
Q1 a) Briefly explain the different phases of project management life cycle. (5)

The project life cycle describes the various logical phases in the life of a project from its beginning to its end in order to deliver the final product of the project. The idea of breaking the project into phases is to ensure that the project becomes manageable, activities are arranged in a logical sequence, and risk is reduced.

(1) The Project Goal

The first step of any project, irrespective of its size and complexity, is defining its overall goal. Every project undertaken aims to provide business value to the organization hence the goal of the project should focus on doing the same. Now, the goal of the project needs to be defined initially as it provides the project team with a clear focus and guides it through each phase of the project. The project is hazy and seems risky at the start, but as the project goals get defined and starts making progress, things start to look brighter and the probability of success increase.

(2) The Project Plan

Also known as baseline plan. The project plan is developed to provide answers to various project related queries such as:

What the project aims to achieve?-The project deliverables

How does the project team aim to achieve it?-The tasks and activities

Who all will be involved in the project?-The stakeholders and the project team

How much will it cost?-The project budget

How much time will it take?-The project schedule

What are the risks involved?-Risk identification

(3) Project Plan Execution

The project plan thus developed needs to now be executed. The project progress should be compared with the baseline plan and communication to all of the project's stakeholders. The project manager has to constantly monitor the project's progress, schedule, budget, and resources.

(4) Project Closure

Project closure marks the culmination of the project. In the event of the project having completed all the work as planned, the project sponsor should formally acknowledge its successful completion, discharge all resources from the ongoing project, and make necessary payment of dues of any external consultants and suppliers. The project closure is also marked by the presentation of a project report that documents all the project deliverables.

(5) Project Evaluation

It is not possible to evaluate the true value of any IT project immediately after its implementation. Sometimes the goals are long term and the results of the project can only be gauged after the passage of a certain period of time. However, this does not mean that evaluation should not be undertaken immediately. For starters, the project team should document all its experience-things it did right, things it should have done differently, and all the lessons learned during the entire course of the project.

The project manager should evaluate each team member and provide feedback to the member as well as the management, the performance of the project manager should be evaluated by the senior manager. Evaluation of the project manager is carried out in terms of; the project delivering the promised work, abiding by budgetary provisions, following established processes, and ability to manage resources.

Q1 b) What is project charter in software project management? What are the elements of project charter? (5)

Project Charter:

A project charter gives a clear definition of the project, its attributes, the end results and the project authorities. A project charter is the final official authorization for the commencement of the project to the project manager. It is a green signal to the project manager to commence work on the project. The project charter and the project plan provide a tactical plan for the execution of the project.

Elements of the project charter:

(1) Official Project Title

Naming a project is especially necessary in organizations which have multiple projects underway at the same time. Also, the project name gives a sense of identity to the project team and stakeholders.

(2) Project Sponsor

The project sponsor is the person authorized by the management to take all decisions in relation to the project, he has the authority to sign the project charter and grant resources. Every change in the project has to be authorized by the project sponsor.

(3) Project Manager

The project manager is another major stakeholder in the project. However, it is not always that the project manager is part of the same organization he may also be a free-lance project consultant who has been hired by the company especially for the project.

(4) Description of the Project

The project description covers the problem or opportunity that has become a catalyst or purpose for undertaking the project. The description should also state how the project aligns with the organization's goal and strategy.

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(5) Measurable Organization Value (MOV)

Although the MOV has been discussed at length in the Business Case it should again be clarified and agreed upon by all the stakeholders in the project charter.

(6) Project Scope

The project scope statement is the most important document in the business charter. It is based upon the project requirement, feasibility, study, business goals and objectives and the business case. The project scope statement defines the project boundaries, project deliverables and the work needed to be done by the project team.

(7) Road Map for Work

The road map will contain of the approach that the project manager has adapted.

(8) Project Schedules

Timeline for the completion of the major milestone stages in the project.

(9) Project Budget

The total cost of the project should be summarized in the project charter.

(10) Project Resources

Specifies the budget for the various stages of the project and other key resources and players of the project.

(11) Assumptions and Constraints

Assumptions are those factors which form the basis of the project and are expected to go as per the plan for the project to be successful. On the other hand, constraints are those factors which limit the scope of the project.

(12) Risks

Every project has certain risk factor associated with it, hence it is always beneficial for the project manager to identify the risk factors associated with the project and be ready with solutions to tackle them.

(13) Project Administration

Project administration focuses on those controls that support the project. Including, the project communication plan, project human resource plan, project change management plan, project quality management plan, and the project scope management plan.

(14) Acceptance

Signing of the business charter indicates the acceptance of the terms of the charter.

Q1 c) What is project portfolio management? Explain the key aspects of project portfolio management. (5)

-A portfolio is a collection of projects, programs and other associated work that are grouped together to facilitate effective management of that work to meet strategic business objectives.

-The projects and programs within an organizations portfolio may not necessarily be associated with each other and the allotment of funding and resources is on the basis of priority and risk/reward equation.

-Organizations manage their portfolio on the basis of specific goals such as maximizing the value of the portfolio and excluding projects not meeting the portfolio's strategic objectives.

-Other goals for managing portfolio could be balancing the portfolio investment and for efficient use of resources.

-IT portfolio management is the application of management techniques to the investments, projects, programs and activities of the company's Information Technology Department.

-The primary objective of IT project management is the quantification of previously undertaken IT projects and programs, enabling measurement and objective evaluation of investment scenarios.

Key aspects of project portfolio management are:

1) Project Portfolio Definition

An organization should record a single repository details of all current projects. A decision will be needed about whether projects of all types are to be included.

One problem for many organization is that projects can be divided into new product development (NPD). NPD projects are often more frequent in organizations which have a continuous development of new goods and services.

2) Project Portfolio Management

Once the portfolio has been established more detailed costing of projects can be recorded. The value that managers hope will be generated by each project can also be recorded, Actual performance of projects on these performance indicators contain be tracked. This info can be basis for more rigorous screening of new project.

3) Project Portfolio Optimization

The performance of portfolio can be tracked by high-level managers on a regular basis. A better balance of projects may be achieved some projects could potentially be very profitable but some also be risky. The portfolio ought to have a carefully thought out balance between the two type of project.

Q1 d) Define the following terms: (5)

i) Net Profit ii) Return on Investment iii) Payback Period iv) Net Present Value

v) Internal Rate of Return

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i) Net Profit

Net profit is the difference between the total costs and the total income over the entire life of the project.

This is the simple method of calculating the total benefits of the project. However, this method does not show profit relative to the size of the investment.

ii) Return on Investment (ROI)

The accounting rate of return (ARR) or the Return on Investment (ROI) method of evaluating projects is so named because it parallels traditional accounting concepts of income and investment.

A project is evaluated by computing a rate of return on the investment, using accounting measures of net income.

The formula for the accounting rate of return is:

$$\text{ARR} = (\text{Annual revenue from project} - \text{Annual exp. of project} / \text{Project Investment}) * 100$$

iii) Payback Period

Also called the payout method.

It is the computational simple project evaluation approach that has been used for many years.

The procedure is to determine how long it takes a project to return the cost of the original investment.

Payback Period = Years previous to B.E.P + (Cum.Cash Flow - Total Cash Outflow / Cash flow during breakeven year) * 12 months

(Note: B.E.P = Breakeven year i.e. it is the year in which Cash inflows = Cash flows)

iv) Net Present Value

Under, this method all the cash inflows and Cash outflows are discounted at a minimum acceptable rate of return, usually the firm's cost of capital.

