Software Project Management (SPM)

Course Code: CACS407
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Credit Hours: 3hrs

Unit - 01: Software Project Management Concepts

Class Load : 8 hrs

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Unit -1

Software Project Management Concepts **8 Hrs**

Introduction, Project and Software project, Software project vs other project, Importance and Problems in software project management, Process of SPM. Characteristics of good project manager, Successful Software Project Manager, Overview of Software Project Planning.

Introduction Session:

Hello Students!

Early Motivation:

Need Further Motivation?

- PMI estimate for project management jobs in the last decade (2010-20) was 15.7 million.
- 6.2 million jobs under that predicted were from United States alone.
- Lowest average base salary is $75,000/yr as of Apr, 2023 according to **Payscale Inc.**
- You get to learn and re-evaluate teamwork, problem solving, task management and soft skills.

Stats:

Project Management Professional (PMP) Jobs by Salary

Job Title	Range	Average
Project Manager, (Unspecified Type / General)	$62k - $127k	$89,542
Senior Project Manager, IT	$90k - $149k	$118,311
Project Manager, Information Technology (IT)	$70k - $135k	$98,452
Information Technology (IT) Director	$93k - $193k	$145,623
Director of Operations	$70k - $176k	$120,417
Program Manager, IT	$90k - $156k	$122,336
Vice President (VP), Operations	$90k - $219k	$150,477

Motivated?


When you suddenly find out how much your PM earns:
I go to Project Management

Introduction

1.1

SPM:

Software Project Management (SPM) is the process of managing and leading software projects to achieve specific goals, within the constraints of time, cost, and scope.

- It's essentially a framework for ensuring that software projects are completed on time, within budget and meet the desired quality standards.
- Example: Navigating a Forest.
  - Project Manager: Guide
  - Team: Explorers
  - Project Goal: Reaching the destination.

Project and Software Project 1.2

What is a Project ?

Project:

A project is a unique endeavor to produce a set of deliverables within clearly specified constraints of time, cost and quality.

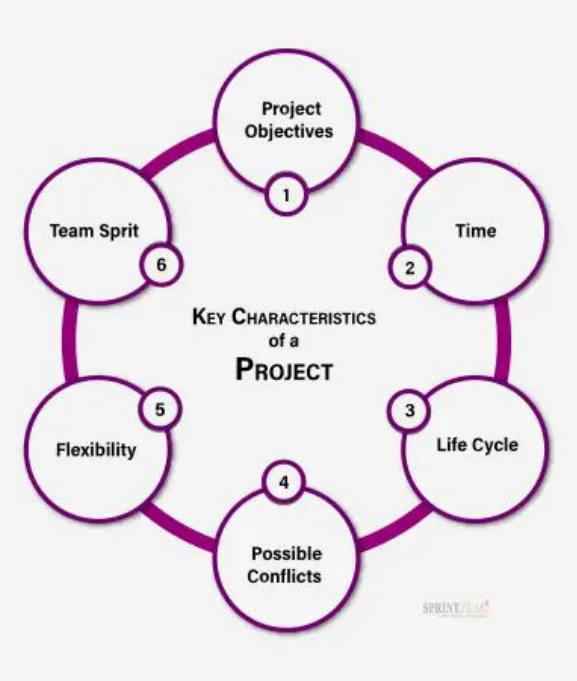
➔ Projects are different from business operations, in terms of uniqueness, timescale, budget, resources, risk and change.

Characteristics of a Project:

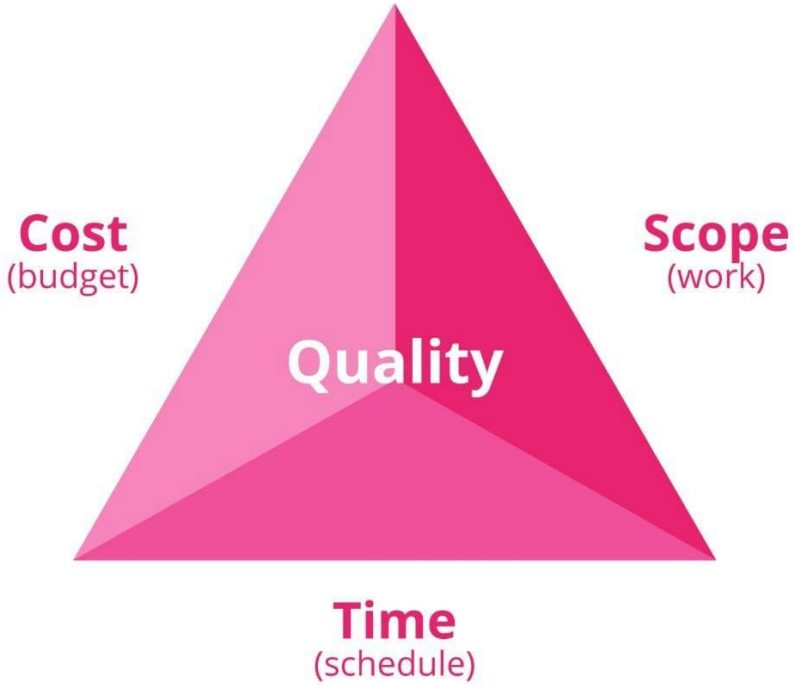
- **Uniqueness: Every project is different from the last,** whereas operational activities typically involve repetitive (if not identical) processes.
- **Timescale:** A project **has clearly specified start and end dates** within which deliverables are produced to meet the customer's requirements.
- **Budget:** A project has **a maximum limit to the expenditure** within the deliverables must be produced, to meet the customer's requirement.
- **Resources:** A project is **allocated a specified amount of labor, equipment and materials at the start.**
- **Risk:** A project **entails uncertainty** and therefore carries business risk.
- **Change:** The purpose of a project is typically to improve an organization through the implementation of business change.

Project:


Characteristics of a project
A clear start and end date
A project has boundaries
A project creates something new
A project is not business as usual


Project Objectives
1
Time
2
Life Cycle
3
Possible Conflicts
4
Flexibility
5
Team Sprit
6
Key Characteristics of a Project

Constraint of a Project:



Project Management:

Project Management is the **utilization of skills, tools and management processes** to undertake a project successfully.

➔ A project management methodology includes:

- **A Set of Skills:** Specialized knowledge, skills and experience help **reduce a project's level of risk** and thereby increase its likelihood of success.
- **A Suite of Tools:** Project Managers use various types of tools to improve a project's success rate.
  - **Examples include**; templates, forms, registers, software and checklists
- **A Series of Processes:** A suite of management processes are needed to monitor and control the project, such as **time management, cost management, quality management, change management, risk management and issue management.**

Software Project:

- **Definition:**

  A software project is the **structured** effort of designing, developing, testing, and delivering a software **product or feature.** It involves planning and resource allocation within **defined constraints** (time, cost, scope).

- **Examples:**
  - Developing a new feature for an existing product, building a custom software solution for a client, or creating an app as part of a larger system.
  - Nagarik App of GoN

Characteristics of Software Project:

- **Intangible product:** Unlike building a house, the **final output** of a software project is software, which is intangible.
- **High complexity:** Software applications involve **intricate components and technologies**, requiring technical expertise.
- **Frequent changes:** User needs, technology advancements, and feedback often demand **adjustments** to the software throughout the project.
- **Higher uncertainty:** Due to its intangible nature and dynamic environment, software development is **inherently more unpredictable**.

Software Project vs Other Project

1.3

Software Project vs Other Project:

The product of software project have certain characteristics which make them different.

- **Invisibility:** When a physical artifact such a bridge or road is being constructed the progress being made can actually be seen. **With software, progress is not immediately visible.**
- **Complexity:** Per dollar, pound or euro spent, **software products contain more complexit**y than other engineered artifacts.
- **Conformity:** The traditional engineer is usually working **with physical systems and physical materials like cement and steel.** These systems can have some complexity but are governed by physical laws that are consistent. Software developers have to confirm to the requirements of human clients **that certainly keeps on fluctuating.**
- **Flexibility:** The ease with which **software can be changed** is usually seen as one of its strengths. Software systems are subject to a high degree of change.

Software Project vs Other Project:

Features	Software Project	Other Project
1. Tangible	Not Tangible	It is tangible
2. End Product	Not clearly defined	Very clearly defined
3. Production	No fixed production plan	Fixed production plan
4. Productivity	Affected changes in employee	Is not greatly affected
5. Methodology	Varies widely on a project basis	Typically standard
6. Ownership	Easily Copy or Distribute	Can't Copy or Distribute
7. Customization	Easily Customized	Require Effort to Customize

SOFTWARE PROJECT VS OTHER PROJECT

Process of SPM 1.4

What is management?

