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Introduction

1.1. INTRODUCTION

During the last few decades, there has been a phenomenal growth in the world population associated with better communication facilities, which have drawn the people of different countries closer than before. New Scientific ideas, concepts and thoughts are being discovered almost everyday and these have caused a very rapid and constant advancement in the development of new technology, products and processes.

The benefits of these advancements are reaching the people to all corners of the globe and, as a result, their life style, taste and behaviour are changing, which are again creating new demands. This interaction between the ever-increasing demand of the world populace and the advancement of science and technology have given rise to an exponential growth and multiplicity of different types of projects, widely varying from one another in their concepts, targets and size. Many of the modern projects are very large in size, demanding mobilisation of lot of resources and involving interdisciplinary activities as well. At the same time, due to competitive market economy, it has become necessary to execute and complete these projects within the scheduled time in an efficient manner and also to achieve the desired quality in a most economical way.

All these however cannot be achieved by applying only intuition and arbitrary decisions, however experienced the manager in charge of a project may be. As such, the present-day project management demands a more systematic approach in the implementation of the project, right from its planning stage to commissioning.

By applying the techniques of modern project management the actual position and status of a project at different time are evaluated and the activities are monitored to achieve all the intermediate stages within the limited scope of time and cost, till the project is completed. If there are deviations or pit-falls, the problem areas are identified and the best practical solution is obtained by the process of optimisation and then controls are applied to realise these solutions efficiently.

The management of a project, is therefore the way to plan, co-ordinate control and implement all the activities of a project in a systematic way to finish the project within the scheduled time and cost and also to achieve the desired quality, so that the end result or the product is acceptable to the user.

1.2. PROJECT

A project may be defined as an entire task (however large or small it may be), limited in scope and time and giving some benefit to the user when the project is completed.

Each project has thus a definite start and a definite finish and is comprised of a series of inter-related jobs or activities. Time is spent and resources like manpower and material are consumed to perform these activities and, as such, cost or expenses are incurred to finish the project within the scheduled time.

As stated earlier in the introduction, projects may be widely varying from one another in their concepts, targets and sizes. They may be executed in different countries under different rules and environment and managed by people who may have their skill, perception and knowledge widely varying from one another. All projects are thus closely related to human activities and there are therefore as many different types of projects as the activities vary from one another. A short list of different types of projects is given below to illustrate the point :

- **Infrastructure development projects:** These include highways, railways, bridges, dams, barrages, reservoirs, hydraulic structures, airfield, ports etc.
- **Industrial development projects:** These include industrial projects in manufacturing sectors, chemical processing industries, mining operations etc.
- **Housing projects:** These include housing complexes, malls, multiplexes, auditoriums etc.
- **Rural development projects:** These include projects related to agriculture, forestry, fishery, agro-irrigation etc.
- **Social infrastructure development projects:** These include public health projects, water supply, waste disposal projects, educational institutions etc.
- **Research and design projects:** These include projects related to development of a new product, process or design.
- **Service sector projects:** These include travel, tourism, marketing, transport, projects connected to information technology sectors etc.

- Defence projects: These are related to defence production, military expedition etc.
- Space travel and allied projects
- Nuclear power projects
- Projects related to rehabilitation of existing structures.

At the micro level, even the effort of an individual to achieve a time-bound objective may be treated as a project, like writing a novel, journey from one place to another place, preparing for an examination, drawing on a canvas etc.

The above list is by no means complete and there are hundreds of different other projects of diverse nature and size. But the common characteristic of all projects is that each project has got a definite finish or completion. Also, each project is comprised of, or they may be broken into a series of intermediate activities consuming resources and time and all projects are essentially cost-benefit enterprises.

Another important special characteristic of each project is its uniqueness, *i.e.* each project is unique in itself, which means that no project is absolutely similar to another. As for example, in a big housing project, there may be hundreds of buildings of a particular type exactly similar in shape and dimensions, but the buildings are constructed at different times by different set of working people in different cost perspectives. Each of these individual units are therefore to be attended to and managed properly to achieve the desired overall result. Similarly in a continuous flow process of manufactured products, quality varies from one sample to another, though the products look alike. Because of this uniqueness, statistical quality control methods are employed to keep the variations within the limits of tolerance.

1.3. DIFFERENT PHASES OF A PROJECT

A project depending on its type, size, nature and objective undergoes through different well-defined phases right from its inception to successful completion. These are briefly explained below.

1.3.1. CONCEPT

The demand, cost-effectiveness and viability of a project under consideration is judged in this stage, for which preliminary enquiries, market surveys are made in order to ascertain whether it will be prudent to embark on this particular project at all. As for example, an entrepreneur may hit upon an idea of setting up a Food Processing Unit somewhere in North India, on the same line of an unit he has seen operating successfully abroad. He would try to first ascertain whether there is market demand of such processed food and whether such a unit may at all be viable and cost-effective under Indian

conditions. For this he may consult or make casual enquiries from experts in this field and also try to know about the performance of other such units operating in the country. He may also travel to a few places to see himself the local conditions and may make discreet enquiries about availability of soft loans from Financial Institutions and availability of technical experts and Skilled Workmen etc.

