

ESE-2025 Prelims Paper-I

Basics of Project Management



Office : F-126, (Lower Basement), Katwaria Sarai, New Delhi-110016 • **Phone :** 011-26522064
Mobile : 8130909220, 9711853908 • **E-mail:** info.publications@iesmaster.org, info@iesmaster.org
Web : iesmasterpublications.com, iesmaster.org



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F-126, (Lower Basement), Katwaria Sarai, New Delhi-110016

Phone : 011-26522064, **Mobile** : 8130909220, 9711853908

E-mail : info.publications@iesmaster.org

Web : iesmasterpublications.com

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PREFACE

As enabling technology is becoming stronger, man's desire to give shape to an idea using that technology is becoming even stronger. However, it is the marked improvement in the managerial genius of project leaders, with technical mind and artistic approach that has been an enabler in getting the desired result.

Engineering Services demand such leadership traits in executing government programmes, global projects, personal and organisational plans to be a successful techno-bureaucrat. This revised and updated edition of **Basics of Project Management** helps you comprehend various processes from project initiation, planning, management, execution, monitoring, and control to project closure, in a fast changing world.

To add to it, the variables defining project management are evolving even faster. Making sense of this changing scenario, the book helps you understand the flow of knowledge and skills through tools and techniques in carving out a unique product or service. This book gives a detailed understanding of the various stages, approaches, structures, and systems in a lucid language.

Designed with a technical approach, this fourth edition of the book incorporates all possible diagrams, flowcharts, tables, mind maps, etc. to quench your thirst to clear the UPSC Engineering Services Examination (ESE). IES Master's research and development wing has done a detailed recce, covering all possible dimensions, on which the questions can be framed. This updated edition features revised chapters, some of which include expanded discussions of fundamental concepts or alternative derivations of important formulas. To jack you up to the level of Engineering Services, a good number of questions have also been incorporated here.

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CHAPTER

1

Fundamentals of Project Management

1.1 INTRODUCTION

INSIDE

- ◆ Introduction
- ◆ What is Project?
- ◆ Project Management Organisations and their Books of Knowledge
- ◆ Types of Projects
- ◆ Characteristics/Features of Projects
- ◆ Operations
- ◆ Stakeholders
- ◆ Project Constraints
- ◆ Need of a Project Management
- ◆ Project Management
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- ◆ Project, Program and Portfolio
- ◆ Project Life Cycle
- ◆ Project Manager
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- ◆ Phase to Phase Relationship
- ◆ Project Success
- ◆ Sources of Conflict in Projects
- ◆ Conflict Resolution Techniques
- ◆ Process Groups and Knowledge Areas

- With the evolution of mankind and radical transformation of society there emerged a need to develop new structure and technologies.
- Creating these technologies or new structures required huge amount of resources and man power.
- This has lead to development of some form of approach or methodology for better and efficient use of these resources.
- Finally a new branch of study “The project management” has emerged.
- Centuries back, so-called “projects” were finished successfully, e.g. the building of the aqueducts in Roman times or the construction of the Great Wall in China, but these projects were managed more on an adhoc basis mostly using informal techniques and tools.
- These days various businesses regularly use project management to grow (or expand) from domestic firms to nationalised companies to global or multinational enterprises, with limited resources under critical time constraints.
- Hence project management nowadays is regarded as a very high priority as all companies or organisations, whether small or large, are at one time or another involved in implementing new undertakings, Innovations and changes etc. – projects!!!.
- There are various social factors that have caused increased usage of project management.
 - (i) **Rapidly changing technologies:** Technologies are changing very fast, so all manufacturing as well as service organizations have to cope up with technological changes, which provide a big scope for project management.
 - (ii) **High entropy of the system:** Changes are very fast. So, energy levels are high. To adapt to the fast changing world, no organization can stick to old things or systems. Any modification or modernization leads to the need of project.

- Launching of Satellite
- Collecting Census Data
- Conducting Lok Sabha Elections

1.4.4 Global Projects

- Prevention of Global warming
- Space exploration
- Organising Peace Mission
- Elimination of Polio
- Fighting with AIDS or EBOLA.

