable and it is assumed that as the activity decomposes, it will continue to be needed.

- The period of an pasture need to be forecastable assuming regular circumstances and the affordable availability of resources.
- Certain activities may require other users to complete before they can begin.

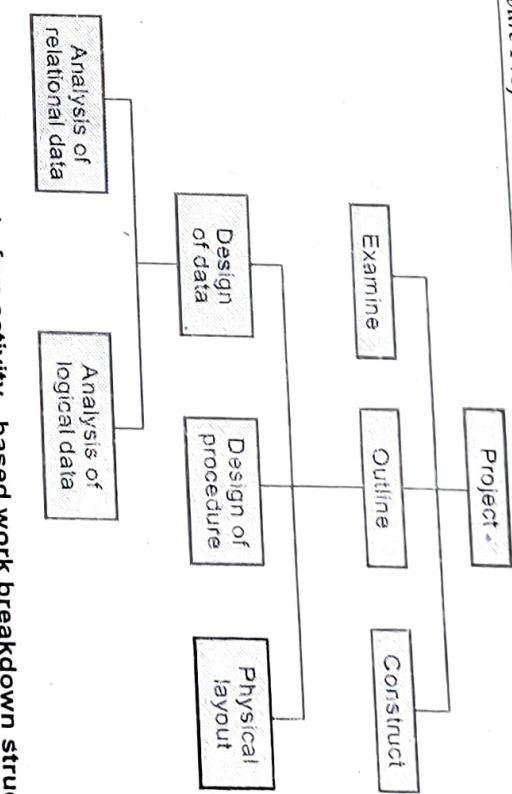
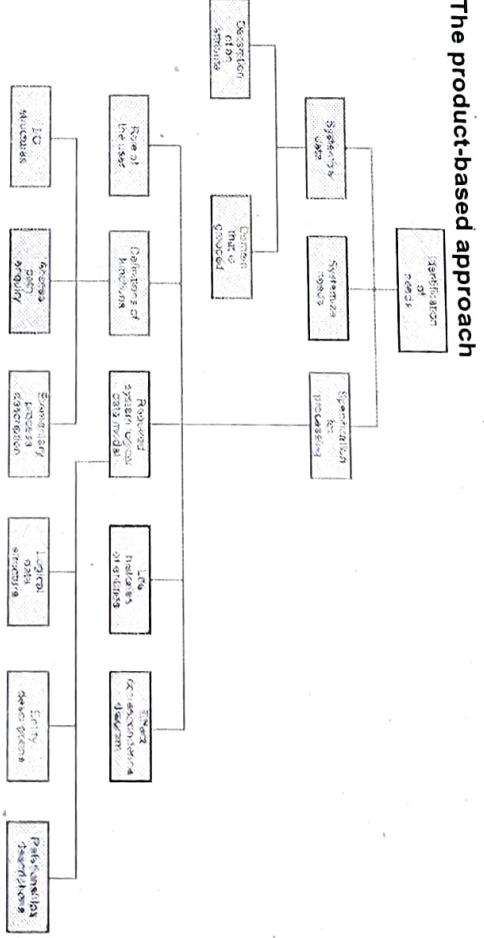
Q.6 Explain different approaches for identifying the activities that make up a project. [9 Marks]

Ans. : Identifying activities

- The activity-based approach, the product-based approach and the hybrid approach are the three basic techniques to determining the activities or tasks that make up a project.

The activity - based approach :

- The activity - based approach involves making a list of all the project's activities should include, which can be brainstormed with the entire project team or derived from an analysis of previous projects. For large projects, it may be helpful to break the project down into lifestyle milestones and view each milestone separately.
- The preferred method of creating a task list is to create a Work Breakdown Structure (WBS) instead of performing this operation all at once and there is an obvious risk of tasks being missed or calculated twice. This includes defining the main goal (or high level). It is necessary to finish the project first and then divide it down into sub-tasks. Fig. Q.6.1 shows an excerpt from the PSP, where the design task is split into three tasks and one of the tasks is split into two tasks.
- Activities are introduced to a branch with inside the shape in the event that they at once make a contribution to the task right away above - in the event that they do now no longer make a contribution to the parent task, then they must now no longer be introduced to that branch.
- The task at every degree in any branch has to consist of the whole thing this is required to finish the task on the better degree.
- When making ready a WBS, attention should accept to the very last degree of element or intensity of the shape. Too outstanding a intensity will bring about a massive wide variety of small duties so that it will be hard to control, while a too shallow shape will offer inadequate element for task control. Branches should, however, be deteriorated as a minimum to a degree wherein every leaf can be allocated to an person or accountable phase in the corporation.
- One of the aforementioned advantages of the WBS method is to determine that it tends to generate a complete task catalogue with non-overlapping activities. Note that only the outline table constitutes the list of activities that make up the project. The top node is just a collection of operations.

The product-based approach**Fig. Q.6.1 : A fragment of an activity - based work breakdown structure****The product-based approach****Fig. Q.6.2 : SSADM product breakdown structure**

- It includes creating a hierarchical product structure and product block diagram. For each product, the PFD indicates which other products are required as input. Therefore, by identifying some proponents who led to this approach argued that products are less likely to be excluded from PBS than activities in unstructured activities and PFD can easily become an ordered list of activities.

- This method is in particular suitable if the usage of a technique inclusive of SSADM, which without a doubt specifies, for every step or task, every of the goods required and the task required to supply it. The SSADM Reference Manual gives a fixed of regularly occurring PBSs for every level in SSADM (inclusive of that proven in Fig. Q.6.2), which may be used as a foundation for producing a project-precise PBS.

- The SSADM reference guide also provides generic activity networks that is a good starting point for designing project-specific action networks by using project-specific PBS and PFD derivatives.

The hybrid approach

- The WBS shown in Fig. Q.6.1 is based largely on structured activities. Or, possibly more frequently, the WBS can be based on the results of the project, as shown in Fig. Q.6.3 and the results of the project are based on a simple list of results. For each result, a series of activities are required to achieve the goal. Fig. Q.6.3 shows a flat WBS and it is likely that the introduction of additional layers of structured products and activities is useful in projects of any size. When the structure is related to the product or the activity may depend on the type of project and the specific development method used. In the same way that pure action - based PSPs, after recognizing actions, our task is to organize them.

- The structure defines the number of layers in the structure and the type of each layer, which can be superimposed on the PSP. For example, IBM recommends using the following five levels in WBS in its MITP method :

Ans. :

- Level 1 : Project
 - Level 2 : Deliverables
 - Level 3 : Components
 - Level 4 : Work-packages
 - Level 5 : Tasks

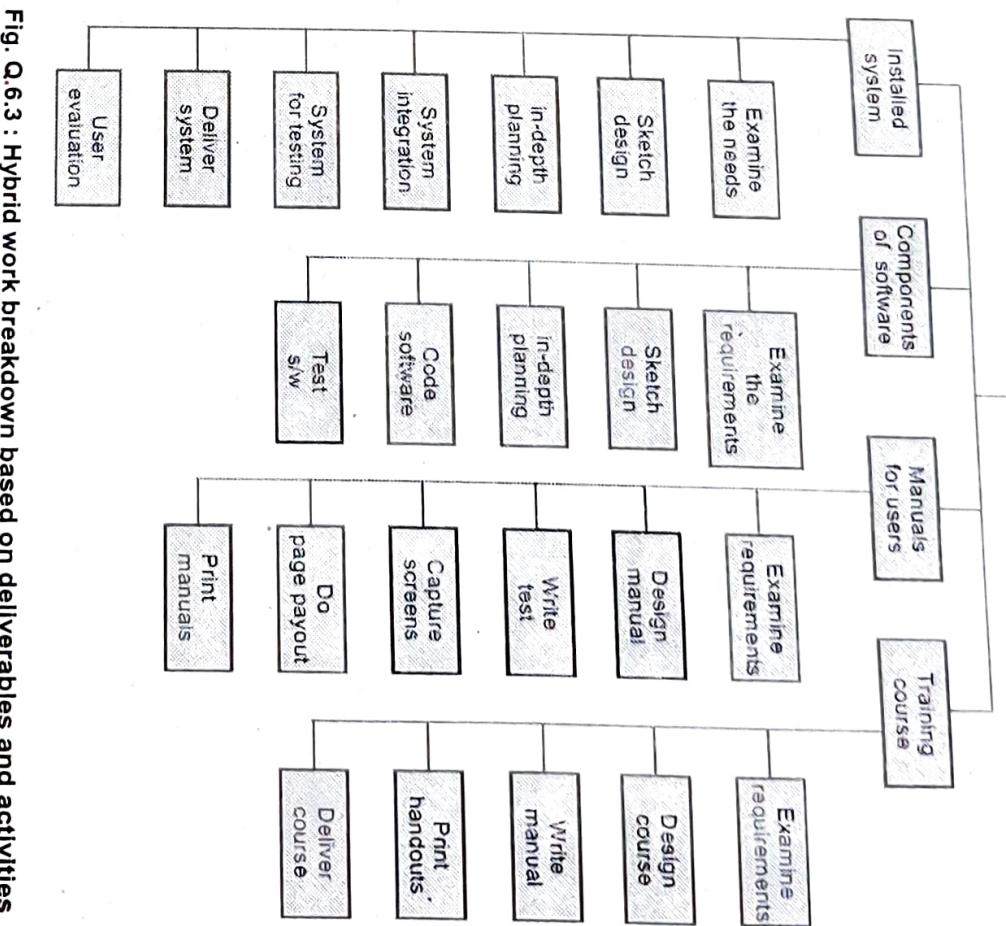


Fig. Q.6.3 : Hybrid work breakdown based on deliverables and activities

Q.7 Define WBS. What are the advantages of WBS ? [3 Marks]

- The preferred method of creating a task list is to create a Work Breakdown Structure (WBS) instead of performing this operation all at once and there is an obvious risk of tasks being missed or calculated twice. This includes defining the main goal (or high level). It is necessary to finish the project first and then divide it down into sub-tasks.

- It is important to take the final level of detail or depth of the structure into account while creating a WBS. A structure that is too deep will produce a lot of little, difficult-to-manage jobs, but one that is too shallow won't give us enough information to manage our project. However, each branch should be divided at least sufficiently to allow each leaf to be allocated to a specific person or accountable division within the organization.

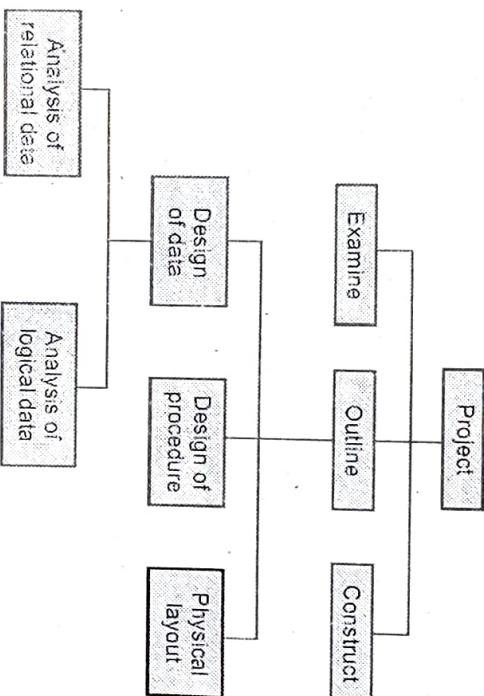


Fig. Q.7.1 : A fragment of an activity-based work breakdown structure

- Advantage of WBS :** The WBS approach is said to have the advantage of being far more likely to provide a task catalogue that is comprehensive and made up of non-overlapping tasks. Keep in mind that the list of project activities is only represented by the structure's leaves; higher-level nodes are only aggregates of project activities.
- The WBS also indicates a framework that could be improved as the project moves forward. We may utilise a somewhat shallow or high-level WBS in the early stages of a project. This WBS can be updated as new information becomes available, usually throughout the project's analysis and specification phases.

- It is necessary to sequence the project's activities after they have been identified (whether or not a WBS was used for this purpose). This means determining which activities must be finished before others can begin.

Q.8 How do you plan a software project's schedule ? [5 Marks]

Ans. :

- In the case of large projects, detailed planning for subsequent stages will be postponed till the details of the necessary task is available at an earlier point in time.

- Before starting work on a project or perhaps in a bigger project phase, a project plan should be created to show the date when each activity should start and end and the amount of each resource. When a plan is improved to a level of detail it is called a project schedule.
- There are four phases to developing a project schedule.
- The initial stage in creating a plan is deciding which activities must be completed and in what sequence they must be completed. On this basis, we can create an ideal activity plan, that is, if resources are not limited, ideally a time plan for each action can be taken. This is about making the perfect plan of activity. The activity plan is gradually created in steps 4 and 5, as shown in the Fig. Q.1.1 of Unit - II.
- The ideal activity plan then becomes the subject of activity risk analysis, the purpose of which is to identify potential problems that can come up with an activity plan that will almost certainly affect the allocation of resources.
- The third phase is to allocate resources. Expected resources availability may limit how some activities can be taken and our ideal plan may need to take this into account.
- The last step is scheduling. Once resources are allocated for each activity, we can create and produce a project schedule, which contains the start and end dates of the plan and an overview of the resource requirements for each activity.

Q.9 Define following terms : [8 Marks]**1. Objective of activity planning****3. Sequencing**

Ans. :

1. The objective of software project planning is to provide a framework that enables the manager to make reasonable estimates of:

- Resources
- Cost
- Schedule

2. A plan of when each activity would ideally be undertaken was resources not a constraint.

3. Sequencing is defined as identifying the depending among activities by the development process
4. Scheduling is defined as process of specifying the time for when each activity should take place.

Q.10 What is dangle in an activity network ? Give an example. [3 Marks]

Ans. :

- A dangling activity is a "loose" activity that doesn't have a predecessor activity or a successor activity in our project calendar. It is challenging to think of an activity that is entirely unrelated to any other activity.

- "Optimizing the database" is an example of a dangling activity in a software project. This activity can be started at any time during the project; no activity needs to wait for the database to be optimized in order to begin.

Q.11 What methods are used to sequence and schedule activities ? [6 Marks]

Ans. :

- During the course of the project, we need a schedule that clearly shows the planned time of each project activity and what resources we need. One way to express this type of plan is to use bar charts, as shown in Fig. Q.11.1.

• Activity key :

- A : Overall design
- B : Specify module 1
- C : Specify module 2
- D : Specify module 3
- E : Code module 1
- F : Code module 3
- G : Code module 2
- H : Integration testing

○ I : System testing

Task person	Weeks											
	1	2	3	4	5	6	7	8	9	10	11	12
A : Bob												
B : Bob												
D : Bob												
E : John												
F : John												
G : James												
I : Roy												

Fig. Q.11.1 : A project plan as a bar chart

- The chart was created with consideration of the development process's nature and available resources. So when creating the chart, we did two things : We organized and planned the task. If we have a different number of employees or if we have to distribute events in a different way, the schedule may be completely different.
- This method combined with sequential planning is very suitable for small projects, especially if we want to assign personnel to perform specific tasks early in the planning phase. However, for bigger projects, It's best to keep two activities distinct : Organizational tasks. Tasks are planned according to their logical relationship and then considering resources and other factors.

Q.12 Explain network planning models.**[3 Marks]**

- Project activities and their interactions are modeled as networks in these project scheduling systems. Time flows from left to right in the network.
- CPM (Critical Path Method) and PERT (Project Evaluation and Reporting Technique) are two of the most well-known of these methods, which were created in the 1950s (program evaluation analysis method).

- When visualizing the project as a network with activities represented as arrows joining circles or nodes that could represent the beginning or end of an activity or series of activities, both of these strategies used an activity-on-arrow approach. Precedence networks, a variant of these methods, have gained popularity more lately. In this method, activities are represented as nodes in activity-on-node networks and the links between the nodes stand in for precedence (or sequencing) requirements. The latter method offers more flexibility for representing specific situations simply while avoiding some of the drawbacks of the activity-on-arrow representation. The vast majority of currently accessible computer applications use this technique.

- These three approaches are highly similar and it must be acknowledged that many people refer to any or all of the approaches by the same name (especially CPM).

Q.13 Explain formulating a network models.**[9 Marks]**

- Ans. :** Representing the activities and their Interrelationships as a graph is the first step in building a network model. To do this with activity-on-node, we represent activities as nodes (boxes) in the network, with the connections between nodes signifying dependencies.

- A. Constructing precedence networks :** It is worthwhile to spend some time thinking about certain guidelines for networks' construction before we examine how they are used.

- A project network should have only one start node :** Although drawing a network with more than one initial node is logically conceivable, doing so is not recommended because it could lead to confusion. In certain circumstances (for instance, when multiple activities may begin as soon as the project begins), it is typical to create a "start" activity that has no duration but might have a real start date.
- A project network should have only one end node :** A project can only be finished once and the end node marks its conclusion. It is feasible to depict a network with more than one end node, however doing so will almost likely cause confusion. It is typical to create a "finish" activity when more than one "final" action is required for a project to be completed.
- A node has duration :** An activity is represented by a node and activities typically take time to complete. But take note that there is no mention of durations in the network in Fig. Q.13.1. This network diagram just illustrates the project's logic the principles dictating the sequence in which tasks are to be completed.

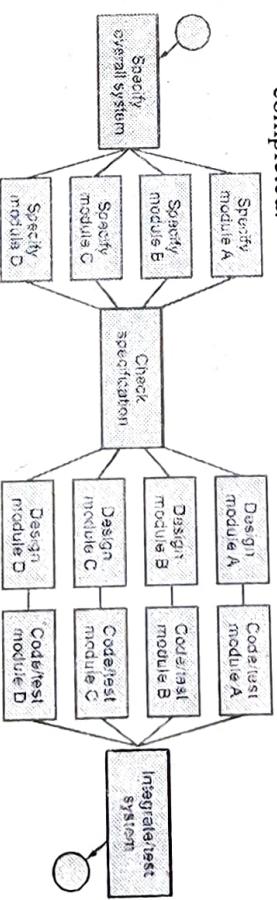
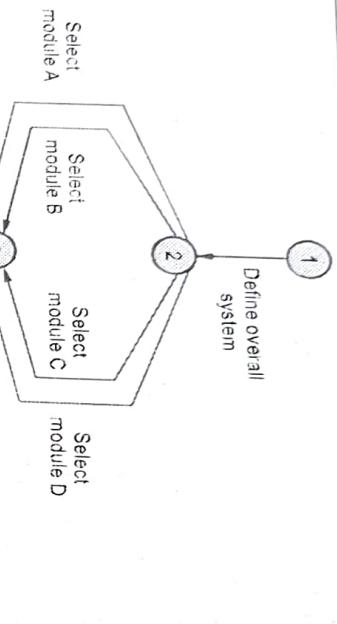


Fig. Q.13.1 : The project activity network for the IOE annual maintenance contracts has a checkpoint activity added to it

Fig. Q.13.2 shows how this network looks like a network with a critical path.



7. A network may not contain loops : Fig. Q.13.4 shows a loop in the CPM network. In a sense, the loop is an error; since it reflects a condition that does not exist in reality. Loops in the iterative sense can occur in practice, but they cannot be directly mapped to the project network. It should be noted that the logical assumption in Fig. Q.13.4 cannot start the program test until the error is corrected.

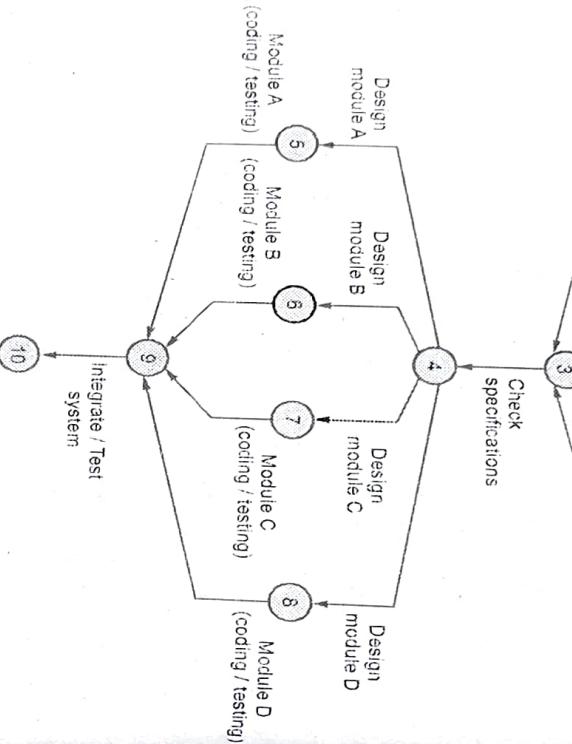


Fig. Q.13.2 : The IOE maintenance group accounts project activity network fragment represented as a CPM network

- Links normally have no duration :** The relationships between activities are represented by links. Installation in Fig. Q.13.3 cannot begin until program testing is finished. Coding and data take-on must both be finished before program testing can begin.
- Precedents are the immediate preceding activities :** According to Fig. Q.13.3, the activity "Program test" cannot begin until the activities "Code" and "Data take-on" have been done and the activity "Install" cannot begin until the activity "Program test" has been completed. Therefore, it can be

We can draw a set of activities as a straight sequence and repeat it the right number of times if we know how often we plan to repeat a set of activities, such as a test-diagnose-correct sequence. If we don't know how often a sequence will occur, we can't estimate how long the project will take without using a different approach, such reframing the entire sequence as a single activity and predicting how long it would take to finish.

Even though the loop in this tiny network fragment is obvious, very large networks can easily have intricate loops that are challenging to identify when they are first built. Thankfully, every network design software will find loops and send out error alerts when they do.

- A network should not contain dangles :** A dangling activity like "Write user manual" in Fig. Q.13.5, shouldn't exist since it could result in mistakes in further analysis. In fact, when activities are created as an afterthought, they frequently show logical problems. Fig. Q.13.5, should be revised to include a final completion activity if, as intended, the project is considered complete once the software has been deployed and the user manual has been prepared. This would be a more true

depiction of what should occur in this scenario. In Fig. Q.13.6 the redrawn network is displayed.

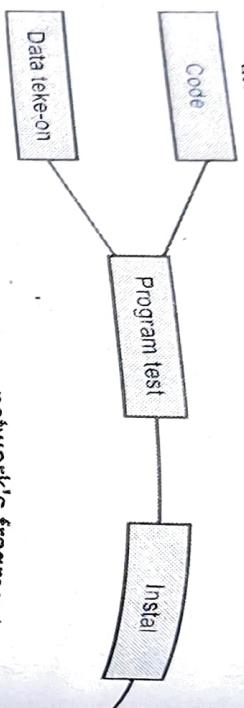


Fig. Q.13.3 : A precedence network's fragment

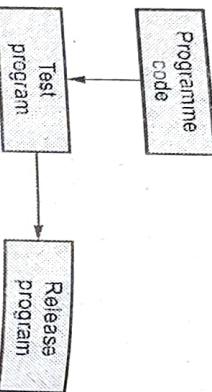


Fig. Q.13.4 : A precedence network's fragment

Fig. Q.13.6 : Resolving the dangle

B. Representing lagged activities

- In some circumstances, we might want to carry out two tasks simultaneously as long as there is a delay between them. When assessing a prototype, we may want to record changes made to a program as it is being tested. We may name the activity "test and document adjustments" in this situation. However, it would be hard to demonstrate that modification recording could begin, say, one day after testing began and terminate, say, a few days after testing was over.
- We depict the lag with a duration on the linking arrow as illustrated in Fig. Q.13.7 when actions can happen in parallel with a time lag between them. This means that documenting changes can begin the day after prototype testing begins and can be finished two days after prototype testing is finished.

Fig. Q.13.5 : A dangle

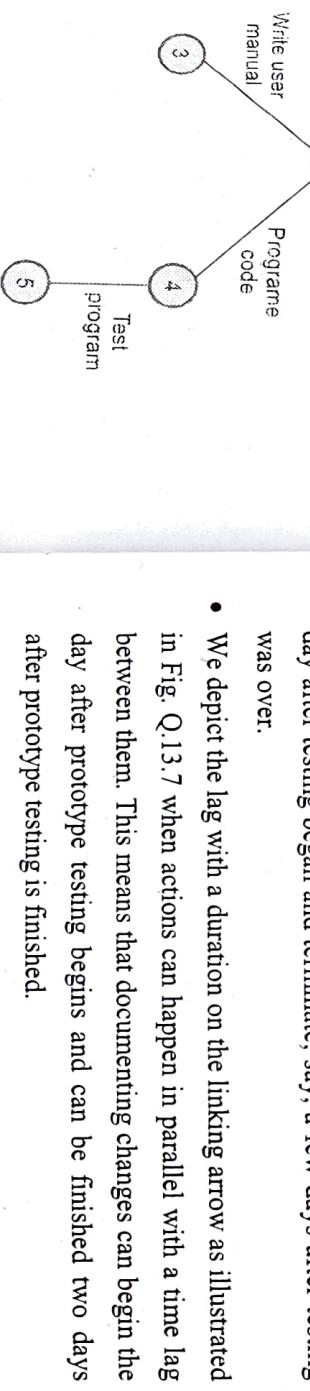
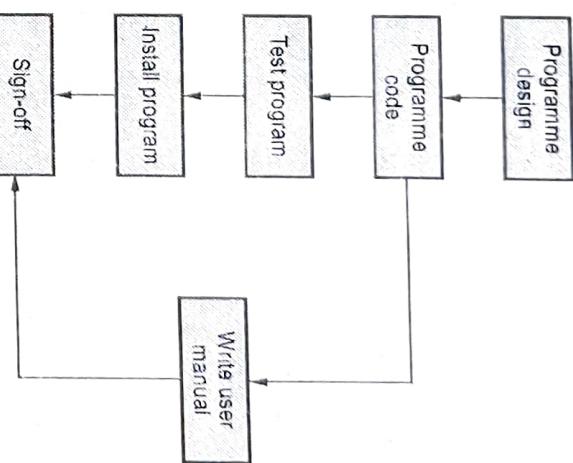




Fig. Q.13.7 : Lags indication

C. Hammock activities

- Activities that are "hammocked" are those that, while having duration by themselves, are considered to begin at the same time as the first activity and terminate at the same time as the last. They are typically employed to depict overhead expenses or other resources that will be used or incurred continuously throughout a set of operations.

