

# ESE-2021 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



## **IES MASTER PUBLICATION**

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

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

**E-mail** : info.publications@iesmaster.org

**Web** : iesmasterpublications.com

### **All rights reserved.**

Copyright © 2020, by IES MASTER Publication. No part of this booklet may be reproduced, or distributed in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise or stored in a database or retrieval system without the prior permission of IES MASTER Publication, New Delhi. Violates are liable to be legally prosecuted.

**First Edition** : 2016

**Second Edition** : 2017

**Third Edition** : 2018

**Fourth Edition** : 2019

**Fifth Edition** : 2020

# 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.

**IES Master Publication**  
New Delhi

# CONTENTS

## *Preface*

(iii)

<b>Chapter 1</b>	<b>FUNDAMENTALS OF PROJECT MANAGEMENT</b>	<b>01 – 37</b>
1.1	INTRODUCTION .....	01
1.2	WHAT IS PROJECT? .....	02
1.3	PROJECT MANAGEMENT ORGANISATIONS AND THEIR BOOKS OF KNOWLEDGE .....	03
1.4	TYPES OF PROJECTS .....	03
1.5	CHARACTERISTICS/FEATURES OF PROJECTS .....	04
1.6	OPERATIONS .....	05
1.7	STAKEHOLDERS .....	05
1.8	PROJECT CONSTRAINTS .....	06
1.9	NEED OF A PROJECT MANAGEMENT .....	07
1.10	PROJECT MANAGEMENT .....	07
1.11	OBJECTIVES OF PROJECT MANAGEMENT .....	08
1.12	PROJECT MANAGEMENT MATURITY .....	08
1.13	PROJECT MANAGEMENT OFFICE .....	09
1.14	FUNCTIONS OF PROJECT MANAGEMENT .....	09
1.15	PRODUCT MANAGEMENT .....	10
1.16	VENTURE MANAGEMENT .....	11
1.17	PROJECT, PROGRAM AND PORTFOLIO .....	11
1.18	PROJECT LIFE CYCLE .....	12
1.19	PROJECT MANAGER .....	15
1.20	ORGANIZATIONAL STRUCTURES .....	17
1.21	PHASE TO PHASE RELATIONSHIP .....	20
1.22	PROJECT SUCCESS .....	21
1.23	SOURCES OF CONFLICT IN PROJECTS .....	21
1.24	CONFLICT RESOLUTION TECHNIQUES .....	21
1.25	PROCESS GROUPS AND KNOWLEDGE AREAS .....	22
<b>Chapter 2</b>	<b>PROJECT INITIATION</b>	<b>38 – 70</b>
2.1	INTRODUCTION .....	38
2.2	PROJECT IDENTIFICATION .....	39
2.3	PRE-FEASIBILITY STUDIES .....	39
2.4	PROJECT FEASIBILITY OR FORMULATION STUDIES .....	40
2.5	DETAILED PROJECT REPORT .....	60
2.6	PROJECT APPRAISAL/EVALUATION .....	60
2.7	PROJECT SELECTION/DECISION .....	60
2.8	PROJECT CHARTER .....	62

<b>Chapter 3</b>	<b>PROJECT PLANNING</b>	<b>71 – 110</b>
	3.1 INTRODUCTION .....	71
	3.2 STEPS OF PROJECT PLANNING .....	71
	3.3 PROJECT KICKOFF MEETING .....	72
	3.4 DEFINING SCOPE OF WORK .....	72
	3.5 WORK BREAKDOWN STRUCTURE (WBS) .....	72
	3.6 ROLE ASSIGNMENT .....	73
	3.7 PROJECT SCHEDULING .....	73
	3.8 NETWORK ANALYSIS TECHNIQUE .....	74
	3.9 PERT ANALYSIS .....	76
	3.10 CPM ANALYSIS .....	83
	3.11 GERT .....	86
	3.12 ACTIVITY ON NODE NETWORK SYSTEM .....	86
	3.13 ESTIMATION OF PROJECT COST .....	87
	3.14 COST SLOPE/SLOPE OF DIRECT COST CURVE .....	88
	3.15 BUDGET PLANNING .....	90
	3.16 RESOURCE ALLOCATION .....	90
	3.17 PROJECT SUPPORT PLANS .....	91
<b>Chapter 4</b>	<b>RISK MANAGEMENT</b>	<b>111 – 123</b>
	4.1 INTRODUCTION .....	111
	4.2 SOURCES OF RISK .....	112
	4.3 STEPS OF RISK MANAGEMENT .....	113
	4.4 RISK MANAGEMENT PLANNING .....	113
	4.5 RISK IDENTIFICATION .....	114
	4.6 RISK ANALYSIS .....	115
	4.7 RISK RESPONSE PLANNING .....	119
	4.8 RISK MONITORING AND CONTROLLING .....	120
	4.9 REVIEW .....	120
<b>Chapter 5</b>	<b>PROJECT EXECUTION</b>	<b>124 – 131</b>
	5.1 INTRODUCTION .....	124
	5.2 OBJECTIVES OF EXECUTION PHASE .....	125
	5.3 APPROACHES TO PROJECT EXECUTION .....	125
	5.4 MANAGING PROJECT EXECUTION .....	125
	5.5 TOOLS REQUIRED FOR EXECUTION .....	126
	5.6 ORGANISING SYSTEMS AND PROCEDURES FOR PROJECT EXECUTION .....	126
	5.7 SYSTEMS REQUIRED FOR THE EXECUTION OF A PROJECT .....	126
	5.8 PROJECT CONTROL PROCESS .....	127
	5.9 ISSUES IN PROJECT EXECUTION .....	128
	5.10 FACTORS AFFECTING PROJECT EXECUTION .....	128
	5.11 FACTORS LEADING TO POOR EXECUTION .....	128