If the present value of the cash inflows is greater than the present value of the cash outflows, the project is acceptable i.e. $NPV > 0$, accept and $NPV < 0$, reject.

In other words, a positive NPV means the project earns a rate of return higher than the firm's cost of capital.

Net Present value = Net Investment - Total Discounted cash inflows

If Net present value > 0 Project is feasible and vice versa.

v) Internal Rate of Return

Internal rate of return is the interest rate that discounts an investment's future cash flows to the present so that the present value of cash inflows exactly equals the present value of the cash outflows i.e. at that interest rate the net present value equals to zero.

Any investment that yields a rate of return greater than the cost of capital should be accepted because the project will increase the value of the firm.

Unlike, the NPV method, calculating the value of IRR is more difficult.

Q1 e) What is a project product?

Explain Product Breakdown Structure with the help of example.

(5)

Project Product

Project Product Description defines what the project must deliver in order to gain acceptance and it is used to:

- Gain agreement from the user on what they want (project's scope)
- Define the customer's quality expectations so the project can deliver a fit for purpose product
- Define the acceptance criteria, method and responsibilities for the project.

Product Breakdown Structure

The Product Breakdown Structure (PBS) is the hierarchical structure of products and elements that the project requires to succeed, or the results that the project will deliver. It is like a shopping list. The PBS is, in effect, a blueprint, which encompasses all physical components of a particular product or system. The Product Breakdown Structure (PBS) starts, from the top, with the end product, followed by sub categories with elements linked to the product.

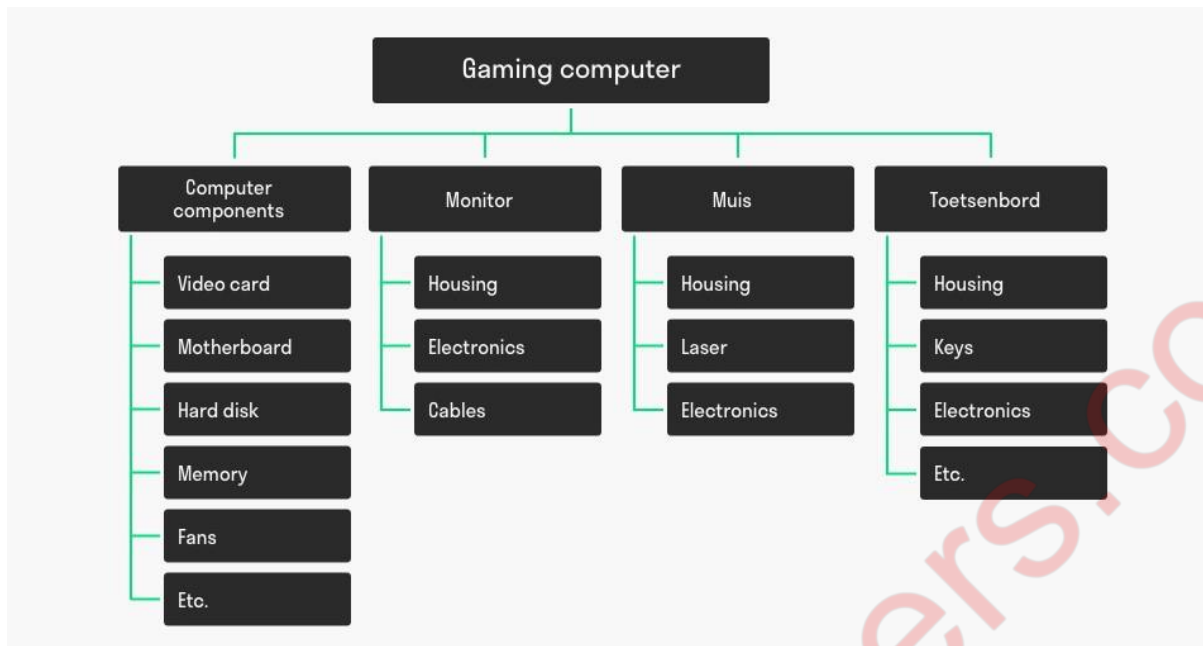
The composition of this type of structure is similar to the structure of the Work Breakdown Structure (WBS).

Why is it important to create a Product Breakdown Structure?

In essence, a PBS splits up the product into various required components. The aim is to create a visual representation of all components, and the relationship between these components. This gives staff working on product planning a clear idea of what will be required to produce the end product.

Example of a Product Breakdown Structure (PBS)

The image below shows a Product Breakdown Structure example of splitting up the required components of a game computer. A PBS provides a clear, complete and hierarchical structure of all deliverable products.



Q1 f) What do you mean by scope and objective of a project? List the activities involved in identifying project scope and objective? (5)

Project scope management includes the processes required to ensure that the project includes all the work required, and only the work required, to carry out the project successfully. Project scope management is primarily concerned with defining and controlling what is and is not included in the project.

As per the Project Management Body of Knowledge (PMBOK), the knowledge area of Project Scope Management comprises of five processes, namely, scope initiation process, scope planning, scope definition, scope verification and scope change control.

(1) Project Scope Initiation Process

In this process the project sponsor gives the project manager the authority and resources to define the project scope

The authority to commit time and resources to defining the project scope is given when the project plan and charter are being developed.

(2) Project Scope Planning Process

The project scope planning process identifies what work is and is not part of the project work. It primarily settles the boundaries of the project work.

It is essential to also identify what is not a part of the project work to avoid future problems.

As **Olde Curmudgeon** has stated, "Failure to define what is part of the project, as well as what is not, may result in work being performed that was unnecessary to create the product of the project and thus lead to both schedule and budget overruns".

(3) Project Scope Definition Process

The project scope definition process identifies the project deliverables and the product deliverables.

Project deliverables is the work that needs to be accomplished to deliver a product with specific features and functions.

Product deliverables are the features and functions that characterise a product. The boundaries and deliverables defined by the scope planning and definition facilitate the development of the project charter and plan. The requirements of the project defines its boundaries.

(4) Project Scope Verification Process

The scope verification process checks the scope for accuracy and completeness.

The project scope needs to be verified. Scope verification is the process of obtaining the stakeholders formal acceptance of the completed project scope and associated deliverables.

Scope verification ensures that the project deliverables are completed as per the standards laid in the delivery definition table (DDT). Scope verification includes the review of each deliverable and comparison with the standards specific in the DDT.

(5) Project Scope Change Control

Although, the project scope has been set with great deliberation and thought, changes to it are bound to arise as the project progresses and new information or need emerges. This warrants the need for project scope change control to manage these changes. The change control process has to approve the change to initiate amendments in project schedule and budget.

The project scope change control process also protects the scope boundaries from expanding unnecessary due demands of additional features and functions to the project scope.

There is a direct relationship between project scope, budget and schedule. An increase in the scope i.e. expansion of scope boundaries leads to a direct increase in project's budget and schedule and vice versa. Hence, such change demands need to be properly scrutinized before being approved.

Q2 a) What do you understand by the term 'ceremonies' in a scrum project?

(5)

Explain the different types of ceremonies that are observed in a Scrum project and their significance.

Scrum has short fixed schedule of release cycles with adjustable scope known as sprints to address rapidly changing development needs.

A Scrum process is distinguished from other agile processes by specific concepts and practices, divided into the three categories of Roles, Ceremonies (also Events or meetings) and Artifacts.