D. Labeling conventions

Earliest start	Duration	Earliest finish
Activity label, activity description		
Latest start	Float	Latest finish

Table Q.13.1 : Labeling conventions

- From Table Q.13.1, for entering data on an activity on-node network, a variety of different conventions have been adopted.
- The activity label, which may also include a project code, is typically a code created to specifically identify the activity.
- Typically, the activity description will be a succinct activity name, like "Test take-on module."

3.3 Activity Relationships (FS, SF, SS, FF), Forward Pass and Backward Pass Techniques, Critical Path Concept and Remedies

Q.14 What is activity relationships in software project management? [4 Marks]

Ans.:

- After determining the activities, we analyze them to see if there is any relationship between them. If there is a relationship, it is best to show it, so as to better comply with the project schedule. There is a link between these two activities shown in Fig. Q.14.1. Let's do two exercises to understand this concept and name activity A and B.
- Activity A and B are predecessor and successor activities. If something goes wrong with the previous operation, it will affect the subsequent operation. Therefore, the subsequent action B is a subordinate action of the previous action A. We can see here-A is an independent action. Logically speaking, action A precedes action B.

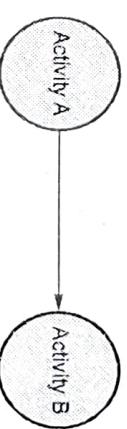


Fig. Q.14.1 : Activity relationships

- There are four types of relationships between Action A and B :
 - Finish-to-start (FS)
 - Finish-to-finish (FF)
 - Start-to-start (SS)
 - Start-to-finish (SF)
- We use F or S to define the relationship between these two characters (AB).

- The first character is linked to the preceding activity (Activity A). It specifies the processor's current state of operation. In the way, we attach the second character to the successor (Activity B). The character specifies the rule that must be applied to the activity shown in the Fig. Q.14.2.

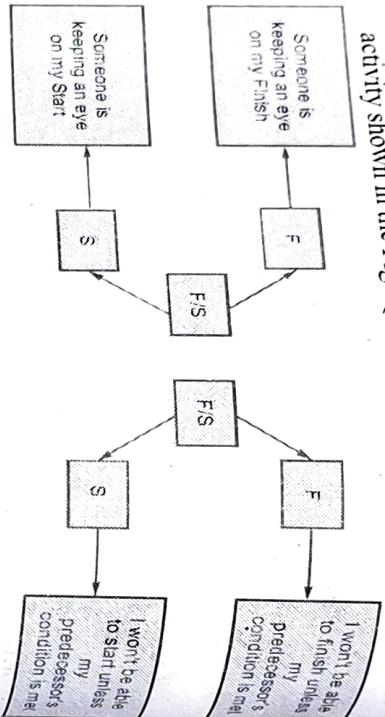


Fig. Q.14.2 : Activity relationships with finish and start activities

- Q.15 How many activity relationships are used in software project management ? Explain any two relationships in detail.** [8 Marks]

Ans. : There are four types of relationships between Action A and B.

- Finish-to-start (FS)
- Finish-to-finish (FF)
- Start-to-start (SS)
- Start-to-finish (SF)

Finish-to-Start (FS)

- A logical link between two activities in which a successor endeavor cannot begin until the predecessor activity is complete.

- The most prevalent logical relationship is Finish to Start.

- As we can see, this limitation of relationships does not affect independent activities, but only dependent activities, that is, in our case activity B.

- As a result of this FS connection, F represents the end of action A and it is at this point that activity B can begin. The second character "S" is the successor rule, making it dependent on the final state of the successor of the action shown in Fig. Q.15.1.

- Activity B is keeping track of my finish date and time

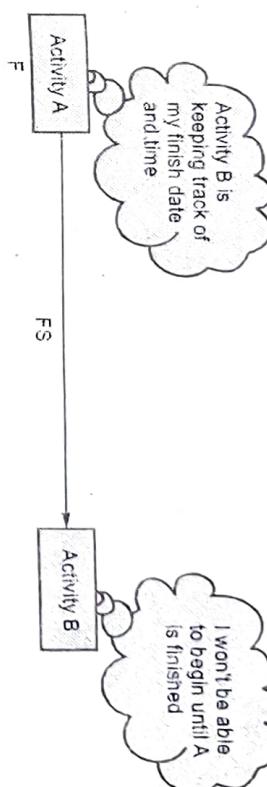


Fig. Q.15.1 : Finish-to-start

Example

- We cannot start development before the design is complete. The development here is an activity that depends on the design activity. Design is the activity that comes before development and it can only begin once it is completed.

Start-to-Start (SS)

- A logical relationship where a successor activity cannot begin until the predecessor activity has begun.
- As a result, if action B is dependent on this relationship, it cannot begin until the preceding (independent) activity A has begun. The start of the predecessor activity B depends on the start status of the successor activity A from activity B shown in Fig. Q.15.2.

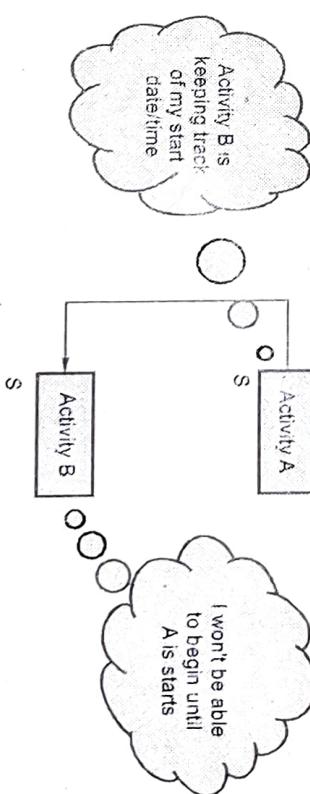


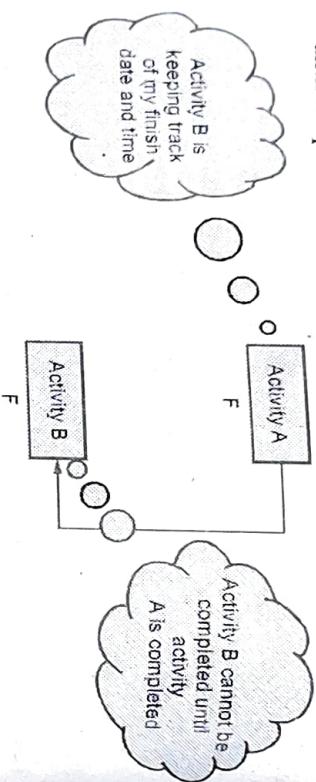
Fig. Q.15.2 : Start-to-start

Example

- The marketing manual preparation activity can only start after the user document is run, so A and B can run in parallel after A starts.
- If we want to know the actual conditions under which operation B can be made dependent on the initial state of operation A.

Finish-to-Finish (FF)

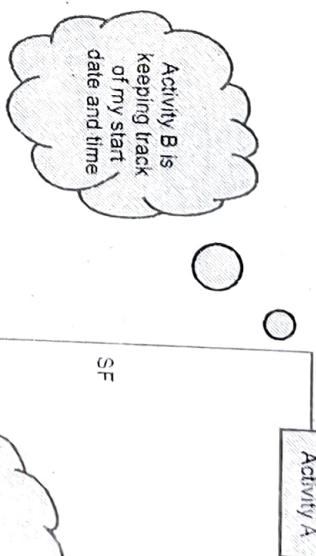
- A logical relationship in which a successor action cannot complete until the predecessor has completed.

**Fig. Q.15.3 : Finish-to-finish**

- If activity B is associated with this relationship, it means that it cannot be completed until the previous (independent) activity A is completed. Therefore, B must complete their result and continue A until A completes. For example, playing a football game cannot end before the game is over. Therefore, the game does not rely on rebroadcasting, but on rebroadcasting. If the game lasts longer than originally planned, the transmission will also continue until this point in time shown in Fig. Q.15.3.
- Even if the game is over, the broadcast can continue. The show can continue to discuss highlights and so on. This means that it will end after subsequent operations, but it must end immediately.

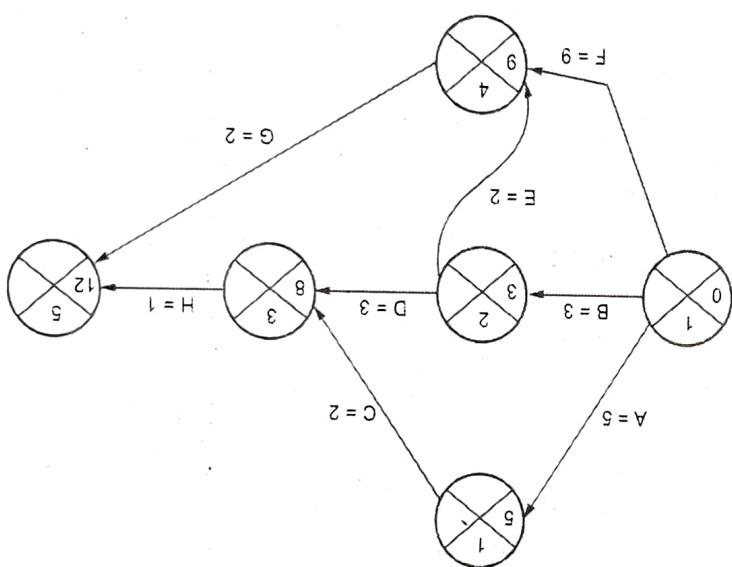
Start-to-Finish (SF)

- A logical connection in which successor activity cannot be completed before the start of the predecessor activity.

**Fig. Q.15.4 : Start-to-finish****Q.16 Explain any good example of finish to-start in detail. [3 Marks]****Ans. :**

- A logical link between two activities in which a successor endeavor cannot begin until the predecessor activity is complete.
- The most prevalent logical relationship is Finish to Start.
- As we can see, this limitation of relationships does not affect independent activities, but only dependent activities, that is, in our case activity B.
- As a result of this FS connection, F represents the end of action A and it is at this point that activity B can begin. The second character "S" is the successor rule, making it dependent on the final state of the successor of the action shown in Fig. Q.16.1.

Fig. Q.18.1 : A CPM network after the forward pass



depends on may be accomplished.

- The forward pass is used to determine the earliest date on which each event and activity can be begun and completed. The earliest date for an event is the earliest date that all of the activities that it depends on may be accomplished.
- The forward pass is used to determine the earliest date on which each event and activity can be begun and completed. The earliest date from the forward pass, the earliest date is recorded in the calculation activity table of the activity.

They are recorded in the network diagram of the activities and the activity table of the activity.

- In the forward pass, the earliest date is recorded in the calculation activity table of the activity.

Ans. :

Q.18 What do you mean by activity table? Explain activity table of forward pass. [8 Marks]

can be made dependent on the initial state of operation A.

- If we want to know the actual conditions under which operation B

user document is run, so A and B can run in parallel after A starts.

- The marking manual preparation activity can only start after the

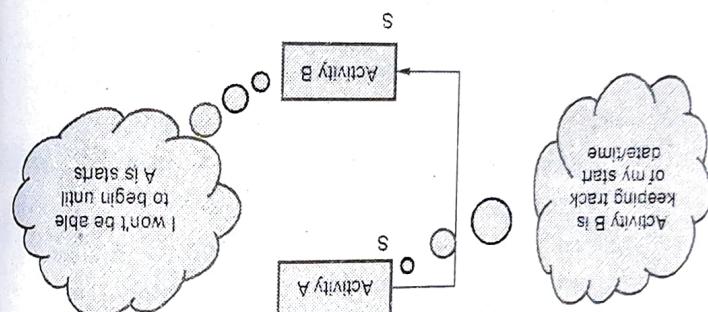
example user document is run, so A and B can run in parallel after A starts.

can be made dependent on the initial state of operation A.

Example

Software Project Management 3 - 28 Activity based Scheduling

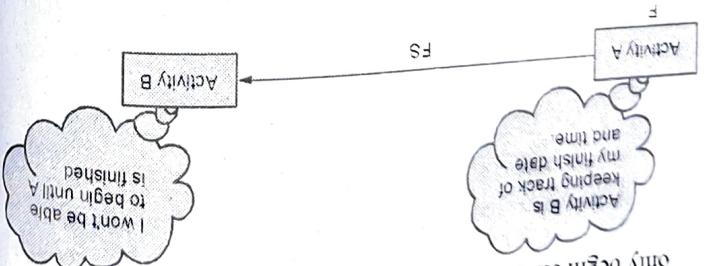
Fig. Q.17.1 : Start-to-start



- A logical relationship where a successor activity cannot begin until the predecessor activity has begun.
- As a result, if action B is dependent on this relationship, it cannot begin until the preceding (independent) activity A has begun. The start of the predecessor activity B depends on the start status of the predecessor activity A from activity B shown in Fig. Q.17.1.

Q.17 What is Start-to Start activity relationship between two activities? Give suitable example. [3 Marks]

Fig. Q.16.1 : Finish-to-start



- We cannot start development before the design is complete. The development here is an activity that depends on the design activity.
- Design is the activity that comes before development and it can only begin once it is completed.

Example

Software Project Management 3 - 28 Activity based Scheduling

- Dates are used to signify the conclusion of a period by convention therefore the project is portrayed as beginning in week zero (or the beginning of week 1).
- The calculation of the forward pass and earliest start date is based on the following considerations.
 - Because activities A, B and F can begin at any time, the earliest start date for event 1 is zero, as well as the earliest start date for these three activities.
 - Activity A will take five weeks to complete, thus the earliest it may be completed is week five (recorded in the activity table). As a result, the earliest we can complete event 2 is week five.
 - Activity B will take three weeks to complete, therefore the earliest it can be completed and the earliest we can complete event three is week three.
 - Because activity F will take nine weeks to complete, the earliest it can be completed is week nine; but, because we have not yet estimated when activity E will be completed, we cannot say whether or not this is also the earliest date that we can complete event five.
 - When both E and F have been finished, that is, week 9, event 5 can be performed (the later of 7 and 10).
 - We can also assume that event 4 will occur in week 8. This is the later of activity D's (week 7) and activity C's (week 7), earliest completion dates (week 8).
 - The earliest project completion date, Activity 5, is the end of week 12 and the last is week 10 (H is the earliest completed) and week 12 (G is the earliest completed).

Activity	Duration (Weeks)	Earlier start date	Latest earliest latest finish date float
A	5	0	5
B	3	0	3
C	2	5	8
D	3	3	7
E	2	3	6
F	9	0	9
G	2	9	12
H	1	8	11

Table Q.18.1 : The activity table following the forward pass

- The Forward Pass Rule :** The earliest date of an event is the earliest end date of any activity that ends with the activity. If more than one event ends with the same activity, we will use the latest of the earliest end dates of these activities.

Q.19 Explain backward pass with activity table in detail. [8 Marks]

- Ans. :
- The second stage is to go back and calculate the last date that each event can reach and start and stop each activity without delaying the project completion date. All follow-up actions must be started so that the project can be completed on time. We assume that the project's latest finish date is the same as the earliest finish date when computing the latest dates - that is, we want to finish the project as soon as possible.
 - Fig. Q.19.1 shows our network and Table Q.19.1 shows the activity table after backward pass, because the forward pass records the activity data in the figure and the activity dates in the activity table.

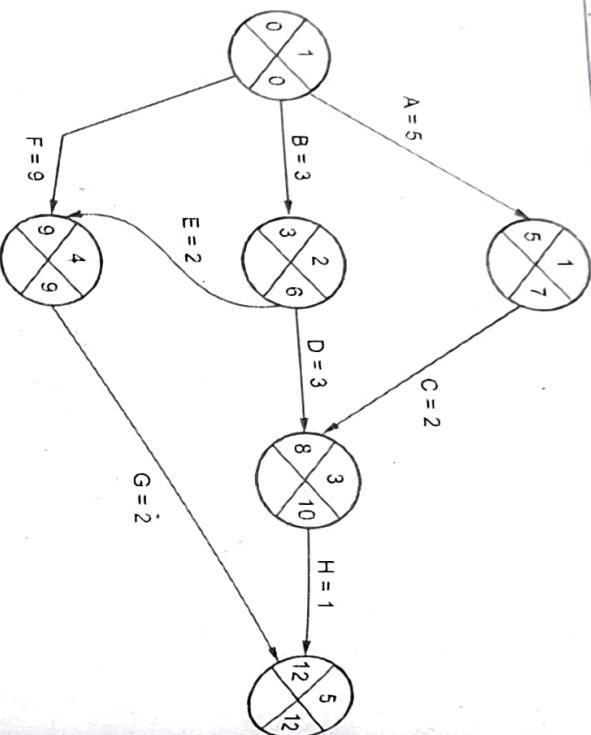


Fig. Q.19.1 : A CPM network after the backward pass

- The following are the most recent event dates :
- Week 12 is supposed to be the latest date for node 6. The earliest date is the same as the current date.
- The final date of activity 5 is week nine. Because activity G lasts for three weeks, if the project completion date is not exceeded, it should be completed in week twelve.
- The final date for activity 4 is week ten, because if activity H lasts for one week and does not have to be completed before week twelve, then activity H does not have to start before week II.

Activity	Duration(Weeks)	Earlier start date	Lates	Earliest	Lates	Total
						Start date finish date
C	2	5	7	8	11	
D	3	3	6	7	11	
E	2	3	6	6	9	
F	9	0	0	9	9	
G	2	9	9	12	12	
H	1	8	10	11	12	

Table Q.19.1 : The activity table following the backward pass

- The final date for activity 3 is the date when we can start activities D and E. Activity E does not have to end before week nine, nor is it required. So start before the 6th week. Activity D does not have to end before week 10. If it is three weeks, it does not have to start before week six. So the final date for event 3 is week six.
- The final date for event 2 is week seven, because C, which lasts for two weeks, does not have to end before week ten.
- Unless there is an arithmetic error, the start event's earliest and latest dates must always be the same.
- The deadline for event I is that we should be able to perform operation A (should begin from week one), operation B (must start from week two) and the deadline for operation F (must start from week 0). The date must start).

Q.20 Differentiate between forward and backward pass.

- The forward pass rule states that an activity's earliest start date is equal to its earliest finish date. Take the latest of the earliest finish dates for those activities when there are multiple ones that immediately precede it.

Activity	Duration(Weeks)	Earlier start date	Latest	Earliest	Latest	Total
						Start date finish date
A	5	0	1	5	7	
B	3	0	2	3	6	

- The backward pass rule states that the latest finish date for one activity is the latest start date for another that starts as soon as the first one is finished.
- Take the earliest of the latest start dates for each activity when more than one can begin.

Forward pass	Backward Pass
The forward pass is used to determine the earliest possible start and end dates for each activity.	The second step in analyzing a critical path network involves performing a backward pass to determine the earliest possible start and end dates for each activity without delaying the project's completion date
When an actual start date is known, actual dates may be used in the calculations. We can also utilize day or week numbers as an alternative.	Since we want to conclude the project as soon as possible, we make the assumption when calculating the latest dates that the project's latest conclusion date coincides with its earliest finish date.
A forward pass is a method for advancing across a network diagram to calculate the project's duration and identify its critical path or free float.	While a backward pass refers to going backward to the outcome in order to determine a late start or determine whether there is any slack in the process.
The procedure used in the critical path technique to choose the early start or early finish times for activities.	The procedure used to calculate the critical path method's late start or late finish times for activities.

Forward pass	Backward Pass
We use forward pass to determine Early Finish, means moving from Late Finish and subtracting from activity duration, to determine Late Start (LS).	<p>We use backward Pass moving from Late Finish and subtracting Duration from Late Finish and subtracting from activity duration, to determine Late Start (LS).</p> <p>LS = Duration - LF</p> <p>If the duration is 10 days and the late finish is 30 days, then the late finish is 20 days.</p> <p>EF = ES + Duration</p> <p>$EF = 6 + 10 = 16 \text{ Days}$</p> <p>if Early Start is 6 days and Duration is 10 days,</p>

Q.21 What do you understand by critical path ?

Ans. :

1. Identifying the critical path

- Any time spent on the critical path will cause the project to be delayed. The slack is the difference between the earliest and latest dates for an event; it is a measure of how late an event can be without compromising the project's finish date. Any non-slack event is critical, because any delay in reaching that event will delay the completion date of the entire project. At least one path will always exist connecting these critical events through the network.

This path is called the critical path (Fig. Q.21.1).

2. The significance of the critical path is two-fold

- When it comes to project management, the next steps on the critical route must be given considerable attention in order to identify and correct the consequences of resource delays or unavailability as quickly as possible. If we want to shorten the project's overall time, we must shorten the critical path during planning. The crucial path is the network's longest path.

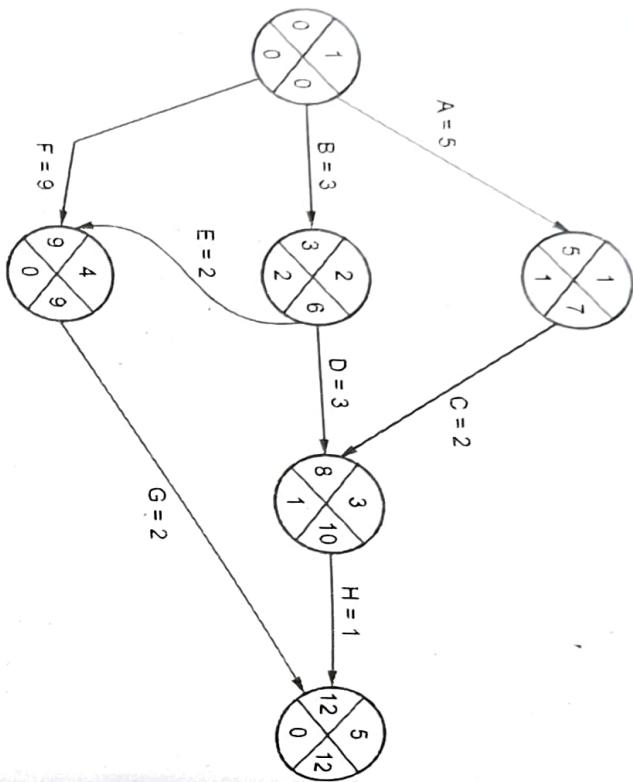


Fig. Q.21.1 : The critical path

Q.22 Write a note on activity float.

OR Differentiate between free float and Interfering float.

Ans. :

- As the event slows down, the action remains the same. The cumulative list shown in Table Q.22.1 is the distinction between the first and last start dates of an activity (or the difference between the earliest and most recent end date). We can postpone the start or end of an event for an extended amount of time without influencing the project's completion date.

Activity	Duration (Weeks)	Earlier start date	Latest earliest latest finish date	Total float
A	5	0	*m	5
B	3	0	2	3
C	2	5	7	1
D	3	3	6	7
			II	11
				2

Table Q.22.1 : The activity schedule showing total float for each activity

- Only a certain amount of float may be available. Although the total float is displayed for each activity, it actually 'belongs' to a path that was only used once. Both Activities A and C have a total float of two weeks. If, on the other hand, activity A exhausts its float (i.e., it is not completed until week 8), activity B will have no float (it will have become critical). In such cases, publicizing entire float could be deceptive and damaging to the project's success! Other activity float metrics include the following:

- Free float :** The amount of time that an activity can be postponed without having an impact on other activities. It's calculated as the difference between the previous activity's earliest completion date and the next activity's earliest start date. This could be a better way to publicize the activities to the people who are actually doing them.
- Interfering float :** Total float and free float are not the same thing. This is a term that is frequently used, especially in conjunction with the term "free float." The interfering float tells us how far the activity can be delayed without delaying the project end date (even if it delays the start of future activities) if the free float has been exhausted (or if it is 0).

Q.23 How to improve the critical path ?

Ans. :

- Shorten the construction period on the critical path.
- Changed task limits to allow greater planning flexibility.
- Breaks down key tasks into smaller tasks that different resources can handle at the same time.
- Check task relevance for greater planning flexibility.

Shortening the project duration

- If we want to shorten the overall duration of the project, we usually consider shortening the duration of the activity. In many cases, this can be achieved by using more resources, working overtime or hiring more employees. We should try to save time. When trying to postpone the completion date of a project, it is obviously meaningless to reduce unimportant activities. Fig. Q.19.1 shows that we can complete the project in 12 weeks and then reduce the activity timeframe F by one week (to nine weeks).

- As we shorten the activity time of critical paths, we must constantly look for new critical paths and refocus our efforts where appropriate.

- One day, we will no longer be able to safely or cheaply shorten the duration of critical operations in order to advance the project completion date. The logical sequence of activities. Time saving is usually achieved by increasing the degree of parallelism in the network and eliminating bottlenecks (of course, always consider resource and quality constraints).

Identifying critical activities

- The critical route indicates actions that are crucial to the project's completion date; nevertheless, activities that are not on the critical path may become critical in the future.

- As the project progresses, the activity will inevitably consume its outstanding part, which will require periodic recalculation of the network.
- Once the activities on a particular route reach their total float, that route becomes a critical path and many previously unimportant activities suddenly become vital.
- Therefore, it is common practice to define "almost critical" paths of limited length. 10 - 20 % of the critical path duration or total inventory is less than 10 % of the unfinished project duration.
- It is important to identify critical and close to critical actions because they are most likely to cause delays in project completion.

END ...

Unit IV

4

Project Tracking and Control

4.1 Introduction, Collection of Project Data, Visualizing Progress

Q.1 What is project tracking and control ?

[2 Marks]

Ans. :

- Project tracking and control activities occur concurrently with project execution process group activities, so that the project is monitored and controlled while the project work is being completed by implementing the appropriate level of oversight and corrective action.
- Project tracking and controlling are processes that are required to track, review and regulate the project's progress and performance. It also identifies any areas where the project management method needs to be changed and initiates the necessary changes.
- The project is frequently inspected and measured against the project plan to ensure that cost, schedule and scope deviations are within acceptable limits and that risks and issues are continuously monitored and remedied as needed.

Q.2 Explain in detail about creating the framework for monitoring and control.

[9 Marks]

Ans. :

- The project management plan serves as the project's foundation. This document serves as a guide for tracking and controlling the project. Access to work performance information, performance reports and change requests will be required of a project manager.

- The inputs to monitoring and controlling project work are :
 1. **Project management plan** : The project management plan is the primary source of information for the project's execution, monitoring and control. It is the plan, as well as any other subsidiary plans that may be required.
 2. **Work performance information** : Information about project activities is known as work performance information. This information contains progress, deliverables, costs and quality assurance validations.

3. Rejected change requests : When examined in the context of determining how the project is progressing, reject change requests might be instructive.

