

Software Project Management Planning a Software Project Chapter-2:SPM

Prof. Arpita Vaidya

Assistant Professor

Department of Computer Science and Engineering

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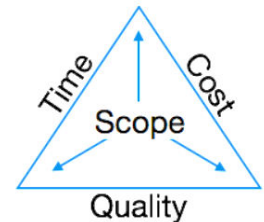
SPM

Software Project Management (SPM) is a proper **way of planning and leading software projects**.

It is a part of **project management in which software projects are planned, implemented, monitored, and controlled**.

Requirement of SPM

It is necessary for an organization **to deliver quality products, keep the cost within the client's budget** constraint and **deliver the project as per schedule**.



MANAGEMENT SPECTRUM

The **management spectrum** describes the **management of a software project**. The management of a software project **starts from requirement analysis** and **finishes based on the nature of the product**. It may or may not end because almost all software products faces changes and requires support. **It is about turning the project from plan to reality**. Here, the manager of the project has to control all these P's to have a smooth flow in the progress of the project and to reach the goal.

People, Product, Process, Project

The management spectrum focuses on the **four P's** -

1. **People**
2. **Product**
3. **Process**
4. **Project.**

People, Product, Process, Project

People is the most important component of a product and its successful implementation is human resources. In building a proper product, a well-managed team with clear-cut roles defined for each person/team will lead to the success of the product.

We need to have a **good team in order to save our time, cost, and effort**. Some assigned roles in software project planning are **project manager, team leaders, stakeholders, analysts** and other **IT professionals**. Managing people successfully is a tricky process which a good project manager can do.

People, Product, Process, Project

Product is the ultimate goal of the project. This is any types of software product that has to be developed.

To develop a software product successfully, **all the product objectives and scopes should be established, alternative solutions should be considered and technical & management constraints should be identified beforehand**. Lack of these information, it is impossible to define reasonable and accurate estimation of the cost, an effective assessment of risks, a realistic breakdown of project tasks or a manageable project schedule that provides a meaningful indication of progress.

People, Product, Process, Project

A software **process** provides the framework from which a **comprehensive plan for software development** can be established.

It regulates how the team will go about its **development in the respective time period**. The **Process has several steps involved like - documentation phase, implementation phase, deployment phase, and interaction phase.**

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People, Product, Process, Project

The **project** is the complete software project that **includes requirement analysis, development, delivery, maintenance and updates**. It can also be considered as a **blueprint of process**.

In this phase, the project manager plays a critical role. They are responsible to guide the team members to achieve the project's **target and objectives, helping & assisting** them with issues, **checking on cost and budget** and making sure that the project stays on track with the given **deadlines**.

W5HH Principle

W5 -> Why, What, When, Who, Where

HH -> How, How Much

Barry Boehm gave a philosophy that **prepares easy and manageable designs or outlines for software projects.**

The W5HH principle in software management exists to **help project managers** guide objectives, timelines, responsibilities, management styles and resources.

W5HH Principle

Boehm suggests an approach (W5HH) that **addresses project objectives, milestones and schedules, responsibilities, management and technical approaches, and required resources.**

Why is the system being developed?

All the stakeholder makes the assessment of the business reason whether this **business needs the software or not?**

What will be done?

The answers to these questions help the team to establish a project schedule by identifying key project tasks and the milestones that are required by the customer. **OR**
Here we define all the task we will do in the project.

W5HH Principle

When will it be accomplished?

Here the team define all schedule to achieve milestone.

Who is responsible for all function?

You will define all the roles and responsibilities of the different roles of each member in whole project.

Where are they located organizationally?

Software developer, customer, end user and other stakeholders also have responsibility.

W5HH Principle

How will the job be done technically and managerially?

Define management and technical strategy must be defined. i.e How we will do things technically, how we will manage things.

How much of each resource is needed?

It is just estimation of the project, Here we make estimate how much resource are required for the completion of the project.

IMPORTANCE OF TEAM MANAGEMENT

A **team** is a small group of people with complimentary skills who are committed to a common purpose.

Team management refers to activities, strategies, and actions that bring a group of people together to work effectively towards a common goal and **enhanced productivity and effectiveness** are the main reason for working in a group.

IMPORTACE OF TEAM MANAGEMENT

Characteristics of Team Management

- Everyone works towards a common goal.
- Everyone has a predefined role in the team, leading to lesser conflicts.
- Everyone has the platform the means to communicate openly with everyone.

IMPORTACE OF TEAM MANAGEMENT

Team management is a crucial aspect of software engineering that ensures the successful execution of projects and delivery of high-quality software.

1. Efficient Task Allocation

- ❖ Proper team management ensures **tasks are assigned based on individual strengths and expertise**, enhancing productivity and reducing bottlenecks.
- ❖ Clearly defined roles and responsibilities minimize confusion and improve accountability.