<b>Chapter 6</b>	<b>PROJECT MONITORING AND CONTROL</b>	<b>132 – 146</b>
6.1	INTRODUCTION .....	132
6.2	PROJECT MONITORING .....	132
6.3	TOOLS AND TECHNIQUES FOR MONITORING .....	133
6.4	PROJECT MANAGEMENT INFORMATION SYSTEM (PMIS) .....	137
6.5	PROJECT CONTROL .....	137
6.6	PURPOSE OF CONTROL .....	138
6.7	ELEMENT OF CONTROL IN PROJECT .....	138
6.8	TYPE OF CONTROL SYSTEMS .....	139
<b>Chapter 7</b>	<b>PROJECT CLOSURE AND REVIEW</b>	<b>147 – 157</b>
7.1	INTRODUCTION .....	147
7.2	OBJECTIVES/BENEFITS OF PROJECT CLOSING .....	147
7.3	STEPS PROJECT CLOSING .....	148
7.4	ENSURING PHYSICAL COMPLETION .....	148
7.5	CLOSING PROCUREMENT OR OTHER CONTRACTS .....	148
7.6	HANDING OVER OF OUTPUT AND OBTAINING FORMAL ACCEPTANCE .....	148
7.7	DOCUMENTING PROJECT RECORDS .....	148
7.8	PERFORMING FINANCIAL CLOSURE .....	148
7.9	DOCUMENTING LESSONS LEARNED .....	149
7.10	RELEASING/REDISTRIBUTION OF RESOURCES .....	149
7.11	PERFORMING POST IMPLEMENTATION REVIEW .....	149
7.12	ARCHIVING PROJECT RECORDS .....	150
7.13	PROJECT AUDIT .....	150
7.14	TYPES FOR PROJECT CLOSING AND TERMINATION .....	151
7.15	CHALLENGES IN PROJECT CLOSING .....	153
<b>Chapter 8</b>	<b>FINANCING OF PROJECTS</b>	<b>158 – 183</b>
8.1	INTRODUCTION .....	158
8.2	CAPITAL STRUCTURE .....	158
8.3	THE TYPICAL PATTERN OF FINANCING .....	160
8.4	SOURCES OF FINANCING .....	160
8.5	METHODS OF OFFERING .....	169
8.6	VENTURE CAPITAL .....	171
8.7	VARIOUS TYPES OF PROJECT CONTRACTS .....	171
8.8	DEPRECIATION .....	172
8.9	COST ESTIMATES AT VARIOUS STAGES OF PROJECT .....	176
8.10	LIFE CYCLE COST .....	177
8.11	FINANCIAL MANAGEMENT .....	177
8.12	CONSTRUCTION ECONOMICS & FINANCE .....	178
	<b>APPENDIX - I</b>	<b>184-185</b>
	<b>APPENDIX - II</b>	<b>186-187</b>

# 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
- ◆ Objectives of Project Management
- ◆ Project Management Maturity
- ◆ Project Management office
- ◆ Functions of Project Management
- ◆ Product Management
- ◆ Venture Management
- ◆ Project, Program and Portfolio
- ◆ Project Life Cycle
- ◆ Project Manager
- ◆ Organizational Structures
- ◆ 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.