- The **Open University Software Project management module (1987)** suggested that management involves the following activities:
  - **Planning:** deciding what is to be done;
  - **Organizing:** making arrangements ;
  - **Staffing:** selecting the right people for the right job;
  - **Directing:** giving instructions;
  - **Monitoring:** checking on progress;
  - **Controlling:** taking action to remedy hold ups;
  - **Innovating:** Coming up with new solutions;
  - **Representing:** coordinate with users;

Activities Covered by SPM:

- A software project is **not only** concerned with the actual writing of software.
- "Off the shelf software" ???
  - **Is still fundamentally a software project as so many of the other elements associated with this type of project is present.**
- Three successive processes bring a new system into being as shown in figure below:

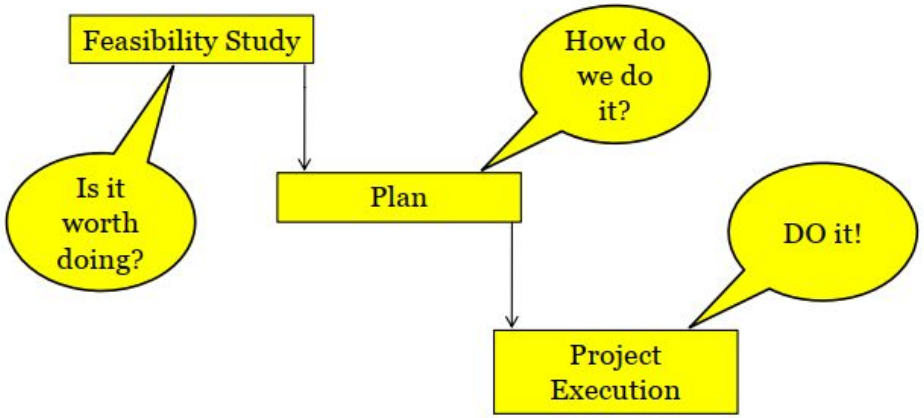
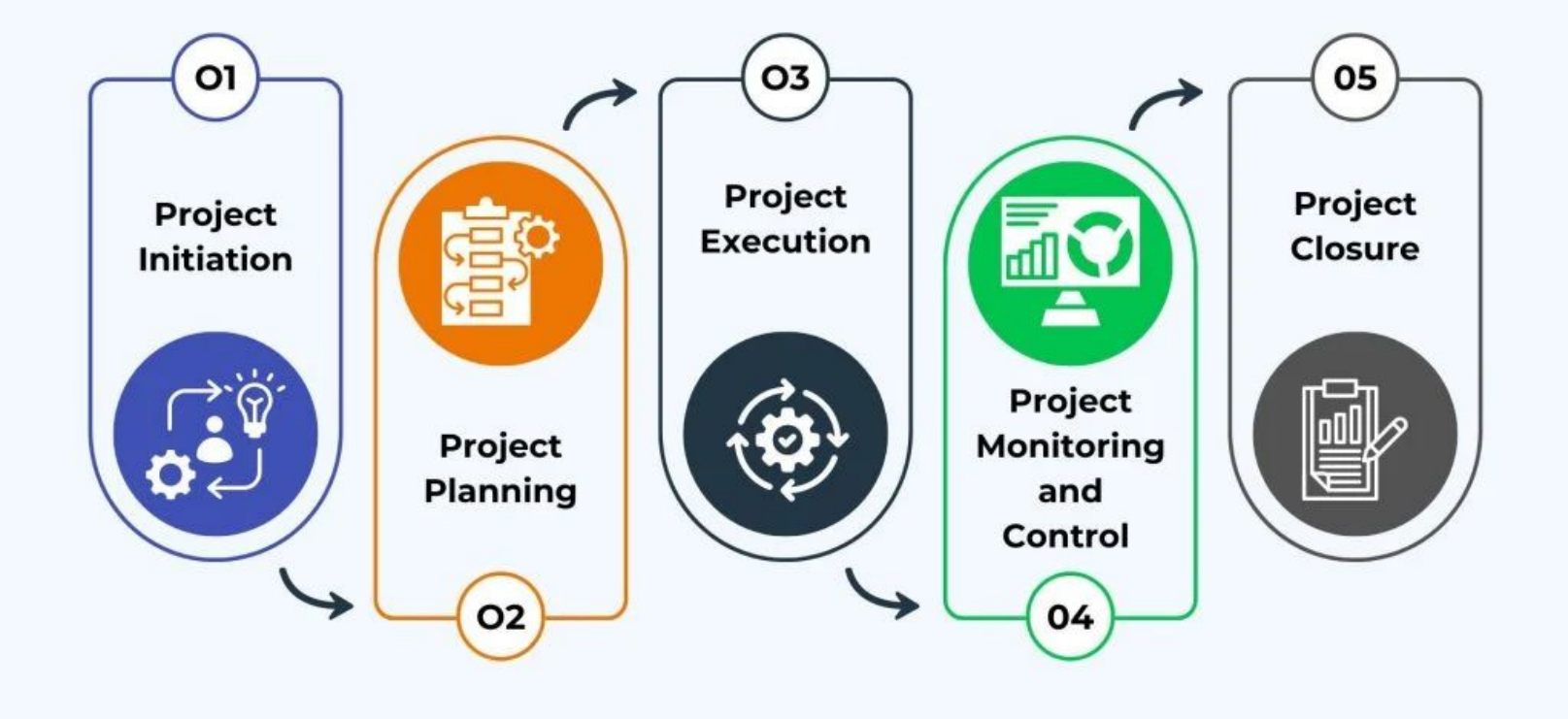