- Monitoring and regulating project operations using tools and procedures.
- The following are some of the tools and methods :
 - **Expert judgment** : Project managers and team members can use expert judgment to make judgments, such as whether to take corrective or preventive actions, based on current project information and previous experience with similar projects.
 - **Earned Value Technique (EVT)** : Earned Value Technique (EVT) is a method of calculating the current project schedule and cost performance for project managers. This data can then be used by project managers to predict future schedule and cost performance.
 - **Organizational project management** : The organizational project management approach offers project managers with detailed instructions and processes to enable effective monitoring and control during each stage of a project.

- **PMIS (Project Management Information System)** : A PMIS helps us to keep track of and regulate variables like cost and resource utilization. A Project Management Information System (PMIS) can also help project managers calculate and manage earned value data, as well as request and update project data automatically.
- Using the right tools and strategies helps keep us informed about the status of our project.
- The following are the outputs of project work monitoring and control :
 - **Recommended corrective actions** : These are based on project work performance information. The project manager or team employs professional judgment to provide solutions to problems that have occurred by comparing this information to the project plan.
 - **Preventive actions recommendations** : These are based on project work performance data. The project manager or team utilizes professional judgment to identify strategies to prevent project risks by comparing this information to the project plan.
 - **Predictions** : Forecasts allow for the projection of successful project outcomes based on work performance data collected during the monitor and control project work process.
 - **Recommended defect repairs** : These are the results of project monitoring and control. When a product fails to satisfy quality standards, this output suggests what has to be done to fix it.
 - **Requested changes** : These are new actions that are required to accomplish the project's goals. The project manager or members of the project team frequently make requests in order to improve processes or solve difficulties.
 - Every company is different and project monitoring and control experiences will vary depending on firm's project management approach and the project type.

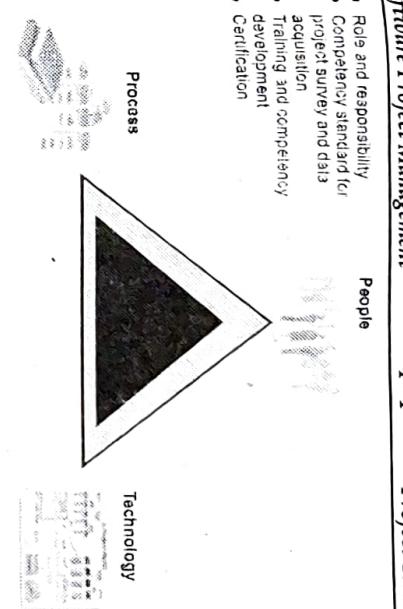


Fig. Q.2.1 : Project tracking and control solution framework

- For defining projects and managing their implementation, there are a variety of frameworks available. IT project framework for Entrepreneurial Culture - Iterative System Development is depicted in Fig. Q.2.2. The EC-ISD project framework is a realistic method for establishing a scalable structure that promotes discipline and best practices. It provides a high-level overview of the phases needed in any IT project, albeit the level of information required for each step will vary depending on the project's complexity and criticality. For smaller, less significant projects, all of the procedures in the first two columns, for example, might be done in a two-hour meeting with an email summary.

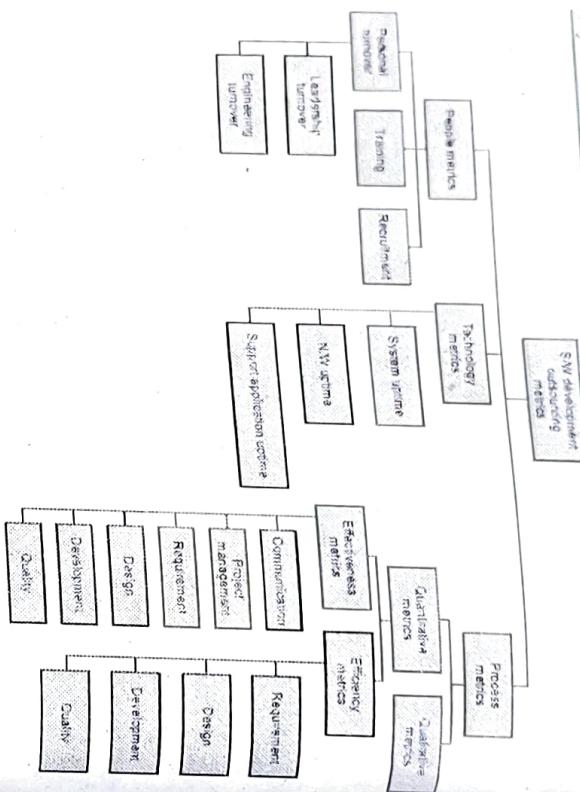


Fig. Q.2.2 : EC-1SD IT project framework

Q.3 What are the different tools and methods used for monitoring and regulating project operations ? [5 Marks]

Ans. :

- Monitoring and regulating project operations using tools and procedures.
- The following are some of the tools and methods :
 - **Expert judgment** : Project managers and team members can use expert judgment to make judgments, such as whether to take corrective or preventive actions, based on current project information and previous experience with similar projects.
 - **Earned Value Technique (EVT)** : Earned Value Technique (EVT) is a method of calculating the current project schedule and cost performance for project managers. This data can then be used by project managers to predict future schedule and cost performance.
 - **Organizational project management** : The organizational project management approach offers project managers with detailed instructions and processes to enable effective monitoring and control during each stage of a project.

Q.4 What is software ? [2 Marks]

Ans. : A collection of data or computer instructions that guide the computer how to operate is known as computer software or simply software. Physical hardware, on the other hand, is what the system is made of and what actually does the work.

Q.5 What are the different ways of collecting data ? [6 Marks]

Ans. :

- Any form of research project requires data collection. Inaccurate data gathering might skew a study's findings and lead to erroneous conclusions.
- For impact evaluation, there are a variety of data collection approaches. Quantitative data gathering methods are on one end of the spectrum, while qualitative data collection methods are on the other.
- There should be a training programme to ensure that the data collectors understand what to do and when to do. Appropriate procedures must be developed and documented in the creation of the training programme. These courses might be as short as an hour with simple collection mechanisms. The best outcomes will get from practical, interactive training, where the group works on actual data collecting situations.
- Without this training, support workers' hours can be spent to respond repeatedly to the same inquiries. Another advantage of the training is that it fosters a sharing of when and how the data are collected. This decreases the chance of invalid and incoherent data being collected.
- The following are some of the advantages of having the data owner gather the data :
 - Data is captured in real time as it is generated, ensuring accuracy and completeness.
 - Data owners are more likely to notice irregularities in data as it is being collected, which improves accuracy.
 - Duplicate recording (once by the data recorder and twice by the data entry clerk) eliminates human error, increasing accuracy.

Owner	Data Owned
• Management	• Project schedule, Budgets
• Programmers	• Time per task, Bugs, Cause for bugs
• Tester	<ul style="list-style-type: none"> • Test case plan / execution / passed • Test coverage
• End users	<ul style="list-style-type: none"> • Real time problems • Time spent on application

- When the correct data are not correctly collected, it is not possible to achieve the goals of the measuring programme. Without proper data, data analysis is useless. The creation of a good data collection plan is therefore the cornerstone of any successful programme of measurements.
- The collecting of data should be :
 - **Consistency** : The same person will gather the data in the same manner every time.
 - **Unambiguous** : Two people taking the same measurement for the same item will get the same results.
 - **Convenient** : Data gathering must be simple enough to not disrupt the individual collecting the data's working patterns. As a result, data collecting must become an integral component of the process rather than an afterthought.
- **Accessible** : In order for data to be useful and utilized, it must be easily accessible. This means that even if data is collected manually on forms, it must be entered into a metrics database at some point.
 - It is widely agreed that as much of the data collection process as feasible should be automated. Standardized forms should be utilized at a minimum for data collection, but the data from these forms must be entered into a metrics database at some point if it is to be relevant in the long run.

- Another technique to inject human error into metrics values is to dump raw data and hand tally or calculate metrics. Even if the data is kept in a simple spreadsheet, automatic sorting, data extraction and calculation are all available and should be used. Using a spreadsheet or database also speeds up the production of measurements when compared to hand tallies.

Q.6 What is the use of checkpoints in monitoring ?

[2 Marks]

- OR What is meant by setting checkpoints ?**

Ans. :

- Based on predictable intervals of time
- Possibly weekly, monthly or quarterly
- Depending on what to look for and how to
- Based on a specific occurrence
- Following each activity
- In the midst of a crucial task
- Before the proposal was announced, it ought to be set
- Make sure everyone is aware of the checkpoints' locations and timing.

[3 Marks]

Q.7 What is check list ?

Ans. :

- This is the most basic of the devices. It is a prepared list of items that are relevant to an object or a specific task. Each item's presence or absence can be specified by checking "yes" or "no" or using a multipoint scale.
- The use of a checklist guarantees that all parts of the object, act or task are considered. Checklists contain phrases that the respondent understands and that express his opinions more briefly and succinctly than open-ended questions.
- It's a rudimentary device, but with proper pre-testing, it may be made less so. When used to examine specific hypotheses, it is at its best. It can be used on its own or as part of a timetable or questionnaire.

- Q.8 Explain various data collection tools in detail.**
- Ans. :**
- Various data collection methods necessitate the use of appropriate recording forms. These are referred to as data collection tools or instruments.
 - They are as follows :
 - Observation schedule
 - Guide to conducting interviews
 - Timetable for interviews
 - Questionnaire sent by mail
 - Scale of evaluation
 - List of items to consider
 - Data sheet/document schedule
 - Institutions calendar
 - Each of the instruments listed above is used for a specific type of data collection :
 - Schedule of observations for method of observation
 - Interview schedule and guidance for interviewing and questionnaire for example, a mail survey.
 - The data collection tools translate the study objectives into particular questions/items, the answers to which will offer the data needed to meet the research goals. To do this, each question/item must transmit to the respondent the notion or collection of ideas required by the research objectives and each item must elicit a response that can be analysed in order to meet the research goals.
 - Below is a brief explanation of the various data collection tools.

Schedule of observations

- This is a format for recording observations of an object or phenomena. The things to be observed are chosen in accordance with the study's nature and goals. They're organised into categories and mentioned in the schedule in the order in which the observer would notice them.

- The schedule must be designed in such a way that it provides the necessary verifiable and quantitative data while also avoiding selective bias and misinterpretation of observed items. Simple and properly stated observation units are required to ensure precise and uniform recording.

Guide to interviewing

- Non-directive and depth interviews are conducted using this method. It does not provide a detailed list of items for which information must be obtained from a responder; rather, it focuses on the broad subjects or areas that will be discussed throughout the interview.

- During the interview, the interview guide serves as a helpful reference or prompter. It assists in focusing attention on important study points and obtaining similar results in different interviews conducted by the same or different interviewers.

Schedule of interviews and questionnaire sent by mail

- In surveys, both of these tools are commonly employed. Both are comprehensive lists of questions designed to collect information from responses. The main distinction between them is how they record replies. The respondent fills out a questionnaire while the interviewer writes up a timetable.

Scale of evaluation

- This is a form for capturing individual attitudes, aspirations and other psychological and behavioural characteristics, as well as group behaviour.

Checklist

- This is the most basic of the devices. It is a prepared list of items that are relevant to an object or a specific task. Each item's presence or absence can be specified by checking "yes" or "no" or using a multipoint scale. The use of a checklist guarantees that all parts of the object, act or task are considered. Checklists contain phrases that the respondent understands and that express his opinions more briefly and succinctly than open-ended questions.

- It's a rudimentary device, but with proper pre-testing, it may be made less so. When used to examine specific hypotheses, it is at its best. It can be used on its own or as part of a timetable or questionnaire.

Data sheet / Document schedule

- This is a list of data that can be gleaned through documents, records and other sources.
- The components contained in the schedule are limited to those that can be uniformly obtained from a large number of case histories or other records in order to secure measurable data.

Institutional calendar

- This is used to conduct surveys of businesses, educational institutions, social and cultural organizations and other organizations. It will contain information on their profile, functions and performance in several categories.

Q.9 Explain in detail construction process of schedule for data collection. [4 Marks]

Ans. : The construction process : Except for a few minor modifications in mechanics, the process of creating a schedule and a questionnaire is nearly identical. This isn't a simple issue of making a list of questions that come to mind. It's a methodical procedure that takes a lot of time, effort and thought. It consists of the major steps listed below :

- 1. Data must be determined** : Because an interview schedule or postal questionnaire is a tool for acquiring data for a specific study, it should be built logically from the information needed for that study.
- 2. Development of "dummy" tables** : Developing "dummy" tables in which to present the data to be acquired is the best way to ensure that the information requirements are met.

3. Establishing the respondents' level : Who are the people who have responded to our survey ? Are they people who have specialist knowledge about the problem under investigation ? Or are they ordinary citizens ? What is their level of understanding and knowledge ? The choice of terms and concepts is determined by the respondents' degree of knowledge.

4. Choosing a data collection method : Should you do a face-to-face interview or send a letter ? The type of question structure you use is greatly determined by the communication medium you use.

5. Instrument composition : Following the determination of the data needed for the study, a basic outline of the instrument, identifying the many major categories of data, can be written.

Second, the order in which these categories appear must be determined. The third step is to make a list of the questions that will be asked under each group category. All elements that are relevant to the 'data need' should be gathered.

6. Evaluation of the draught instrument : The researcher must thoroughly evaluate each question in the draught instrument in cooperation with other knowledgeable individuals.

7. Pre-testing : The new draught must be pre-tested in order to detect the instrument's flaws and make the necessary changes to correct them.

8. Procedures / instructions specification : Once the instruction has been finalised after pre-testing, the procedures or instructions for its use must be provided.

9. Choosing a format : The format should be appropriate for the research. The instrument should be organised into sections that correspond to various facets of the situation.

Q.10 Differentiate questionnaire vs. schedule.

Ans. :

[2 Marks]

- The most frequent data collection instruments are schedules and surveys. Both of these tools have a lot in common. Both feature a set of logically related questions; both aim to elicit responses from respondents; and in both cases, the content, response structure,



question wordings, question order and other factors are the same for all respondents. So why are they referred to as "schedule" and "questionnaires," respectively ? This is due to the fact that the strategies they employ are different. A questionnaire is utilized for mailing, whereas a timetable is used for interviewing.

- Because of this difference in usage, there is a slight distinction between these two recording formats. In a face-to-face interview, the interviewer fills out a schedule, whereas the respondent fills out a questionnaire. As a result, two distinct terms are required.
- When used for interviewing, the tool is referred to as a schedule; when delivered to a respondent for completion and return, it is referred to as a questionnaire.

Q.11 Define following term as : Pilot study, preliminary trial, requirement of pre testing. [6 Marks]

Ans. :

1. Pilot study : It's difficult to organize a big study or project without a thorough understanding of the topic matter, the target population and their degree of knowledge and understanding, among other things. What are the problems that need to be addressed ? What are the ideas that go along with the topic ? What are the options for putting these into action ? Which research approach is best ? What is the expected duration of the study ? What will the price tag be ? These and other such concerns necessitate a thorough understanding of the study's topic matter and scope. A preliminary research is carried out in order to get such pre-knowledge of the subject matter of a large study. A pilot study is what it's known as.

2. Preliminary trials : A pre-test is a trial test of a single aspect of the study, such as the method of data collecting or data collection instrument - interview schedule, mailed questionnaire or measuring scale - while a pilot study is a full-fledged tiny investigation of a topic.

3. The requirement for Pre-testing : The data collection instrument is created keeping the study's data requirements in mind. However, it cannot be perfected just through the designer's and other researchers' rigorous inspection. It should be put to the test. As a result, pre-testing a draught instrument is essential.

Q.12 What are different methods to collect data ? [3 Marks]

Ans. :

Phone interviews	Online interviews	In-person interviews
High confidence	Self manage, data accuracy	In-depth
Need to hire an agency	Need internet	Time consuming

Phone Interviews

- **Pros :** High level of confidence in the information gathered, accessible to practically everybody
- **Cons :** Costly, unable to administer oneself, requiring agency employment

Online Interviews

- **Pros :** Low cost, self-administer and very unlikely to include data errors
- **Cons :** Not all of our consumers may have email addresses or be online and other customers may be reluctant to share information online.

In-Person Interviews

- **Pros :** Comprehensive data with a high level of confidence
- **Cons :** Costly, time-consuming and susceptible to being discounted as hearsay

[3 Marks]

Ans. :

- The project manager only needs to provide a few remarks to generate a project status report for the project and the project management report will be generated automatically, showing :
 - Milestones from the previous period and if they were met, milestones due the following time.
 - Action items that have not been completed by the deadline.
 - The Project Manager's opinion on action items due to be completed in the next period.
 - The report can be sent to a specific distribution list via e-mail. The project manager can decide on the time frame.
- The report's worth isn't as high as it appears. The benefit comes from ensuring that the team is required to examine due and outstanding items at least once per reporting period. This usually forces them to concentrate on accomplishing tasks and milestones in order to avoid being included in the report. This function can be used as a project status report template or as software for reporting period status

Q.14 What are the different methods used in visualizing progress explain in detail ? [2 Marks]

OR **What are the different types of visualizing progress explain in detail ?**

OR **What are the two methods used to progress of project in picture ?**

Ans. : **Methods used for Visualizing Project Progress :** A management must show the data collected regarding the project's development after gathering it. Some approaches for presenting the picture of a project and its future are :

1. **Gantt chart :** A Gantt chart is essentially an activity bar chart with activity floats that shows the scheduled activity dates and duration.

- 2. Slip chart :** The slip chart provides a more vivid visual depiction of the operations. The more the slip line bends, the more deviation from the plan there is. A very jagged slip line suggests that rescheduling is required.

- 3. Time line :** A timeline is a way of keeping track of and illustrating how targets have changed during the course of a project.

Q.15 What are the benefits of visualizing progress ?

[2 Marks]

Ans. : Benefits of visualizing progress

- It is simple to understand, as the information is presented in a single, consistent style.
- The project team is required to review progress on a regular basis.
- To create a report, only a small amount of effort is required.
- Periods can be customized to meet the needs of the firm.

- Q.16 What is Gantt chart ? Explain in detail.** [3 Marks]

OR Outline the use of Gantt charts and timeline charts in visualizing project progress with suitable diagrams.

Ans. :

- The Gantt chart, which is essentially an activity bar chart representing scheduled activity dates and duration and frequently supplemented with activity floats, is one of the simplest and oldest methods for tracking project progress.
- The Gantt chart is one of the earliest and most straightforward methods for monitoring project progress. Essentially, this is an activity bar chart with activity labels that shows the duration and dates of planned activities. The graphic shows reported progress (often by coloring activity bars) and a "today cursor" shows which tasks are ahead of or behind schedule immediately.
- Fig. Q.16.1 depicts a portion of Amanda's Gantt chart as of Tuesday, Week 17's final day. 'Code and test module D' has been finished earlier than expected and 'Code and test module A' likewise seems to be going more quickly than expected. The remaining two modules' coding and testing are running behind schedule.

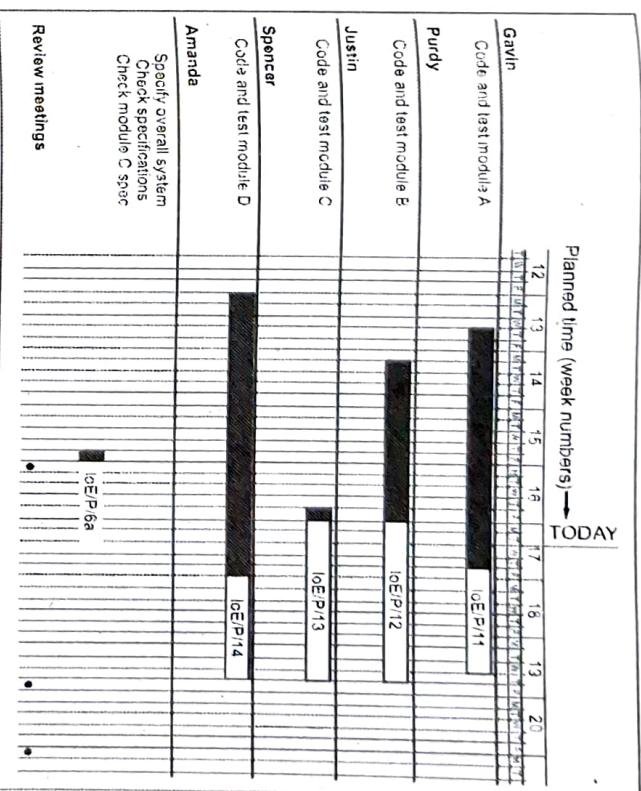


Fig. Q.16.1 : Part of Amanda's Gantt chart with the 'today cursor'

in week 17

- Q.17 What is slip chart ? Explain in detail.**

OR What is slip chart ? Mention its use.

[4 Marks]

Ans. :

- Some project managers prefer the slip chart as a very similar alternative because they feel it provides a more glaring visual indication of those activities that are not progressing according to schedule. The more the slip line slants, the more the actual progress from the plan differs from the schedule.

Advantages :

- It displays the slip line bends that show how the project deviates from the design.
- It gives a more pronounced visual indication of those actions that are proceeding according to plan.
- A very similar alternative is a slip chart (Fig. Q.17.1), which some project managers prefer because they think it gives a more glaring

visual indicator of which operations are not moving along according to plan: The more the slip line slants, the more deviation there is from the original plan. At regular intervals, new slip lines are inserted and as they accumulate, the project manager may see whether or not the project is progressing (as evidenced by following slip lines bending less). Rearranging the schedule is indicated by a highly jagged slip line.

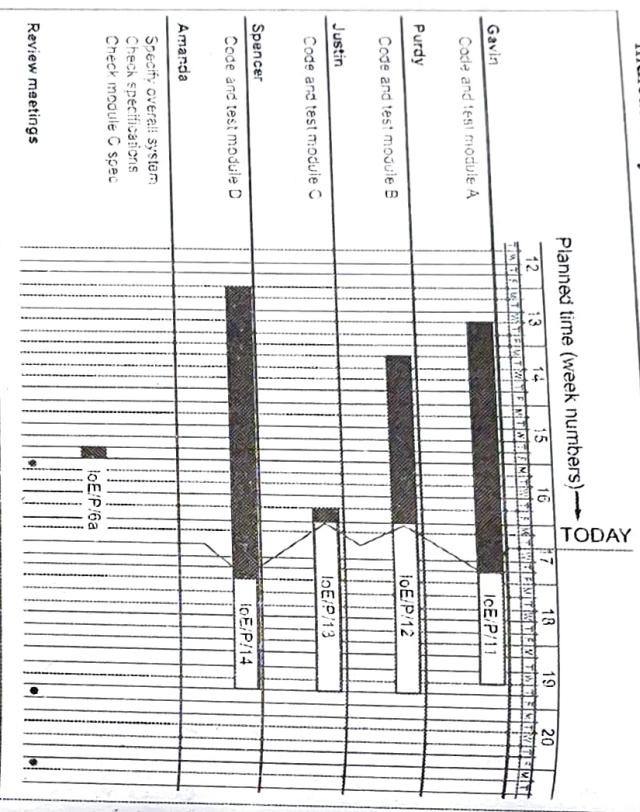


Fig. Q.17.1 : The slip chart emphasizes the relative position of each activity

Q.18 What is timeline? Explain in detail.

OR Outline the use of Gantt charts and timeline charts in visualizing project progress with suitable diagrams. [5 Marks]

Ans. :

- The charts that have been described thus far have the drawback of not clearly displaying the project completion date slippage over the course of the project. We can forecast the project's future progress by analyzing and comprehending tendencies in the project's past performance. For instance, if productivity hasn't been as great as

expected so far on a project, it's possible that the project's completion date would be delayed even more unless measures are done to make up for or increase productivity.

- A timeline chart for Brigitte's project at the conclusion of the sixth week is shown in Fig. Q.18.1. The horizontal axis is used to plot planned time and the vertical axis is used to plot elapsed time. The lines meandering down the chart show the dates on which the various activities are supposed to be completed. For example, at the beginning of the project, the activity "analyze existing system" was supposed to be finished by the Tuesday of week 3, the activity "obtain user requirements" by the Thursday of week 5, the activity "issue tender" was supposed to be finished by the Tuesday of week 9 and so on.

- Brigitte analyses these target dates at the conclusion of the first week and decides to leave them as they are, thus on the actual time axis, lines are drawn vertically downward from the target dates to the end of week 1.
- Brigitte concludes at the end of week two that "get user needs" will not be finished until Tuesday of week six; she consequently diagonally stretches that action line to reflect this. The completion goals for the other activities are similarly postponed.
- By the Tuesday of the third week, "analyze existing system" has been finished and Brigitte adds a blob to the diagonal timeline to show it. By the end of the third week, she decides to stick with the current goals.
- She extends "draught tender" and "issue tender" by an additional three days at the conclusion of week 4.
- Take note that two activities were finished before the end of week 6 while three remained unfinished. She has already made three target date revisions and the project as a whole is currently seven days behind schedule.

- According to the PMBOK, there are numerous approaches for monitoring and controlling project costs :

1. Budgeting for the project

- Making a budget for the project at hand should preferably be done at the start of the planning session. This budget will be used to aid you with all payments and charges that you will incur during the project's life cycle. As a result, creating this budget necessitates extensive research and critical thinking.

- You must always provide room for revisions in your budget, just as you would in any other budget, because costs may not remain constant over the project's duration. The key to making a profit from a project is to stick to the budget at all times.

2. Keeping expenses tracked

- It's just as crucial to keep track of all actual expenditures as it is to use any other strategy. It's preferable to make a time-based budget here. This will assist you in keeping track of a project's budget at each phase. Actual expenditures must be compared against the budget's periodic targets. If the project will last a long time, these goals could be set on a monthly, weekly or even yearly basis.

- Rather than having a single complete budget for the duration of the project, this is considerably easier to deal with. If you need to do any new work, you'll need to make some estimates to see if it can be done within your budget.

3. Time management effortlessly

- Time management is another useful strategy. Although this strategy can be used in a variety of management situations, it is particularly useful in project cost management.

Q.18 What is cost monitoring ?

Ans. :

- Cost monitoring entails keeping track on project expenses. A company's accounting system could be used to keep track of project expenses.