In many cases, the conceptual stage of the project remains dormant in the mind of the entrepreneur, when he toys with the idea of such a project along with his other activities, sometimes for years together, before entering into the next stage *i.e.* planning of the project. If, however, the new project is an outcome of the by-product of his existing project, he may not take much time to make up his mind and would like to utilise his by-product by starting the new project, as soon as his earlier project becomes viable and fully operative.

In housing projects, in urban areas the demand, cost-effectiveness and viability aspects are too well-defined, because there are always good many examples of such projects already executed. In such locations, the promoter may start the next planning stage, as soon as he finds himself financially sound and gets hold a good piece of land to build such projects.

1.3.2. PLANNING

The planning part of the project may be divided into several stages as under :

1.3.2.1. FEASIBILITY STUDY

This is done at the early stage of the planning process, when the limits of the available resources and capability of the promoter is verified in greater details and a study is made to find out the magnitude, dimension and characteristics of the project. The feasibility study includes topographical survey, if it is a construction project like bridges, dams etc. or a detailed market survey if the project involves introduction of a new product. The object of the feasibility study is to have more detailed information about the location, nature, dimension, raw materials needed, the process designs, requirement of plant, machinery, equipments, evaluation of the expected range of the end products, necessity of foreign technical know-how, availability of foreign exchange and details about the users who will be benefitted from the project. Along with those information, a rough project estimate is done and a cost-benefit analysis is also made to ascertain the quantum of investments and the benefit anticipated both in economic and social terms. Sometimes the process designs and the sizes of equipments etc. are altered substantially at this stage, if it is found that the project

is either too big to handle or involves foreign exchanges and technical know-how which may not be readily available.

If the results of the feasibility study is favourable and the authorities/promoter of the project decides to embark on the venture, the final plan is then prepared. In the feasibility study, as well as in the preparation of the final plan, the services of consultants are frequently sought and they are entrusted with finalising the technical details of the project including requirement of plant, equipment and the design of processes involved in the project. As such this final plan shows a detailed layout plan of the project, showing the layout of the buildings or main structural components, a process layout (in case of manufacturing units) showing the process design, sizes and types of equipments and machinery needed with brief specifications for these items.

Along with final plan, the project estimate, as done earlier, is also re-cast to include all the changes made in the project and their costs. This estimate should take into account the actual price of the equipments (to be obtained from enquiry from equipment suppliers) and the anticipated escalation in costs to make the estimate realistic and acceptable to the authorities, who will be partly or wholly finance the project.

1.3.2.2. LICENCE/MUNICIPAL APPROVAL

At this stage, a project report is prepared and this report along with the plan and estimates are sent to Govt. authorities concerned for approval and issue of licence. In case of large projects, involving multidisciplinary activities, a number of Govt. departments are to be approached like : Municipal authorities, Fire Brigade, Police, Pollution Control Board, Govt. Financial Institutions, Concerned ministries for licence, Reserve Bank for issue of foreign exchange, Land and Revenue Dept. for land purchases, Govt. Public Works Departments for approach roads, telephone departments for telecommunication facilities, electric supply departments, for supply of electricity etc. A lot of technical and other queries are made by these departments before they sanction the project and it requires all the ingenuity, tenacity and perseverance of the promoter at this stage to get the project through within the shortest possible time.

1.3.2.3. DETAILED ENGINEERING AND CONTRACT MANAGEMENT

Once the licence/approval is obtained the project comes under the perview of both financial and technical experts. While the financial experts or managers are busy in arranging the much-needed finance of the project, the technical experts prepare the tender documents,

detailed specifications, detailed designs, working drawings, shop drawings and contract documents. Finance may be in the form of own investment and/or borrowing from financial institutions. In this stage, the role of participating outside agencies like consultants, suppliers and contractors is more or less clearly defined. Available resources are taken note of, as also the resources further needed and they are allocated. Contract documents are prepared keeping in mind the role of the participating agencies to avoid ambiguities, dual responsibility and confusion at a later date.

In case of small building projects, where the owner is the promoter, he arranges the finance himself and engages the contractors or suppliers, without going into the complexities of preparation of tender documents. But he also gets a detailed design from his consultant and fixes his terms, conditions and rates with his contractors and suppliers. Essentially therefore the basic managerial functions are almost identical in both a small and a big project.

