

Success in Engineering Management - A Methodical Approach

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Abstract

Engineering projects, particularly those related to the development of infrastructure, form a highlighted area in the national economy of most developing countries of the world today. Sadly enough, a large number of these projects do not give the desired result and eventually end up with large cost and time overruns. The reasons for such failures are quite complex and no simple solution is available. Based on the experience of the author on implementation of engineering, including and infrastructural projects in India and other developing countries, he has tried to suggest a methodical approach on successful management of engineering projects.

1. Introduction

An engineering project is a collection of activities linked together to achieve a desired result, has a well-defined purpose focused on the interest and expectation of the end users and it must be completed conforming to the specified quality, time and cost constraints. Such projects are normally complex due to the involvement of people of different disciplines in various departments and locations and have to be flexible enough to accommodate changes as the work proceeds. It involves risk at various steps and the management must co-ordinate and control the whole effort focusing its attention on the desired final objective.

2. Management Strategy

Management strategy is an essential first step in execution of an engineering project. Many projects fail due to the strategy not being formulated at the outset and not being followed through. Hence, it is imperative that the strategy for managing the engineering project must be formulated and laid down during the conceptual planning of the project.

3. Project Phases

The life-cycle of a project broadly consists of four distinct phases. In a real-life project, the phases normally overlap with each other to a large extent. The phases are:

Phase 1: Project concept, survey, site selection, alternative studies, fixing project goals, fixing overall project criteria, possible strategy for design, engineering and implementation, preliminary plans with cost and schedule.

Phase 2: Project development - design and engineering, planning resource utilisation, detailed planning, detailed formulation of project scope, schedule, cash flow, quality assurance and quality control.

Phase 3: Project implementation - organisation, communication within and outside the organisation, implementation plan, monitoring and evaluation, feed-back and follow-up, motivating and leading, identifying, analysing and solving problems.

Phase 4: Project termination - finishing, handing over, settlement of disputes and claims, overall project evaluation and review, contract closure, preparation of as-made drawings, final project completion report for future reference.

4. Project Implementation Stages

The implementation stages in an engineering project mainly consist of detailed project report, contract finalisation, consultant selection, cost estimation, land acquisition, site preparation, setting up of project organisation, procurement of materials and equipment, construction and erection work, installation of equipment and service facilities, scheduling and cash flow, monitoring and control, test, trial run, startup, commissioning and progress reporting.

5. Role of the Management

The main role of the management is to lead, plan, organise, coordinate and control the project ensuring optimum utilisation of available resources, the 4 Ms that is manpower, materials, machineries and money. In most engineering projects, managing the first M, that is, manpower, is the most complex and difficult.

6. Well-Managed Project

The essential factors in a well-managed project are an efficient project team, good team motivation, good leadership and well-defined project objectives. Management shortcomings are frequently noticed on the communication front including language bar, establishment of priorities, follow-up and control. Inattention to the manpower aspect is also common. Many projects fail due to inadequate strategy and control, lack of leadership commitment, ill-defined goals, delayed decision, ineffective planning and resource mobilisation and political and legal obstacles.

7. Engineering Organisation

Engineering management is a team game where each player has to be carefully selected, assigned well-defined duties and responsibilities and each player must play his part well in an efficient and co-ordinated manner. Inter-relationship of staff in the organisation must be well-defined avoiding duplication of responsibility. The organisation must be flexible enough to change depending on the exigencies of the project situation.

8. Team Motivation

The success of an engineering project depends largely on the performance of individual members of the project team. Adequate measures have to be taken to motivate the team

members at various levels to achieve the best result. The main motivating factors are, food, clothing, shelter, job security and stability, self-esteem, social recognition, status, position, power, etc. The motivation of a worker depends on the level at which the worker is. The suggested guidelines are:

Bottom level worker- Monetary incentive, accident coverage, etc.

Middle level worker- Security of service, retirement benefit, appreciation, etc.

Top level employer- More power, promotion, recognition, etc.

9. Management and Communication Techniques

Modern management techniques like Work Breakdown Structure (WBS) and Activity Networks (PERT/CPM) must be used to derive full advantage with computerised analysis, reporting and updating. Effective communication is of paramount importance with utilisation of internet, e-mail, computer networking, mobile phones, SMS, video conferencing and other state-of-the-art techniques.

11. Management Software

MS Project and Primavera are the most popular of all the project management software in use today. The software has to be carefully selected keeping in view the specific requirement of the project, ease of learning and application, compatibility with available hardware, cost and possibility of upgradation.

12. Conclusion

Faulty management strategy is frequently the main cause of failure in an engineering project. Fund flow is not the main constraint today. In most developing countries, large projects, particularly in the infrastructural sector, are coming up with internal and external funding. In addition to international funding agencies like the World Bank (WB) and the Asian Development Bank (ADB), the British are funding through the DFID. American, Japanese and German Banks are also funding development projects in third world countries. The major factors constraining successful implementation of development projects are ineffective engineering management, insufficient capacity building and insufficient capacity utilisation. Engineering management in the developing world has to rise to the occasion and play its part properly to ensure successful implementation of development projects.

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