4.2 Cost Monitoring, Earned Value Analysis, Project Tracking

[4 Marks]

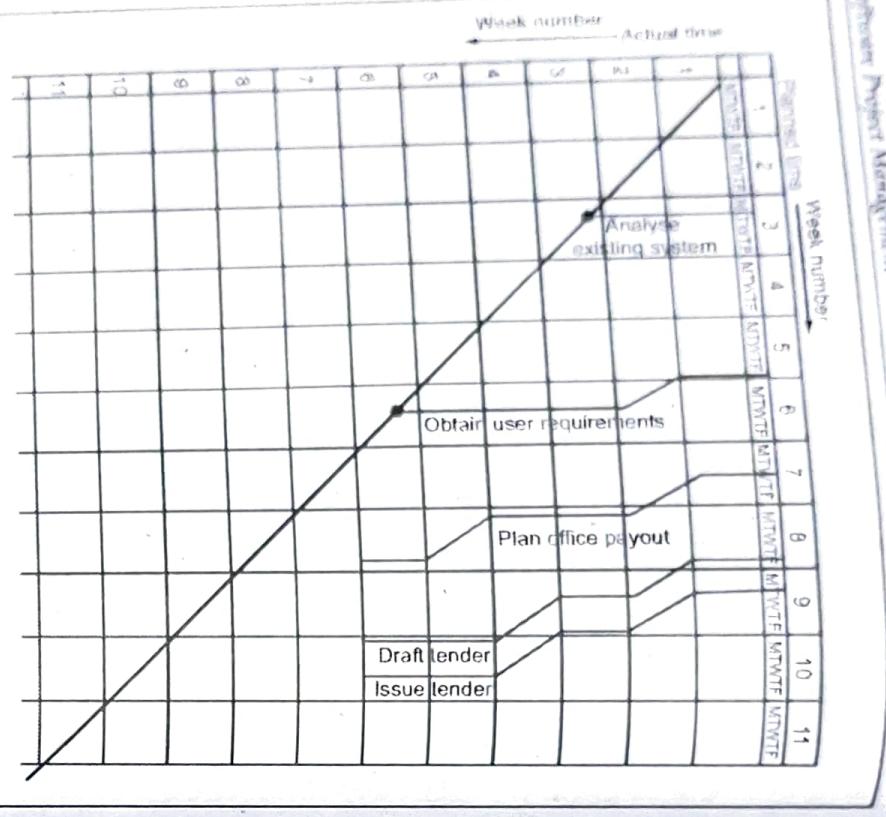


Fig. Q.18.1 : Brigitte's timeline chart at the end of week six

- The timeline chart is helpful both during project execution and for post-implementation analysis. Analyzing the timeline chart and the causes of the changes can reveal estimation errors or other mistakes that, with this knowledge, could be avoided in the future.

Q.19 What is cost monitoring ?

Ans. :

- Cost monitoring entails keeping track on project expenses. A company's accounting system could be used to keep track of project expenses.

- In order to ensure that work is finished on time, the project manager would need to remind his or her team of the project's key deadlines on a regular basis.

4. Project change management

- Another important strategy is project change control. Change control systems are required to account for any potential changes that may occur over the project's duration.

- This is because each modification to the project's scope will have an influence on the deliverables' dates, therefore the adjustments may raise project costs by increasing the amount of effort required.

5. Earned value applicability

- Similarly, using the accounting technique known as 'Earned Value' to determine the value of the work that has been completed thus far is quite beneficial.
- This is especially beneficial for large projects since it allows you to make any last-minute changes that are critical to the project's success.

Q.20 What is earned value analysis ?

[4 Marks]

Ans. :

- Earned Value Analysis (EVA) is a project management approach that is used for monitoring and controlling purposes, shown in the Fig. Q.20.1.

• The Earned Value Analysis comprises the indicators -

1. Earned Value (EV),
2. Planned Value (PV),
3. Actual Cost (AC) and
4. Budget at Completion (BAC)

1. Earned Value (EV)

- The projected value is the percentage of the budget (excluding management reserve) allotted to the activities or periods under consideration.

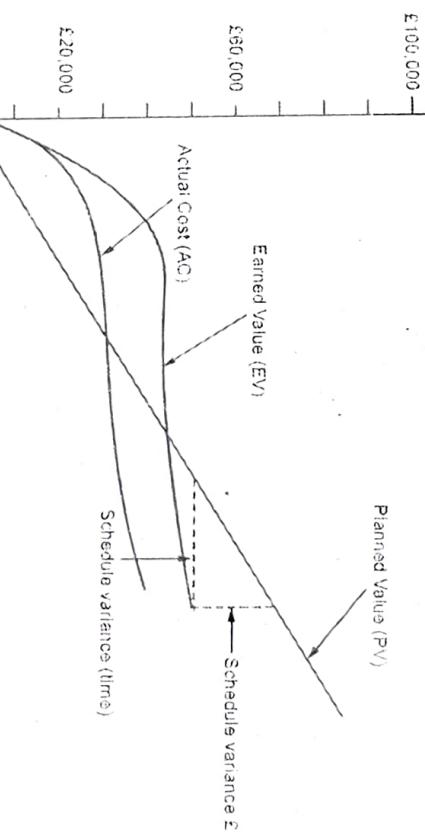


Fig. Q.20.1 : Earned value analysis

2. Planned Value (PV)
 - This metric represents the project's progress. It's worth is equal to the total of the budgeted and permitted funds for the work that has already been done.

3. Actual Cost (AC)

- The AC stands for the amount paid for the work done.

4. Budget At Completion (BAC)

- The total budget is the allowed value (plus the sum of expected costs) of a project's scope at the end.
- The purpose of an earned value analysis is to assist and support the control cost process. Earned Value Management (EVM) uses the outcomes of this study to analyze variations, trends and forecasts based on the EVA results.
- Earned value analysis is a suggested approach of the following procedures for projects adopting the PMI methodology :
 - Work on the project should be monitored and controlled.
 - Schedule of control,
 - Cost-cutting and
 - Control the procurement process.

- Ex. Earned Value

- Task
- Specify module 5 days
- Code module 8 days
- Test module 6 days

At the beginning of day 20, Planned Value (PV) = 19 days
If everything but testing completed, EV = 13 days
Schedule variance = EV – PV i.e. $13 - 19 = -6$

Schedule performance indicator (SPI) = EV / PV

$$13 / 19 = 0.68$$

Actual Cost (AC) is also known as actual cost of work performed

In previous example, if

'Specify module' actually took 3 days (planned 5)

'Code module' actually took 4 days (planned 8)

Actual cost = 7 days

Cost variance (CV) = $EV * AC$ i.e. $13 * 7 = 6$ days

Cost performance indicator (CPI) = EV / AC i.e. $13 / 7 = 1.86$

Positive CV or CPI > 1.00 means project under budget or the work is completed better than planned.

Q.21 What are the common method of assigning Earned Value (EV) ? [2 Marks]

Ans. : 0 / 100 technique

• A task is assigned a value zero until it is completed. On completion its value will be 100 of the budgeted value.

50 / 50 technique

• At the starting 50 of the budgeted value. Upon completion 100 % (remaining 50 %) of the budgeted value.

75 / 25 technique

• At the starting 75 of the budgeted value. Upon completion 25 % of the budgeted value.

The milestone technique

- Value is given based on the achievement of the milestones

Percentage complete

- Value will be assigned based on the objective measurement of the work completion 0 / 100 technique is preferred for software development.

Q.22 Explain in detail variance in terms of project control. [3 Marks]

Ans. : Deviations from the plan are known as variances. Consider a variance to be the difference between what was expected and what happened. Variations can be divided into two categories :

Positive variances

- Positive variances are variations from the plan that show an event that occurred ahead of time or that an actual cost was lower than anticipated. The project manager will be pleased with this type of variation.

Negative variances

- Negative variances are variations from the plan that indicate a scenario that is behind schedule or that an actual cost is higher than the projected cost. Negative variances aren't always bad news, just like positive variances aren't always good news. For example, you may have overspent because you completed more work than anticipated within the report period. However, by overpaying during this time, you could have completed the work for less money than you had anticipated. By glancing at the variance report, you won't be able to know.

Q.23 List and explain different types of project status reports. [4 Marks]

Ans. : The following are the five different types of project status reports :

1. Reports for the current period : These reports only cover the most recently completed period.

They provide updates on activities that were open or slated for work throughout the time period. Reports may emphasise completed tasks as well as the difference between expected and actual completion dates.

2. Cumulative reports : These reports detail the project's progress from the start to the end of the reporting period. Because they illustrate trends in project progress, they are more informative than current period reports.

3. Exception reports : Exception reports detail deviations from the original plan. Typically, these reports are intended for senior management.

4. Stoplight reports : Stoplight reports are a version of the previous report kinds that can be used on any of them. On the top right of the first page of the project progress report, stickers of various colours are placed. The different colours of stickers serve the following purposes :

- Green sticker :** It indicates that the project is on track and that everything appears to be going according to plan. Senior managers will see this sticker and know that everything is going according to plan and they won't even need to read the linked report.

b) Yellow sticker : This indicates that the project has met a problem or has slipped behind schedule. That's a signal to upper management that the project isn't progressing as planned, but you've got a back-up plan in place.

c) Red stickers : This indicate that a project has gotten out of hand. Red reports should be avoided at all costs because they indicate that a problem has arisen on the project and you don't have a fix in place or even a suggestion for top management.

5. Reports on variance : Variance reports reflect discrepancies between what was intended and what really occurred. Typical variance reports are snapshots of the status of an entity being tracked in time (the current period). The majority of variance reports leave out information on how the project got to that point.

Q.24 Define project tracking.

Ans. :

• To ensure that the project runs smoothly, create a reporting system that keeps you up to date on the many variables that explain how the project is progressing in comparison to the original plan.

- The following are characteristics of a reporting system :
 - Provides timely, complete and accurate status information;
 - Is easily accepted by the project team and top management
 - Warns of impending problems in time for action to be taken.
 - Those who have a need to know will find it simple to comprehend.

• The majority of project management software packages allow you to tailor basic reports to match even the most precise requirements.

4.3 Change Control, Software Configuration Management, Managing Contracts, Contract Management

Q.25 Explain in detail change control process. [4 Marks]

Ans. :

- Changes are unavoidable when developing and maintaining a product. People make mistakes, consumers require adjustments and the product's operating environment changes. People also continue to improve their understanding of the problem and their abilities to solve it. It's a common adage in software development that solving one problem will lead to the creation of additional ones.
- The goal of change control is to have complete control over all product change requests and completed modifications. Any configuration item must be able to be distinguished from its predecessor in terms of changes.

Software Project Management

4 - 30

Project Tracking and Control

Inputs

- An event triggers the control of change. A longing for change might be referred to as an event, yet it isn't necessary to express it as a specific wish. An event is any observation made in this context. Something unexpected, uncomfortable or outright wrong occurs while using the thing to be configured. For example, it may be:

- During the inspection of a document, a misspelling was discovered.
- During a walk-through of some source code, a coding mistake was discovered.
- During the course of the project, the customer comes up with a new idea, which leads to an enhancement request.
- An error was discovered during the integration test.
- A desire to expand or improve the finished product after it has been put into service.
- A request to a helpdesk for assistance with a problem relating to the use of a system.
- An upgrade to a new version of the middleware necessitated a change in the code.
- Supporting a system that may or may not be backwards compatible.

Outputs

- Documented events and change requests derived from these are the result of change control.

- Events. Both should be kept in a secure database so that relationships between them can be tracked.
- Change requests and configuration items can be kept up to date in a reliable manner.
- Change requests may be referred to configuration management, but this is uncommon.

- Where configuration management must be done in a structured manner.

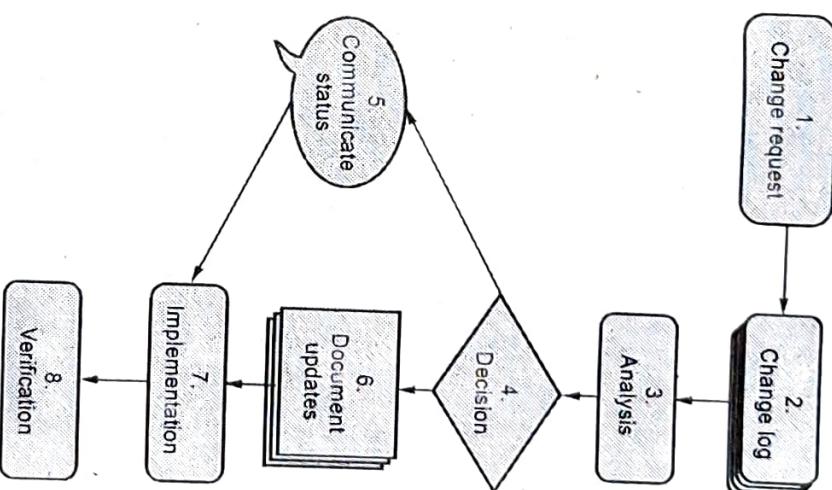


Fig. Q.25.1 : Change control process

Q.26 What are the different activities of change control ?**[5 Marks]**

- Ans. :**
- A change management process is a mini-development project in and of itself. A written and controlled life cycle for an event registration should broadly follow the phases. Each phase should be outlined in depth, including the company's responsibilities and particular activities.
 - Depending on the kind of events to be handled, a corporation may need to specify many types of life cycles.

Q.27 What is usage of metadata ?

[4 Marks]

Ans. :

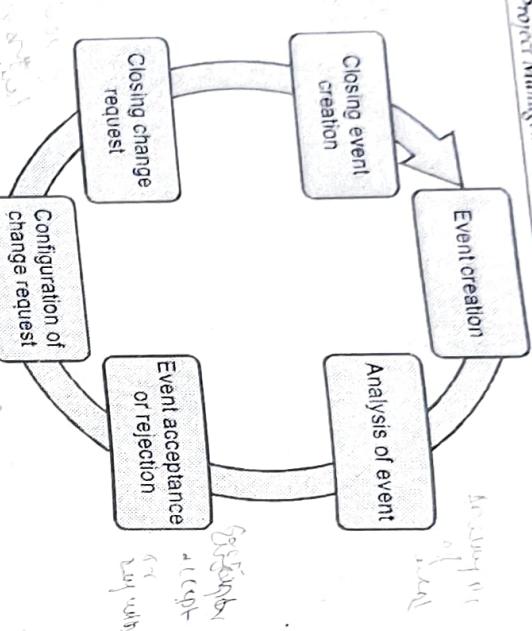


Fig. Q.26.1 : Phases of change control activities

- **Event creation :** The registration page for the event has been developed, as well as a description for the event.
- **Event analysis :** The configuration item(s) that may be affected by potential changes are identified and the scope of these changes is calculated.
- **Event acceptance or rejection :** If the event registration is approved, a change request for each configuration item that is affected is created.
- **Configuration of change request :** The update is implemented after a new configuration item is recognised and generated. Feedback is supplied to the configuration control board during the acceptance and storage of the new item.
- **Change request closing :** After the change has been implemented and accepted, the request can be closed.
- **Event creation closing :** When all change requests are completed, the event registration can be closed.

Analysis of consequences

- When studying an event, it's important to factor in the cost of making modifications. This isn't always an easy task. The checklists below, based from a list by Karl Wiegers, may be useful in assessing the impact of a proposed change. The lists are not exhaustive and should only be used as a source of inspiration.

Identify

- All requirements that are affected by or in conflict with the proposed change.
- Consequences of not implementing the proposed change.
- Potential negative effects and other risks associated with implementation.
- How much of the product's value will be lost if the proposed solution is implemented?

Check to see if the requested change is feasible

- Has an impact on nonfunctional criteria, such as performance requirements (ISO 9126, a quality standard, includes six quality characteristics : Functional, performance, availability, usability, maintainability and portability). Nonfunctional is a term used to describe the last five.)

- May be implemented using existing technology and resources.
- Will result in unacceptably high resource requirements during development or testing.
- Will result in a higher unit price.
- Will have an impact on marketing, production, services or support.

- Q.28 What are different factors of change control process ? [3 Marks]**
- Ans. : There are several factors that a change control process should take into account.

Steps in change control process	Action taken in change control
Initiation and control of change requests	<ul style="list-style-type: none"> • Change requests should be uniform and subject to management scrutiny. • Request for a change or Information to be continued
Impact assessment	Ensure that all proposals for change are evaluated in a methodical manner to identify potential effects.
Control and documentation of changes	<ul style="list-style-type: none"> • A change log should be kept that includes the date, the identity of the person who made the modifications and the changes that were made. • Only those who are authorized should be able to make modifications. • There should be a method for reverting to an earlier version.
Documentation and procedures	The processes and related paperwork should be updated whenever system modifications are made.
Authorized maintenance	Controlling system access rights is necessary to prevent unwanted access.

- Contract management is a complex monitoring process that includes execution, vendor selection, issue identification and control, tracking and processing of contracts from pre-award to conclusion. Contract management techniques, when effectively implemented, ensure that budgets and capabilities are in line with project goals.
- The best contract management integrates project management and control seamlessly throughout the company, always incorporating team members for input and outcomes and closely monitoring contractors for performance and deadlines.

- Q.29 Define contract management. What are the different stages of contract management ? [5 Marks]**

Ans. :

- The Stages of Contract Management :** Contract management entails more than just drafting and approving contracts. It consists of a number of stages that guide the process to a successful end. Any missing steps can lead to delays and errors later on. Here's a rundown of the five most important stages :
1. **Create :** The contract management system must be able to include standardised procedures with specific features tailored to the organization's objectives. The first step is to determine the sort of

contract and who will be in charge of each duty. While developing an overview of prospective problems and hazards, the planning process should take into account company resources, objectives and team member strengths and limitations.

2. Negotiate : The contract should be designed in a way that matches the organization's needs and beliefs, in order to enable the two parties create confidence. As part of the negotiating process, line items might be discussed, altered or eliminated.

3. Approve : Approval normally entails a number of signatures. Before the final deal is made, a number of managers, departments and even contractors may need to sign off on the details.

4. Finalize : The signing of contracts between businesses is the last step before the project can begin. It's critical to get signatures from a variety of parties and bodies immediately, especially when distance is an issue, to minimise delays in the process.

5. Manage : Changes can still happen once the project starts. Revisions must be meticulously monitored and notified to all relevant parties. Deadlines, audits, revenue and expenses must all be kept track of, completed and communicated with the rest of the team.

Q.30 What are the challenges of contract management ? [3 Marks]

Ans. : Contract management processes can be difficult to manage, especially when done manually. The following are some specific challenges :

- **Execution :** Without adequate administration, paperwork can quickly become misplaced and final approvals and signatures can take considerably longer than they should.
- Contract tracking and auditing can be challenging once contracts have been signed and passed on to other employees who may not comprehend the intricacies that must be tracked. Budget information, e-mails, meeting minutes and modifications are all stalled in transit before being addressed. Project delays reduce profitability since time is money.

- **Revisions :** It's just as vital to manage change before a contract is approved as it is after it's been performed. Larger projects usually involve national or international teams, posing challenges to deadlines and teamwork. Original documentation updates might take days, if not weeks, to complete. Furthermore, if teams work from various versions of the same document, incorrect conclusions may be made. Any of these possibilities could result in higher risk, missing deadlines, errors and even legal action.

- **Contractual compliance :** Contractual responsibilities are non-negotiable. There may be regulatory or compliance problems that must be followed to the letter from a legal aspect. Failure to comply can result in serious consequences.

Q.31 Explain stages in contract placement. [9 Marks]

Ans. :

- **Requirement :** All the requirements are documented and which consist of following things.
 - Description of the current system and its surroundings.
 - Plans or strategies for the future.
 - Features that are required or desired by the system.

Deadlines

- Software functions with required inputs and outputs.
- Other apps with which software must be compatible must follow certain standards.

For example, there are quality requirements that must be met. Timeliness of responses.

- Bidders are needed to provide further information.

Evaluation plan :

- This include different methods for evaluation of proposals :
 - Reading proposals
 - Interviews
 - Demonstrations

- Need to assess value for money for each desirable feature.
- Site visits
- Practical tests

Example :

- Feeder file saves data input
- 6 hours a month saved
- Cost of data entry at RM20 an hour
- If cost of feature RM1000, would it be worth it ?

Invitation To Tender (ITT)

- Note that the bidder is responding to the ITT with an offer.

- Acceptance of an offer creates a contract;
 - The customer may require additional information
 - Different technical solutions to the same problem
- Evaluation of proposals**
- Verify that the paper meets all of the requirements. Supplier interviews, demonstrations, site visits and practical tests are all part of the process.

Benefits of contract management process

- Communication, response time, goal alignment, transparency and accountability are all improved when contracts are managed properly. Good contract management can help you track and improve these and other project performance metrics :
- Efficiency : Contract management streamlines contract adherence and can help businesses save money. All essential documentation may be discovered and tracked in one location, providing greater transparency for team members from other departments as well as contractors operating offsite. Automation makes documents and modifications more accessible, which can shorten the time it takes to respond to changes, additions or issues. Positive contracting experiences may help lock in better raw material pricing and availability, as well as lower service expenses in the future.

- Building relationships : When vendors and subcontractors have a favourable contract experience, they become long - term business partners. Finding good staff is critical for future initiatives, especially in the construction business.

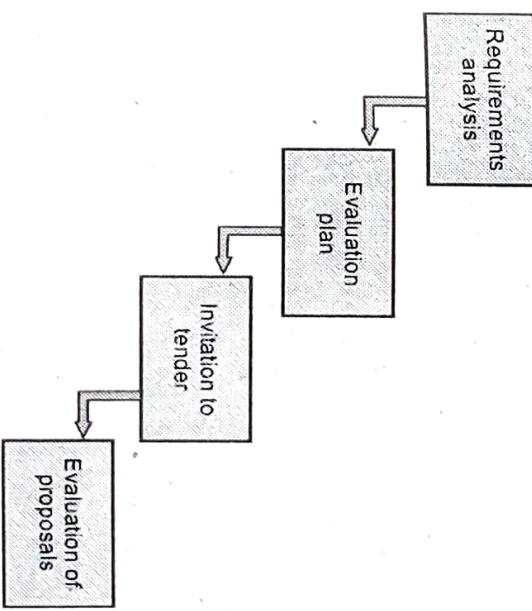


Fig. Q.31.1 : Stages in contract placement

- Contract management technologies organise and centralise documents and processes, allowing for easier access to corporate data and analytics. Standardized reporting and record - keeping ensures accuracy and transparency, resulting in actionable insights.

Projects are less likely to become stuck due to an unanticipated challenge or compliance issues when contracts are managed transparently.

Q.32 State different SCM tools.

[4 Marks]

Ans. : Software Configuration Management Tools

- SCCS (Source Code Control System) and RCS (Revision Control System) are two popular configuration management tools available on most UNIX systems. They are used for controlling and managing different versions of text files (but not binary files) and provide an efficient way of storing versions that minimizes the amount of occupied disc space.

- Binary files cannot be handled by SCCS or RCS (i.e., executable files, documents, files containing diagrams, etc.). Versions can be stored effectively with SCCS and RCS, using the least amount of disk space possible. If a module called MOD exists in three different versions - MOD1.1, MOD1.2 and MOD1.3 - SCCS and RCS will keep MOD1.1 in its original form together with the modifications that turned MOD1.1 into MOD1.2 and MOD1.3 became MOD1.3. Deltas are the adjustments that must be made in order to upgrade each baseline file to the newest version. Storage capacity is the primary justification for storing the deltas rather than the entire revision files.
- Both SCCS and RCS include options for checking components in and out (also known as reserve and restore procedures), as well as the ability to place limits on the group of people who can produce new versions. Individual developers examine and alter components. They check in the modified module into SCCS or

RCS when they have completed all necessary modifications to a component and after these modifications have been reviewed.

Q.33 What are different types of participants SCM process. ?

[4 Marks]

Ans. : 1. Configuration manager:

- The person in charge of recognizing configuration elements is the configuration manager.
- CM makes sure the team adheres to the SCM methodology
- He/she must accept or reject requests for changes.

2. Developer :

- The developer must alter the code in accordance with change requests or customary development operations. He is in charge of keeping the code configuration.
- The developer needs to review the modifications and resolve any problems.

3. Auditor :

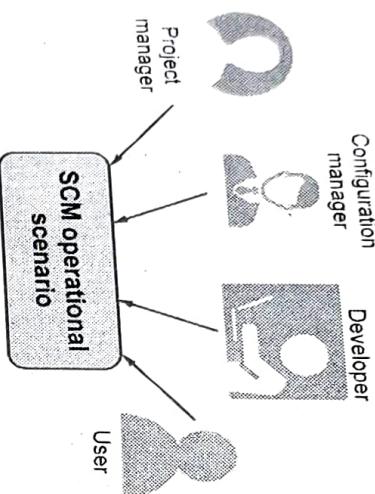
- The auditing professional is in charge of SCM audits and reviews.
- The release must be consistent and comprehensive.

4. Project manager :

- Ensure that the product is created within a specific amount of time.
- Keeps track of development's progress and pinpoints problems with the SCM procedure
- Produce reports on the condition of the software system.
- Ensure that procedures are followed while developing, modifying and testing

5. User:

- To make sure he has the most recent version of the software, the end user should be familiar with the essential SCM terminologies.

**Fig. Q.33.1 : Participant of SCM process****Q.34 Explain different tasks in SCM process.****[5 Marks]****Ans. :** • The tasks in the SCM process course includes :

- Configuration identification
- Change control
- Version control
- Configuration auditing
- Reporting

- The core of SCM is configuration identification. It lays the groundwork for the SCM process's subsequent tasks. Software Configuration Items (SCIs) are identified through a process known as configuration identification. This process also involves defining the basis for identifying SCIs, the method to depict the relationship between SCIs, the identification scheme for naming SCIs, identifying SCIs, identifying the baselines to be established and the corresponding SCIs and the procedure for obtaining SCIs from the project repository.

- A defined process is used to manage change requests in the SCM process's change control task from the time they are initiated until the change is completed and made available to users. The evaluation of a change request, the implementation of the change and the verification and release of the change are all parts of the change control process.
- To manage numerous versions of a configuration and the SCIs that make it up, the **version control** job of the SCM process is used. Version control principles are applicable to all types of versions of software products, including revisions, variations and variants.
- Software Quality Assurance (SQA) is the role of the **configuration auditing** task of the SCM process. It is carried out professionally and objectively to make sure that the modifications have been implemented correctly and that quality has been upheld. Functional Configuration Audits (FCA), Physical Configuration Audits (PCA) and Formal Qualification Reviews are the three different forms of configuration audits (FQR).
- The **reporting** task of the SCM process informs those who might be impacted by the changes in a timely manner about the status of the requested modifications and the SCIs. The developers, the project manager and senior management may be those making modification requests.