IMPORTACE OF TEAM MANAGEMENT

2. Collaboration and Communication

- ❖ Software engineering involves developers, testers, designers, and project managers. which enables collaboration and communication among team members.
- ❖ Encourages knowledge sharing, reducing misunderstandings and improving problem-solving.

3. Meeting Deadlines

- With well-organized team management, project timelines can be tracked effectively, ensuring milestones are achieved on time.
- Helps in identifying potential delays.

IMPORTACE OF TEAM MANAGEMENT

4. Conflict Resolution

- Diverse teams can face conflicts due to differences in opinions, work styles, or priorities. Good team management helps in resolving conflicts constructively.

5. Quality Assurance

- the team ensures that software quality is maintained throughout development.
- Proper management ensures adherence to coding standards, testing protocols, and quality benchmarks.

IMPORTACE OF TEAM MANAGEMENT

6. Motivation and Morale

- Effective management boosts team morale by recognizing and rewarding contributions.
- Motivated teams are more likely to deliver innovative and high-quality solutions.

7. Risk Mitigation

- Team management helps in identifying potential risks early, such as resource shortages or technical challenges.
- Enables teams to implement strategies to minimize risks and ensure project continuity.

IMPORTACE OF TEAM MANAGEMENT

8. Adaptability to Change

- Software engineering often requires teams to adapt to changes, such as revised client requirements or technology updates.
- Good team management ensures smooth transitions and minimizes disruption.

9. Better Decision-Making

- Encourages collective decision-making by involving team members with diverse skills and perspectives.
- Results in well-informed and balanced decisions that benefit the project.

IMPORTACE OF TEAM MANAGEMENT

10. Achieving Project Goals

- A well-managed team aligns individual efforts with project goals, ensuring everyone works toward a common objective.
- Increases the likelihood of project success and customer satisfaction.

PLANNING A SOFTWARE PROJECT

Planning a software project is a critical phase in software development, ensuring the project's **objectives** are **clearly defined**, **risks** are **minimized**, and **resources** are **effectively utilized**.

Below are the essential components to consider during project planning-

SCOPE OF SOFTWARE PROJECT

1. **Scope and Feasibility-**

“Scope” refers to the **clearly defined boundaries of what the project will include, outlining the features, functionalities, deliverables, and limitations of the software**, essentially acting as a roadmap to guide development and ensure everyone involved understands exactly what needs to be built and what is not included.

FEASIBILITY OF SOFTWARE PROJECT

The feasibility study Feasibility Study in Software Engineering is a study to evaluate feasibility of proposed project or system.

1. Technical Feasibility
2. Operational Feasibility
3. Economic Feasibility
4. Legal Feasibility
5. Schedule Feasibility

FEASIBILITY OF SOFTWARE PROJECT

1. Technical Feasibility-

Technical Feasibility analyzes/evaluates **current resources for hardware, software, and technology needed to develop the project**. This technical feasibility study provides information on whether the appropriate resources and technology required for use in project development are in place.

FEASIBILITY OF SOFTWARE PROJECT

2. Operational Feasibility-

Operational feasibility evaluates whether the software will **fit smoothly into the organization's existing processes** and **whether users can adapt**. It considers factors **like user training, change management, and the impact on daily operations**.

FEASIBILITY OF SOFTWARE PROJECT

3. Economic Feasibility-

Project costs and benefits are analyzed in a profitability study. **A detailed analysis of the costs of the development project will be made.** This includes all costs necessary for the final development, such **as hardware and software resources required, design and development costs, operating costs,** etc. It is then analyzed whether the project is financially beneficial to the organization.

FEASIBILITY OF SOFTWARE PROJECT

4. Legal Feasibility-

In a legal feasibility study, the project is analyzed from **the view of legality**. This includes analysis of obstacles in the **legal implementation of the project, data protection or social media laws, project certificates, licenses, copyrights**, etc. Overall, a legal feasibility study is a study to determine whether a proposed project meets legal and ethical requirements.

FEASIBILITY OF SOFTWARE PROJECT

5. Schedule Feasibility-

A schedule feasibility study mainly analyzes the proposed project **deadlines/deadlines**, including the time it will take the team **to complete the final project**.

PLANNING A SOFTWARE PROJECT

2. **Effort Estimation-**

Effort estimation in software development is the process of quantifying the amount of **work that can be done in terms of person-hours or person-days needed to accomplish a given task or the whole project.**

The whole process of the SDLC, that is- **the gathering of requirements** and preparation of **specifications**, the design, the **coding** and **testing** of the software, and **the maintenance** of the software.