1.4.5 Based on Completion Time

- Long duration projects (over 5 years)
- Medium duration projects (3 to 5 years)
- Short duration projects (1 to 3 years)
- Special short-term projects (less than 1 year)

1.4.6 Based on Value of Project

- Mega value projects (>1000 Crores)
- Large value projects (100-1000 Crores)
- Medium value projects (1-100 Crores)
- Small value projects (< 1 Crore)

1.4.7 Based on Speed of Execution

- Fast track projects
- Normal pace projects

1.4.8 Based on Ownership

- **Public projects:** These are the one done by government ie. construction of bridge, Dam, Adult education program and etc.
- **Private Projects:** These are the one done by private companies e.g.. construction of flats by real estate builder or software development for another or self owned company.
- **Public private partnership projects:** These are one undertaken by both government and private enterprise together e.g. generation and supply of solar energy, collection of garbage and etc.

1.5 CHARACTERISTICS/FEATURES OF PROJECTS

- In previous section we have discussed examples of various projects of different background which vary widely in scope, complexity, cost and speciality.

- However there are some common features in all these projects.

1. **Change:** Projects are “a way to introduce change”.
2. **Temporary:** Project is never a continuous activity, it has a “definite beginning” and a “definite end”. i.e. Its life span is fixed.
3. **Unique:** All projects are unique in themselves, no two projects are exactly similar.



Fig. 1.1: A schematic diagram of project life cycle.

- 4 **Life cycle:** Like living organisms every project also has a defined life cycle which can be divided into four phases.
 - **Phase I:** Initiating phase, during which project idea or goal is conceived.
 - **Phase II:** Planning phase, during which project plan is made and it starts building its size.
 - **Phase III:** Execution phase, during which the plan made in planning phase is executed.
 - **Phase IV:** Closing phase, during which project output or deliverables are handed over to client and a review is done about complete project.
5. **Defined objective/goal:** All the projects have their own defined objective/goal for which they are carried out, as every project is undertaken to create a unique product, service or result.

- There can be hundreds of constraints for a project, but PMBOK has tried to classify these constraints into 6 major groups.

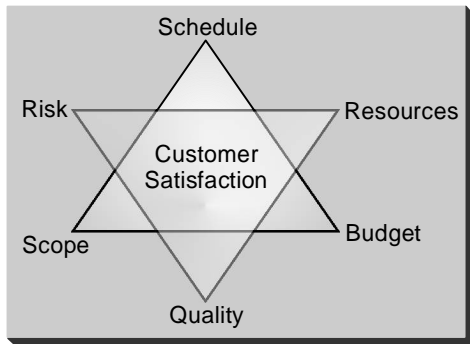


Fig. 1.2

- (i) Scope (ii) Quality (iii) Schedule
- (iv) Budget (v) Resources (vi) Risk

Note: Out of above discussed constraints **Cost, Time and Scope** are also called as **Triple constraints Triangle**.

- The purpose of triple constraints is to emphasize that cost, time and scope are strongly interrelated to each other, which will be discussed later in this chapter.
- There were many modification of this triangle model in which cost and time were consistently present but scope was however changed in the context of goal/Product /Deliverable/Quality/ Specification, performance based on requirement of projects.

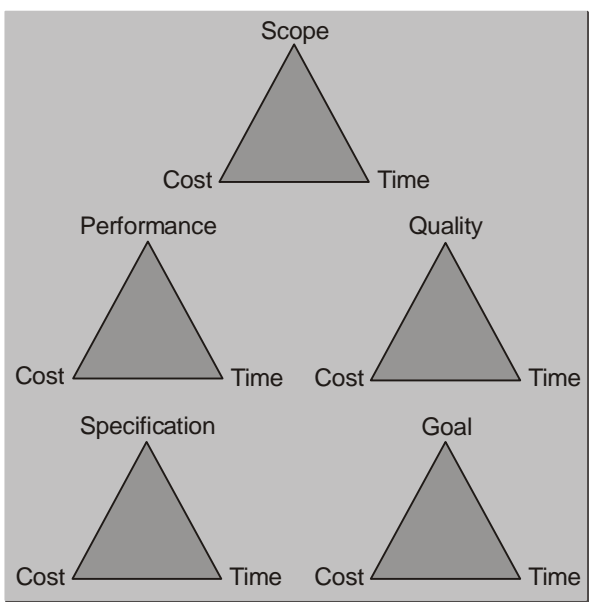


Fig. 1.3

1.9 NEED OF A PROJECT MANAGEMENT

- In any project, the relationship among six project constraints is such that if any one of the constraints changes, at least one of the other constraint is affected.
- For example, if schedule is to be shortened then budget is to be increased to increase number of resources for completing same amount of work in less time.
- If increasing budget is not possible then either scope or quality is to be reduced for completing the project in less time within the same budget.
- Also all the six constraints shall be given proper and equal importance, because exclusive emphasis on any one of them may cause undermining of others.
- Now here comes the role of project management team.
- Project management team has to assess the situation, balance the demands, and maintain good communication with stakeholders in order to deliver a successful project.
- In reality there are two group of thought about project management.
- One group of companies suggest that due to project management they require less development times, lower cost i.e. higher profit margins better quality and reliability, sharper orientation towards goal, better interdepartmental coordination or higher work moral.
- Where as on other side a few companies consider that project management causes more organisational complexity, higher cost of manpower, more management difficulties and low personal utilization.