Different types of ceremonies that are observed in scrum project:

1) Sprint Planning Meeting

The goal of Sprint Planning is to answer the questions “What are we going to work on, and how are we going to do it?” It’s also important for the team to have a shared goal and a shared commitment to this goal before beginning their Sprint – the list of items the team plans to work on during that specific Sprint. The team then breaks down these items into tasks, typically no bigger than a 2 days’ worth of work.

2) Daily Scrum

Once we begin a Sprint, we have what we call a Daily Scrum every day. Organized by the Scrum Master, Daily Scrum is typically a 15-minute stand-up meeting to synchronize the work of team members, i.e. what’s done on the prior day, what needs to be done today, identify any impediments, and creates visibility around the work that everyone is doing in the Sprint.

3) Sprint Review Meeting

Held at the end of each sprint to demonstrate the added functionality. The goal is to get feedback from the product owner and other stakeholders to ensure that the delivered increment met the business need and to revise the Product Backlog based on the feedback. This feedback will then become items that will be looped back into the Product Backlog, where it can be ordered and pulled in by the team in a future Sprint.

4) Sprint Retrospective Meeting

Retrospectives typically last 90 minutes and are there to help us incorporate continuous improvement into our team culture and into our Sprint cadence.

This is where the Scrum Team meets to reflect on their previous Sprint and to figure out how to improve as a team by asking – what went well, what did not and what can be improved. It allows the team to focus on its overall performance and identify strategies for continuous improvement.

Significance of ceremonies in scrum project

-Backlog Grooming is the practice of meeting regularly to ensure that the team’s backlog is prioritized according to current business needs, is clear enough at the top that the teams know what will be expected of them if they take on a work item, and is estimated far enough down the list that we’re not scrambling during Sprint Planning to size before committing.

-Sprint Planning is the point at which the team gets together, takes the most important work off the top of the prioritized backlog, and commits to what they believe they can deliver in their next sprint. Work items here should meet the team’s “definition of ready” and be as fully understood as possible before the team commits to them.

-Daily Standups are the forum for the team to update one another on what they’ve done, what they’re doing, and ask for any assistance or call out blocking issues that are holding them back.

-Sprint Reviews allow the team to share the work that they’ve done with the stakeholders for the product in a live, interactive meeting. The goal here should be to confirm reviews already done with the Product Owner/Manager, as well as to elicit feedback from the stakeholders in the room to add to the team’s backlog where appropriate.

-Retrospectives provide the key opportunity for the team to improve their throughput, their processes, or other aspects of their work. This is the forum for teams to discuss the things that are working, that they want to continue doing; the things that aren't working, that they want to stop doing; and the things that they want to try in the next iteration to make things better, easier, or different.

Q2 b) List the advantages and disadvantage of software prototyping.

(5)

Advantages of software prototyping:

- Improves communication between the user and the developer as the user gets a feel of how his specification is going to work in reality. Once the user gets a feel of the system his involvement increases.
- In case there is no previous system to mimic, a prototype provides more inputs into how the system should be and work.
- A prototype tests the completeness and consistency of the specification and highlight discrepancies in the specification.
- Prototype reduces the need for documentation.
- The user will ask for changes at the prototype stage itself thereby reducing the maintenance cost at the operational stage.
- Prototype helps in the accurate calculation of expected results.
- A prototype is able to demonstrate the achievability and non-achievability of system features that wouldn't have been possible on a paper design.

Disadvantage of software prototyping:

- the users may take the prototype to be the final system and start expecting the similar response time and stringent input validation.
 - Additional expense and time.
 - Prototyping could act as excuse for the lack in planning.
 - Although the user may feel that his requirements are being addressed at the prototyping stage they may become difficult to implement at later stage in the conventional mode.
 - Prototyping is based on the premise the developer and user are in close proximity which may not always be the case.
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Q2 c) Explain the five major components of Albrecht Function Point Analysis.

(5)

The five major components of Albrecht Function Point Analysis are:

1) EI

The number of external inputs. These are elementary processes in which derived data passes across the boundary from outside to inside. In an example library database system, enter an existing patron's library card number.

2) EO

The number of external outputs. These are elementary processes in which derived data passes across the boundary from inside to outside. In an example library database system, display a list of books checked out a patron.

3) EQ

The number of external queries. These are elementary processes with both input and output components that result in data retrieval from one or more internal logical files and external interface files. In an example library database system, determine what books are currently checked out to a patron.

4) ILF

The number of internal log files. These are user identifiable groups of logically related data that resides entirely within the application boundary that are maintained through external inputs. In an example library database system, the file of books in the library.

5) ELF

The number of external log files. These are user identifiable groups of logically related data that resides entirely within the application boundary that are used for reference purposes only, and which reside entirely outside the system. In an example library database system, the file that contains transactions in the library's billing system.

Q2 d) What are effort multipliers in COCOMO II model? List the effort multipliers used at early design. (5)

Effort multipliers

Cost estimation of IT project is usually measured in terms of effort. The most common metric used is person months or years (or man months or years).

The effort is the amount of time for one person to work for a certain period of time.

It is important that the specific characteristics of the development environment are taken into account when comparing the effort of two or more projects because no two development environments are the same.

A clear example of differences in development environments are the amount of time people work in different countries; the typical workweek in America is 40 hours per week, while in India the typical workweek is more than 40 hours per week. Thus, when comparing a project from America with a project from India, a conversion factor would have to be used to allow for an accurate comparison.

Effort multipliers used at early design are:

PERS-Personnel Capability

PREX-Personnel Experience

RUSE-Required Reusability

RCPX-Product Reliability and Complexity

PDIF-Platform Difficulty

SCED-Required Development Schedule

FCIL-Facilities

Q2 e) Explain eight core principles of Dynamic Systems Development Method. (5)

1) Focus on the Business Need

- Establish the business case through the business need perspective
- Align the business case to organizational goals and priorities
- Seek continuous business sponsorship
- Validate the business commitment through results
- Guarantee Minimum Usable Subset (MUST)

2) Deliver on Time

- Time box work activities / always hit deadlines
- Allocate time periods to complete the work
- Time boxing fixed periods of time for each planned activity
- Hitting deadlines builds trust in the process

3) Collaborate

- Involve the right people at the right time
- Bring in SME's and experts at points within the project when their experience can be best utilized
- Gain business support through open communication
- Remove the top-down approach to project decisions

4) Never Compromise Quality

- Continuously review quality goals and current level of quality
- Review with the team on a regular basis the current level of quality and the current quality goals
- Adjust goals as needed, but never sacrifice quality for time or extra features (remember MUST)

5) Build Incrementally from Firm Foundations

- Confirm that the solution is correct and meeting expectations
- Decide on and focus on the priorities needed to build a firm foundation
- Building a firm foundation will more easily allow for expansion of the project later in other iterations of the development process

6) Develop Iteratively

- Try things first, experiment, be open to changes
- Allow detail to emerge later, rather than a strong detailed definition at the beginning
- The project is being rough sketched in, as it progresses the sketch will become more detailed

7) Communicate Continuously and Clearly

- Encourage in informal meetings & engage in more collaborative practices
- Focus on the quality of the communication
- Use visual communication practices
- Use modelling or visual aids
- Keep documentation lean

8) Demonstrate Control

- Rather than focus on completing each activity, focus on the results
- Measure progress through delivery
- Proactively manage the project, continuously evaluating progress
- Use an appropriately level of formality when reporting

Q2 f) State Caper Jones rules of thumb for software estimation.