EFFORT ESTIMATION

1. Effort Estimation-

Barry Boehm in the **1970s** put forward the **Constructive Cost Model (COCOMO)**, the first of its type for software effort prediction.

Choosing the right estimation approach depends on various factors, including:

- Project Size and Complexity
- Data Availability
- Development Methodology
- Team Experience

Schedule and Staffing

Schedule and Staffing-

A **Schedule** in your project's time table actually consists of **sequenced activities and milestones** that are needed to be **delivered under a given period of time**.

- ❖ Refers to the timeline for completing various tasks, activities, and milestones within a software project.
- ❖ Ensures that project deadlines and deliverables are met.

Schedule and Staffing

- ❖ Developed using project planning tools and techniques such as Gantt charts, Critical Path Method (CPM), and Program Evaluation and Review Technique (PERT).
- ❖ Includes key milestones, task dependencies, buffer times, and deliverable timelines.

There are several **advantages** provided by **project schedule** in our project management:

- 1) It simply ensures that everyone remains on same page as far as tasks get completed, dependencies and deadlines.

Schedule and Staffing

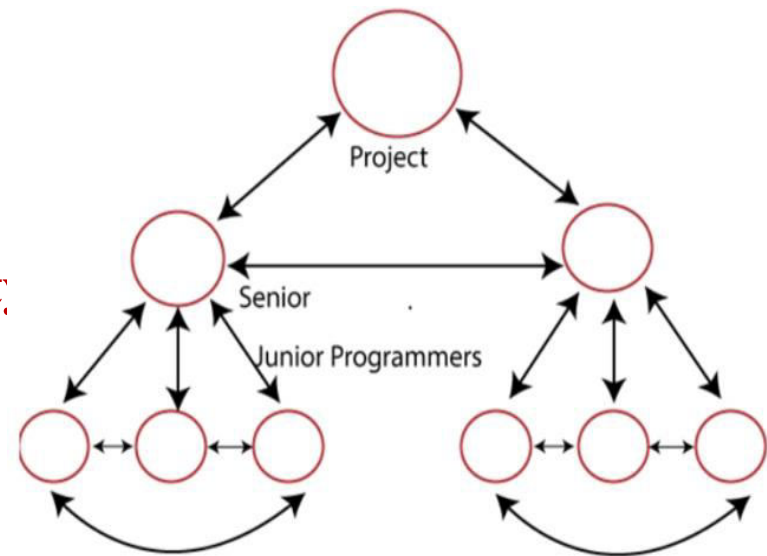
- 1) It helps in identifying issues early and concerns such as lack or unavailability of resources.
- 2) It provides effective budget management and risk mitigation.

Staffing-

- Involves assigning the right number of **person with appropriate skills** to project tasks.

Schedule and Staffing

- Determines the **roles and responsibilities of team members** (e.g., developers, testers, designers).
- Accounts for factors **like resource availability, skill levels, and team dynamics**.
- Ensures **staffing** levels are sufficient for each phase of the project, **from design to deployment**.



Quality Planning

Quality Planning-

Quality planning is one of the most critical aspects of project management. It helps ensure that **projects are done correctly and on time, meeting the needs and expectations of the customer.**

Components of Quality Planning-

1. **Quality Objectives** - such as **performance, reliability, usability, and maintainability.**
2. **Identifying Quality Standards** - Adopt **industry standards (e.g., ISO 9001, CMMI)** and project-specific **benchmarks.**

Quality Planning

3. **Planning Testing Strategies** - Define the types of tests (e.g., unit testing, integration testing, system testing) and the testing environment.
4. **Allocating Quality Roles** - for quality assurance and control activities, including testers, developers, and QA leads.
5. **Continuous Improvement Processes** - feedback

Risk Management

Risk management-

Risk Management is a **systematic process of recognizing, evaluating, and handling threats or risks** that have an effect on the finances, capital, and overall operations of an organization.

These risks can come from different areas such as **financial instability, legal issues, errors in strategic planning, accidents and natural disasters.**

Risk Management

Characteristics of risk -

- I. Uncertainty:** The risk may or may not happen.
- II. Loss:** If the risk occurs in reality, undesirable results or losses will occur.

Risk Management

Risk Management Process-

1. Risk Identification-

Risk identification refers to the systematic **process of recognizing and evaluating potential threats or hazards** that could negatively impact an organization.

This involves identifying various types of risks, ranging from **IT security threats** like **viruses** and **phishing attacks** to **unforeseen events** such as equipment **failures** and **extreme weather conditions**.

Risk Management

There are **different types of risks** which can affect a software project:

- Technology risks – related to H/w & S/W tech. required to build s/w
- People risks- related to development team
- Organizational risks – related to org. where S/W is being created.
- Tools risks – related to using tools & other S/W
- Requirement risks- related to users/customers/stake-holders
- Estimation risks- related to cost of the resources required to build the software.