1.10 PROJECT MANAGEMENT

- Project management is a methodical approach to planning and guiding project processes from start to finish. It is the method of planning the plan. It starts from project definitions and ends with goal achievement.
- According to PMBOK "Project Management is application of knowledge, skill, tools and techniques to project activities to meet project requirements".
- In simple words "Project Management is the process which includes initiating the project, developing a plan, executing the project as per approved plan, monitoring and controlling the project, handing over the output of the project to the client, and finally closing the project.

1.17.3 Portfolio

- Portfolio is a group of related or non-related projects or programs.
- Note that in program management only related projects were managed whereas in portfolio related and non-related projects are managed.

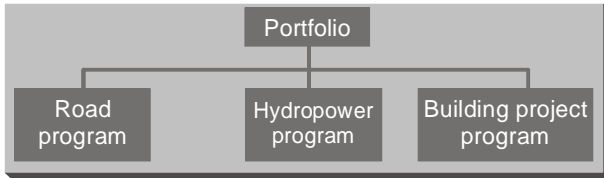


Fig. 1.6

Portfolio Management

- Portfolio Management has a bigger scope and objective than program management.
- Portfolio management is an effective, centralized management (including identifying, Prioritizing, authorizing and controlling) of a collection of projects or program and other work that are grouped together to meet strategic business objectives.
- Please note that, although portfolio management decides the priority of the projects or programs in a group, but it does not supervise or look after any individual project or program.

Benefits of Portfolio Management

- Better allocation and utilization of resources between projects and programs.
- Extending constant support to projects or programs.
- Reduction in conflicts or better communication between projects or programs.
- Improvised coordination among projects or programs.

Difference between Portfolio Management and Program Management

- In program management we manage similar projects, whereas in portfolio management we manage dissimilar projects or unrelated programs.
- In program management scope of projects is defined whereas programs have a larger scope and provide more significant benefits, while portfolios have a business scope that changes with the strategic goals of the organization.

Note:

Portfolio	Program	Projects
Competitive consumer vehicle	Green vehicle	Improve engine MPG
	Compact SUV'S	Higher metals for body
	High End sedan's	Alternative fuel using bio fuel
New satellite Navigation System	Space segment	Design of satellite
	Ground segment	Construction of each satellite Launch of the satellite

1.18 PROJECT LIFE CYCLE

- Every project has a definite beginning, a middle period during which various processes and activities drive the projects towards the completion, and definite end (either successful or unsuccessful).
- Project management office can divide projects into phases to provide better management control over the projects. As project life cycles defines.
 - (a) What work should be done in each phase (feasibility study is part of planning or initiation phase)?
 - (b) Who should be involved in each phase (e.g., resources that need to be involved in various activities of project)?
- Hence it helps in identifying deviations of various levels which helps in decision making with regard to continuation or termination of project.
- Collectively these phases are called as "Project Life Cycle".
- Irrespective of scope, cost, complexity, any project goes through a series of stages during its life.