1.3.3. SCHEDULING

With the detailed design, tender documents master plan ready, participating agencies identified and their responsibilities fixed, availability of finance sorted out and Govt./municipal approval obtained, the project is now ready for implementation. In order to accomplish the different activities of the project in an efficient manner within the framework of cost and time perspective, the modern techniques of project management are adopted and the project activities are scheduled. This scheduling work, may be done by Gantt, charts, Milestone charts or by Network analysis as per PERT/CPM model depending on the size and nature of the project. Allocation of resources are also fixed in full details at this stage. A Master Schedule is prepared for the whole project and the Master Schedule is broken up into Sub-Schedules encompassing the activities of a particular department or a particular chain of activities like civil work, placing equipments, plumbing and pipe line job, electricals etc. In fact, every participating agency or department prepare their own schedule, which are essentially part of the Master Schedule.

1.3.4. IMPLEMENTATION AND CONTROL

The implementation of the project is then carried out, firstly with the setting up of the infrastructural facilities like : water, approach road, boundary walls communication systems, power, security etc. Then, the organisation for implementing the project is also set up by recruiting the required member of men and staff and the institutional framework is made ready and geared up. The project is then started. Necessary supply of raw materials is arranged through the contractors,

the consultants and the supervisory staff step in to supervise the construction/installation work and the contractor starts building up the project. It is the duty of the contractor and the supervisory staff to maintain the quality of the end product at every stage of project execution. Proper co-ordination is maintained among all participating agencies by the owner or his organisation through regular reporting, meetings, exchange of views and by maintaining team spirit and motivation of all concerned.

All progress made are noted and compared with the schedules made earlier and the status of the project is determined regularly to ensure that the project is not having an over-run either in cost or time. If there are deviations due to cost over-run or time-lag, the causes are identified, the problem areas kept under close surveillance and the activities are monitored in a well co-ordinated way to bring back the project within the schedule.

1.4. PROJECT MANAGEMENT

Project management is the way to manage the whole or part of an entire project/s that are limited in scope and time. The primary objective of the project management is to finish the project within the scheduled time and budgeted cost and at the same time to achieve good workmanship or quality by ensuring quality control, quality assurance and inspections.

1.5. OWNER

The owner of a project may be a single person (like the owner of a residential building), a co-operative body, a government institution or the ownership may be shared jointly (as in a joint venture project). A good number of big industries in the Steel, petrochemical and engineering fields are now-a-days owned jointly by the government financial institutions and the private industrialists.

1.6. USER

The user of a project may be the same person/body as the owner, as in the case of residential buildings or industrial establishments. However, in some cases such as roads, hospitals, educational institutions the public at large are the user of the project, though the owner may be others.

1.7. PROJECT MANAGER

The project manager is the person who is responsible in realising the project targets by optimum use of available resources through efficient co-ordination and creating motivation of all concerned. He is responsible to the owner (unless he is the owner himself), he has to

look after the economy, the engineering and technical part of the project, he has to know the local rules and environment, he arranges procurement of materials, he coordinates in the production activities and he also ensures quality control and proper inspection, supervision and he is the main coordinator amongst his subordinate staff and departments. As such the selection of a project manager should be carefully done keeping in mind his functions, his problem areas and his experience and capabilities in handling such situations.

1.8. WHY CONTROL IS NEEDED

In earlier times, as well as in present days, many projects are implemented by the project manager by applying his intuition and experience. Sometimes he applies arbitrary decisions, which may or may not be the correct ones to tackle the particular problem situations. If the project is small and the activities are well defined and known to the project manager, he may be able to execute the project in an efficient manner. But in the present days, many of the projects are very big, complex and involves co-ordination of thousands of persons, hundreds of participating agencies ; the time of completion is limited in the present competitive markets ; many of such projects are of multidisciplinary nature and there are innumerable activities spreading over considerable span of time and space—all these are no simple affair for any project manager to tackle by applying arbitrary and intuitive decisions, however experienced he may be in his own field of know-ledge. To overcome these problems he needs to control the activities, to know the status of the project at any time and to find out ways and means to locate the problem areas and solutions, if the project gets delayed and involves cost over-run or the limits of tolerance in the quality is exceeded. Among the methods most commonly used now-a- days are the application of Bar Charts, Tables, Reports and the PERT/CPM method of network Analysis. Among the tools, the project manager takes the help of the modern communication network systems and the help of computers. In addition to these he also applies sometimes the statistical methods of solutions or adopts the techniques of Resource Levelling, Resource Allocation and optimisation to meet problem situations when there are constraints in resources.

We would discuss in the following chapters all these methods and techniques in more details, so as to have a basic idea of their applicability in management and control of projects.

QUESTIONS

1. What are the common characteristics of different types of projects ?
2. Explain briefly the different phases of a project and how the project manager is involved in achieving the targets.
3. What is the relation between the owner of a project and its project manager ?
4. What is the object of project management ?
5. Write short notes on :
 - (a) Feasibility Study
 - (b) Uniqueness of a project
 - (c) Master Schedule
 - (d) Functions of a project manager
 - (e) Infrastructure of a project.