Fig: The feasibility study/plan/execution cycle

Process of SPM (Project Management Cycle):



SPM Process:

- **Initiation:**
  - Define the project's ***objectives, scope***, and ***constraints***.
  - Identify ***stakeholders*** and their ***requirements***.
  - Perform ***feasibility studies*** to assess the viability of the project.
  - Develop a ***project charter*** or initiation document.

SPM Process:

Planning:

- Define project ***goals***, ***deliverables***, and ***milestones***.
- Develop a project plan outlining tasks, resources, timelines, and ***dependencies***.
- Allocate ***resources*** (human, financial, and technical) appropriately.
- Identify risks and develop ***risk*** management strategies.
- Establish communication ***channels*** and reporting structures.
- Develop quality assurance and control processes.
- Create a budget and financial ***plan.***

SPM Process:

- **Execution:**
  - ***Implement*** the project plan according to the established timelines and milestones.
  - ***Assign tasks*** to team members and monitor their progress.
  - Conduct regular team ***meetings*** and status updates.
  - Manage changes to the project scope, schedule, and resources.
  - Ensure ***effective communication*** among team members and stakeholders.
  - Address any issues or risks as they arise.

SPM Process:

❖ Monitoring and Controlling:

- ➢ ***Track*** project progress against the plan.
- ➢ Monitor ***key performance indicators (KPIs)*** such as budget, schedule, and quality.
- ➢ Conduct ***regular reviews*** and ***audits*** to assess project performance.
- ➢ Take corrective actions to address ***deviations*** from the plan.
- ➢ Manage changes and scope ***creep*** effectively.
- ➢ Ensure ***compliance*** with relevant standards and regulations.

SPM Process:

Closure:

- Complete all project deliverables and documentation.
- Obtain ***formal acceptance*** from stakeholders.
- Conduct a ***post-project review*** to identify lessons learned.
- ***Archive*** project documentation and resources.
- ***Release*** the final product to the customer or end-users.
- Celebrate successes and ***recognize*** team contributions.

Importance & Problems in SPM

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Importance of SPM:

- **Increased Success Rate:** SPM helps define **clear goals**, manage resources **effectively**, and **mitigate risks**, leading to a higher probability of delivering projects on time, **within** budget, and meeting quality standards.
- **Reduced Costs:** Effective planning and resource management can **prevent** costly delays, overruns, and rework, **leading** to significant cost savings.
- **Improved Quality:** SPM emphasizes quality assurance practices throughout the development process, resulting in software that is reliable, secure, and meets user expectations.
- **Enhanced Communication:** SPM fosters clear and transparent communication among stakeholders, reducing misunderstandings and promoting collaboration.
- **Boosted Team Morale:** Well-managed projects with clear goals and effective leadership contribute to a positive and productive work environment for the team.