(5)

Rules Formulated by Capers Jones-

Rule 1: SLOC Function Point Equivalence

When it comes to estimating the size of the project the function point analysis is used on account of its advantages. Thus, it becomes necessary for the project manager to determine SLOC measure from its function point measurement.

Jones through his experience determined the equivalence between SLOC and function point. SLOC function point equivalence varies across different programming languages so it would take about 320 lines of assembly code to implement one function point. In C language to express one SLOC several instructions of assembly language are needed.

Rule 2: Project during Estimation

Function point raised to the power 0.4 predicts the approximate development time in calendar months.

E.g. if the size of a project is estimated by 325 function points i.e. approximately 40,000 SLOC then the completion time for the project would be approximately 17 months.

Rule 3: Rate of Requirement Creep

User requirements creep in at an average rate of 2% per month from the design through coding phases.

Requirement creep is the increase in the requirements of the user and these keep on increasing for a variety of reasons as the project progresses.

Requirement creeps is not expected to increase during project testing and installation stages. The rule states that creep takes between the requirement phases till the testing phase and therefore only that part of the project should be considered.

Rule 4: Defect Removal Efficiency

Each software review, inspection or test step will find and remove 30% of the bugs that are present.

Defect removal steps at various stages of the project development ensure that the final product is reliable.

Rule 5: Project Manpower Estimation

The size of the software in function points divided by 150 predicts the approximate number of personnel required for developing the application.

Rule 6: Software Development Effort Estimate

The approximate number of staff months required to develop software is given by the software development time multiplied by the number of personnel required.

Function points divided by 500 predicts the approximate number of personnel required for regular maintenance activities.

Q3 a) With the help of example explain forward pass and backward pass to calculate activity duration in network diagram. (5)

Forward Pass - forward pass is performed on a network schedule to calculate;

- a. The earliest time and each activity in the network can start and finish.
- b. The minimum overall duration of the project.

-Early Finish (EF) = Early Start (ES) + Duration

-Early Start (ES) = Max Early Finish (EF) of related predecessor activity.

Backward Pass - The purpose of performing a backward pass on a network is to calculate the latest time that each activity in the network can start and finish and still maintain the minimum overall duration of the project is calculated by the forward pass.

-Late Start (LS) = Late Finish - Duration

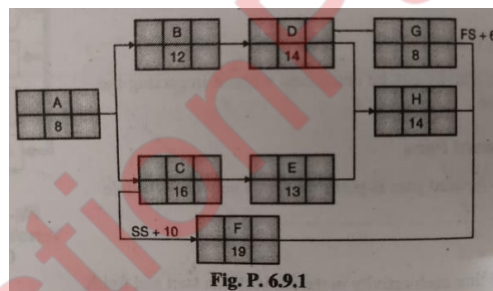
-Late Finish = Minimum Late Start (LS) of related successor activity.

Example:

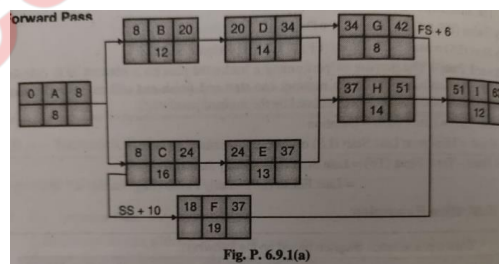
Draw a precedence diagram based on the following.

Activity Code	Immediate Predecessor	Relationship and Lag	Duration(days)
A	-	-	8
B	A	FS	12
C	A	FS	16
D	B	FS	14
E	C	FS	13
F	C,G	SS+10,FS+6	19
G	D	FS	8
H	D,E	FS	14
I	H	FS	12

Calculate the forward and backward passes.



Forward Pass Calculations



1. Activity A: this is the starting activity hence Early State (ES) = 0.

Early Finish (EF) = Early Start + duration = 0 + 8 = 8

2. Activity B: here Early Start (ES) = 8 which is the Early Finish of Activity A.

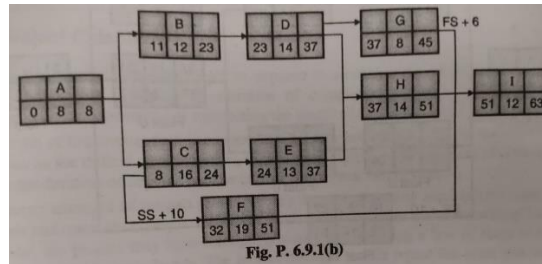
Early Finish (EF) = Early Start + duration = 8 + 12 = 20

3. Activity C: here Early Start (ES) = 20 which is the Early Finish of Activity B.

Early Finish (EF) = Early Start + duration = 20 + 14 = 34

Similarly the Forward Pass for other Activities can be calculated and have been depicted in the figure above. Also, Activity F has two predecessor activities, namely activity C and G, while calculating forward pass of activity F we will have to consider higher duration of predecessor activity.

Backward Pass Calculations



1. Activity H: The minimum late start of activity I which is the related successor is 51 days.

Late Start = Late Finish (minimum late start of related successor activity) - duration = 51-14 = 37

2. Activity D: The successor activity to activity D is H which has minimum late start of 37 days.

Late Start = 37-14 = 23

We can similarly calculate the backward pass for the other activities. However activity C has two successor activities, namely activities E and F.

3. Activity C: The successor activities of activity C are activities E and F who have a minimum late start of 24 and 32 respectively. The smaller value is considered for backward pass.

Late Start = 24-16 = 8

Q3 b) Define the following terms

(5)

i) Critical path ii) Float iii) Free float iv) Interfering float v) Hammock activity

i) Critical Path

-The critical path denotes the sequence of events that determine the project completion date.

-It is the longest path from project start to completion.

-Every project has multiple paths from project start to completion but there is only one path that takes longer than any other in the project network diagram and this is our critical path.

-A path is a series of continuous activities through the network that start from the initial node of the network to its final node.

ii) Float

The number of days that an event or lag can be delayed or extended without impacting the completion of the project.

iii) Free float

-AS the name indicates free float is that part of the total float that can be used without affecting the float of the succeeding activities.

-Thus, it is that quantum of the total float which can be consumed without affecting the early start of the succeeding activity.

-Therefore, Free Float = earliest start time of succeeding activity - earliest finish time of this activity.

-Free float indicates the amount of time an activity can be delayed beyond its earliest starting time without affecting the earliest start of the succeeding activity and the total float of the other succeeding activities.

iv) Interfering float

-There are chances that the utilization of the total float of an activity may affect the float times of other activities in the network.

-Thus, the part of the total float that causes a reduction in the float of the successor activity is called as interfering float.

-Interfering float is that portion of the total float that cannot be consumed without affecting the float of the succeeding activity.

Thus, Interfering Float = Latest Finish of Activity - Earliest Finish of the succeeding activity.

v) Hammock activity

The concept of hammock activities plays a central role in project management. They are used to fill the time span between other "normal" activities since their duration cannot be calculated or estimated at the initial stage of project planning

Q3 c) Explain Boehm's top ten software project risks and the different strategies for reducing it. (5)

(A) Finding and fixing a software problem after delivery is often 100 times more expensive than finding and fixing it during the requirements and the design phase.

This is a well-known fact about the increasing cost of defect removal (Holzman,2001) during the different stages of software development lifecycle. This reiterates the importance of complete detail requirement analysis and design, which is the key to defects reduction.

(B) Current software projects spend about 40 to 50 percent of their effort on avoidable rework.

