Quest. Discuss Scope Management in case of Manufacturing Industries?

Ans. Scope Management is the process whereby the outputs, outcomes and benefits are identified, defined and controlled. Scope is used in management of projects to refer to the totality of the outputs, outcomes and benefits and the work required to produce them.

It involves defining and controlling what is included and excluded in a project. It includes:

a) Definition:
   i) Clearly define the project objectives, deliverables, constraints, and assumptions.
   ii) Specify the boundaries of the project, detailing what is in and out of scope.

b) Scope Planning:
   i) Develop a scope management plan outlining how scope will be defined, verified, and controlled.
   ii) Identify stakeholders and gather requirements to ensure all perspectives are considered.

c) Scope Change Control:
   i) Establish a formal process for handling scope changes ensuring they are documented, evaluated, and approved.
   ii) Assess the impact of changes on cost, schedule, and resources before approving or rejecting them.

d) Work Breakdown Structure (WBS):

i) Create a WBS to break down the project into manageable tasks and components.

ii) Assign responsibility for each work package to relevant teams or individual.

e) Scope Verification:

i) Ensure that project deliverables meet the defined acceptance criteria.

ii) Obtain formal acceptance from stakeholders before proceeding to the next project phase.

f) Scope Control:

i) Monitor and control changes to projects scope throughout the project life cycle.

ii) Implement corrective actions if the project starts to deviate from the defined scope.

g) Risk Management:

i) Identify and assess potential risks related to project scope.

ii) Develop contingency plans to address unforeseen scope challenges.

Ques2. Give a detailed overview of Scheduling by mentioning the utilisation of PERT and Gantt chart.

Ans. Scheduling is a crucial aspect of project management that involves planning, organizing, and controlling the tasks and resources to achieve project goals within defined constraints. Two commonly used tools for scheduling are PERT (Program Evaluation and Review Technique) charts and Gantt chart.

a) PERT Chart:

Purpose: Used for planning and scheduling tasks in a project, especially when there is certainty about the time needed for each activity.

Representation: Use nodes to represent tasks and arrows to represent tasks and arrows to represent the sequence of tasks. Each task node includes information about the expected duration and dependencies.

Critical Path: Helps identifying the critical path which is the longest sequence of dependent tasks that determine the minimum time needed to complete the project.

Probability and Variability: Incorporates probabilities to account for uncertainty in task durations. Three times estimates (optimistic, pessimistic, and most likely) are used to calculate the expected duration, considering the beta distribution.

b) Gantt Chart:

Purpose: Gantt charts are visual representations of a project schedule that display tasks and their duration over time. They provide a new clear view of project timelines, dependencies and resource allocation

Representation: Use horizontal bars to represent tasks or activities along a timeline. Each bar's length corresponds to the duration of the task, and the chart displays the start and end dates for each activity.

Resource Management: Assist in resource allocation by showing when specific resource are needed for particular tasks, helping prevent overloading or underutilization of resources.

Dependencies: Visually depicts task dependencies, allowing project managers to understand the sequence of activities and plan accordingly.

Utilization of PERTS and Gantt charts:

a) Easy Project Planning: Useful during early stages.

b) Detailed Planning: Analysis and visual representation

c) Communication: Communication with stakeholders.

Ques3. What are the various parameters for deciding quality of project? Support your answer by citing any institution.

Ans. Project quality is continually measuring the quality of all activities and taking corrective action until the team achieves the desired quality.

These help to:

a) control cost of the project.
b) Establish standards to aim for.
c) Determine steps to achieve standards.

Effective quality management of a project also lowers the risk of product failure or unsatisfied clients.