Problems of SPM:

- **Scope Creep:** **Uncontrolled changes** to the project scope, often due to unclear requirements or stakeholder pressure, can **lead to** delays, budget overruns, and compromised quality.
- **Poor Communication:** Insufficient communication between team members, stakeholders, and management can **lead to** misunderstandings, missed deadlines, and confusion.
- **Lack of Planning:** Inadequate planning during the initial stages can lead to **unrealistic** expectations, poor resource allocation, and inadequate risk management.
- **Unrealistic Estimates:** Underestimating time, effort, and cost can **lead to** project failure or the need for significant cutbacks later in the development process.
- **Technical Challenges:** Unexpected technical problems or compatibility issues can arise, requiring adaptations and potentially impacting deadlines and budgets.
- **Inadequate Resource Management:** Inefficient allocation of people, skills, and equipment can lead to bottlenecks, delays, and inefficiencies.

Characteristics of Good Project Manager

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Characteristics of Good Project Manager :

- **Leadership:** A good project manager inspires and motivates team members, sets clear direction, and leads by example.
- **Communication:** Excellent communication skills are essential for conveying project objectives, expectations, and progress clearly to team members, stakeholders, and clients.
- **Organization:** Effective project managers are highly organized, able to develop detailed plans, manage resources efficiently, and keep track of multiple tasks and deadlines.
- **Problem-solving:** They possess strong problem-solving abilities, quickly identifying issues and implementing solutions to keep the project on track.
- **Adaptability:** Good project managers are flexible and adaptable, able to adjust plans and strategies in response to changing project requirements, priorities, or unforeseen obstacles.

Characteristics of Good Project Manager :

- **Decision-making:** They make informed and timely decisions, weighing risks and benefits while considering the impact on project goals and objectives.
- **Team-building:** Skilled project managers build cohesive teams, foster collaboration, resolve conflicts, and promote a positive work environment.
- **Time management:** They effectively prioritize tasks, manage time efficiently, and ensure that projects are completed within deadlines and budget constraints.
- **Technical expertise:** While not always necessary, having a solid understanding of the technical aspects of the project domain can be beneficial for effective communication with technical team members and stakeholders.

Successful Software Project Manager

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Successful Software Project Manager:

A successful software project manager possess **specific traits and skills** tailored to the unique challenges of managing software development projects. Here are the key characteristics of successful software project manager:

- **Deep Understanding of Software Development Processes:** Knowledge of **methodologies** like Agile, Scrum, and Waterfall, and knowing when to apply them.
- **Technical Proficiency:** Basic understanding of software development technologies to communicate effectively with technical team members.
- **Clear Communication:** Ability to convey technical information to non-technical stakeholders and ensure everyone understands project goals and progress.
- **Strategic Planning:** Breaking down project goals into actionable tasks, setting milestones, and developing realistic timelines and budgets.

Successful Software Project Manager:

- **Risk Management:** Identifying and mitigating risks specific to software projects, and developing contingency plans.
- **Team Leadership:** Inspiring and motivating teams, fostering a collaborative work environment, and encouraging innovation.
- **Adaptability:** Software projects often encounter changes in requirements, technology, or market conditions. Successful project managers are adaptable and can pivot quickly to address these **changes** while keeping the project moving forward.
- **Quality Assurance:** They prioritize quality throughout the software development lifecycle, implementing processes and tools to ensure that deliverables **meet quality standards** and customer expectations.

Successful Software Project Manager:

- **Client Management:** Successful software project managers build **strong relationships** with clients or stakeholders, actively involving them in the project and managing their expectations effectively.
- **Continuous Improvement:** They are committed to continuous improvement, seeking feedback from team members and stakeholders, analyzing project performance, and identifying areas for **improvement** in processes, tools, or methodologies.

Overview of Software Project Planning

1.8

Software Project:

Definition: A software project is the **structured** effort of designing, developing, testing, and delivering a software **product or feature**. It involves planning and resource allocation within defined **constraints** (time, cost, scope).

Examples: Developing a new feature for an existing product, building a custom software solution for a client, or creating an app as part of a larger system. (Nagarik App of NG).