This finding should not be too surprising, but the actual percentage of avoidable work is frightening. With the advent of 'agile' methodologies in the last 10 years, it would be interesting to see if the percentage of avoidable rework can be reduced.

(C) About 80 percent of avoidable rework comes from 20 percent of the defects.

Research showed the two major sources of avoidable rework came from 'hastily specified requirements and nominal-case design and development'.

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(D) About 80 percent of the defects come from 20 percent of the modules, and about half of the modules are defect free.

The first part of this finding is not too surprising since 20% of production code is doing most of the processing while the other 80% of code should be just exception handling. According to Boehm and Basilli (2001, p. 136), the reasons for defects to concentrate in half of production modules include data coupling and cohesion, size, complexity and changes to reused code.

(E) About 90 percent of the downtime comes from, at most, 10 percent of the defects.

Based on the study of the software failures history of nine large IBM software products indicated that 0.3 percent of defects accounted for around 90% of the downtime. This finding might be reason for the recent interest in applying risk-based testing as a cost-effective mean to deduce potential downtime.

(F) Peer reviews catch 60 percent of the defects.

It is not clear how often are peer reviews (while include requirement review, design review, test cases review and so on) are being practised during the development lifecycle in industry. The way that peer reviews are conducted is also correlated to how effective they are in catching defects.

(G) Perspective-based reviews catch 35 percent more defects than non-directed reviews.

Perspective-based review is a set of formal software reading techniques based on different perspectives developed by Basili (1997) for defect detection. The techniques have been showed to improve fault detection rates anywhere from 15 to 50 percent.

(H) Disciplined personal practices can reduce defect introduction rates up to 75 percent.

These personal practices include the Personal Software Process (PSP) and Cleanroom software development process. NASA data showed a 25 to 75 reduction in failure rate using the Cleanroom process. The PSP approach is shown to reduce personal defect rates significantly.

(I) All other things being equal, it costs 50 percent more per source instruction to develop high-dependability software products than to develop low-dependability software products.

However, the investment is more than worth it if the project involves significant operations and maintenance costs. Simply put, it costs more to develop high-dependability software than low-dependability software. The first finding is based on COCOMO II maintenance model. The second finding is based on COCOMO II - related quality model.

(J) About 40 to 50 percent of user programs contain nontrivial defects.

A study of spreadsheet error (Brown and Gold, 1987) showed that 44 percent of 27 spreadsheet programs produced by experienced developers contain nontrivial defects (e.g. errors in spreadsheet formula).

Q3 d) Write short note on Project Evaluation and Review Technique.

(5)

Project Evaluation and Review Technique (PERT) is a procedure through which activities of a project are represented in its appropriate sequence and timing.

It is a scheduling technique used to schedule, organize and integrate tasks within a project. PERT is basically a mechanism for management planning and control which provides blueprint for a particular project. All of the primary elements or events of a project have been finally identified by the PERT.

In this technique, a PERT Chart is made which represent a schedule for all the specified tasks in the project. The reporting levels of the tasks or events in the PERT Charts is somewhat same as defined in the work breakdown structure (WBS).

Characteristics of PERT:

- It serves as a base for obtaining the important facts for implementing the decision-making.
- It forms the basis for all the planning activities.
- PERT helps management in deciding the best possible resource utilization method.
- PERT take advantage by using time network analysis technique.
- PERT presents the structure for reporting information.
- It helps the management in identifying the essential elements for the completion of the project within time.

Advantages of PERT:

- Estimation of completion time of project is given by the PERT.
- It supports the identification of the activities with slack time.
- The start and dates of the activities of a specific project is determined.
- It helps project manager in identifying the critical path activities.
- PERT makes well organized diagram for the representation of large amount of data.

Disadvantages of PERT:

- The complexity of PERT is more which leads to the problem in implementation.
- The estimation of activity time are subjective in PERT which is a major disadvantage.
- Maintenance of PERT is also expensive and complex.
- The actual distribution of may be different from the PERT beta distribution which causes wrong assumptions.
- It under estimates the expected project completion time as there is chances that other paths can become the critical path if their related activities are deferred.

Q3 e) Explain the different categories of cost incurred in a software project.

(5)

$$\left\{ \begin{array}{l} \text{Project cost} = \\ \text{Direct cost} \\ \text{Indirect cost} \\ \text{Fixed cost} \\ \text{Variable cost} \\ \text{Sunk cost} \end{array} \right\}$$

1) Direct cost

Direct costs are those directly linked to doing the work of the project. For example, this could include hiring specialised contractors, buying software licences or commissioning your new building.

2) Indirect cost

These costs are not specifically linked to your project but are the cost of doing business overall. Examples are heating, lighting, office space rental (unless your project gets its own offices hired specially), stocking the communal coffee machine and so on.

3) Fixed cost

Fixed costs are everything that is a one-off charge. These fees are not linked to how long your project goes on for. So if you need to pay for one-time advertising to secure a specialist software engineer, or you are paying for a day of Agile consultancy to help you start the project up the best way, those are fixed costs.

4) Variable cost

These are the opposite of fixed costs - charges that change with the length of your project. It's more expensive to pay staff salaries over a 12 month project than a 6 month one. Machine hire over 8 weeks is more than for 3 weeks. You get the picture.

5) Sunk cost

These are costs that have already been incurred. They could be made up of any of the types of cost above but the point is that they have happened. The money has gone. These costs are often forgotten in business cases, but they are essential to know about. Having said that, stop/continue decisions are often (wrongly) based on sunk costs. If you have spent £1m, spending another £200k to deliver something that the company doesn't want is just wasting another £200k. Epstein and Maltzman write:

"Sunk cost is a loss which should not play any part in determining the future of the project."
Unfortunately, project sponsors and other senior executives (and even project managers) often value completion over usefulness and it does take courage to suggest to your sponsor that you stop a project that has already seen significant investment.

Q3 f) What is resource smoothing? Explain two different ways of prioritizing activities for resource allocation. (5)

Resource Smoothing

-In smaller or simpler projects, resource smoothing can be done by simply analysing the project network to find out the demand for resources.

-During this analysis it is assumed that all the activities will start on their respective earliest start time. We will then schedule the resource as per requirement and then observe the overlaps and the period when the demand for the resource is the highest.

-In case the resource is limited and there is an overlap than the activities will have to be rescheduled. Alternative schedules will have to be prepared as per the slack of each activity.

-Also if the duration of a project is directly proportional to the amount of resource applied then the length of the project is a function of the number of workers assigned to the project. Thus, the project length would be shorter when more number of workers are assigned.

Criteria for prioritizing activities for resource allocation:

-The criteria for scheduling are the slack that the activities have and resources are allocated to the activities as per the slack that they have. For this activities have to be arranged according to the float they have starting from the activity having the minimum float to the one that has the highest float.

-Also, if two activities have the same float then the one with the smallest duration should be scheduled first. The objective behind scheduling the activity with the smallest duration is that the waiting time for the other activity is reduced. Now, if there are two activities having identical float and duration then the activity requiring more resources should be scheduled first.

Q4 a) Explain review process model with the help of diagram. (5)

Software Review is systematic inspection of a software by one or more individuals who work together to find and resolve errors and defects in the software during the early stages of Software Development Life Cycle (SDLC). Software review is an essential part of Software Development Life Cycle (SDLC) that helps software engineers in validating the quality, functionality and other vital features and components of the software. It is a whole process that includes testing the software product and it makes sure that it meets the requirements stated by the client. Usually performed manually, software review is used to verify various documents like requirements, system designs, codes, test plans and test cases.