Risk Management

2. Risk Assessment

Risk assessment simply means to **describe the overall process or method to identify risk and problem factors that might cause harm.**

It is a systematic examination of a task or project that you perform to simply identify significant risks, problems and hazards, and then to find out control measures that you will take to reduce risk.

Risk Management

Key Steps in Risk Assessment:

- Identification of Risk – like Technical risks, Operational risks etc.
- Risk Analysis – Qualitative Analysis , Quantitative Analysis
- Risk Prioritization
- Risk Evaluation and Risk Tolerance
- Assessing Risk Impact
- Documenting Risks and Results

Risk Management

Importance of Risk Assessment:

- ❖ Proactive Risk Management
- ❖ Informed Decision Making
- ❖ Improved Resource Allocation
- ❖ Risk Minimization
- ❖ Enhanced Communication

Risk Management

3. Risk Control

Risk control in software engineering refers to the processes and practices implemented to manage, mitigate, and monitor risks that can affect a software project's success. Effective risk control is vital to ensuring that projects are completed on time, within budget and to the required quality standards.

Risk Management

Key Elements of Risk Control:

- Regular Monitoring and Review
- Communication
- Risk Transfer
- Risk Acceptance

Importance of Risk Control:

- Proactive Management
- Resource Efficiency
- Project Success

Risk Management

4. Project Monitoring Plan

A Project Monitoring Plan is a strategic framework for tracking the progress of a software project to ensure that it is completed on time, within scope, and according to the desired quality standards.

It involves continuously assessing the performance, identifying issues early and making necessary adjustments to meet project goals.

Risk Management

Key Components of a Project Monitoring Plan:

- ❖ Setting Milestones and Deliverables
- ❖ Regular Progress Reports
- ❖ Risk Management Updates
- ❖ Quality Control Monitoring
- ❖ Team and Resource Monitoring
- ❖ Project Meetings and Communication
- ❖ Performance Reviews and Adjustments

Risk Management

Importance of a Project Monitoring Plan:

- ✓ Early Detection of Issues
- ✓ Better Decision-Making
- ✓ Stakeholder Confidence
- ✓ Improved Resource Management

5. Detailed Scheduling

It **refers to the process of creating a comprehensive timeline that outlines all tasks, milestones, deadlines, and dependencies required to complete a software project.**

Key Components of Detailed Scheduling:

- Work Breakdown Structure (WBS)
- Task Identification and Breakdown
- Dependencies and Precedence Relationships

Risk Management

- Time Estimates and Resource Allocation
- Gantt Charts
- Regular Updates and Monitoring

Importance of Detailed Scheduling:

- ☐ Better Resource Management
- ☐ Improved Timeline Accuracy
- ☐ Risk Reduction
- ☐ Clear Communication
- ☐ Project Control

PPT Content Resources Reference :

1. Book Reference

Software Engineering: A Practitioner's Approach, by R.S.Pressman published by TMH.

2. Reference Books:

3. Software Engineering, 8th Edition by Sommerville, Pearson.
4. Software Engineering 3rd Edition by Rajiv Mall, PHI.
5. An Integrated Approach to Software Engineering by Pankaj Jalote Wiley India, 2009.

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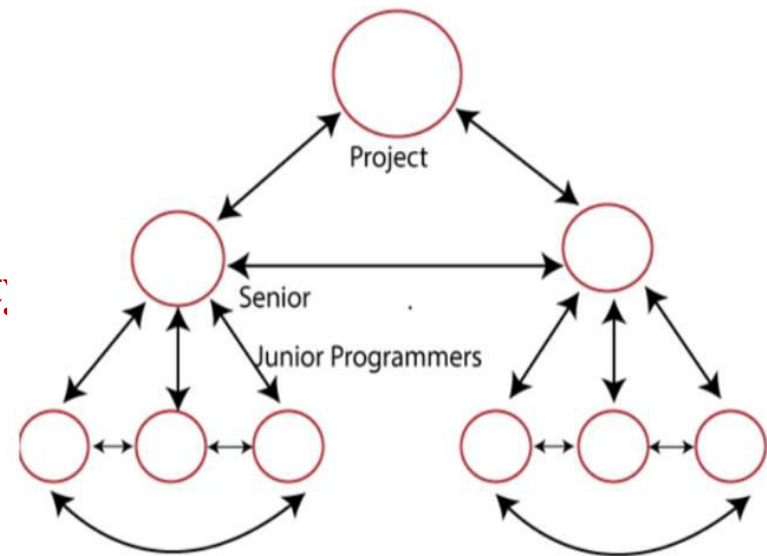
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