Taking Symbiosis Law School's LMS. Following parameters can be considered while deciding the quality of the system:

a) Functionality: The LMS effectively manages library operations such as cataloging, check-in/check-out, and inventory management. It supports features like searching, reservation and tracking of books to meet the the functional requirements of library.

b) Reliability: Students and faculty rely on the LMS for accurate and consistent information about the library's collection. The system should be dependable ensuring that transactions are recorded accurately and can be trusted for the availability status of books.

c) Usability: Should be user friendly for both library staff and patrons. An intuitive design, easy navigation, and clear instructions contribute to a positive user experience.

d) Efficiency : This system should efficiently handle tasks like processing book transactions, generating reports, and managing user accounts. Efficient software contributes to timely and smooth library operations without unnecessary delays.

e) Maintainability : Regular updates, bug fixes, and system enhancements are essential for an LMS. A maintainable system allows for easy modifications and improvements to adapt to changing library needs, technology updates, or regulatory requirements.

f) Portability : Depending on the infrastructure at SLS the LMS is designed to run on relevant platforms and integrate seamlessly with existing system. This ensures flexibility and compatibility with hardware or software environments.

g) Security : Protecting sensitive user data, transaction records and library information is critical. The LMS should have robust security measures to prevent unauthorized access, data breaches, or any form of data loss.

In context of Symbiosis Law School's Library Management System, ensuring high software quality involves addressing these factors to provide a reliable, user-friendly, efficient and secure platform for effective management.

Ques 4. Discuss:

a) Project Selection Process:

Project selection is the evaluation of project ideas to help decide which project has the highest priority. It is an important part of project portfolio management (PPM), which is a process used by project by project management organizations (PMOs) and project managers to analyze the potential return on undertaking a project. When project managers select a program, the may consider the following factors:

a) Costs
b) Resources
c) Benefits or ROI
d) Duration
e) Risks

Methods: Cost Benefit Analysis, Payback period, Discounted cash flow, Opportunity costs, Ranking method, Scoring model, Analytical hierarchy process.

b) Reverse Engineering:

Process of recovering the design, requirement specifications and functions of a product from an analysis of its code. It builds a program database and generates information from this. The purpose of reengineering is to facilitate the maintenance work by improving the understandability of a system and producing the necessary documents for a legacy system. It can extract design information from source code, but the abstraction level, the completeness of the documentation, the degree to which tools and a human analyst work together, and the directionality of the process are highly variable.

c) Human Resource Planning:

Human Resource Planning is the continuous process of systematic planning to achieve optimum use of an org's most valuable asset - quality employees. It ensures the best fit between employees and jobs while avoiding manpower shortages or surpluses. There are 4 key steps to the process. They include analysing present labor supply, forecasting labor demand, balanced project labor demand with supply and supporting organizational goals. It serves as a link between human resource management and the overall strategic plan of an organization.

d) Risk Identification and Mitigation:

Risk Mitigation is a strategy to prepare for and lessen the effects of threats faced by a business. Comparable to risk reduction, risk mitigation takes steps to reduce the negative effects of threats and disasters. Risk Assessment simply means to describe the overall process or method to identify risk and problem factors that might cause harm. It is actually a systematic examination of a task or project that you perform to simply identify significant risks and find out control measures.

e) Work Breakdown Structure:

Work Breakdown Structure is the tool that utilizes this technique and is one of the most important project management documents. It singlehandedly integrates scope, cost and schedule baselines ensuring that project plans are in alignment. The PMI defines WBS as, 'deliverable oriented hierarchical decomposition of the work to be executed by the project team. There are 2 types of WBS: a) Deliverable based
b) Phase based

Qus6. Define Software Reliability and its impact on the success of a project.

Ans. Software Reliability means Operational reliability. It is described as the ability of a system or component to perform its required functions under static conditions for a specific period.

Software reliability is also defined as the probability that a software system fulfills its assigned task in a given environment for a predefined number of input cases and assuming that the hardware and the inputs are free of error. It is an essential connect of software quality, composed with functionality, usability, performance serviceability, capability, installability, maintainability, and documentation.

Software reliability is hard to achieve because the complexity of software turn to be high. While any system with a high degree of complexity, containing software, will be hard to reach a certain level of reliability system developers tend to push complexity into the software layer, with the speedy growth of system size and ease of doing so by upgrading the software.

It is the probability of failure-free operation of a computer program for a specified period in a specified environment. It is a customer-oriented view of software quality. It relates to operation rather than design of the program and hence it is dynamic rather than static.