Objectives of Software Review:

The objective of software review is:

To improve the productivity of the development team.

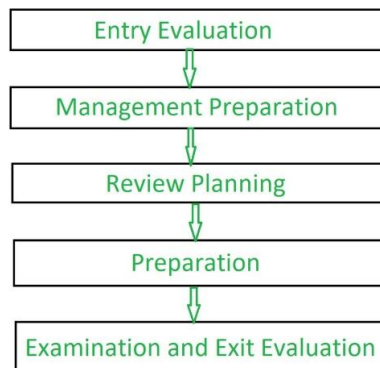
To make the testing process time and cost effective.

To make the final software with fewer defects.

To eliminate the inadequacies.

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Process of Software Review:



Types of Software Reviews:

There are mainly 3 types of software reviews:

Software Peer Review:

Peer review is the process of assessing the technical content and quality of the product and it is usually conducted by the author of the work product along with some other developers. Peer review is performed in order to examine or resolve the defects in the software, whose quality is also checked by other members of the team. Peer Review has following types:

(i) Code Review:

Computer source code is examined in a systematic way.

(ii) Pair Programming:

It is a code review where two developers develop code together at the same platform.

(iii) Walkthrough:

Members of the development team is guided by author and other interested parties and the participants ask questions and make comments about defects.

(iv) Technical Review:

A team of highly qualified individuals examines the software product for its client's use and identifies technical defects from specifications and standards.

(v) Inspection:

In inspection the reviewers follow a well-defined process to find defects.

Software Management Review:

Software Management Review evaluates the work status. In this section decisions regarding downstream activities are taken.

Software Audit Review:

Software Audit Review is a type of external review in which one or more critics, who are not a part of the development team, organize an independent inspection of the software product and its processes to assess their compliance with stated specifications and standards. This is done by managerial level people.

Q4 b) What is meant by software configuration management? Explain the two principal activities of configuration management. (5)

-IT Project Management is like a well-rehearsed play going awry at the last moment. No matter the number of hours of practicing and rehearsing, there are bound to be some last minute glitches which can put the entire project on tender hooks.

-Project managers have to get back to the drawing board and start redesigning the process again. They may have either discovered a better way of getting job done or some changes requested by management or user in the project deliverables may have prompted the change in plans.

-Whatever be the reason the project manager has to decide whether the change in the project is feasible and the system to put in place to review, approve or decline the request for change.

-Although, incorporating changes in IT project management is not an easy task they are subject to changes due to the dynamic nature of the industry.

-Changes may be made necessary due to the introduction of new software, security issues, or new requests from stakeholders.

-On his part the project manager has to evaluate the time, cost, risk, and any other repercussions that each change requests brings along with it. In case the change request it needs to be documented, tracked and implemented.

-However in the real world these are not how things work. Changes are forced onto the project and the project manager is forced to alter the project scope.

-The project manager tries to alter the project plan with the new requirements from the project. This does not work and the project fails. To prevent this, the project manager should follow the process to control and implement change. This is where the concept of Configuration Management comes in handy.

The major activities covered are software configuration identification,

Software configuration control,

Software configuration status accounting,

Software configuration auditing, and Software release management and delivery.

Q4 c) Explain the main sections in a requirement document for contract placement.

(5)

This requirements document is sometimes called an operational requirement.

Main sections in a requirements document

- 1 Introduction
- 2 A description of any existing systems and the current environment
- 3 The customer's future strategy or plans
- 4 System requirements
- 5 Deadlines
- 6 Additional information required from potential suppliers

The requirements define carefully the functions that need to be carried out by the new application and all the necessary inputs and outputs for these functions. The requirements should also state any standards with which there should be compliance, and the existing systems with which the new system needs to be compatible. As well as these functional requirements, there will also need to be operational and quality requirements concerning such matters as the required response times, reliability, usability and maintainability of the new system.

In general, the requirements document should state needs as accurately as possible and should avoid technical specifications of possible solutions.

The onus should be placed on the potential suppliers to identify the technical solutions that they believe will meet the customer's stated needs.

After all, they are the technical experts who should have access to the most up-to-date information about current technology.

Each requirement needs to be identified as being either mandatory or desirable.

- **Mandatory** if a proposal does not meet this requirement then the proposal is to be immediately rejected. No further evaluation would be required.
- **Desirable** A proposal might be deficient in this respect, but other features of the proposal could compensate for it.

For example, in the case of the Bright mouth College payroll acquisition project, Brigitte might identify as a mandatory requirement that any new system should be able to carry out all the processes previously carried out by the old system. However a desirable feature might be that the new payroll software should be able to produce accounting details of staff costs in an electronic format that can be read directly by the college's accounting computer system.

Among the other details that should be included in the requirements document to be issued to potential suppliers would be requests for any information needed to help us judge the standing of organization itself. This could include financial reports, references from past customers and the CVs of key development staff.

Q4 d) What is fixed price contract? List the advantages and disadvantages of fixed price contract. (5)

Fixed Price Contract

-This is the simplest type of all contracts. The terms are quite straight forward and easy to understand.

-To put in simple, the service provider agrees to provide a defined service for a specific period of time and the client agrees to pay a fixed amount of money for the service.

-This contract type may define various milestones for the deliverables as well as KPIs (Key Performance Indicators). In addition, the contractor may have an acceptance criteria defined for the milestones and the final delivery.

-The main advantages of this type of contract is that the contractor knows the total project cost before the project commences.

Advantage-

Known customer expenditure: If there are few subsequent changes to the original requirements, then the customer will have a known outlay.

Supplier motivation: The supplier has a motivation to manage the delivery of the system in a cost-effective manner.

Disadvantage-

Higher price to allow contingency: The suppliers absorbs risk for any errors in the original estimate of product size. To reduce the impact of this risk, the supplier will add a margin when calculating the price to be quoted in a tender.

Difficulties in modifying requirements: The need to change the scope of the requirements sometimes becomes apparent as the system is developed - this can cause friction between the supplier and customer.

Upward pressure on the cost of changes: When competing against other potential suppliers will try and quote as low a price as possible. If, once the contract is signed, further requirements are put forward, the supplier is in a strong position to demand a high price for these changes.

Threat to system quality: The need to meet a fixed price can mean that the quality of the software suffers.

Q4 e) What are three important categories of stress management techniques? (5)

Strategy 1: Avoid Stress

1. Learn how to say "no"

Know your limits and stick to them. Whether in your personal or professional life, refuse to accept added responsibilities when you're close to reaching them. Taking on more than you can handle is a sure-fire recipe for stress.

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2. Avoid people who stress you out

If someone consistently causes stress in your life and you can't turn the relationship around, limit the amount of time you spend with that person or end the relationship entirely.

3. Take control of your environment

If the evening news makes you anxious, turn the TV off. If traffic's got you tense, take a longer but less-travelled route. If going to the market is an unpleasant chore, do your grocery shopping online.

4. Avoid hot-button topics

If you get upset over religion or politics, cross them off your conversation list. If you repeatedly argue about the same subject with the same people, stop bringing it up or excuse yourself when it's the topic of discussion.

5. Pare down your to-do list

Analyse your schedule, responsibilities, and daily tasks. If you've got too much on your plate, distinguish between the "should" and the "musts". Drop tasks that aren't truly necessary to the bottom of the list or eliminate them entirely.

Strategy 2: Accept things you cannot change

1. Don't try to control the uncontrollable

Many things in life are beyond our control-particularly the behaviour of other people. Rather than stressing out over them, focus on the things you can control such as the way you choose to react to problems.