Q.35 Write a note on : Configuration management process.**[4 Marks]****Ans. :** • The following two primary actions constitute configuration management :

- Determine which components of the system should remain under configuration management by doing configuration identification.
- Configuration control is a process used to guarantee that system modifications go smoothly.

Software Project Management 4 - 43 Project Tracking and Control

any given moment thanks to configuration management tools.

- We give a summary of these two actions in the section that follows.
- Identification of configuration project managers typically categorize the outputs of a software development process.
- Regulated, pre-controlled and uncontrolled, which are the three main groups. Work products that are subject to configuration control are known as controlled work products. To change these, the team members must adhere to some specific protocols. Although pre-controlled work products are not currently under configuration control, they will be in the future. Work products that are not under control will not be subject to configuration control. Both controlled and pre-controlled work items fall within the category of controllable work products.

- Typical examples of controllable work products are as follows :
- Document defining the requirements
- Design documents
- The system's construction tools, including compilers, linkers, lexical analyzers, parsers, etc.
- Each module's source code
- Test cases
- Problem reports
- Configuration control

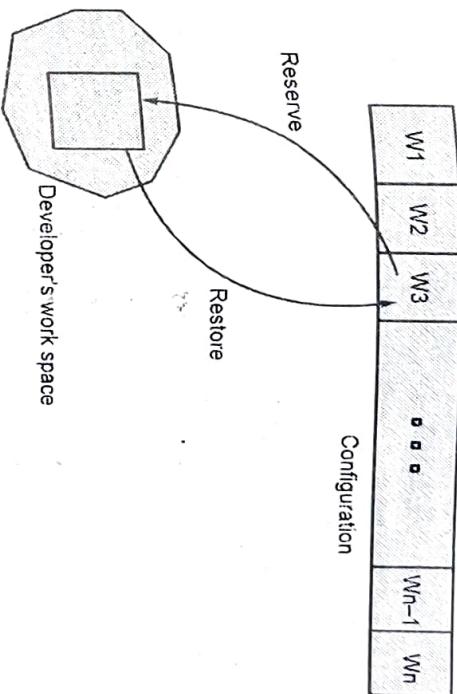


Fig. Q.35.1 : Work product modifications under configuration management

Q.36 What is the purpose of software configuration management? [5 Marks]

Ans. : • It is crucial to properly manage the configuration of the work items in a project for a number of reasons.

- The following are some of the serious issues that could arise from not using a suitable configuration management system.
- **Problems Associated with concurrent access :** Controlling access to many deliverable items is probably the most crucial function of configuration management. If rigorous rules are not maintained regarding the updating and archiving of various work items, a number of issues may arise. Let's imagine that numerous developers are working on a program module that is only kept in a single copy. When making modifications to the various components of the same work product at the same time,
- A developer can obtain a private copy of a regulated work product, such as a code module, using a reserve action in order to modify it (See Fig. Q.35.1). Only one team member may reserve a module at particular work deliverables.

- o Two developers may accidentally overwrite each other's changes.
- o Rolling back changes : It becomes simple to reverse some aspects of a revision or even go back in time to a specific version of development. A change is exceedingly challenging to reverse without a good configuration management system in place.
- o System accounting system refers to documenting who made specific configuration item changes, what changes were made and when those changes were made. Understanding why changes were made, determining whether some changes are redundant and evaluating the effectiveness of various versions will all be aided by knowing the what, who and when of changes. In some cases, it could be necessary to go back to an earlier baseline if a modification was made in an unjustified or improper manner. Users may want to contrast some software versions from today with versions from yesterday or last year. This becomes a straightforward task since a configuration management system maintains track of each version and revision.
- o Handling with variants : As we've already mentioned, it's frequently required to produce versions. This makes it difficult to maintain track of all variants, their versions and revisions without a configuration management system. Additionally, the availability of software product varieties leads to some odd issues. Let's say we have different versions of the same module and we discover a bug in one of them. After then, all versions and revisions must be rectified. We shouldn't have to make the patch in each and every version and revision of the software independently in order to do it effectively. When one application is changed, it should be reflected in all pertinent versions and revisions.

- o Accurate project status determination : A project manager typically uses a configuration management tool to carry out the configuration management activity. A configuration management tool also assists in tracking numerous deliverable objects so that the project manager can quickly and clearly ascertain the project's present status. The developer can control changes to the various components thanks to the configuration management tool.
- o Protecting work products from unauthorized access : Implementing a regulated modification process is made easier by configuration management. As a result, it is now possible to stop illegal alterations from being made to the work products.

END ... ↲

5

Agile Project Management

Unit V

5.1 Predictive versus Empirical Management, Comparison between Non-Agile and Agile Project

Q.1 What is Agile project management ?

Ans. :

- Agile project management is an iterative approach to project delivery that takes place across the course of the project's life cycle.
- Iterative or agile life cycles are made up of a series of iterations or incremental phases that lead to a project's completion. Iterative techniques are commonly employed in software development projects to increase velocity and adaptability since they allow us to alter as we go rather than following a linear path. An agile or iterative strategy strives to deliver benefits throughout the process rather than just at the end. Trust, adaptability, empowerment and cooperation should all be essential ideals and behaviors in agile initiatives.
- **Agile project management** is one of the most innovative approaches to project management that has been offered. This is a new project management strategy that is mostly used in the software development industry. When learning about agile project management, it's ideal to think of it as akin to the software development process.

[4 Marks]

Q.2 What is agile software development ?

Ans. :

- One of the simplest and most successful ways to turn a vision for a company's need into software solutions is to use the Agile software development methodology. Continuous planning, learning, improvement, team collaboration, evolutionary development and early delivery are all terms used to describe agile software development methodologies. It increases adaptability in the face of change.
- The four essential values of agile software development are given:
 1. Interactions between individuals and teams over processes and tools.
 2. Working software trumps thorough documentation.
 3. Collaboration with customers rather than contract negotiations.
 4. Adapting to change in accordance with a strategy.

[2 Marks]

Q.3 What is agile methodology ?

Ans. :

The Agile methodology is an approach that encourages continuous development and testing throughout the project's software development lifecycle. In contrast to the waterfall methodology, the Agile model allows for simultaneous development and testing.

[2 Marks]

- Agile was created for the software industry to enhance and expedite the development process so that flaws and issues could be identified and corrected fast. Through short, iterative sprints/sessions, it allows teams and developers to create a better project, faster. Agile is a fantastic fit for organizations trying to improve the way they manage projects and operate in general, especially as many companies move to the digital workplace. Here are some reasons why the agile methodology is advantageous.

Speed to market

- We can use the agile process to bring the notion to our users as quickly as feasible. An agile project creates something useful during each iteration. We could opt to launch what has been supplied at any time to begin building our user base or to test our idea.

Flexibility

- The agile methodology is built on the idea of adapting to change. Projects, especially software, are always changing. We must be able to adapt and update the product as new products are released or the market expands. Agile also recognises that brilliant ideas might emerge in the middle of a project and that locking oneself inside a scope will prevent us from taking advantage of such insights.

Risk management

- Users and stakeholders might use and test a product early in the process if incremental releases were available. This allows us to spot feature deficiencies and difficulties early on in the manufacturing process. Being responsive to changes also means that changing the scope of our project midway through is not a problem, which is difficult with the waterfall process.

Quality

- Testing is integrated into the agile methodology throughout the project lifecycle. Delivering tested products on a regular basis means higher overall quality and less time spent quality-assuring the product as a whole. Early and regular product testing is possible with incremental releases. Even if the items aren't out to the general public, it's easier to find defects and make improvements when we have the actual product to play with rather than a series of new designs to work with from the beginning.

0.5 What is an agile manifesto ? What principles aid in the development of agility? [5 Marks]**Ans.: Agile manifesto**

- The Agile manifesto is a declaration of the agile methodology's beliefs and principles. It tries to identify new ways of producing software by offering a clear and measurable structure that supports iterative development, team cooperation and change recognition. It is made up of four basic ideals and 12 key principles.

Values

1. Over processes and tools, it's about people and their interactions.

- 2. Working software trumps thorough documentation.
- 3. Collaboration with customers is preferred over contract negotiations.
- 4. Adapting to change in accordance with a strategy.
- As listed below, there are 12 principles that guide agile project management.

Principles

1. Agile's first aim is to satisfy customers by delivering critical products and services on time and on schedule.
2. Projects are delivered on a regular basis, ranging from a few weeks to a few months, with a preference for shorter timelines.
3. Accept any changes in requirements, even if they occur late in the project's development. Agile processes take advantage of change to give customers a competitive edge.
4. Throughout the project, developers and stakeholders must work together and collaborate.
5. Build our projects around people who are excited about what they're doing. Give them the support and environment they require and trust them to complete their tasks.
6. The most efficient means of communicating information to and within the development team is through face-to-face conversations.
7. The true test of a project's success is the ultimate working product.
8. Agile processes aid in the promotion of long-term development. The pace must be maintained indefinitely by the creators, sponsors and users.
9. Continuous attention to good design and technological excellence improves agility significantly.

- These ideals and principles are followed by those who use any sort of agile approach. When it comes to agile development life cycle techniques, the manifesto provides a solid picture of what is expected.
- 12. The team should reflect on how they can become more productive at frequent intervals, then adapt and tune their behavior accordingly.

Q.6 List out criticism of agile methodology. [2 Marks]

Ans. :

1. It is not based on documents.
2. There is a lack of structure.
3. There are a lot of meetings.
4. Requires a significant amount of cultural change to implement.
5. Adds ambiguity to the contract negotiation process because actual work effort estimates are difficult to create.
6. If not adequately managed, can be inefficient.
7. Can raise the danger of scope creep.

Q.7 What is scrum ? Explain with a suitable diagram. [6 Marks]

Ans. : Scrum is a popular agile process for product development, particularly software development. Scrum is a project management methodology that may be used on any project with tight deadlines, complicated requirements or a high level of uniqueness. Projects in scrum are progressed through a series of iterations known as sprints. Each sprint usually lasts two to four weeks shows in the Fig. Q.7.1.

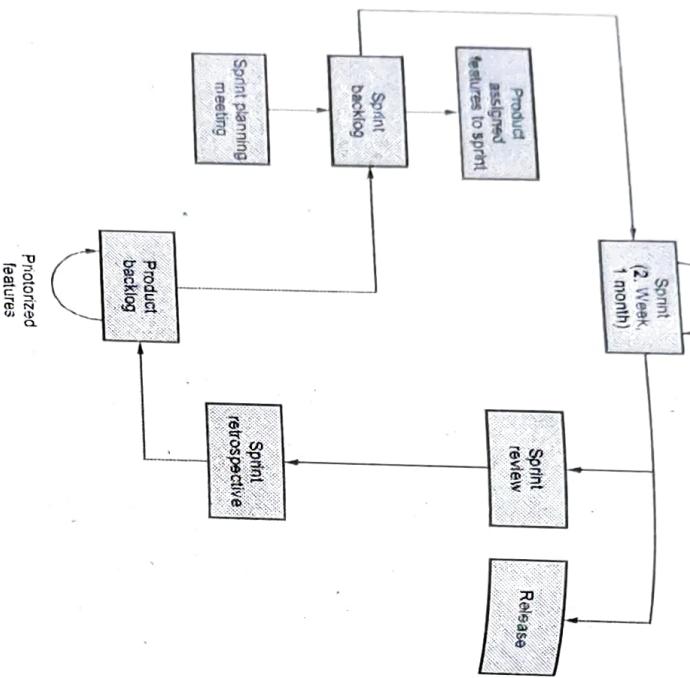


Fig. Q.7.1 : Scrum

- **Product backlog** : A prioritized feature list that includes every desired item or update to the product. Note : The term "backlog" is sometimes misunderstood since it refers to two separate things. To be clear, the product backlog is a list of the product's intended features. A sprint backlog is a list of tasks that must be accomplished in a given sprint.
- **Sprint planning meeting** : At the start of each sprint, the product owner presents the team with the top items on the product backlog in a sprint planning meeting. The Scrum team prioritizes the tasks that can be completed in the next sprint. The work is then shifted from the product backlog to a sprint backlog, which is a list of activities required to finish the product backlog items that the team has committed to completing during the sprint.
- **Daily scrum** : Throughout the sprint, a brief meeting known as the daily scrum is held each day. This meeting helps the team stay on track by providing context for each day's work. The daily scrum is mandatory for all team members.
- **Sprint review meeting** : At the end of each sprint, the team holds a sprint review meeting to show off the finished functionality. Typically, this takes the form of an informal demonstration of the new capabilities; for example, PowerPoint slides are not permitted. The meeting should not become a chore in and of itself, nor should it become a diversion from the process.
- **Sprint retrospective** : At the end of each sprint, the team (including its scrum master and product owner) holds a sprint retrospective, which is a meeting in which the team (including its scrum master and product owner) considers how well scrum is working for them and what changes they might want to make to make it even better.

Q.8 Differentiate between predictive and empirical management [4 Marks]

Ans. : Predictive management

- A predictive control process is one that specifies the actions or phases that must be followed in order to deliver a solution. The assumption is that providing software is a straightforward problem domain from which an ideal procedure can be derived to get good results. The **waterfall model**, in which a process is shown, is a good example of a predict and control process.

- A predictive control technique is ideal for well-known and repeated problem areas that can be forecasted with a high degree of precision, such as manufacturing processes where a run of 100,000 duplicate goods must be produced.

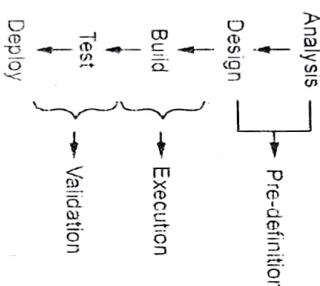


Fig. Q.8.1 : Predictive process

- The problem is that most software development is focused on product development and creating the first of its type and as a result, it tends to operate in a complex domain that is difficult to forecast. The approach must be adjusted to the empirical evidence in this case.

Empirical management

- Scrum is built on empirical process control and employs empiricism to make evidence-based decisions. In the philosophy of science, empiricism emphasizes the use of facts gathered via testing rather than innate notions or traditions to gain knowledge.

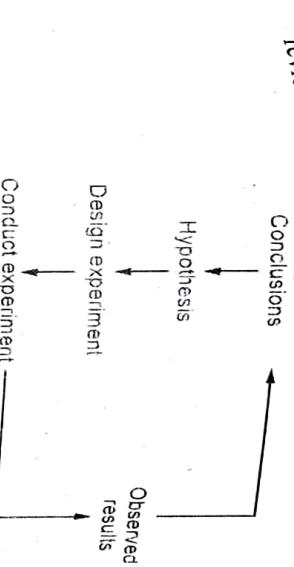


Fig. Q.8.2 : Empirical process

- This method uses a looping experimental cycle to fine-tune the final solution to meet actual demands and capabilities rather than those that were anticipated at the outset.
- The approach can be open-ended and ambiguous at first and it may take several cycles to provide something useful; however, the cost of experimenting and providing an accurate solution is arguably much less expensive than predefining the solution and then discovering that it is deficient, as with a predict and control process.

- An empirical process is excellent for examining complex issue areas in order to find a solution that is evidence-based, meets the needs and provides something that may not be quantifiable at first.

Q.9 Comparison between non Agile and Agile project.

[4 Marks]

Ans. :

Sr. No.	Traditional	Agile
1.	Make a plan for what we want to happen.	Make a detailed plan for what we expect to happen based on the horizon.
2.	Make certain that what occurs matches what was planned :	“Control” is achieved through inspection and adaptation :
3.	<ul style="list-style-type: none"> • Directive management • Containment, containment, containment. 	<ul style="list-style-type: none"> • Reviews and retrospectives • Teams that self-organize.

Table Q.9.1 : Traditional Vs Agile project

- Traditional and agile processes eventually converge on the same set of artifacts. They just appear at different times over the project's life cycle. Between the two groups of artifacts, there is one significant difference. A typical methodology would have identified and planned for a number of deliverables that were either changed after deployment or never completed. Agile approaches, on the other hand, would have planned just what was really delivered. As a result, the agile project has a clear lack of waste.

Q.10 What is the difference between agile and waterfall project management?

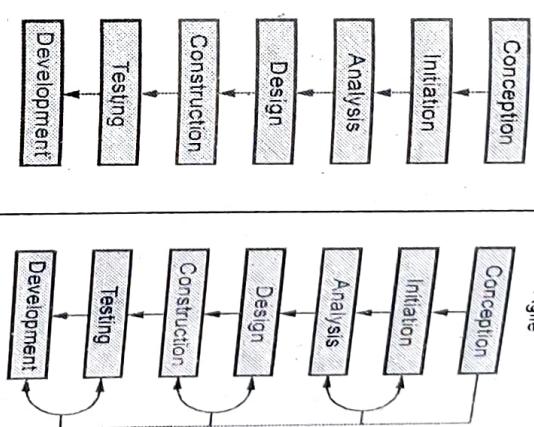
[4 Marks]

Ans. :

Despite the fact that both approaches are viable and mature, the decision to use one over the other is based on the project at hand and the firm carrying it out. The following diagram illustrates the differences between agile and waterfall.

Waterfall model

Agile

**Fig. Q.10.1 : Agile Vs waterfall****Project scope**

- Changes could be made well in advance in agile while staying within the project budget. Even when the scope isn't established in advance, the agile process works perfectly.
- When the scope is well-defined in advance, the waterfall methodology works perfectly. The alterations that can be made are often limited by the contract terms.

Project team

- Small, to mid-sized specialized teams working in close collaboration are common in Agile.
- Large teams are commonly used in waterfalls, which reduces member coordination.

Customers

- Customers can be available throughout the project thanks to the agile process.
- Customer's availability is only required at milestones in a waterfall project.

Feature prioritization

- Features are usually prioritized in agile and issues are dealt with according to their priority. This improves financial efficiency while also preventing project failure.
- Features are never prioritized and as a result, the project either succeeds or fails completely.

Funding

- Agile is effective at increasing funding efficiency.
- Waterfall works perfectly because it reduces fixed costs by using up-front contracts.

Project changes

- During an ongoing process, agile management allows for sporadic modifications.
- Waterfall does not enable adjustments during the project process and if a mistake is made, the project must be restarted from the beginning.

5.2 Three Stages of Agile Project, Estimation, Scope Management, Roles and Responsibilities, Scheduling and Tracking

Q.11 What are the different stages of Agile ? Explain each one in brief. [9 Marks]

Ans. :

1. **Survival** : Survival mode is the first step toward becoming an agile team. Regardless of whether they are agile or not, all teams begin here. They're attempting to get projects up and running, as well as solve bugs and give a solution. There isn't much time for innovation or proactively when we are solely focused on 'surviving', getting things done and following new processes.

What's the best way to get to the next agile stage ?

- During stand-ups and planning sessions, observe our team as a whole and each individual to see where improvements may be made.
- What types of people make up our team ?
- What are the barriers they're up against ?
- Are their roadblocks a result of their interpersonal skills or their technical abilities ?
- Do our employees exemplify our company's values ? If not, what are the ones that are missing ?
- Are they on track to accomplish their short-term objectives ? Is there a pattern to their failures if not ?
- Our staff will learn by experience, but this process can be accelerated with adequate planning and organisation.
- Keep our team's pipeline organized so they can concentrate on what matters.
- Evaluate future jobs and determine the resources needed by choosing people who will work well together on that assignment.
- Allow our team members to see what they're working on now and in the future. This aids our team's psychological as well as practical preparation.
- To avoid overscheduling our team, try to schedule all project resources three months ahead of time.
- Ascertain that our team is familiar with our clients long-term business objectives and values.
- Remove disruptions from our team's work (such as asking for the whereabouts of login information) and multitasking.
- Make sure that everyone on our team contributes to weekly status reports. These provide a picture of how our team is progressing on their projects at any one time and will include information such as what was accomplished and next actions, general concerns and

positive outcomes, hours worked, leave schedules and sprint burndown charts. These aid in identifying and improving problematic areas in our project, as well as identifying team member's strengths and weaknesses.

- 2. Learning :** Teams that are in the learning stage are one step ahead of those who are in survival mode. Their teething issues are no longer an issue and they now have more time to learn and enhance their job, processes and skill sets. Team leaders and project managers may now devote more effort to implementing these changes in their organisations.

How to advance to the next agile level

- Stakeholders must be informed about why project delivery may take longer (due to time spent learning), so that our team's performance isn't measured by the same standards as previously.
- Our team will learn how to work together throughout this stage. It's critical that they have enough time to get to know each other's strengths and limitations.
- We should be able to get a good combination of personalities to establish a high-performance team, by using DISC profile techniques (dominant, influencers, steady, compliant).
- It is not necessary to spend a lot of money to train our employees. Pairing juniors with senior team members is a terrific approach for our team to gain experience while staying productive. Some team members may benefit from external training in the form of seminars and workshops.

Team's up skilling

- More than just upskilling our employees is part of the learning stage. To get to self-sufficiency, we need to create motivation for the team to upskill by identifying their professional goals and a path to achieving them.

Software Project Management

Improve our team's abilities by:

- They're honing their technical abilities.
- They're working on improving their communication with clients and co-workers.

Motivate people to learn new skills :

- Discuss their career goals and how they might improve their skills to reach them.
- SMART goals, one-on-ones and surveys can all be used to see if our team is on track to meet their personal and professional objectives.

3. Self-sufficient agile team :

Any agile team's last step and ultimate goal is to be self-organizing and self-sufficient, allowing for quick and flexible response to change. Processes are fully defined and followed at this point. A truly agile team's day-to-day activities include adaptive planning, evolutionary development, early delivery and continuous improvement. Rather than having a direct involvement in the day-to-day management of projects, team leaders can take a stepback and monitor the team and identify areas for development.

- It takes time to develop into a self-sufficient agile team. Experience is what makes teamwork agile. Our team members must have prior team experience, understand how to communicate and engage with one another and be aware of each other's strengths and flaws. This allows them to plan ahead of time and organise fast and efficiently. Self-sufficient teams may readily adjust their approach and are willing to do so if it improves their processes and produces better results.

- Retrospective sessions will be held by agile teams to examine what they've learned, what went well and what didn't. These discussions discuss project outcomes and lessons learned, as well as how they may improve and attempt again. This is essentially a form of trial and error, with the goal of improving with each project or sprint.

- In this stage, team leaders and project managers will have the least day-to-day involvement because they will be providing crucial direction and higher-level decisions rather than dealing with day-to-day processes and firefighting.
- Overall, a highly agile team will be able to deliver projects more quickly and with fewer faults than a team that has gone through the previous two stages. Their proactive nature, as well as their ability to learn and develop, allows them to make a significant and valued addition to our company.

Q.12 Explain the importance of estimation in agile project management. [4 Marks]

OR Differentiate between traditional and agile estimates.

Ans. :

- The deconstruction of work into epics and user stories, which are then added to the backlog for development, is central to Agile. Each user narrative is divided into use cases, which are then calculated using story points.
- Understanding how much work each story point will take a developer is an art form in Agile estimating, which team leads and managers polish over time. If stakeholders don't understand that each iteration rapidly raises the accuracy of estimating on a project, this apparent fluctuation might cause concern early in the development process.

Software Project Management 5 - 18 Agile Project Management

- Traditional and Agile estimates given in Table Q.12.1.

Approach	Advantages	Disadvantages
Traditional	A good estimate can be obtained by performing well regarded significant work ahead of time.	Often ineffective and projects are already over budget and behind schedule.
Agile	Stakeholders are in charge.	Senior management does not yet accept it.
Combination	<ul style="list-style-type: none"> • A realistic estimate. • Stakeholders are in charge. 	It's possible that the initial budget and schedule aren't detailed enough.

Table Q.12.1 : Traditional and Agile estimates

Q.13 List the factors to be considered for scope management. [6 Marks]

OR Differentiate between traditional and agile scope management.

Ans. :

- Agile scope management differs from traditional waterfall scope management in that Agile manages scope flexibly while waterfall manages it rigidly. Because the business environment and client requirements regularly change in the global world, it is difficult to fix all scope from the outset, which is why Agile keeps scope flexible. Agile is also built to adapt flexibly to changing business requirements through time-bound iterations (one to four weeks in length) and frequent reviews (Sprint review and daily scrum).

Defining the scope of the product :

- Themes, epics and user stories are all examples of Agile product backlog items.
- **WBS :** WBS is used to establish the product scope in a waterfall project. It is considered to be the Agile product backlog's equivalent of the product backlog.

- One of the roles clearly defined in Agile is product owner, who is responsible for setting the scope and product backlog as well as optimizing the product's value. Who is similar to a captain on a ship who determines the project's destination and purpose. Despite the fact that all project members should contribute to defining the scope, the product owner is ultimately responsible for the outcome.
- The project scope is a broader term that includes product scope and specifies all actions performed by the project team, as well as what they do not do. Despite the fact that the goal of the software project is to create a software product, the project team is occasionally involved in other activities such as customer support or sales. Some organizations even outsource one of their development processes, such as testing, to a third party. Input and output of defining the scope of the project is shown in Fig. Q.13.1.

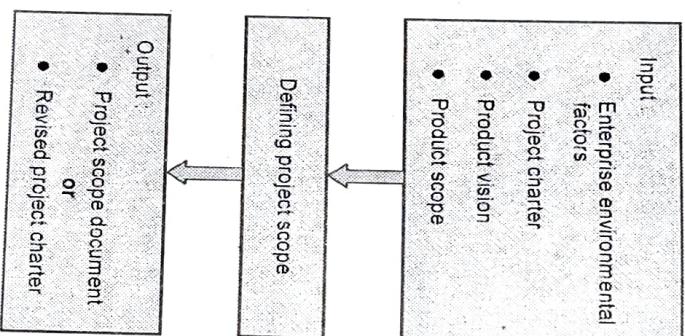


Fig. Q.13.1 : Project scope

Defining the scope of the project

- As projects are subject to a corporate and business approaches and techniques for establishing project scope differ. Because product scope is such an important part of the project scope, the majority of the project scope will arise once the product scope is defined.
- To collect all essential information, brainstorm with stakeholders and project members.
- Consider activities other than software development that are required, such as customer service, sales and so on.
- In terms of the relationship between the project scope and the product owner, the product owner is also responsible for the project scope's output.
- Traditional and Agile scope management is given in the Table Q.13.1

Table Q.13.1

Traditional	Agile
Scope definition.	Backlog and planning meeting.
Create WBS.	Release and iteration plans WBS.
Scope verification.	Feature acceptance.
Scope change control.	Constant feedback and the ranked backlog.