Impact of Software Reliability on the success of a project.

a) Consistent Performance: Reliable software ensures steady and predictable performance, contributing to a positive user experience.

b) Minimized failures: The impact of unexpected failures is reduced, enhancing system stability and preventing disruptions that could jeopardize the project's success.

c) User satisfaction: A reliable software system boosts user satisfaction by providing a dependable and efficients solution, which is vital for the success of any project.

d) Reduced Downtime: Reliable Software minimizes downtime due to system failures, ensuring continuous availability and functionality, which is crucial for meeting project timelines.

e) Confidence Building: Reliability instills confidence in users and stakeholders, fostering trust in the project's capabilities and contributing to its success.

f) Risk Mitigation: Reliable software mitigates the risk of critical errors, preventing potential negative consequences and ensuring a smoother project implementation.

g) Financial Impact: The financial implications of an unreliable software, such as increased support demands and potential losses, can have a direct negative effect on the project's overall success.

Ques7. Explain various benefits of Verification and Validation in Software development.

Ans. Verification: Verification is the process of determining whether a software system or component meets its specified requirements and adheres to the design and technical standards. It involves checking the softwares for correctness, completeness and compliance with intended functionality. Verification ensures that the software has been developed correctly.

Validation: Validation is the process of ensuring that data or inputs meet the required criteria and are suitable for the intended purpose. It is a crucial step in preventing erroneous or inappropriate data from being processed further. Validation is commonly used in various software applications, such as web forms, database systems and user interfaces, to ensure data accuracy and integrity.

Benefits of Validation and Verifications

a) Bug Identification: Verification and validation processes help identify and address bugs and issues in the early stages of software development, reducing the likelihood of critical errors in the final product.

b) Improved Quality: By systematically checking and validating each phase of development, software quality is enhanced, leading to a more reliable and robust end product.

c) Cost Savings: Early detection and resolution of issues through verification and validation prevent costly fixes later in the development lifecycle, contributing to overall cost savings.

d) Customer Satisfaction: Thorough verification and validation result in a software product that meets or exceeds customer expectations, leading to higher satisfaction and better user experience.

e) Risk Mitigation: Systematic testing helps identify and mitigate potential risks associated with the software, ensuring a more predictable and secure developmental process.

f) Compliance Assurance: Verification and validation process ensure that the software adheres to industry standards, regulations, and requirements, ensuring legal and regulatory compliance.

g) Timely Delivery: Identifying and fixing issues early in the development lifecycle helps in adhering to project timelines, ensuring timely delivery of the software project.

h) Enhanced Maintenance: A throughly validated software product is easier to maintain, reducing the effort and resources required for ongoing support and updates.

i) Process Improvement: The feedback obtained during verification and validation processes allows for continuous improvement of development processes, leading to increased efficiency and effectiveness over time.

Ques8. A software development project is binding for government contract in development of High-risk Defence System. Explain and identify what types of risks are there in the system and mention different mitigation techniques to be applied in removing or minimising these risks.

Ans. a) Security Risk:

Implement stringent security protocols, conduct through penetration testing, and adhere to established security standards to safiguard against cyber threats.

b) Operational Risks:

Develop comprehensive operational procedure, conduct simulations, and provide extensive training to minimize human errors and operational failures.

c) Compliance Risks:

Regularly audit and ensure compliance with government regulations, industry standards, and specific defense system requirements throughout the development process.

d) Technological Risks:

Conduct feasibility studies, adopt proven and reliable technologies, and establish contingency plans for technology-related challenges.

e) Integration Risks:

Develop a well-defined integration strategy, perform through testing at each integration point, and employ modular development practices to facilitates smoother integration.

f) Budgetary Risks:
Implement robust project cost estimation, continuous monitoring of expenses, and establish contingency funds to address unforeseen financial challenges.

g) Schedule Risks:
Develop a realistic project schedule, regularly monitor progress, and implement agile project management methodologies to adapt to changing circumstances.

h) Supply Chain Risks:
Diversify suppliers, maintain clear communication with vendors, and establish backup plans to address potential disruptions in the supply chain.

i) Quality Assurance Risks:
Implement a robust quality assurance process, conduct thorough testing at each development stage, and adhere to industry best practices to ensure the system's reliability and performance.

j) Geopolitical Risks:
Stay informed about geopolitical developments, establish contingency plans for potential geopolitical disruptions, and consider geopolitical factors in project risk assessments.

k) Ethical Risks:
Establish clear ethical guidelines, conduct regular ethical reviews, and ensure transparency in decision-making to mitigate risks related to ethical considerations.