2. Look for the upside

As the saying goes, "What doesn't kill us makes us stronger." When facing major challenges, try to look at them as opportunities for personal growth. If your own poor choices contributed to a stressful situation, reflect on them and learn from your mistakes.

3. Share your feelings

Talk to a trusted friend or make an appointment with a therapist. Expressing what you're going through can be very cathartic, even if there's nothing you can do to alter the stressful situation.

4. Learn to forgive

Accept the fact that we live in an imperfect world and that people make mistakes. Let go of anger and resentments. Free yourself from negative energy by forgiving and moving on.

Strategy 3: Make time for fun and relaxation

1. Set aside relaxation time

Include rest and relaxation in your daily schedule. Don't allow other obligations to encroach. This is your time to take a break from all responsibilities and recharge your batteries.

2. Connect with others

Spent time with positive people who enhance your life. A strong support system will buffer you from the negative effects of stress.

3. Do something you enjoy everyday

Make time for leisure activities that bring you joy, whether it be stargazing, playing the piano, or working on your bike.

4. Keep your sense of humor

This includes the ability to laugh at yourself. The act of laughing helps your body fight stress in a number of ways.

Q4 f) Explain Vroom's expectancy theory of motivation.

(5)

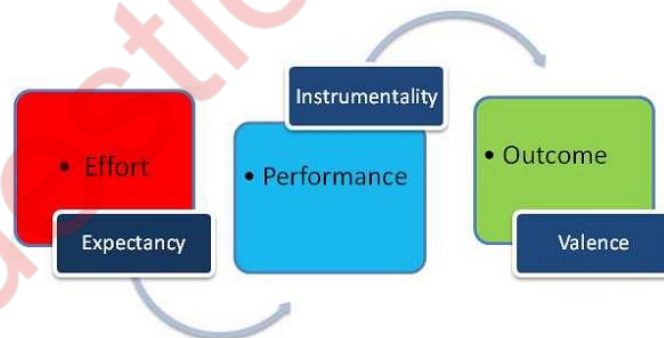
Vroom's expectancy theory separates effort, performance and outcomes, while Maslow and Herzberg focus on the relationship between internal needs and the resulting effort expended to fulfil them.

Vroom's expectancy theory assumes that behaviour results from conscious choices among alternatives whose purpose it is to maximise pleasure and to minimise pain.

Vroom realised that an employee's performance is based on individual factors such as personality, skills, knowledge, experience and abilities.

He stated that effort, performance and motivation are linked in a person's motivation.

He uses the variables Expectancy, Instrumentality and Valence to account for this.



According to Vroom Motivation is a product of valence, expectancy and instrumentality. It can be put in an equation as follows –

$$\text{Motivation} = \text{Valence} \times \text{Expectancy} \times \text{Instrumentality}$$

Expectancy

Expectancy is the idea that increasing the amount of effort will increase performance (if I work harder then I will perform better).

This is affected by:

Having the right resources available (e.g. raw materials, time)

Having the right skills to do the job

Having the necessary support to get the job done (e.g. supervisor support, or correct information on the job)

Instrumentality

Instrumentality is the idea that if you perform better, then the outcome will be achieved (If perform well, there I will achieve the desired outcome).

This is affected by:

A clear understanding of the relationship between performance and outcomes – e.g. the rules of the reward 'game'

Trust in the people who will take the decisions on who gets what outcome

Transparency of the process that decides who gets what outcome

Valence

Valence is the perceived value the employee puts on the outcome. For the valence to be positive, the person must prefer attaining the outcome than not attaining it. (If someone is mainly motivated by money, he or she might not value offers of additional time off).

The three elements are important behind choosing one element over another because they are clearly defined:

Effort-performance expectancy (E-->P expectancy) and performance-outcome expectancy (P-->O expectancy).

E-->P expectancy: our assessment of the probability that our efforts will lead to the required performance level.

P-->O expectancy: our assessment of the probability that our successful performance will lead to certain outcomes.

Vroom's expectancy theory works on perceptions, so even if a motivation tactic works with most people in the organisation, it doesn't mean that it will work for everybody.

Q5 a) Explain the advantages of a functional organization over project organization. (5)

Advantages

The functional structure gives you the least power as a project manager, but offers plenty of other advantages:

It works well for small teams and small projects because the function has full control over the team members and other resources required.

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You can easily access the experts you need because they are in the same functional area.

It's quick to get everyone together to resolve problems related to the project.

You can limit the project communications tools you need to use because the team is relatively small and simple.

You often get enthusiastic team members who are keen to work on the project because it provides them with career opportunities. Project work can be a great way to motivate your team.

If you are handing the project over to a functional team, it will be the functional team you work in, which can make closing a project easier.

Q5 b) List the obstacles to good group decision making. Also explain Delphi decision making process. (5)

Amanda finds that group decision making has some disadvantages: it is time consuming; it can in some cases stir up conflicts within the group; and decisions can be unduly influenced by dominant members of the group.

Conflict could, in fact, be less than might be expected. Experiments have shown that people will modify their personal judgements to conform to group norms. These are common attitudes that are developed by a group over a period of time.

You might think that this would tend to moderate the more extreme views that some individuals in the group might hold. In fact, people in groups often make

A different type of participatory decision-making might occur when end users are consulted about the way a projected computer system is to operate.

Once established group norms can survive many changes of membership in the group. Decisions that carry more risk than where they have to make the decision on their own. This is known as the risky shift.

Measures to reduce the disadvantages of group decision making One method of making group decision making more efficient and effective is by training members to follow a set procedure. The Delphi technique endeavours to collate the judgements of a number of experts without actually bringing them face-to-face. Given a problem, the following procedure is carried out:

- The co-operation of a number of experts is enlisted;
- The problem is presented to the experts;
- The experts record their recommendations;
- These recommendations are collated and reproduced;
- The collected responses are recirculated;
- The experts comment on the ideas of others and modify their recommendations if so moved;

- If the leader detects a consensus then the process is stopped, otherwise the comments are recirculated to the experts.

The big problem with this approach used to be that because the experts could be geographically dispersed the process was time consuming.