- (iii) **Squeezed life cycle of products:** Project life cycle is squeezed to a great extent with innovations taking place at a very fast rate. Projects are needed for the upgradation of products.
- (iv) **Globalization impact:** All producers and service providers in the present world are exposed globally. Projects need to modify their system of operations to match the global practices, thus creating opportunity for projects.
- (v) **Large organizations:** Projects face problems of management of huge workforce and work division, so they divide their work in projects and create a team to accomplish the objectives in the form of projects. This has also helped the organization to develop a method for performance appraisal.
- (vi) **Customer focus:** Increased customer focus has been a market trend in recent times. A few years back, cost reduction was a major formula of success for an enterprise. Thus, there was more emphasis on standardization. In recent years, customer focus has redirected market towards customization. Though it is not purely customisation, it is more of a combination of standardization and customization. All this has led to the application of project management.
- Before we understand this approach of managing projects, we shall briefly address ourselves to certain questions or fundamental concepts like
  - What is project?
  - How it is different from operations or a program?
  - What is project manager?
  - What are roles of a project manager?
  - What are different types of Organisational structures?
  - How do different Organisational structure change role and power of a project manager?
- In this chapter we will try to understand fundamentals of project management and will try to address the questions stated above.

## 1.2 WHAT IS PROJECT?

### According to Webster's Dictionary

- "A project is a planned piece of work that has a specific purpose (such as to find information or to

make something new) and that usually requires a lot of time".

or

- "A project is a task or problem in school that requires careful work over a long period of time."

### According to Oxford Dictionary

- "A project is an individual or collaborative enterprise that is carefully planned to achieve a particular aim."

or

- "A project is "a piece of research work undertaken by a school or college student."

### According to ISO-21500

"A project is a unique process consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements including to constraints of time, cost and resources."

### According to PRINCE 2

"Project is a temporary organisation that is created for the purpose of delivering one or more business products according to specified business case".

**Note:** Prince 2 is an acronym of "**P**rojects **I**N **C**ontrolled **E**nvironments". It is an methodology for project management developed by U.K. Government.

### According to IS-15883 (Part 1): 2009

"A project is a non-recurring task having a definable beginning and end, with a definite mission and has a set objectives and achievements".

### According to Project Management Institutes– "A guide to the project management body of knowledge" (PMBOK guide)

- "A project is a temporary endeavor undertaken to create a unique product, service or result."

**Note:** Above definition given by PMBOK is the most acceptable and undisputed definition.

- There are two key words in above definition.
  - (i) Temporary
  - (ii) Unique
- The term *temporary* refers to the execution of the project and not to the product of the project, which is usually created to deliver a lasting or sustained outcome. Example of this kind of project could be a newly constructed highway, software, automobile, or a power station.



**Note:** Temporary nature of project does not mean that all the projects are of short duration, rather it signifies that every project has a "definite beginning" and a "definite end".

- Any project is said to be complete when its goal or objective is achieved, or due to unforeseen reasons the project is terminated prematurely i.e. either goal/objective cannot be achieved or output of project is no longer needed.
- The term *Unique* means that any project can never be exactly repeated again.
- This does not mean that every aspect of the project is unique. A project may contain some or a few repeating elements such as processes or infrastructure elements.
- For example residential flats or apartments are constructed with same materials and might have same architecture and design, but the location and team could be different.

**Note:** Project can also be defined as a single use plan to achieve a certain objective of introducing something unique or a change and ensure that progress is maintained in line with the objective, generally in terms of time, cost, and various technical and quality performance parameters. Important aspects of a project could be as below:

- Definite Start date
- Definite Finish date
- Specific goals and conditions
- Defined responsibilities
- Budget
- Planning
- Parties involved

### 1.3 PROJECT MANAGEMENT ORGANISATIONS AND THEIR BOOKS OF KNOWLEDGE

- Earlier, project manager used to learn with trial and error.
- With rapid growth of project management, this has also changed and the role has become "professionalised".
- Major international organizations dedicated to this professionalisation are

- (a) Project Management Institute (PMI), USA
- (b) Association for project management (APM), UK
- (c) International Project management Association (IPMA), Switzerland

- One major objective of these organisation is to codify the areas of knowledge required for appropriate and efficient project management. Some of standards literature available in this field are:

- (i) APM Body of Knowledge
- (ii) Project Management body of Knowledge (PMBOK) by PMI, USA

### 1.4 TYPES OF PROJECTS

Since our childhood all of us are 'involved in' or 'undertake' various projects, whether they be our personal, Organisational or Business project, National or Global Project. Examples of such projects are as given below

#### 1.4.1 Personal Project

- Preparing for Gate/Engineering Service Exam.
- Writing a Report/Book.
- Wedding in house.
- Birthday function.
- Family vacation.
- Construct a house extension.
- Going through a heart transplant.

#### 1.4.2 Business/Organisational Project

- Design a new car
- Construction of Dam, bridge, Highway, building etc.
- Setup a refinery.
- Designing and installing a computer network.
- Making a Music Album/Movie.
- Conducting a political campaign.
- Setup a new office.
- Introduce a new product in the market.

#### 1.4.3 National Projects

- Swatch Bharat Abhiyan
- E-Governance/Digital India
- River Inter-linking Project