Categories of Software Project:

❖ INFORMATION SYSTEMS VS. EMBEDDED SYSTEMS

Information Systems	Embedded System (Real Time/ Industrial Systems)
It interfaces with the organization.	It interfaces with a machine.
Example: A stock control system that controls when the organization reorders stock.	**Example:** A process control system that may have elements of the air conditioning equipment in a building.

Categories of Software Project:

❖ OBJECTIVES VS. PRODUCTS

➢ Projects may be distinguished by whether their **aim** is to produce a product or to meet an objective.

Objectives	Products
The project may be required to meet certain objectives.	A project might be to create a product, the details of which have been specified by the client.
Example: The first stage of a project is always objective driven.	**Example:** The objective driven project a software product.

Let's Check the Concept!

"New Summit College, a higher education institution, was previously managed by a local government authority but has recently become autonomous. Although the college now operates independently, its payroll is still processed by the local government's computer center, which produces pay slips and other payroll outputs. The local authority charges the college for this service. The college's management believes it would be more cost-effective to purchase an "off-the-shelf" payroll software package and handle payroll processing internally."

Question:

Would the project to implement an independent payroll system for the college be considered an objective-driven project or a product-driven project? Explain your reasoning.

Project Planning:

Definition:

Project planning is a **procedural step** in project management, where required **documentation** is created to ensure successful project completion.

- Documentation includes all **actions required** to define, prepare, integrate and coordinate additional plans.
- The project plan **clearly defines** how the project is executed, monitored, controlled and closed.
- Project planning is never truly finished until a project is completed.

Project Planning Questions:

- A well-prepared plan should address and consequently answer the following questions:
  - **Why?** -This question is about the reasons why a project is sponsored and the problem it addresses.
  - **What?** -This question is about the work that is to be done to deliver products/results, etc. and deliverables themselves.
  - **Who?** - This is about involved people, their roles and responsibilities as well as the way they are supposed to be organized.
  - **When?** - This is about project's schedule/timeline.

Types of Project Plan:

Plan	Description
Quality plan	Describes the quality procedures and standards that will be used in a project.
Validation plan	Describes the approach, resources and schedule used for system validation.
Configuration management plan	Describes the configuration management procedures and structures to be used.
Maintenance plan	Predicts the maintenance requirements of the system, maintenance costs and effort required.
Staff development plan	Describes how the skills and experience of the project team members will be developed.

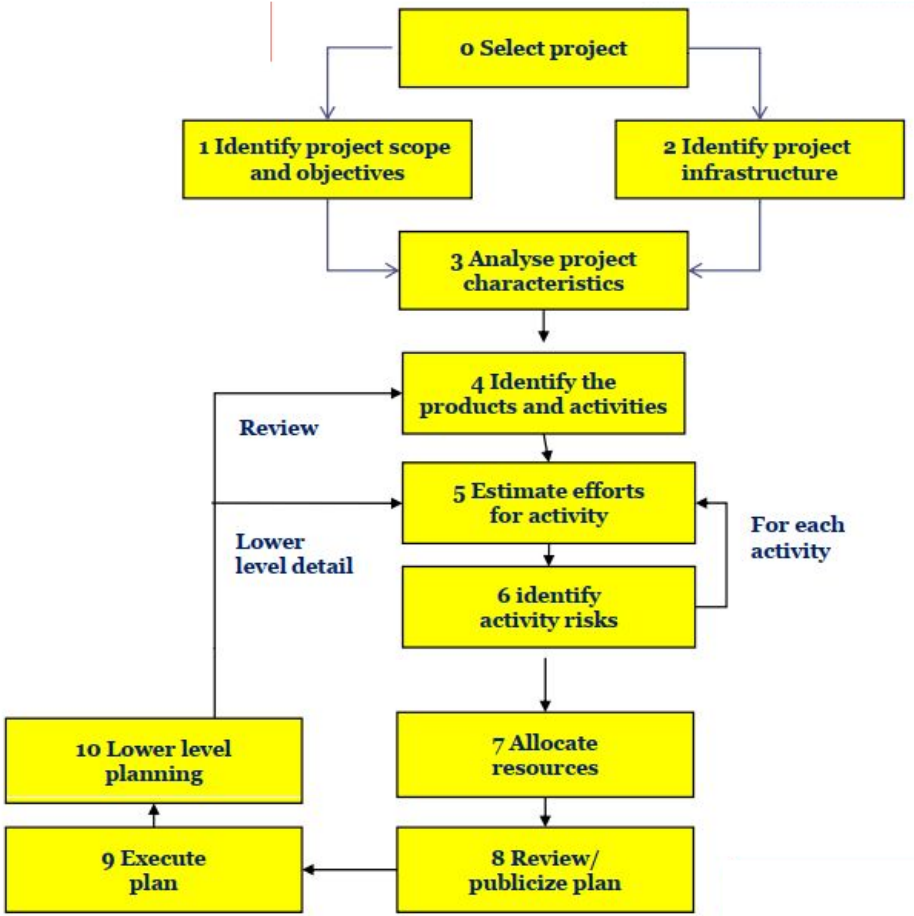
Project Plan Process:

```
Establish the project constraints
Make initial assessments of the project parameters
Define project milestones and deliverables
while project has not been completed or cancelled loop
    Draw up project schedule
    Initiate activities according to schedule
    Wait ( for a while )
    Review project progress
    Revise estimates of project parameters
    Update the project schedule
    Re-negotiate project constraints and deliverables
    if ( problems arise ) then
            Initiate technical review and possible revision
    end if
end loop
```