Table Q.13.1 : Scope management of traditional and agile project

[7 Marks]

Ans. : **Agile team roles :** Depending on the Agile methodology, particular team roles may be required to conform to the framework or no roles may be required at all. Though not every Agile implementation would necessitate all of these roles, here are a few that we might encounter :

- Scrum master :** The scrum master keeps each sprint on track and assists in the removal or resolution of any issues or challenges that may arise. They are the team's spokesman.

- **Product owner :** The owner of the product. The product owner's job is to create each sprint's goals, manage and prioritise the team backlog and act as the customer's or internal stakeholder's voice.
- **Team members :** Members of the team. This team's members are the ones who carry out the job in each sprint. These teams, which often consist of three to seven people, might be made up of people with diverse skills and talents or they can be made up of people who have the same job functions.
- **Stakeholders :** Is purely an informational job. Stakeholders should be kept informed about the product and sprint goals, given the opportunity to evaluate and approve work throughout the sprint and given the opportunity to provide feedback during the sprint retrospective.
- While each Agile approach has its own set of team members and roles, there are a few universal role features that should be included in most Agile team structures :
 1. **T-shaped :** A valuable Agile team member has a broad understanding of their subject, as well as in-depth knowledge, experience and ability in one (or more) specific areas.
 2. **Cross-functional :** Agile team members with talents outside of their usual areas are called **cross-functional**. They may have a rudimentary understanding of graphic design principles and data analysis, as well as HTML/CSS.
 3. **Adaptable :** If they have a wide range of abilities, they know how to put them to good use. Their output is consistent regardless of the environment.
 4. **Curious :** Asking the correct questions and challenging the status quo when it's appropriate are all part of optimizing and being more efficient.
 5. **Entrepreneurial :** A member of an Agile team is one who does not wait to be told what to do. Wherever they sense a need, they're ready to step in and design campaigns.

Q.15 What are the responsibilities of agile project ? [4 Marks]

Ans. : Procedure and safeguard :

1. Organize meetings.
 2. Remove stumbling barriers.
 3. Keep the team focused and free of distractions.
 4. Assist with communication.
 5. Serve as the team's memory :
 - Remind everyone of the big picture.
 - Remind the team of the process's purpose.
 - Remind the team of the decisions they made.
 6. Be the truth's voice :
 - If what they're doing doesn't seem to make sense, ask the team to explain it to us.
 - Keep an eye on our velocity estimates.
 - Bring up the possibility of unfinished features with them.
 - Keep track of our metrics.
- Communication :**
1. Resolving team conflicts.
 2. Ascend the escalation ladder from the bottom.
 3. Negotiate with people that aren't on our team.
 4. Provide highly visible information radiations as well as a formal progress report.

6. Team-oriented : Team members put the team's success ahead of their own personal glory. They consider it a triumph if everyone delivers on time and works effectively together.

7. Committed to excellence : One of the main advantages of Agile projects is the ability to deliver high-quality work more quickly. Team members that are dedicated to greatness do not accept second best. They aren't perfectionists, but they are committed to providing their finest work at all times.

5. External dependencies to be managed.
6. Coordinate releases with others.

Establishes a community :

1. Create a secure atmosphere that enables experimentation and collaborative decision-making.
2. Maintain a work climate that encourages high output.
3. Function as a connector, advocate and ambassador.
4. Participate in the management of the organization.
5. Share our knowledge with others.

We do not

1. The product owner is in charge of the product backlog.
2. The delivery team is in charge of the estimates.
3. Make delivery decisions : We enable this activity for the team and then make judgments on project administration, as well as strategic and organizational issues.

4. Customers or product owners make product decisions.
5. If we need all the answers, consult the team.

Q.16 How to schedule a project using agile methods ? [4 Marks]

Ans. : Scheduling in agile projects

1. Just detailed plans are produced for jobs that are about to start.
2. Staff schedules their tasks with only oversight.
3. Staff chooses their tasks rather than being assigned assignments.
4. Make brief iterations a priority.
5. Create a timetable that prioritizes requirements.
6. Organize tasks involving outside groups.
7. It incorporates education.
8. Take into account the environment.

Q.17 Write important factors to be considered while monitoring an agile project. [4 Marks]

Ans. :

- Kanban and Scrum are two frameworks or methodologies that aid in the implementation of Agile principles by teams. Despite the fact that they are two separate techniques, they have certain

similarities. They usually work with three types of tasks : Those that need to be completed, those that are in process and those that have already been completed. This is where Agile project management software can really help with project planning. When designing a project timeline, a project manager can follow these broad guidelines :

- o Break the project down into manageable tasks and set sprint lengths : An Agile project begins with a list of features to implement and multiple iterations to do so. These tasks should be identified by the project management, prioritised with the support of their team and entered into the schedule. Each feature will be assigned a timeframe that will correspond to each iteration. Each feature will be assigned a timeframe that will correspond to each iteration. A status will be required for each feature and sprint, such as not started, in progress or completed.
- o Include the tasks that must be accomplished as part of the sprint : Agile management software can assist project managers and their teams in viewing the tasks that must be completed and marking them as "done" when they are complete. Agile management software includes tools like Jira, Trello, Monday and Zoho Sprints, to name a few.
- o Define the sprint's anticipated time for each issue : The project team, which should include some of the project's numerous stakeholders, reviews each part or iteration. The following stages are determined by the insights gathered from the feedback.

- While there are many misconceptions about Agile, tracking the progress of teams on Agile projects is a major worry for firms unfamiliar with the methodology.

- One temptation is to deal with this unpredictability by cramming conventional Waterfall-based project management cost measures into arbitrary specified milestones within an Agile plan. This can add needless reporting to the project while also obstructing significant visibility into actual progress toward success. Agile, when properly applied, allows project productivity and quality to be measured.
- Understanding the principles that govern how these are monitored can give stakeholders and managers with a high level of continuing visibility into progress and early detection of possible issues.
- Over the last few years, rapid technological innovation has enabled businesses and organizations to become more efficient than ever before. Not only may new software improve work procedures, but it can also boost team productivity. The journey to digital adoption, on the other hand, is rarely easy. As a result, many project managers employ the agile methodology to maintain their projects on schedule.
- Agile project management is an iterative planning process that divides a project into short portions called **sprints**. After that, each sprint is made available for testing and quality assurance. The purpose of Agile is customer happiness and a successful product, hence it relies on a continual feedback mechanism.

END ...

6 Staffing in Software Projects

Unit VI

6.1 Managing People, Organizational Behaviour, Best Methods of Staff Selection, Motivation

Q.1 What are the roles of manager ?

[4 Marks]

Ans.:
Project managers are required to be strong leaders, communicators, negotiators, problem solvers and capable of persuading stakeholders to engage in behaviours and activities that will contribute to the project's overall success.

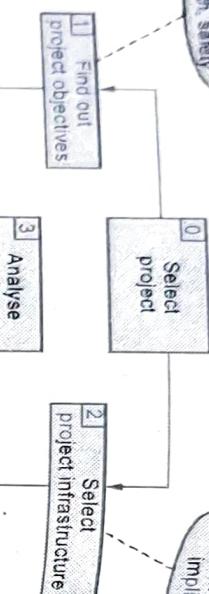
- Project human resource management, thus comprises a set of processes required to make effective use of all stakeholders such as sponsors, customers, project team members and subcontractors.
- The following are some of the most significant things that a project manager must consider when managing a team :

- Techniques that are appropriate for personal and organizational connections are selected.
- Techniques that are suited for the project's current demands are chosen.
- To ensure compliance, the performing organization's administrative human resource requirements must be known. The project manager makes sure that everyone in the team is aware of what is going on.
- Efforts made to encourage members of the project team to act in a professional and ethical manner.

Stepwise framework overview of managing people and organizing teams

Objective
Health safety

Be aware about
implications



Q2 Write a note on behavior. Explain organizational behavior in detail. [9 Marks]

Ans. :

- The management of people is consistently cited as a crucial component of project management by those with actual experience in the field. People like Brigitte and Amanda would like to know whether or not professional counsel may assist in the successful and compassionate administration of workers. If the advice is supported by data that has been acquired through some form of research, it may be more persuasive.

- Social science research methodologies must be used in this study of individual and group behavior in software and ICT development environments. The perspective needed for this kind of research is distinct from what software developers often need.
- Although user requirements that can be interpreted in several ways are typically the basis for system development, the final result is a system that operates in a flawlessly consistent manner. The designers who create these systems will unavoidably have a predisposition to think of things in terms of deterministic systems, where the results can be predicted quite well once the sequence of inputs is known.
- As in the physical sciences like chemistry, such systems are thought to be guided by mechanistic laws. This attitude, which is also known as a **positivist approach**, frequently favors experimentation as a way to determine the links between inputs and outputs.

Fig. Q.1.1 : Stepwise overview

- In stepwise framework allocation all stakeholders have agreed on the objectives and are committed to achieving them. While doing this project manager must consider some objective related to safety

- This approach has been attempted to be applied to social systems. However, due to the complexity of social systems, including commercial organizations, it is impossible to forecast their results with any degree of precision. Finding statistical correlations inside such systems that can be stated as generalized models or theories is what can be done.
- Theories that attempt to explain human behavior have developed in the field of organizational behavior. These theories are sometimes formulated as "If A is the scenario, then B is probably going to happen." A statistical relationship between the two variables is sought while attempting to monitor behavior where variables for A and B are measured. Contrary to physical science, it is almost never true that B must always follow A.
- In the real world, a scenario will be impacted by a variety of factors, many of which are imperceptible to the spectator. Determining which set of research findings is pertinent is so challenging. We run the risk of developing a collection of maxims that are essentially superstitions. People can, at the very least, become more sensitive and considerate about these concerns by studying them.
- Studies in Organizational Behaviour (OB) have its roots in Frederick Taylor's work from the late 19th and early 20th centuries. Taylor made an effort to analyze the most effective manner to carry out manual chores. The personnel were then instructed on how to complete the task
- Taylor has three main goals :
 - To choose the best candidates for the position;
 - To teach them the most effective techniques;
 - To reward top performers with increased compensation as incentives.

- Software Project Management*
- Taylorism is frequently portrayed as being simplistic and mechanistic. The need for defining best practices is real, nevertheless. The development of both structured and agile methodologies in the less glamorous area of software development is an illustration of the focus on best practice. Brigitte and Amanda will be anxious that duties are completed correctly. Although Amanda and Brigitte will encounter many coworkers who share Taylor's opinion on the significance of "performance-related pay," his focus on the solely financial basis of staff motivation is more problematic.
 - Unfortunately, it's likely that Amanda and Brigitte have very little influence over the financial incentives provided to their employees. They should take heart from research showing that motivation is not only dependent on such benefits.
 - While conducting a now-famous series of studies on the working circumstances of staff in the 1920s, OB researchers found that both a control group and a group of workers who had their working conditions left unaltered increased their work rates. The act of merely caring about what employees accomplished enhanced output. This demonstrated how employee's attitudes affected their productivity.
 - Thus, a more nuanced picture of people at work can be contrasted with the cash-oriented or instrumental, view of labour held by certain managers. Donald McGregor gave the two attitudes the names Theory X and Theory Y.
 - Based on Theory X,
 - The typical person has a natural aversion to work;
 - Therefore, there is a need for compulsion, direction and control;
 - People frequently avoid their responsibilities.
 - On the other hand, Theory Y proposes that :
 - Play and rest are equally natural as is work;

- External control and coercion are not the sole means of enforcing an organization's objectives;
- Commitment to goals is a result of the benefits attached to their accomplishment:
- The average person can learn to take responsibility and pursue it.

- There are many people with the ability to use their imagination and other qualities.
- A "reward" need not be monetary; it could be something positive like a feeling of accomplishment.

Q.3 How to select the right person for the job ? Explain recruitment process.

[7 Marks]

OR State and explain the basic steps involved in a typical selection procedure.

Ans. :

- Taylor emphasized the necessity for the right person for the job. The productivity of programming is impacted by a variety of elements, including the use of software tools and approaches.
- The biggest variations in software development performance, nevertheless, are between individuals. In 1968, experienced professional programmers working on the same assignment were compared.
 - In one case, the ratio between the quickest and longest times to code the programme was 1.25 and probably more importantly, the time required to debug it was 1.28. Therefore, it would be understandable for Amanda and Brigette to want to hire only the best candidates.
 - Staff members who can interact successfully with customers and with one another are what Amanda and Brigette will seek.

- Information Systems (IS) professionals appeared to have substantially less "social needs" than persons in other occupations, according to American academics Cougar and Zawacki. Gerald

Software Project Management

Weinberg is quoted as saying, "If questioned, most programmers probably say they want to work alone where they wouldn't be bothered by other people."

- Many software developers are talented and drawn to the field, but many do not make effective managers later in their careers.

The recruitment process :

- It must be stressed that project managers frequently have little control on the individuals who will make up their team - They are forced to make due with "resources that are available." Recruiting is frequently the responsibility of the organization and the hired individual may eventually work in a variety of different departments.

- Meredith Belbin makes a helpful distinction between qualified and qualified applicants. Candidates that are qualified have a Curriculum Vitae (CV) that includes information like the "correct" number of years spent in a previous position and the "proper" academic credentials. Effective applicants are capable of performing the task well.
- Making the error of choosing an eligible candidate who is not actually appropriate. On the other side, qualified candidates who are not formally eligible may be the best choices since, once appointed, they are more loyal.
- Belbin advises that we aim to evaluate actual talents rather than prior experience and offer training to fill up any slight gaps in expertise.
- We believe, this proves that avoiding discrimination on the basis of race, gender, age or irrelevant disability may be both a socially decent and effective hiring strategy.

The following might be a broad strategy :

- Create a job specification : Advice is frequently required because a formal document could have legal ramifications. The needs of the job, including the kinds of tasks to be performed, should be written and agreed upon, whether formally or informally.

- Create a profile for the job holder :** The individual required to perform the job is profiled using the job specification, characteristics, credentials, training and experience necessary. These would be listed.

Recruit applicants : Typically, an advertisement would be published, either internally within the company or outside in the local or trade press. To determine the media most likely to reach the most number of possible applicants at the lowest cost, the job holder profile would be thoroughly evaluated. For instance, it would make sense to place an ad in the appropriate specialized publication if a specialist was required. The second rule is to include enough details in the advertisement to permit some self-elimination. The applicant pool will be reduced to those who have more realistic qualifications by providing the income, location, job description and any prerequisites.

- Examine resumes / CV :** Nothing is more unpleasant for everyone involved than when persons have CVs that make it plain they are ineligible for the job but are still invited for an interview despite this. These should be carefully examined and compared to the job holder profile.

- Interviews :** Aptitude exams, personality tests and the scrutiny of work samples are all examples of selection approaches. Any technique must put to the test certain traits that are listed in the profile of the job holder.
 - The method that is most frequently utilized is an interview. In order to maximize the chance of follow-up questions and discussion, it is preferable to conduct more than one interview session with each applicant.
 - Additionally, there should only be two interviewers each session. For the attributes being evaluated, a formal scoring system should be developed and interviewers should then decide on individual scores that are then compared.
 - An interview could be of a more general or technical nature, when the candidate's practical expertise is evaluated. In the latter
- Q.4 Explain Maslow's hierarchy of needs.** [4 Marks]
- Ans. : There is a hierarchy of human needs, according to this well-known organisational idea. Only after their lower-level requirements have been met can people look for higher-level needs. The following is a list of these demands, in order of importance :
- Needs for self-actualization - Seeking knowledge and maximising potential.
 - Respect for others, self-respect, freedom and acknowledgment are all requirements for self-esteem.
 - Social requirements - Community and social phobias.
 - Needs for safety - Job security and financial stability.
 - Physiological requirements - Basic requirements such as water, shelter and food.

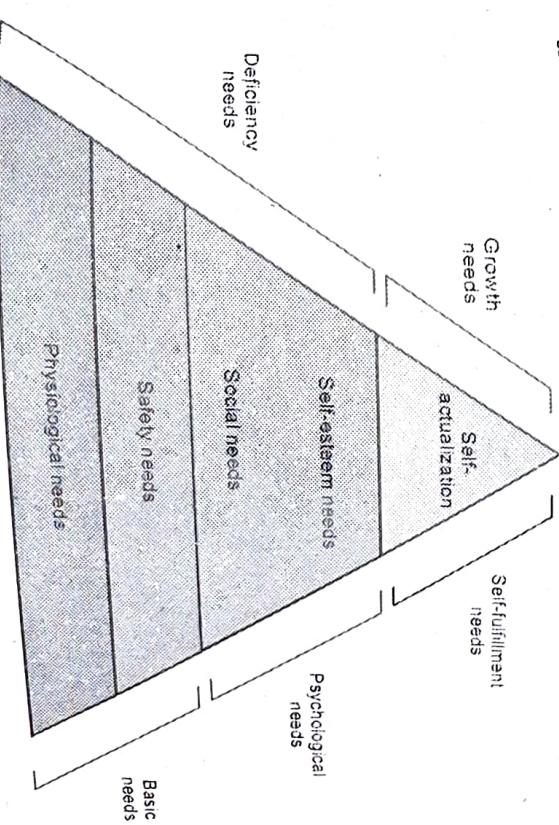


Fig. Q.4.1 : Maslow's hierarchy of needs

Q.5 Write a note on : McGregor's theory of X and Y and Z theories [6 Marks]

Ans. : According to this theory, there are two types of employees Theory X employees are to be watched, cannot be trusted and must be micromanaged because they avoid work, do not take responsibility and generally dislike work. Theory Y employees are motivated, take on responsibilities, enjoy their jobs, are given challenging assignments and are encouraged to work independently.

Theory X	Theory Y
Work avoiding	Work is natural
Need to control	Capable of self-direction
Avoid responsibility	Take responsibility
Worker seek security	Can make good decisions

Z Theory

- Workers must be included in the decision-making process according to the Z hypothesis, because this will make them more responsible and accountable for their choices.

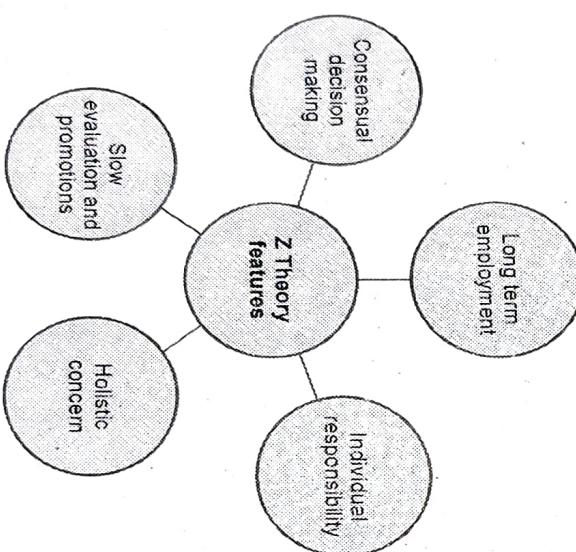


Fig. Q.5.1 : Z theory features

Q.6 Explain different organizational theories [6 Marks]

Ans. : Even though people's needs and values differ from one another, group effort makes it easier for them to achieve organisational goals effectively. Human relations can be defined as the process of motivating people in organisations to work together as a team. Although human relationships have existed for a long time, the study of human relations has only recently emerged.

- Organizational theories explain how different organisational arrangements affect the behaviour of groups and individuals. Those were derived from organisational structures and procedures that emerged in England and Europe during the industrial revolution. Organizational theories provide insight into how people work and how organisations operate.
- These theories are used by project managers to identify the strengths and weaknesses of their teams, as well as to reduce project time and costs.

Q.7 List out the basic needs in a hierarchy. Explain any one in detail. [6 Marks]

Ans. :

- It is critical to motivate people to work. Motivation is a state of mind characterised by vigour and zeal that propels a person to operate in a specific manner in order to attain desired outcomes. Motivation is a force that drives a person to work with a high level of dedication and focus, even when the odds are stacked against him. Motivation results in a specific type of human behaviour.
- The following are the various models for motivating employees in an organisation.

Maslow's hierarchy of needs

- Our physiological needs, such as air, food and water, are the first important motivating needs, according to Maslow. After our physiological demands have been met, we become anxious about

- our own physical safety and security, as well as the security of our jobs. The second need to satisfy is social : We want to form bonds with other people. The need for love, friendship and family is widely regarded as a basic human drive. Our need for esteem - The need to be respected by one's peers, to feel important and to be appreciated - becomes more crucial after we have a sense of belonging. The urge for self-actualization is at the top of the hierarchy.
- There is a hierarchy of human needs, according to this well-known organisational idea. Only after their lower-level requirements have been met can people look for higher-level needs. The following is a list of these demands, in order of importance :

- Needs for self-actualization - Seeking knowledge and maximising potential.
- Respect for others, self-respect, freedom and acknowledgment are all requirements for self-esteem.
- Social requirements - Community and social phobias.
- Needs for safety - Job security and financial stability.
- Physiological requirements - Basic requirements such as water, shelter and food.

Hertzberg's two factor theory

- Hertzberg divided the requirements into two groups : Hygienic elements and motivating factors.
- To ensure that an employee is not unsatisfied, hygiene criteria are required. Employee happiness and motivation for improved performance are both dependent on motivator factors. The presence of hygiene factors does not ensure motivation and motivation factors do not work in the absence of hygiene aspects.

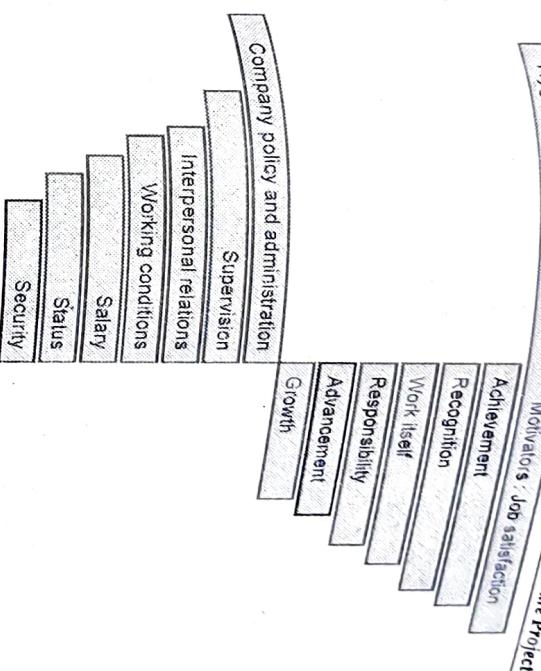


Fig. Q.7.2 : Hertzberg's two factor theory

Vroom's theory of expectancy

- Individuals will be highly productive and driven, according to Victor Vroom, if two criteria are met :
 - 1) People believe their efforts will likely result in successful results and
 - 2) Those people believe they will be rewarded for their achievement.
- People will be more driven to put up a high degree of effort if they believe there are links between their efforts and their performance.

Q.8 Explain different motivational models in detail.

[8 Marks]

Ans. : We'll examine a few motivational model examples.

1. The Taylorist model :

- The usage of piece rates in manufacturing and sales bonuses among sales staff are examples of how Taylor's philosophy is represented in these practises. Problems with piece rates may arise if a new system alters how people work.
- If new technology increases production, it will be difficult to change piece rates to reflect this. A shift from piece rates to day rates is typically required prior to implementing major changes in labour patterns.
- Workers who are paid a fixed amount per item they create, are said to be paid on a piece-rate basis. When discussing pay for time worked, day rates are used.
- People who are paid according to how much they do will not necessarily optimize their productivity in order to maximise their pay, even in stable work environments where output and reward are easily correlated. "group norms" informal, sometimes unspoken agreements among co-workers about the amount to be produced often serve as a constraint on the output.
- Rewards based on piece rates must be directly related to the task completed. Since system development and support are typically team efforts, it is challenging to isolate and quantify work performed by one individual when a computer application is being developed.
- This support department succeeds because we are a team, not because we are all individuals, as one employee in a study of software support work put it. This is the only way the support team can function effectively.
- A reward system that unfairly discriminates between coworkers could harm morale and productivity in this type of workplace.

2. Maslow's hierarchy of needs :

- People are motivated for different reasons. Money can be a powerful drive. However, when we're poor, need for money is met, new drivers are likely to emerge.
- American psychologist Abraham Maslow proposed a hierarchy of needs. A greater level of needs gradually appears as a lower level of demands is met. If requirements are met, another level will then emerge.

- Food, shelter and personal safety are considered basic needs. Maslow asserts that the need for "self-actualization," or the sensation of fully realizing one's potential, is the highest level needed.
- In practice, people are probably inspired by many factors depending on their stage of life. For instance, salary raises, while always appreciated, probably have less of an effect on a more experienced worker who is already quite well paid than they do on a trainee who is paid little.

- Older team members might place higher significance on aspects of the job that respect their judgment and sense of responsibility, such as being provided autonomy.

3. Herzberg's two-factor theory :

- We might not always be happy with a job. The job may not become more enjoyable even if the reasons for this discontent are eliminated.
- Herzberg and his colleagues conducted research on characteristics that affect job satisfaction and discovered two sets of factors :
 - Aspects relating to hygiene or maintenance that, if not met, might lead to dissatisfaction, such as wages or working conditions;

- Motivators, such as a sense of accomplishment or the difficulty of the work itself, that make us feel like the job is worthwhile.
- At Brightmouth College, Brigitte may find it challenging to compete with the high level of maintenance factors that may be offered by a major organization like IOE, but the smaller organization may be able to offer greater motivators due to its closer ties to the users.

4. The expectancy theory of motivation :

- The ups and downs of system growth must be considered by Amanda and Brigitte in order to understand how motivation is impacted. This is demonstrated through a motivational model created by Vroom and his associates.
- It lists three factors that affect motivation :
 - Expectancy** : The conviction that exerting more effort will result in improved results;
 - Instrumentality** : The conviction that superior work will be rewarded;
 - Perceivable value of the subsequent prize.**
- All three conditions must be favorable for motivation to be high. Motivation can be eliminated if any one of the elements is at zero.
- Imagine attempting to make a software package from a third work. We give up after realizing that there is a bug that will prevent us from ever getting it to function. No matter how hard we try, we will never be successful(zero expectancy).
- We are working on a package for a user and even though we think we can make it work, we find out that the user has moved on to another package and no longer requires the one we are working on. It's likely that we'll feel like we're wasting our time and give up (zero instrumentality).