Delphi decision making process

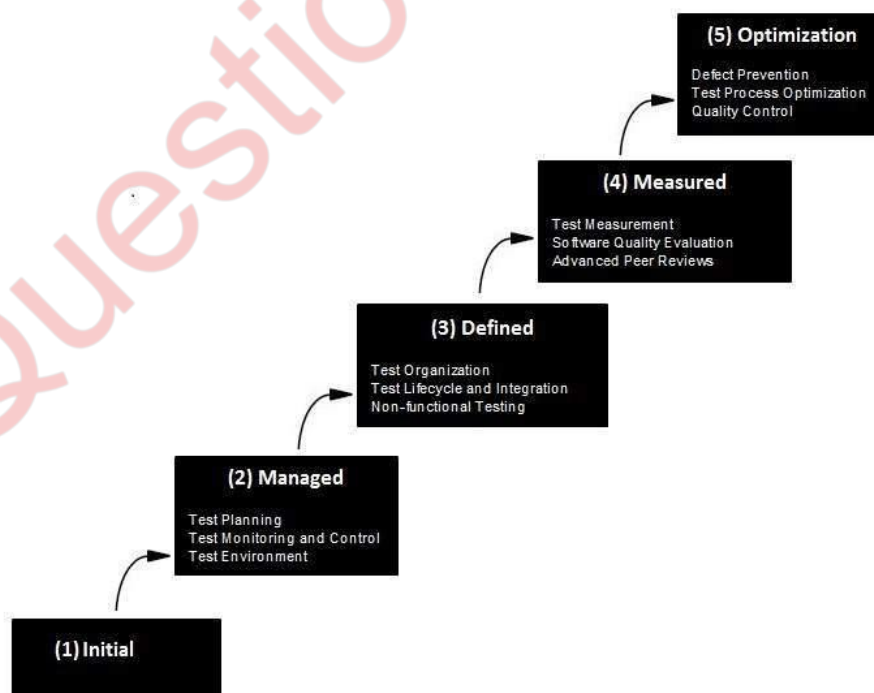
The Delphi Technique is an essential project management technique that refers to an information gathering technique in which the opinions of those whose opinions are most valuable, traditionally industry experts, is solicited, with the ultimate hope and goal of attaining a consensus. Typically, the polling of these industry experts is done on an anonymous basis, in hopes of attaining opinions that are unfettered by fears or identifiability. The experts are presented with a series of questions in regards to the project, which is typically, but not always, presented to the expert by a third-party facilitator, in hopes of eliciting new ideas regarding specific project points. The responses from all experts are typically combined in the form of an overall summary, which is then provided to the experts for a review and for the opportunity to make further comments. This process typically results in consensus within a number of rounds, and this technique typically helps minimize bias, and minimizes the possibility that any one person can have too much influence on the outcomes.

Q5 c) Write short note on SEI capability maturity model.

(5)

The Software Engineering Institute (SEI) Capability Maturity Model (CMM) specifies an increasing series of levels of a software development organization.

The higher the level, the better the software development process, hence reaching each level is an expensive and time-consuming process.



Level One: Initial - The software process is characterized as inconsistent, and occasionally even chaotic. Defined processes and standard practices that exist are abandoned during a crisis. Success of the organization majorly depends on an individual effort, talent, and heroics. The heroes eventually move on to other organizations taking their wealth of knowledge or lessons learnt with them.

Level Two: Repeatable - This level of Software Development Organization has a basic and consistent project management processes to track cost, schedule, and functionality. The process is in place to repeat the earlier successes on projects with similar applications. Program management is a key characteristic of a level two organization.

Level Three: Defined - The software process for both management and engineering activities are documented, standardized, and integrated into a standard software process for the entire organization and all projects across the organization use an approved, tailored version of the organization's standard software process for developing, testing and maintaining the application.

Level Four: Managed - Management can effectively control the software development effort using precise measurements. At this level, organization set a quantitative quality goal for both software process and software maintenance. At this maturity level, the performance of processes is controlled using statistical and other quantitative techniques, and is quantitatively predictable.

Level Five: Optimizing - The Key characteristic of this level is focusing on continually improving process performance through both incremental and innovative technological improvements. At this level, changes to the process are to improve the process performance and at the same time maintaining statistical probability to achieve the established quantitative process-improvement objectives.

Q5 d) What is reliability growth model? Explain any two reliability growth models. (5)

The reliability growth group of models measures and predicts the improvement of reliability programs through the testing process. The growth model represents the reliability or failure rate of a system as a function of time or the number of test cases.

Models included in this group are as following below.

Coutinho Model –

Coutinho adapted the Duane growth model to represent the software testing process. Coutinho plotted the cumulative number of deficiencies discovered and the number of correction actions made vs the cumulative testing weeks on log-log paper. Let $N(t)$ denote the cumulative number of failures and let t be the total testing time. The failure rate, $\lambda(t)$, the model can be expressed as

$$\lambda(t) = \frac{N(t)}{t} = \beta_0 t^{-\beta_1}$$

where β_0 : and β_1 are the model parameters. The least squares method can be used to estimate the parameters of this model.

Wall and Ferguson Model –

Wall and Ferguson proposed a model similar to the Weibull growth model for predicting the failure rate of software during testing. The cumulative number of failures at time t , $m(t)$, can be expressed as

$$m(t) = a_0 [b(t)]^{\alpha_1}$$

where α_0 and α_1 are the unknown parameters. The function $b(t)$ can be obtained as the number of test cases or total testing time.

Similarly, the failure rate function at time t is given by

$$\lambda(t) = \{m'(t)\} = \{a_0 \alpha_1 b^{\alpha_1 - 1}(t) [b'(t)]\}$$

Wall and Ferguson tested this model using several software failure data and observed that failure data correlate well with the model.

Q5 e) What are the steps of conducting a post implementation project review? (5)

Conduct a gap analysis.

Review the project charter to evaluate how closely the project results match the original objectives.

Review the expected deliverables (including documentation) and ensure either that these have been delivered to an acceptable level of quality, or that an acceptable substitute is in place.

If there are gaps, how will these be closed?

Determine whether the project goals were achieved.

Is the deliverable functioning as expected?

Are error rates low enough, and is it fit for purpose?

Is it functioning well, and in a way that will adjust smoothly to future operating demands?

Are users adequately trained and supported? And are there sufficiently enough confident, skilled people in place?

Are the necessary controls and systems in place, and are they working properly?

What routine activities are needed to support the project's success?

If there are problems here, how will these be addressed?

How does the end result compare with the original project plan, in terms of quality, schedule and budget?

Determine the satisfaction of stakeholders.

Were the end users' needs met?

Is the project sponsor satisfied?

What are the effects on the client or end user?

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If key individuals aren't satisfied, how should this be addressed?

Determine the project's costs and benefits.

What were the final costs?

What will it cost to operate the solution?

What will it cost to support the solution in the future?

How do the costs compare with the benefits achieved?

If the project hasn't delivered a sufficiently large return, how can this be improved?

Identify areas for further development.

Have all of the expected benefits been achieved? If not, what is needed to achieve them?

Are there opportunities for further training and coaching that will maximize results?

Could you make further changes, which would deliver even more value?

Are there any other additional benefits that can be achieved?

Identify lessons learned.

How well were the project's deliverables assessed, and how well were timescales and costs assessed?

What went wrong, why did these things go wrong, and how could these problems be avoided next time?

What went well, and needs to be learned from?

Report findings and recommendations.

What have you learned from this review?

Do you need corrective action to get the benefits you want?

What lessons have you learned that need to be carried forward to future projects?

Does this project naturally lead on to future projects, which will build on the success and benefits already achieved?

Q5 f) Explain the different reason for which a project may need to be terminated. (5)

-Project is closed when it has reached its stated objectives i.e. it has been successfully implemented and been handed over to its user. A successful project is simply developed to its customer.

-A project may be closed when it is transferred to another organizational division to take the work forward. Such a decision may be taken if the management feels that the current project team is not a position to reach the project objectives.

-Another reason for project closure or rather premature project closure is when the project manager reaches the conclusion that the project is unfeasible and that the objectives are out of reach, resulting in a prematurely closed down project.

-A project on perfect course may face closure on changed requirements of the user naming the project redundant and forcing to call of the project.

-Crises within the organization or customer may force the closure of a project.

-Sudden an unanticipated changes in technology may force the closure of a project.

-Budgetary issues may force the closure of a project.

-Absence of key project personnel may force project closure.

-The planning of project closure should be top priority and should be planned for in the inceptive stages of a project as it's elevated the chances of a successful completion.

-The importance accorded to the closure stage of the project can be gauged when organization employ a specific manager, who possess an appropriate set of skills and knowledge of project closure, to overlook this phase of the project.