Steps in Project Planning Process:

- **Step 0:** Select project
- **Step 1:** Identify project scope and objectives
- **Step 2:** Identify project infrastructure
- **Step 3:** Analyze project characteristics
- **Step 4:** Identify project products and activities
- **Step 5:** Estimate effort for each activity
- **Step 6:** Identify activity risks
- **Step 7:** Allocate resources
- **Step 8:** Review/publicize plan
- **Step 9:** Execute plan
- **Step 10:** Execute lower levels of planning

Steps in Project Planning Process:



Steps in Project Planning Process:

- **Step-1: Identify Project Scope and Objectives**
  - Define objectives and assess effectiveness.
  - Establish project authority for unified purpose.
  - Identify stakeholders and analyze their interests.
  - Set up communication channels among all parties.

- **Step-2: Identify Project Infrastructure**
  - Link project to organizational strategy to align order and standards.
  - Establish project-specific standards and procedures.
  - Organize the project team structure.

Steps in Project Planning Process:

- **Step-3: Analyze Project Characteristics**
  - Determine if the project is objective-driven or product-driven.
  - Analyze quality and risk factors; identify high-level risks.
  - Select an appropriate lifecycle approach.
  - Re-assess resource estimates based on identified risks.

- **Step-4: Identify Project Products and Activities**
  - List all products and required activities.
  - Document product flow and create an ideal activity sequence.
  - Incorporate stages and checkpoints for quality assurance.

Steps in Project Planning Process:

- **Step-5: Estimate Effort for Each Activity**
  - Estimate required staff, time, and resources for each task.
  - Break tasks into manageable sub-tasks.

- **Step-6: Identify Activity Risks**
  - Assess risks for each activity and plan for contingencies.
  - Adjust plans and estimates to accommodate risks.

- **Step-7: Allocate Resources (Staffing)**
  - Identify and assign staff for each task.
  - Adjust plans for resource constraints and staffing availability.

Steps in Project Planning Process:

- **Step-8: Review and Publicize Plan**
  - Ensure quality controls with ‘exit requirements’ for each task.
  - Document the plan and gain agreement from all stakeholders.

- **Step-9: Execute Plan and Lower-Level Planning**
  - Build project deliverables and present to the customer for approval.

Structure of a Software Project Management Plan

Project	What is the name of the project ?
Background	How did this project arise ? How was it identified ? How has it evolved ?
Description	What is a brief description of the project ?
Values	What values underpin this project ?
Target group & their needs	Who will benefit ? What are their needs ?
Aims	What are the overall aims this project is trying to achieve ?
Outcomes hierarchy	What is the outcomes hierarchy that will lead to the achievement of these aims ?
Objectives	What are the specific objectives this project will achieve ?
Strategies/ steps	What are the principal strategies or steps that will be required to make this project happen ? How will the project work ?
Management	Who is responsible for the management of the project ?
Funding	What financial resources are required and where are they coming from ?
Time frame	What is the time frame ?
Action	How has to do what to make the project happen ? By when ?
Evaluation	How will the project be evaluated ?

THANKS!

Do you have any questions?

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