Health and Safety

Q9 Explain Oldham, Hackman job characteristic model. [4 Marks]

Ans.:

- The elements of tasks that need to be completed should be grouped together by managers so that they constitute relevant and fulfilling assignments. According to Oldham and Hackman, there are five characteristics that contribute to job satisfaction.
 - The first three elements below help a person's employment feel "meaningful" to them:
 - Skill variety** : The range of abilities that the job holder has the chance to use;
 - Task identity** : Refers to how clearly our labour and results can be attributed to us;
 - Task significance** : The extent to which our work affects other people.
 - The remaining two elements are:
 - Autonomy** : The freedom to choose how we will carry out our duties;
 - Feedback** is information we receive regarding the outcomes of our job.
- The requirement for personal development on the part of job holders as well as their workplace environment had an impact on how they perceived their jobs, according to Oldham and Hackman.

Given that the users genuinely desire the product, our incentive may be nothing more than the nice glow of helping our coworkers and their appreciation. We might decide not to become involved if users later ask for assistance implementing an alternative package if all they do when using the package is complain and blame us for flaws. (Low perceived value of reward).

6.2 The Oldham, Hackman Job Characteristic Model, Stress,

- Some authors have argued that people are more inclined to rank their work higher on the Oldham-Hackman dimensions if they are happy with it for other reasons. As a result, cause and effect could be inverted.

Methods of improving motivation

- The manager could thus take the following actions to increase motivation :
 - Set specific goals :** These objectives must be challenging while still being supported by personnel. Goals are more likely to be accepted if staff members are involved in their creation.
 - Provide feedback :** Goals must be established, but employees also require regular feedback on their development.
 - Consider about job design jobs can be changed to increase staff member's sense of responsibility and make them more interesting.
 - Job enlargement and job enrichment are two strategies that are frequently used to improve job design.
 - Job enlargement :** The person performing the job does a larger range of tasks. It goes against the trend of specialization growth. For instance, a software developer in a maintenance team might be assigned responsible for both specifying and implementing minor changes to the code. Programmer/analysts had a greater level of job satisfaction than programmers, according to Cougar and Zawacki.
 - Job enrichment :** The position holder performs duties that would often be performed by managers or supervisors. In a maintenance team, programmers could be given the permission to accept requests for improvements that need less than five day's worth of work without the manager's approval.

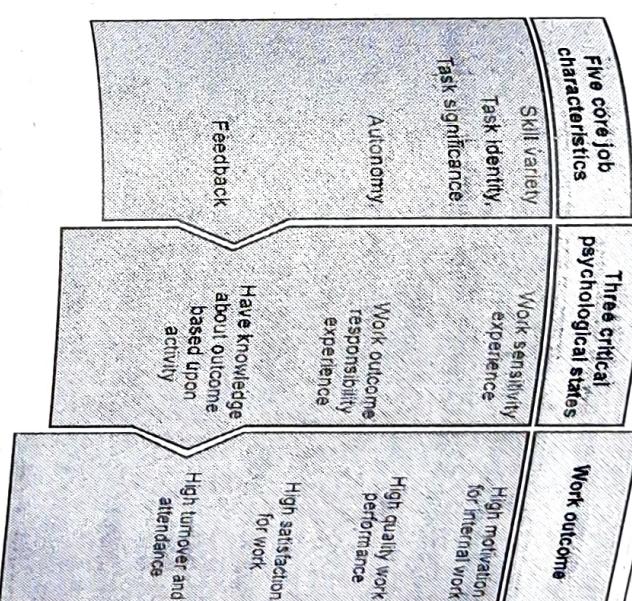


Fig. Q.9.1 : The Oldham, Hackman job characteristic model

Q.10 What are five core job characteristics ? [2 Marks]

Ans. : Five core job characteristics

• Skill variety : The range of abilities that the job holder has the chance to use;

• Task identity : Refers to how clearly our labour and results can be attributed to us;

• Task significance : The extent to which our work affects other people.

• Autonomy : The freedom to choose how we will carry out our duties;

• Feedback is information we receive regarding the outcomes of our job.

Q.11 How to deal with stress ? Explain.

[4 Marks]

Ans. :

- Projects are about getting things done and overcoming challenges. Both the project manager and the team members will almost certainly be under pressure.

- Once a project gets going, we should expect participants to putting in at least 60 hours a week,' an American project manager is reported as stating. The project manager should plan to work as many hours as possible.
- In fact, some pressure is healthy. Many careers might become soul-destroying due to boredom. However, at a certain point, the quality of the labour declines and health issues may arise. There is solid evidence indicating that working more than 40 hours per week reduces output quality and productivity.
- In a US research conducted in 1960, it was shown that those under 45 who worked more than 48 hours per week had a twofold increased chance of dying from coronary heart disease.

- Many software developers are required to work additional hours without getting paid for them. In these situations, the fact that the work is essentially free to the employer more than makes up for any loss in productivity.
- Clearly, there are occasions when extra effort is required to overcome a momentary roadblock or handle an emergency, but if working overtime becomes the norm, there will be long-term issues.
- By making a more accurate evaluation of the effort and time required, based on comprehensive documentation and study of the results of past projects, good project management can reduce the need for overtime. Effective planning and management will also lessen 'unanticipated' issues that cause unneeded crises.
- Role ambiguity** can lead to stress when employees are unsure about the goals that their job is designed to achieve, what is expected of them by others and the precise extent of their obligations. There is no doubt that the project manager is at fault in these situations.

- Some managers assert that they achieve success by using essentially bullying tactics to force projects through.

- To support the employment of such strategies, they must manufacture crises. However, this is the exact opposite of professional project management, which tries to create complicated goods in an organized, methodical and sensible manner.

Q12 What is health and safety in the construction and engineering projects? [6 Marks]

Ans.:

- Construction and other heavy engineering projects tend to have greater health and safety concerns than ICT development. However, there are occasions when setting up office systems calls for building physical infrastructure, which might come with its own set of risks. ICT infrastructure might be implemented in a building that is still under construction, for instance.
- A project manager needs to be familiar with the information in the document that pertains to the setting where the project will be carried out.
- As far as the project manager is concerned, safety goals should be handled the same way as other goals, such as the degree of dependability of the finished product or the project's overall cost, when applicable. Therefore, the general management of the project should include the management of safety.
- The specifics of the many laws that control safety policy can be found in the relevant literature. A documented safety policy statement is required by law in the United Kingdom for companies with more than five employees.

- All levels must have a clear understanding of who is responsible for safety. There are a few things to take into account, such as :

1. The safety policy must have the support of top management;
 2. Duties for safety must be clearly delegated;
 3. Job descriptions should outline the responsibilities for maintaining safety;
 4. The people to whom responsibilities are assigned must comprehend and accept those obligations;
 5. The dispatch of a safety officer and the assistance of professionals in specific technical fields;
 6. Safety consultation;
 7. A budget that takes safety expenses into account.
- Employees need to be made aware of safety procedures and receive the proper instruction as needed.

Q.13 Explain five stages of team development.

Ans. : The PMBOK - Project Management Body of Knowledge .

defines five phases for team building : Forming, storming, norming, performing and adjourning.

- **Forming :** The formation phase is where team members are introduced to one another. In the relationships between team members, this phase is characterised by politeness and formality.
- **Storming :** The team begins to shift from "as is" to "to be." Some team members may be at odds with one another due to a power struggle or a clash of individual identities or cultures. As a result, the term "storming" was coined. During the storming phase, team members are more likely to clash. The team's leadership or management, on the other hand, makes a concerted attempt to reconcile their conflicts.
- **Norming :** Following the storm, the team comes to an agreement on the 'to be' method and learns to collaborate. However, if problems or concerns arise, the team may be forced to return to the

[4 Marks]

Q.14 How to balance a team with different types of people?

Ans. :

- **The chairperson :** They don't have to be brilliant leaders, but they must be good at handling meetings, be calm, strong and tolerant.
- **The plant :** Someone has a knack for coming up with new ideas and potential answers to issues.
- **The monitor evaluator :** Is skilled at assessing ideas and prospective solutions and assisting in the selection of the best option.
- **The shaper :** Is a member of the team who helps to focus the team's attention on the most essential concerns.
- The team player who excels in fostering a positive working atmosphere.
- The resource investigator is skilled at locating resources, both physical and informational.
- The task finisher is concerned with completing the task.
- The company's employee is a good team player and is willing to take on less pleasant jobs if the team's success requires it.

6.3 Ethical and Professional Concerns, Working In Teams, Decision Making, Organizational Structures, Dispersed and Virtual Teams, Communications Genres, Communication Plans

Q.15 Write a short note on ethical and professional concerns.

Ans. :

[7 Marks]

- Regardless of their position, all community members have some ethical responsibilities, like notifying the emergency services when a serious motor vehicle accident occurs.
- Other ethical responsibilities have an impact on certain organizations and the members of them. Additional responsibilities are related to a person's field of expertise, such as a software engineer or an IT professionals.
- Given their larger ability to cause harm than people, organizations may be regarded to have more ethical obligations, especially when they carry out significant development projects of all types.
- However, there is a claim that people employed by for-profit businesses have a duty to protect and improve the assets of the company's investors. This claim is notably linked to the economist Milton Friedman.
- These company's stockholders, which could include regular people who invested their retirement funds in the company, are those who have contributed money to the business and are therefore legally its owners.
- It was suggested that the company's employees would act dishonestly if they pursued alternative objectives that would benefit the community as a whole at the expense of the stockholders.
- Ethical responsibilities are supported by the fact that they compete with other companies.

Our competitors must lose if our company succeeds in any way in this game investors might lose money and employees might lose their jobs. However, it is countered that this is simply how the market functions and as a result, consumers benefit from lower prices.

- However, in the long run, eliminating competitors through competition results in monopolies taking control and driving up prices.
- However, the majority of corporations will acknowledge that they do have ethical obligations. This might only be done for personal gain. Potential customers like us might be leery of giving their business to companies that are plainly driven by greed.
- Organizations frequently articulate their goals and aspirations, perhaps in the form of a mission statement and these goals frequently include concerns for the environment and other issues of general public interest.
- Despite flattening reporting systems and eliminating levels of management, hierarchies in large organizations will never completely disappear.
- Next-level managers will adopt the strategy and create work plans to carry out the strategic objectives in their spheres of accountability. They are making decisions in accordance with their assigned responsibilities when they do this.
- Until we reach the individuals who really implement the decisions, this process will be repeated at progressively lower levels inside the organization.
- Any choice must satisfy a number of organizational constraints, some of which may appear to clash. To fulfill a legal obligation within a certain time, for instance, a new ICT application can be required.
- It would take a big team to create a high-quality system with guaranteed correctness and reliability. This would be extremely expensive and require a reduction in customer service levels.

- The need for reliability in the new system and the standard customer service would need to be balanced in some way. There would be some risk associated with the results regardless of the ultimate choice.
- Risk-related choices will include those that are delegated to technical professionals like engineers and ICT specialists. Since they possess information and expertise that others may not completely understand but on which they rely, they will have particular ethical obligations. These specialists will probably be trusted with making decisions on the introduction of new technologies.
- Knowing a person's area of competence is essential because ICT practitioners are unlikely to be knowledgeable in every facet of ICT and its evolution.
- An ICT practitioner would clearly be acting unethically if they pretended to be an expert in a field they are not. It follows that it would be unethical for an ICT practitioner to keep quiet if their knowledge could stop a colleague from acting in a damaging way.
- The decisions made by these specialists would need to be fair as well as technically justifiable. It is obvious that accepting payments that resemble bribes is unacceptable.
- However, suggesting a certain technology just because the practitioner is an expert in it and its adoption would further his or her career might not seem unethical to an individual right away.
- All decisions include some level of risk, which real professionals would need to recognize and highlight.
- Organizational actions tend to implement a top-down approach, with major strategic decisions made first, followed by an examination of the various components of the overall plan and more specific decisions. These high-level decisions sometimes contain technical errors and it is the job of the software engineer or ICT professional to draw attention to these faults.

This responsibility to manage new technical risks does not fall exclusively on the shoulders of the practitioner. A method for communicating such concerns to a responsible manager qualified to assess the situation and take appropriate action is required in the organization. This can entail escalating the problem to a higher management level.

Q16 How to build a team and how to work in a team? Justify the answer. [6 Marks]

- We start by examining the formation of small work groups, where the term "team" is likely most appropriate.
- Just putting people together won't make them instantly able to work as a team. The five fundamental stages of development that teams should go through are as follows :
- Forming :** The group members strive to establish some ground rules for behavior as they get to know one another.
- Storming :** As the group's methods of operation are being defined and various group members attempt to assert leadership, conflicts start to occur.
- Norming :** The majority of problems are resolved and a sense of collective identity develops.
- Performing :** The current focus is on the current tasks.
- Adjourning :** The group splits up.
- Sometimes, particular team-building activities can be carried out. For instance, several companies take their management teams on outdoor activities. Without going to these extremes, Amanda and Brigitte might create some training exercises that foster teamwork. Valuable research has examined the best mix of personalities for a project team. Belbin looked at cooperative teams playing management games. He originally attempted to combine the smartest individuals into one group. Surprisingly, these elite teams frequently performed poorly because they frequently disagreed, which led to the neglect of crucial responsibilities.

- Belbin concluded that teams required a balance of various types of people.
 - **The chair :** They need to be adept at running meetings, be cool and firm yet tolerant not necessarily smart leaders.
 - **The plant :** a person who, in general, excels at coming up with ideas and potential solutions to issues.
 - **The monitor evaluator :** capable of analysing concepts and potential answers to aid in choosing the optimal one.
 - **The shaper :** rather a worrier who aids in focusing the team on the crucial issues.
 - **The team worker :** adept in fostering a positive work environment, such as by "jollying people along."
 - **The resource investigator :** skilled at finding resources, both in terms of data and material resources.
 - **The completer finisher :** focused on getting work done.
 - **The company worker :** a strong team player who is willing to carry out less appealing activities when necessary for the success of the group.
 - A person can exhibit traits from multiple types. On the other hand, only roughly 30 % of the individuals Belbin investigated could be categorized in any way.
 - When there is an imbalance in the role types of the individuals in a group, issues can arise. For instance, a group is likely to have a stormy atmosphere if there are two or more shapers present and no one volunteers to serve as the group's chair and mediate disagreements.
 - On the other hand, if a group is primarily made up of plants and experts without any shapers or complete-finishers, the team is more likely to have stimulating conversations but may not end up putting anything into practice. Belbin advises choosing the crucial technical specialists first when assembling a team. These people's

- responsibilities can then be evaluated and any remaining group members can be assigned with the goal of balancing out the team roles.

Working in a team

Software development is a work that requires a lot of human effort, despite the fact that we identify it with advanced technologies.

Software-based systems can be very complex; for example, the software that controls a telephone switching system may have five million lines of code. As a result, this human effort must be split among several software engineers working in teams and across companies.

- Teams are typically defined as groups of individuals working together. The individuals typically work together or co-locate, although we will see that this is not always the case. However, all the individuals working on a project may occasionally be referred to as the "project team." These people might be separated from one another by a distance in distinct work groups. These groups are subject to evolution. Thus, as projects begin and end, specific software developers are likely to switch between teams.
- Well begin by examining the context of small groups, where the term "team" may be most appropriate. We'll examine the formation of real teams. We'll see how team members take on social duties that enhance team effectiveness in addition to their technical roles.
 - To complete a joint assignment, a team is formed. We'll learn how some tasks that contribute to the project's goals are best carried out by a single person. Other tasks, typically those requiring judgments or decision-making, might be carried out more effectively by teams.
 - We'll examine team coordination strategies. The distribution of employees among tasks within a company must be under control. This is one sort of coordination between teams and individuals that is required for a project; other types will be described.

- Communication methods are often referred to as **communication genres**. This encompasses the organizational conventions used in the communication in addition to the technologies involved. It is possible to choose and construct specific communication used to address a specific need for project coordination. Well known genres include a **communication plan** can be used to formalize agreements for communication among project stakeholders.
 - In addition to coordination that responds to daily issues, there also has to be proactive central guidance. This introduces leadership, related topics.
 - Nearly all phases of the Step Wise project planning framework will be influenced by the collaborative nature of project work (Fig. Q.16.1).
1. Identify the goals and scope of the project. Here, communication routes are developed and project stakeholders are identified.
2. Name the infrastructure for the project. The project team will operate inside a specific organizational structure, which has been specified.
3. Examine the attributes of the project. The team structure required will depend on choices made for how the project will be carried out, such as whether to purchase or develop software capabilities.
4. Calculate the effort for every activity. Developer productivity will be significantly influenced by individual and group experience.
5. Determine activity dangers. There will be risks related to staff, such as their availability going forward.
6. Distribute resources.
7. Review and promote the plan. At this time, a communication plan might be created.

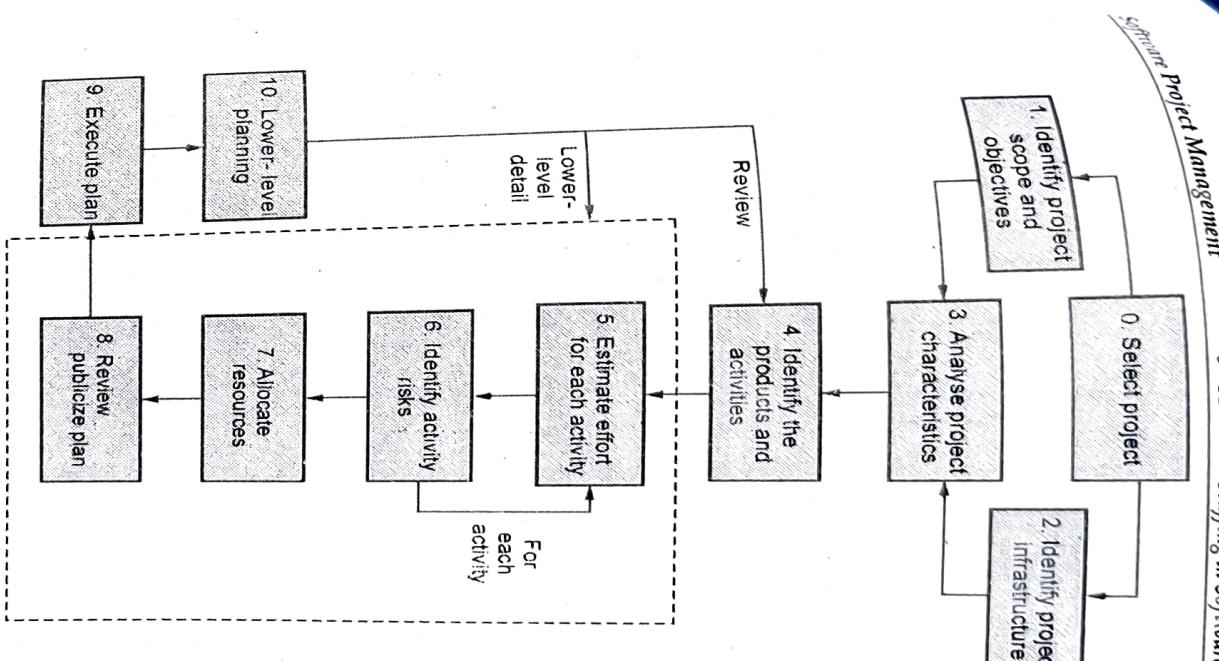


Fig. Q.16.1 : The Stepwise structure includes some places where collaboration is influenced

- Q.17 Define a group performance. List out group tasks and explain each task in detail.**

Ans. :

- Decisions on which tasks are best completed collectively which are best allocated to individuals are necessary for initiatives. In the words of one IBM manager, "Some work provides better results if carried out as a team whereas some things are slowed down if the work is not compartmentalized on an individual basis."
- The following are some categories for group tasks :
 - Additive tasks;
 - Compensatory tasks;
 - Disjunctive tasks;
 - Conjunctive tasks.
- When performing an **additive task**, each participant's efforts are combined to produce the final outcome, such as when a group of people clean snow. There is no fixed cast of characters.
- With **compensatory tasks**, group members' judgments are combined so that the faults of some are made up for by the contributions of others. For instance, the work required to build a piece of software may be estimated individually by group members, with the results then being averaged. In these situations, group efforts typically outperform those of an individual.
- There is only one right response when dealing with disjunctive jobs. The group's effectiveness is dependent on :
 - Someone providing the proper answer;
 - The others accept it as accurate.
- The group's performance here is only as excellent as its best member and it may be worse!
- **Conjunctive tasks** are those where the slowest performer's rate determines how quickly things move along. An excellent illustration of this is the manufacturing of software where different staff members are in charge of various components. The

[5 Marks]

Q.18 What is decision making ? Explain mental obstacles to good decision making.

[5 Marks]

Ans. :

- We must first take a broad view of the decision-making process before we can examine the effectiveness of group decision-making in more detail.
- The following categories of decisions exist :
- Structured judgments are usually simple, routine ones where rules may be applied reasonably simply or
 - Unstructured : More difficult and frequently requiring some inventiveness.
 - Decisions can also be grouped according to how much risk and uncertainty are there.
- Some mental obstacles to good decision making**
- We have correctly stressed a structured, rational approach to decision-making up to this point.
 - However, in the real world, many management decisions are made under duress and on the basis of inaccurate information. In certain situations, intuition must be accepted, however there are several mental barriers to efficient intuitive thinking. For example :
 - **Faulty heuristics** : Despite the risks, heuristics or "rules of thumb" might be helpful :

Q.20 What are the measures to reduce the disadvantages of decision making?

Ans. :

- By training members to adhere to a predetermined collective decision-making can be made more efficient, successful. Without actually getting the experts together in person, the Delphi approach aims to compile their opinions. The technique is carried out as follows given a problem :

- A lot of professionals are persuaded to work together;
- Presenting the issue to the experts;
- The experts write out their suggestions;
- These recommendations have been compiled and copied;
- Redistributing the responses that have been gathered;
- The experts offer feedback on other people's concepts and revise their suggestions if necessary;
- If the leader notices a consensus, the process is terminated; otherwise, the experts are given another chance to speak.
- The fact that the specialists could be spread out geographically is a benefit of this strategy. However, this implies that the process can take a while.

Q.21 Write a note on following terms :

- 1) Team heedfulness ii) Egoless programming
- iii) Chief programmer teams iv) Extreme Programming (XP) v) Scrum.

Ans. :

1) Team heedfulness

- In spite of all these problems, teams can occasionally function effectively. A football team does not perform at its best when individual players just showcase their skills individually without providing support for one another, to use the inescapable sports analogy. When one player notices that another is poised to score a goal if given a ball, they can make a successful move.

[4 Marks]

II) Egoless programming

- In the early years of computer development, managers had a tendency to imagine software developers as having a mystical connection to the hardware. It was common for programmers to overprotect their creations, viewing them as extensions of themselves. One might understand how this would affect a program's capacity to be maintained. The then-revolutionary idea to have programming team leaders and programmers read each other's code was put up by Gerald Weinberg.
- The programming group would effectively own the programs as a collective asset and programming would stop being driven by ego.
- Peer code reviews are built on this concept, where products created by specific team members are reviewed by chosen coworkers.

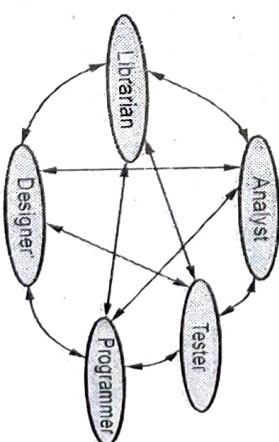


Fig. Q.21.1 : Egoless programming structure and communication path

III) Chief programmer teams

- The increased communication in a larger development group causes it to move more slowly. Large projects that are time-sensitive therefore frequently have a more organized, centralized structure. When creating a huge complicated system, Brooks

This is an example of team heedfulness, in which members of the group are conscious of the actions of others that support the success of the group as a whole and are able to suggest methods to assist those situations. There is obviously no such thing as a "collective mind" in reality and the appearance of one is the result of familiarity, shared knowledge and effective communication.

stressed the requirement for design consistency and challenging this is when many individuals are involved in the development process. He advised lowering this number while increasing support for the remaining programmers to help them be as productive as feasible.

- The Chief Programmer Team was the outcome. In addition to designing, coding, testing and documenting the software, the programmer also defines the specification. A co-pilot who writes some code and can communicate with the main programmer while address issues is there to help him or her. They are assisted by an editor who will write up the chief programmer's documentation by an programme clerk who will manage the actual code and a tester. The prevailing perception is that this group is managed by a single unifying intelligence.

- The influential New York Times data bank project, where many facets of structured programming were tested, employed the chief programmer concept. Each chief programmer oversaw a senior programmer and a programme librarian in this instance. For the purpose of addressing specific issues or duties, the team may temporarily add more members.

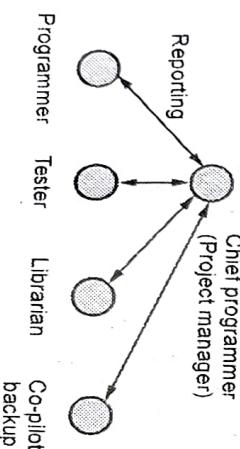


Fig. Q.21.2 : Chief programmer team

Extreme principles have been carried over into the new extreme of these programming (XP) approaches. The majority of XP proponents can be viewed as means of encouraging a "collective consciousness." Adding extra documentation is a standard strategy used in traditional software development projects to enhance collaboration and communication. This, according to XP proponents, is counterproductive. They propose different, less formal strategies for coordination and communication. The essential software products software code and test data are improved rather than separate documents being created. For instance, to ensure that the code accurately reflects how the system operates, it is regularly refactored (i.e., rewritten). Before the code is written, test cases and expected outcomes are created and they serve as a kind of specification.

To clarify user wants, there should be a user representative present. Continuous integration testing ensures the fit of software components. It is recommended that developers work in pairs to create software; this appears to be a modernized version of the chief programmer/co-pilot arrangement.

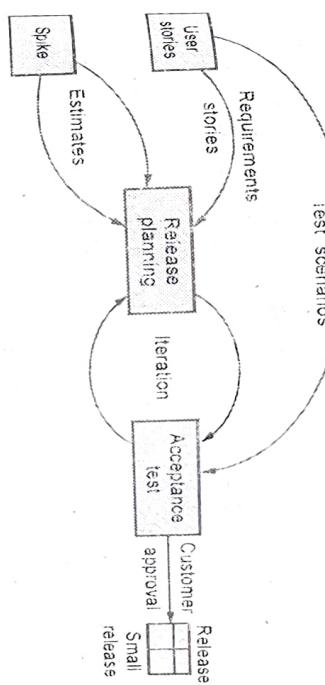


Fig. Q.21.3 : Extreme programming structure

- It would be counterproductive if the agile approaches' recommended practices ended up being rigidly codified, regimented and codified themselves. The first to emphasize that

Various project types will require different approaches by proponents of agile methods like Kent Beck.