Ques9. A software development team is using COCOMO to estimate effort but they face challenges due to the evolving requirements and technology. Suggest different method by which these challenges can be addressed while using COCOMO for estimation.

Ans. Incremental Development:

Adopt an incremental development approach, breaking the project into manageable increments. This allows for adjustments in estimation as requirements evolve, with each increment building the previous one.

Prototyping:

Use prototyping to iteratively refine and validate requirements. This helps in gaining a clearer understanding of evolving needs and facilitates more accurate estimation in subsequent stages.

Agile Methodologies:

Embrace Agile methodologies, such as Scrum or Kanban which accomodate changing requirements and foster regular communication between the development team and stakeholders. COCOMO estimates can be adjusted during each iteration.

Continuous Communication:

Maintain open and continuous communication channels between the development team and stakeholders. Regular updates and feedback can help in refining requirements and adjusting effort estimates accordingly

Risk Management:

Conduct thorough risk assessments to identify potential changes in requirements or technology. Allocate contingency reserves in the estimation for addressing uncertainties associated with evolving project variables.

Flexible Resource Allocation:

Have a flexible resource allocation plan that allows for scaling the team up or down based on changing project requirements. COCOMO estimates can be adjusted to reflect the impact of resource changes.

Baseline Estimation:

Develop a baseline estimation early in the project based on the initial set of requirements. As the requirements evolve, use this baseline as a reference point for adjusting the estimates rather than starting from scratch.

Regular Estimation Reviews:

Conduct regular reviews of the COCOMO estimates throughout the project. This allows for continuous refinement based on the evolving understanding of requirements and technology.

Documentation Process:

Maintain detailed documentation of requirements and changes This document serve as a reference for estimating the impact of evolving requirements on the project scope and effort.

Historical Data Analysis:

Analyze historical project data identify patterns and trends related to evolving requirements and changing technologies Use this analysis to inform future COCOMO estimates.

Scenario Analysis:

Perform scenario analysis to evaluate the impact of various possible changes in requirements and technology on effort estimates. This helps in creating more robust and adaptable estimates.

Ques10. Draw a comparison chart for the following:

a) Spiral Model V/S Prototype Model

Aspect	Spiral Model	Prototype Model
Development Process	Iterative & Incremental	Iterative & Incremental
Primary focus	Managing risks through Iterative prototyping	Early user feedback through rapid prototyping
Phases	Planning, risk analysis, engineering, evaluation	Requirements, Design Implementation, User evaluation.
Iterations	Multiple cycles of planning, risk analysis, and development	Quick iterations of prototyping and refinement
Risk Management	High emphasis on risk identification & mitigation	addresses risks through continuous user feedback
User Involvement	Limited until later iterations	Active user participation
Suitability	Large & complex	Unclear and evolving requirements.
Documentation	Comprehensive documentation	Prototyping doc and feedback

b) Black box-testing v/s White box Testing

Aspect	Black Box	White Box
Focus	External behaviour and functionality	Internal logic, code structure & implementation
Knowledge Requirement	No knowledge of internal code struc.	Requires knowledge of internal code & algo
Testing Level	Typically applied at system and acceptance testing levels	Applied at unit, integration and system -testing levels
Test-Cases	Derived from specification and requirements	Derived from code struc. logic and algo
Testing Approach	Functional and Non-functional	Unit/Integration, System and Acceptance testing
Design Visibility	No knowledge of internal design or code	Full knowledge of internal design and code.
Error Localization	Identifies errors but provides limited information about the location	Enables precise localization of error within the code.