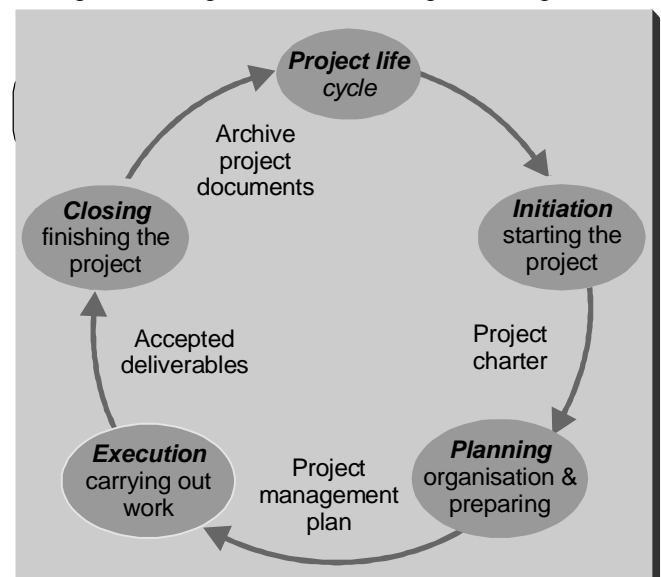


Fig. 1.7

- Generally there are four stages of life cycles as given as below.
 - (a) Initiation phase
 - (b) Planning phase
 - (c) Execution phase
 - (d) Closing phase
- Project life-cycle descriptions can be very general or very detailed.

Note: Highly detailed descriptions may have numerous forms, charts, and checklists to provide structure and consistency. These detailed approaches are called project management methodologies.

- Most project life-cycle descriptions share a number of common characteristics
 - (a) Cost and staffing levels are low at the start of the project, it increases progressively during planning phase, reaches to peak in execution phase. Finally it drops rapidly in closing phase.

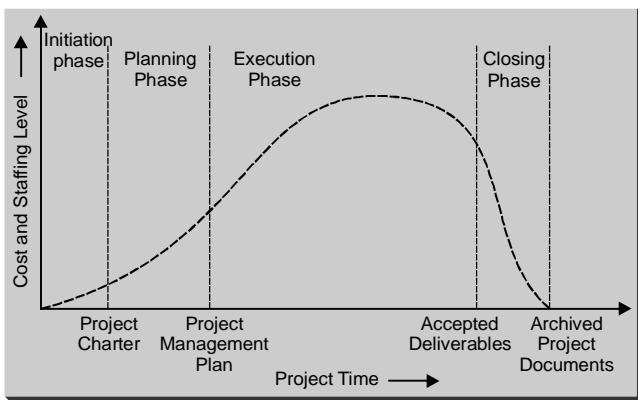


Fig. 1.8

- (b) At the start of project probability of successfully completing project is lowest and hence risk and uncertainty are highest. As project progresses probability of successfully completing project increases and risk reduces.

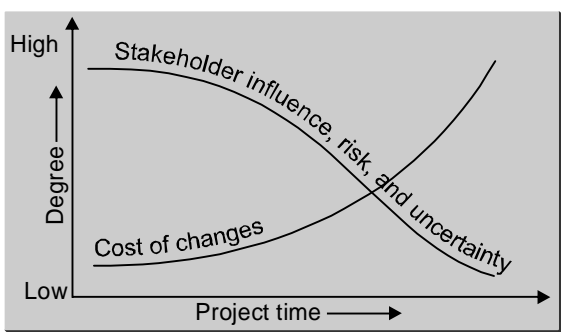


Fig. 1.9

- (c) Initially total project cost of project is low and it increases as project continues. In initiating phase rate of increase of Total Project Cost is slow, which increases in planning phase. This rate of increase of Total Project Cost is maximum in Execution phase and finally in closing phase it is slowest.

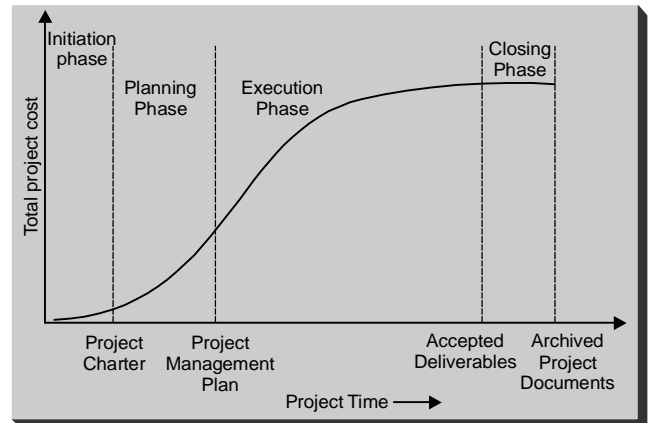


Fig. 1.10

- (d) At the start of project ability of stakeholders to influence final output of project is highest and gets progressively reduced as project progresses. A major reason for this phenomenon is that the cost of "changes and error correction" increases as project continues.

- Project life cycle defines phases that connect beginning and end of the project. After each phase deliverables are reviewed for the completeness in time, accuracy according to defined objective and their final approval (approval for acceptance) before moving to the next phase.

Note: These phases can be sequential or overlapped discussed later in this chapter.