- Some of these ideas are shown by the Scrum software process, which combines parts of both the chief development methodology and agile methodologies. The word "Scrum" is derived from rugby scrums and conjures up images of a group of people working together to complete a task. Instead of as a committee for a single client, the procedure was initially created for the development of new software products for a market that is competitive.

- In this case, getting something to market before our rivals might be more crucial than having a wide selection of optional options. While having a product that is appealing to a variety of clients is crucial, there is no way to precisely specify the needs of a certain client. As concepts are tested out during development, feature proposals are likely to change.

- The systems architecture and planning phase are the first steps in the Scrum process. This resembles the chief programmer technique in that the chief architect establishes the entire product architecture. At this stage, the product's needed release date and a list of its desirable features, each with a priority, would be established.

- After this phase, there are several sprints that usually last between one and four weeks each.

- Selected are the features that are hoped to be created during a sprint. There is a list of the steps required to implement the features. Groups, ideally with seven developers and no more than ten, carry out sprints. Scrum teams may work on many sprints concurrently, but each team's sprint must be completed on the same day.
- There are daily brief meetings (usually lasting 15 minutes) to track the sprint's progress. Members of the team update the group on how they are doing with their current work and discuss any

difficulties they are running into. Any coworkers who can help with a problem are welcome to speak up during the discussion. This can be the case since the coworker previously encountered a similar issue and resolved it. Discussions about potential solutions take place after the meeting. The team should be motivated throughout these Scrum meetings because everyone can see each other's progress, which should assist the group develop a shared understanding.

Sprints are time-boxed and some incomplete, lower-priority features may be left over at the end of the sprint period. It will be recalled that with XP, adjustments can be requested at any time. In contrast, external needs are frozen throughout the sprint. To examine the finished products, all sprint teams, together with the other project stakeholders, gather at the end of the sprint. At this time, new features may be introduced and existing ones may be eliminated or changed. Desired features' order of importance could be changed. The tasks required to deploy those features are then selected for the upcoming sprint and planned. The sprint procedure is then carried out once more. After each sprint is finished, there is a final closure phase where duties like regression and integration testing, as well as the creation of user and training guides, are carried out to produce a finished product for market release.

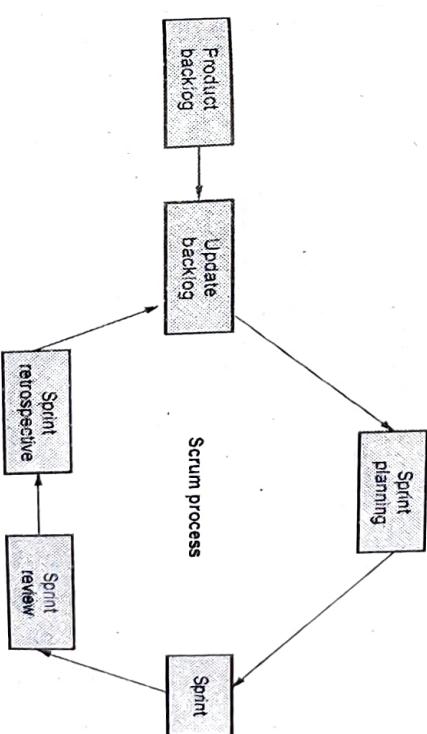


Fig. Q.21.4 : Scrum process

Software Project Management 6 - 42 Staffing in Software Project

Q.22 Differentiate between functional and project formats.

Q.23 What are organization and team structures ? Discuss different types of software development departments.

[4 Marks]

Ans. : **Functional** **Project**

Functional

Project

Ease of staffing

Provides an efficient solution to the staffing problem.

Mandates the manager to accept a fixed number of developers at the start of the project.

As needed, any number of required personnel can be brought into projects and once completed, they can be returned to the functional group.

Because these developers work for the entire project, many individuals are idle in the beginning and the entire team is put under pressure in the later stages.

Document quality

It produces good quality documents.

Quality of documents produced is poor.

Job specialization

Developer get specialized in different domains

No specialization is available.

Efficiency of job handling

It handles jobs efficiently.

Doesn't adequately deal with the problem.

Career orientation

Technical orientation such as business analyst.

OR What is the matrix format ? Explain with a suitable diagram. [4 Marks]

Ans. :

- In large software development businesses, departments are typically set up. A company's departmentalization may be based on a variety of factors, including employee specialty, product lines, client demographics or geographic location. A certain business, for instance, might have departments for banking, embedded applications and telecom software development. Verticals are another name for these divisions. Small companies do not typically have extensive departmentalization. Consequently, we can think of a small business as having just one department.
- Each department often manages a number of projects at once, with a different team of developers being allocated to each one. The way a department is divided into teams and how each team is set up has a big impact on how effective the developers are at completing the project's goals.

- In this context, two crucial challenges that are essential to every organization's ability to function effectively are :

- **Department Structure :** How are teams arranged inside a department ?
- **Team Structure :** How are project teams structured ?

- A. Department structure :** A software development department can be organized in one of three general ways: functional, project-wise or matrix-wise.

1. Functional format

- According to their areas of expertise or experience, the developers are organized into functional groups in the functional format. To put it another way, each functional group is made up of developers who have experience with a particular task or functional area. For

instance, an organization's many functional groups may have areas of expertise in areas like database, networking, requirements analysis, design, testing and so forth. Fig. Q.23.1 depicts the functional organizational structure.

- Depending on their area of expertise, each developer in organization would belong to a specific functional group. Different projects hire developers from the respective functional group. Developers return to their respective functional groups (functional groups after finishing their tasks).
- The work done on the partially finished product by allows it to evolve as it is passed from one team to many teams members of other functional teams who worked on it. The aspects of the project are not physically present when one functional team is working on it.
- As a result, a team can only fully comprehend the work done by other functional teams by carefully reading the documentation they create. Teams working on the project afterwards will struggle to comprehend the work already done unless each team produces high-quality papers. So, we may conclude that producing high-quality documentation is required for a functional organization.

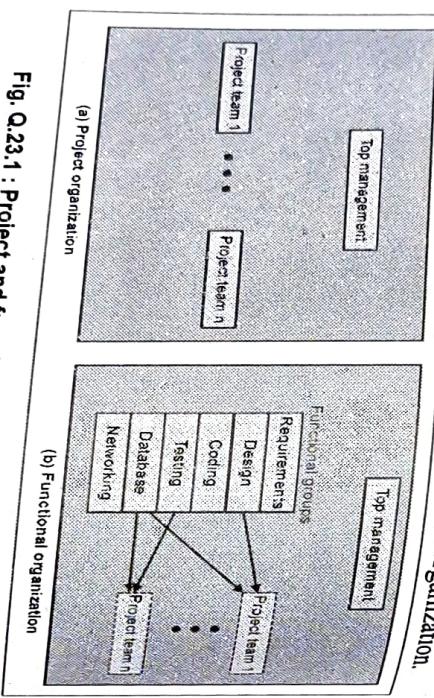


Fig. Q.23.1 : Project and functional organization structures

Software Project Management

- **project format** is intended to help task-oriented teams function.

- The project in the project format has a group of developers assigned to it at the beginning (See Fig. Q.23.1 (a)). It is expected that the designated personnel can do the various tasks necessary for the project's completion. Until the project is finished, the developers are still working on it. Thus, all project operations are completed by the same team.

- This is different from a functional organization, where each developer is a member of a functional group and members of the related functional area are temporarily allocated to the project and returned to their own functional area after the activity is completed.

Functional versus project formats

- The team members working on the various project activities do not cross paths in a functional structure. This format's flaw is the resulting communication gap. Additionally, customers frequently prefer the project team method because they will have a team that is solely focused on meeting their needs and because they won't have to interact with many other functional group members. Additionally, the members of the project team become proficient with the software over a considerable amount of time and can complete maintenance tasks quickly. The project team model is therefore appropriate for doing the software maintenance tasks.
- The functional format, on the other hand, comes with a variety of additional benefits. The following are the primary benefits that the functional team format provides:
 - **Ease of staffing :** The staffing issue is effectively solved by the functional organizational structure. Typically, various numbers of developers are required to complete certain project tasks. Any relevant personnel can be brought into a project as needed and returned to the functional group after their work is done, greatly easing the problem of project staffing. This may be the most significant benefit of a functional organization.

- On the other hand, a project organization structure requires management to accept a specific number of developers at the beginning of the project. Throughout the course of the project, these developers are employed. As a result, many project members waste time during the early stages of team development and the team as a whole is under extreme pressure during the final stages of development.
- **Production of good quality documents :** Since the team members working on one aspect of a project do not interact with the developers who have finished another aspect of the project and returned to their functional teams, a functional organization necessitates the production of high-quality papers.
- **Job specialization :** Developers can become specialists in specialized tasks like database, networking, compilers in requirements analysis, design, coding, testing, maintenance, etc. These tasks repeatedly for many projects, gaining experience thanks to the functional organizational structure. They carry out and understanding in their individual fields of specialization.
- **Efficient handling of the problems associated with manpower turnover :** Compared to a democratic organization, functional organizations help to successfully manage the issue of employee turnover. When necessary, developers are initially pulled from the functional pool. Additionally, the effective documentation created in this organizational structure makes it easier for any new member to immediately become familiar with the job already done.
- **Career planning :** Compared to a democratic organization, functional organizations help to successfully manage the issue of employee turnover. When necessary, developers are initially pulled from the functional pool. Additionally, the effective documentation created in this organizational structure makes it easier for any new member to immediately become familiar with the job already done.

Matrix organization

Matrix format
In order to offer the benefits of both functional and project structures, matrix format is an extension of functional format. The pool of functional specialists in a matrix organization is apportioned to various projects as required. Thus, a matrix can be used to depict the placement of various functional specialists in various projects (see Fig. Q.23.2).

Functional group	Project		
	#1	#2	#3
#1	2	0	3
#2	0	5	3
#3	0	4	2
#4	1	4	0
#5	0	4	6
Project manager	Project manager 1	Project manager 2	Functional manager 3
Functional manager	Functional manager 4	Functional manager 5	

Fig. Q.23.2 : Matrix organization

- Be aware that a team member who is assigned to a project reports to both the manager of his functional group and the manager of the project. As a result, in a matrix organization, the project manager must collaborate with several individual functional managers to complete the project.
- Depending on the balance of power between the functional managers and the project managers, matrix organizations can be categorized as strong or weak. A powerful functional matrix gives functional managers the power to allocate employees to projects and project managers are required to accept the individuals they are given. In a weak matrix, the project manager has total control over the project budget, the choice of whether to hire outside workers and the ability to reject applicants from functional groups.

- Despite the fact that a matrix team organization has many benefits, it may also experience the following two serious issues.

- Conflicts over staffing can arise between functional and project managers as a result of the multiplicity of authority.
- In a strong matrix organization, personnel may be often shifted around when the functional managers go into firefighting mode to address the problems in various projects.

Q.24 What is team structure ? Discuss advantages disadvantages of the chief programming team.

Ans. : Team structure : The reporting, responsibility and communication arrangements within specific project teams referred to as team structure. We only take into account the democratic, chief programmer and mixed team organizations, while there are many other types that might be used. Please be aware that not every project team inside an organization must be constituted in the same way. In fact, due to variations in their complexities and sizes, various projects typically adopt diverse team structures within the same business.

Chief programmer team

- Fig. Q.24.1 shows a schematic illustration of the chief programmer team structure. In this team organization, the head programmer is a senior member who offers technical leadership. The chief programmer team's mentality and organizational structure are in line with Brooks' recommendations that a small team should handle all design work in order to preserve uniformity in the look and feel of the final product. He stated that the other team members should help the designers be as productive as they can be. The chief programmer creates the high-level design and defines the specification. After that, he or she divides the remaining detailed design activities such as coding, testing, documentation, etc. into several smaller jobs and distributes them to the team members. Additionally, he or she combines and verifies the work that other team members have performed.

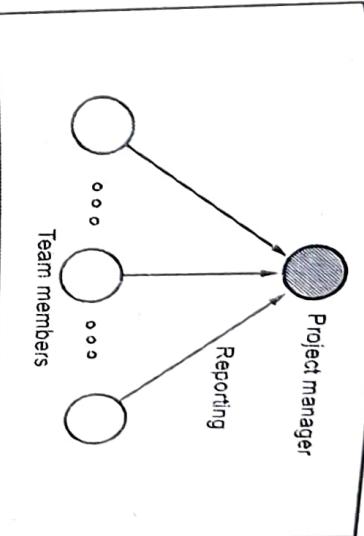


Fig. Q.24.1 : Chief programmer team structure

Advantages of the chief programmer team

- For basic and short projects, a chief programmer team is more effective than a democratic team because the chief programmer can quickly come up with an acceptable design and delegate work to the team members to code and test various modules of his design solution.

Disadvantages of the chief programmer team

- The chief programmer is given the power to delegate work to team members and oversee their performance. However, because the team members work under the main programmer's constant supervision, this lowers team morale.
- The chief programmer team structure prevents the team members from thinking creatively and independently and the chief programmer typically makes all significant decisions by themselves.
- Since the chief programmer is given an excessive amount of authority and responsibility, the chief programmer team is vulnerable to single point failure. In other words, if the chief programmer leaves the company or is otherwise unable to work on a project, it could be seriously hampered.

- Finding a truly great programmer to fill the position of chief programmer is a significant issue with the chief programmer system. The primary programmer runs the risk of information overload because they perform numerous responsibilities independently. Large projects are a case in point.

Q.25 Explain democratic team and mixed control team structure [6 Marks]

Ans. :

- The democratic team structure does not impose a formal hierarchy, as the name suggests. As indicated in Fig. Q.25.1, team constitute the basis for decisions and any member is free to discuss with any other member. An administrator typically provides the leadership in this area.

- Different team members take on different roles as technical leads at various points. Since there is a lot of discussion and disagreement among team members, there is a high overhead cost for large teams.

- It is well acknowledged that a democratic structure gives team members increased morale and job satisfaction. As a result, a democratic team typically experiences lower staff turnover than a chief programmer team. A group of developers can come up with better answers than a single developer as in a chief programmer team, hence democratic teams are suited for less known problems even though they are less productive than chief programmer teams for short and basic tasks.

- For research-oriented projects requiring fewer than five or six developers, a democratic team structure is appropriate. Purely democratic organizations often devolve into chaos when dealing with major projects. Programmers can exchange and critique one another's work in a democratic team environment, which promotes egoless programming.

Mixed control team structure [6 Marks]

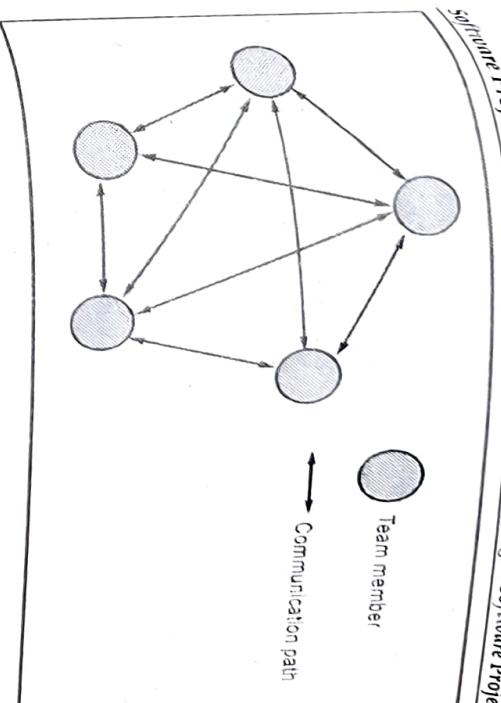


Fig. Q.25.1 : Democratic team structure

Mixed control team structure

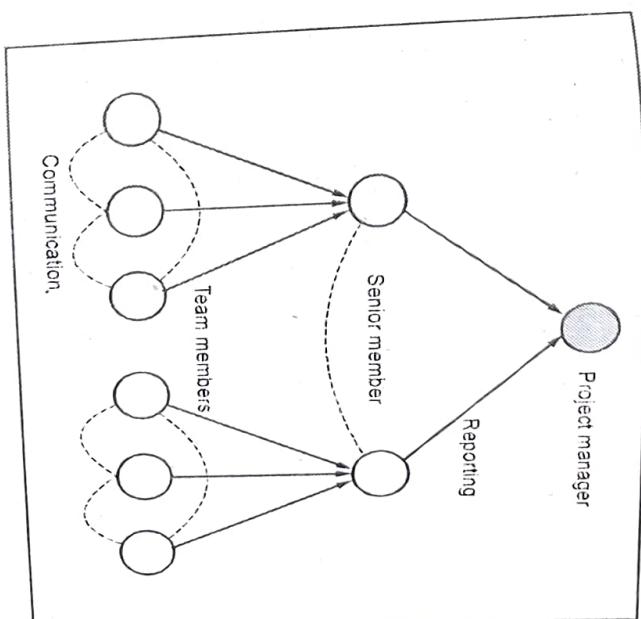


Fig. Q.25.2 : Mixed control team structure

- As its name suggests, the mixed team structure incorporates elements of both the democratic and chief-programmer team models. Fig. Q.25.2 depicts the mixed control team structure in

visual form. Fig. Q.25.2 depicts the reporting structure using arrows and the communication pathways using dashed lines. Solid aware that this team structure combines democratic setting hierarchical reporting. The problem is divided into pieces using the democratic system at the level of manageable developers.

Q.26 What are the benefits of the dispersed or virtual team?

Ans. : [5 Marks]

- As we have seen, projects need a team of individuals to complete them and each member of this team may be an expert in a specific sector. Collaboration in problem resolution is therefore at the core of many projects. The Second World War emphasized the necessity of individual and group collaboration to carry out significant international activities and it promoted post-conflict research on efficient teamwork. At the time, group working essentially required that the team members be physically close to one another while they worked. However, the idea and practice of using scattered or "virtual teams" have gained popularity recently.
- We also need to understand how projects function. Large software projects, in particular, require coordination, which necessitates team communication. Being situated in the same physical area undoubtedly helps with this. Although software development requires communication, it also requires periods of focused, alone work. Offices can be noisy places. De Marco and Lister refer to the state of intense focus required for productive creative work as "flow," and they contend that it takes around 15 minutes of continuous effort to reach this state. Every pause ruins the flow and it takes another 15 minutes for it to resume.
- As was said before, project managers frequently have limited influence on who is assigned to their team.

They have even less chance of having any influence over the setting in which the team will work. According to studies conducted by IBM many years ago, a software developer should ideally possess:

o 100 square feet of specific area;

o 30 square feet or less of work space;

o Partitions or covered offices that are at least six feet tall for noise protection.

- DeMarco and Lister discovered definite correlations between reported noise levels at the workplace and the amount of defects found in the produced software, despite the fact that it is frequently challenging to provide this kind of accommodation for software engineers for a variety of reasons.
- Modern communication technology also make it easier for organizations to create temporary teams from inside their workforces to complete certain tasks without having to transfer their workforce. Because of the nature of some project's work, there is sporadic demand for specific specialized talents.
- The project manager would want to have temporary access to these abilities that he or she could then release, saving money. A brief requirement for a graphic designer to create aesthetically acceptable graphics for a web application project can serve as an illustration of this. Because of the need for flexible labour, contract employees are frequently employed. These contractors can complete clearly defined duties at their own location using the internet, eliminating the need to travel to the client's location.
- The usage of "off-shore" staff who reside and work in another region of the world is then merely a matter of time. Thus, the dispersed or virtual team is reached.
- The following are potential benefits of this arrangement:
 - o A reduction in staff costs due to the use of labour from undeveloped countries where salaries are lower.

- A reduction in the overhead expenditures associated with having our own personnel on-site, such as lodging, security contributions and training expenses.

○ Employees are used flexibly; they are not hired when they are not required.

○ Productivity might be greater.

○ Using specialized staff for particular tasks rather than broad project workers could increase quality.

○ People working in various time zones can be utilized to reduce task duration. For instance, software engineers can send new code versions to testers in a different time zone so that they can test them and return the results at the beginning of the following working day.

• The following are a few difficulties with distributed working:

○ Carefully defining the requirements for work that is allocated to contractors.

○ Previously, practices might have been picked up through observation and imitation of coworkers on the job site. Now, procedures must be explicitly stated.

○ It might be challenging to coordinate a workforce that is distributed.

○ It could be necessary to change payment systems to fixed-price or piece-rate ones.

○ Employees that work remotely and are never seen might not be trusted.

○ Thorough evaluation of the provided products' quality is required.

○ Different time zones might interfere with coordination and communication.

Q.27 What are communication genres ? What are different communication styles for projects ? [9 Marks]

Ans :

• Research has been done to examine the properties of various communication methods. One strategy has been to look for communication genres. These are not simply talking about the technical ways of communication. These are the kinds of communications that individuals are used to having and where there are "ground rules" for when and how they should be conducted. These guidelines could be rather formal for some forms of communication, including formal meetings. There may be several different meeting styles, each with their own customs, that fall under the umbrella term "management meetings." These can be regarded as distinct genres.

• Advanced email-based apps can be created within the general heading of the email communication genre in which the email's content is organized according to predetermined proformas created to satisfy a standard process, such as asking for a change to a software specification. These applications might be thought of as distinct communication genres.

• The limitations of time and place have a significant impact on the character of communication genres. Same time/different time and same place/different place are two opposites that can be combined to form multiple modes of communication (see Table Q.27.1).

	Same place	Different place
Same time	Meeting Interviews etc	Telephone Instant messaging
Different times	Notice boards Pigeon-holes	E-mail Voicemail Documents

Table Q.27.1 : Time/place constraints on some communication methods

- It's also important to take into account the type of information being conveyed.

- How extensive and intricate is the information that needs to be communicated? A phone call can be a rapid and efficient means to communicate short messages, but it is not the best means to exchanging detailed information.
- Is it simple to comprehend? For instance, are both the sender and the recipient aware of the context? A two-way communication method would be preferable if it is expected that the recipient may seek clarification of certain informational elements.
- Face-to-face contact is the most effective mode of communication when it comes to matters that are particularly sensitive, even though it may be uncomfortable or inconvenient for those involved.
- Different communication styles will probably be preferred at various stages of a project.

1. Early stages of a project

- Team members will need to gain each other's trust and confidence early on in the project. It is definitely ideal to really meet for this conversation at the same time and location. According to Charles Handy, "paradoxically, the more virtual an organization becomes, the more its personnel need to interact in person." It is asserted that this is especially true for distributed initiatives.
- Some people might not agree with this, though. In his account of co-authoring a philosophy textbook with a person he had never met, Julian Baggini makes the following claim: "It is simply not required to know the full person in order to have a good relationship with them."
- At least a portion of the team will be involved in making decisions during the early phases of a project regarding the general design of the product to be delivered and the procedure to be followed in its creation. Same time/same place meetings are the most efficient way to advance, at least in the early phases.

Intermediate design stages of the project

Once the product's broad architecture has been determined, it is possible to work concurrently on the detailed design of various components in various places. However, some details will need to be addressed and for this, same-time, different-location contact, like teleconferencing, may be best.

3. Implementation stages of the project

Work can move forward after the design is clear and everyone is aware of their responsibilities. At this point, communication tools like email that allow for information interchange across time and space are likely to be enough.

- Even at this point, some advise holding regular face-to-face meetings with at least a portion of the workforce since it gives the project a rhythm, aids in coordination and keeps employees motivated. The workings of a distributed project were examined by Martha Maznevski and Katherine Chudoba, who reported that "interaction between coordinating sessions was mostly in response to the previous meeting or in anticipation of the next one." The team's procedures received a rhythmic infusion of new energy at the coordination meeting.

Q.28 Write note on communication plan.

[15 Marks]

Ans. : Effective internal and external communication is vital to project success thus, communication plans are important in your initiatives. Communication is required for receiving feedback on a deliverable, asking a coworker where a file is saved, receiving critical information from a client, executing the review and approval process and other everyday project chores. It's critical to have a project communication plan that outlines stakeholders, as well as when and how to contact them.

Benefits of project communication plans

- Project communication plans, at their core, help people communicate more effectively. They'll assist you avoid failure by making your projects run more smoothly. Setting project managing expectations, better stakeholder management and assisting with the project planning process are some of the other main advantages.

Expectations should be set and managed

- It's a two-way street when it comes to project communication. Expectations must be made and both the project team and client stakeholders must carry out their obligations in order for communication to run successfully, much like project planning.

Management of stakeholders and clients

- Stakeholder buy-in and transparency on project status are dependent on effective communication about alignment on goals and milestones, as well as future realignment as projects change.
- A project communication plan can help you maintain that common knowledge of what's occurring and what should be happening throughout your project, which is crucial to maintaining a healthy connection with the customer.

Planning a project

- A project management communication strategy specifies how, when and by whom vital information will be communicated throughout the project. While you're working on project planning, you should also be working on communications planning.

What should communication plans include ?

- While the specifics of your communication plan will vary based on the type and scale of your project, there are a few fundamental components that should be included in every project communication plan :
- **Essential stakeholders :** Including your primary client contact, should be noted. Include contact information such as phone numbers and emails in the communication strategy so that everyone who accesses it may locate it.

Members of the team

- Include the major members of your project team, as well as their responsibilities. This is useful for anyone who is new to the project or is unfamiliar with it. Make a list of who's on your list.

Key communication techniques

- Describe the key communication techniques and channels you'll use to reach out to stakeholders, including email, phone calls, in-person meetings, video meetings, Slack, social media and any others. Make a note of the channels that the stakeholders prefer.
- Stakeholder and communication method communication styles : Can be broken down. Is it necessary to have a formal tone when communicating with a certain stakeholder or may you use a more informal tone ?
- Schedule of meetings : While you can alter this as needed throughout the project, having a general sense of how frequently you'll meet with stakeholders is beneficial.
- Determine the important message or information that will need to be shared with each stakeholder throughout the project for each stakeholder. This includes any data or feedback you may require from them.

- Communication goals : Having a communication plan that includes communication goals will help you make decisions that are based on your objectives.

Communication plan example

#	Communication	Medium	Delivery date	Frequency
1	Project team communication	Meeting	Ongoing	Weekly
2a	Executive communication	Presentation	Ongoing	Weekly