1.18.1 Phases of Project Life Cycle

1. Initiation Phase

- During this first phase, project objective or need is identified, which can be a business problem or opportunity. A feasibility study is done to investigate whether each option addresses the project objective and a final solution is determined in the form of DPR. Once DPR is approved, a project charter is formed and project manager is appointed to initiate the project.
- Then approval of project manager is sought to move on to the next phase of planning phase.

Questions

1. Which is true regarding projects?
 - (a) A project is a unique service undertaken to create a temporary product
 - (b) A project is a unique endeavor undertaken to create a temporary service
 - (c) A project is a temporary endeavor undertaken to create a unique product or service.
 - (d) A project is a temporary product undertaken to create a unique endeavor or service
2. At what stage in the project life cycle would costs be the lowest?
 - (a) Concept
 - (b) Development
 - (c) Implementation
 - (d) Close out
3. Project Managers have least power in which organization structure?
 - (a) Matrix
 - (b) Functional
 - (c) Projectized
 - (d) Balanced
4. In a weak matrix organisation the
 - (a) Most of the power belongs to functional manager
 - (b) Most of the power belongs to project manager
 - (c) Both have equal power
 - (d) No one have power
5. Which organisation violates the principal of unity?
 - (a) Projectised organisation
 - (b) Functional organisation
 - (c) Matrix organisation
 - (d) None
6. What is primary role of portfolio manager?
 - (a) To deliver unique product, service, or result of the project
 - (b) to provide project governance and sponsorship
 - (c) To directly manage people assigned to several different projects
 - (d) To assess all potential projects against known organizational strategic goals.
7. What is name for group of related projects managed in a coordinated way to obtain a synergy between them which is not found by managing them individually
 - (a) Multi project
 - (b) Portfolio
 - (c) Program
 - (d) Strategy
8. Which of following best define stakeholder?
 - (a) Your project team member, project sponsor and client
 - (b) Any person or group who can affect or be affected by your project
 - (c) Any person or group
 - (d) The client, the project sponsor and external government agencies
9. One phase is planned and then the another phase is planned, that is which type of relationship?
 - (a) Overlapping relationship
 - (b) Sequential relationship
 - (c) Multi-phase relationship
 - (d) Iterative relationship
10. Your development team is waiting for the design team to finish their work. As a Project Manager, use this approach to reduce uncertainty in the project. Which of the following relationships does this describe?
 - (a) Iterative relationship
 - (b) Sequential relationship
 - (c) Overlapping relationship
 - (d) Common relationship
11. Consider the following statements:
 1. A project has a mission
 2. A project has to terminate at some time or the other
 3. Projects vary in terms of technology, equipment and materials, machinery and people, work ethics and organisational culture.Amongst the above, the characteristic features for a project are
 - (a) 1 and 2
 - (b) 2 and 3
 - (c) 1 and 3
 - (d) 1, 2 and 3

50. The term "Sacred Cow" is often used to denote a project that
- (a) a powerful, high-ranking official is advocating
 - (b) facts are advocating
 - (c) sound reasoning is advocating
 - (d) less weaknesses are advocating
51. Which one of the following projects are those which are to be completed within a stipulated time, even at the cost of ending up with a higher project cost?
- (a) Normal projects (b) Business projects
 - (c) Crash projects (d) Research projects

52. Consider the following statements:
- The broad areas of corporate appraisal and the few important aspects to be considered under them are
1. Marketing and Distribution
 2. Production and Operation
 3. Research and Development
 4. Project Rating
- Which of the above statements are correct?
- (a) 1, 2, 3 (b) 2, 3, 4
 - (c) 1, 2, 4 (d) 1, 3, 4

ANSWER KEY

1. (c)	10. (b)	19. (c)	28. (d)	37. (b)	46. (d)
2. (a)	11. (d)	20. (d)	29. (b)	38. (a)	47. (b)
3. (b)	12. (d)	21. (d)	30. (a)	39. (b)	48. (b)
4. (a)	13. (c)	22. (c)	31. (c)	40. (b)	49. (b)
5. (c)	14. (d)	23. (a)	32. (a)	41. (c)	50. (a)
6. (d)	15. (d)	24. (b)	33. (a)	42. (b)	51. (c)
7. (c)	16. (c)	25. (b)	34. (c)	43. (d)	52. (a)
8. (b)	17. (a)	26. (d)	35. (c)	44. (d)	
9. (b)	18. (c)	27. (b)	36. (d)	45. (c)	