CHAPTER FIVE

Project Implementation, Monitoring and Evaluation

Project Management-Introduction

The basic building blocks of the traditional form of organisation are a functional division of management and a well-defined hierarchical structure. Typically, a firm is organised in to various departments, such as production, purchasing, marketing, finance, personnel, engineering, and R&D. Some of these departments have a line function and others a staff function. Line managers have the principal responsibility for achieving the goals of the firm and are vested with decision making authority. Staff managers primarily serve in an advisory capacity-of course, within the staff departments they enjoy administrative powers.

The traditional form of organisation is quite appropriate for handling established operations which are characterised by continuous flow of repetitive work, with each department attending to its specific functions-in such a setting, relatively stable inter departmental and inter-personal relationships emerge. However, the traditional form of organisation is not suitable for project management for the following reasons.

1. A project is a non-routine, non-repetitive undertaking often plagued/overwhelmed with many uncertainties;
2. The relationship in a project setting are dynamic, temporary, and flexible; and
3. A project requires a coordination of the efforts of person drawn from different functional areas and contributions of external agencies.

Due to these reasons, project management calls for a different form of organisation, sharper tools of planning and control, and improved means of coping with human problems. This chapter, concerned with various issues relating to project management is divided into five sections:

- Form of Project Organization
- Project Planning
- Project Control
- Human Aspects of Project Management

- Pre-requisites for successful Project Implementation.

Forms of Project Organization

The traditional form of project organization is not suitable for project work for the following reasons:

i) It has no means of integrating different departments at levels below the top management, and

ii) It does not facilitate effective communication, coordination and control, when several functional departments, with different professional backgrounds and orientations are involved in the project work under time and cost pressures, which often call for overlap, at least partial, of the development, design, procurement, construction, and commissioning work.

Hence, there is a need for ensuring an individual (or group) with the responsibility for integrating the activities and functions of the various departments and external organisations involved in the project work. Such an individual may be called the project manager or project coordinator. Depending on the authority that is given to the person responsible for the project, the proper organisation may take one of the following three forms:

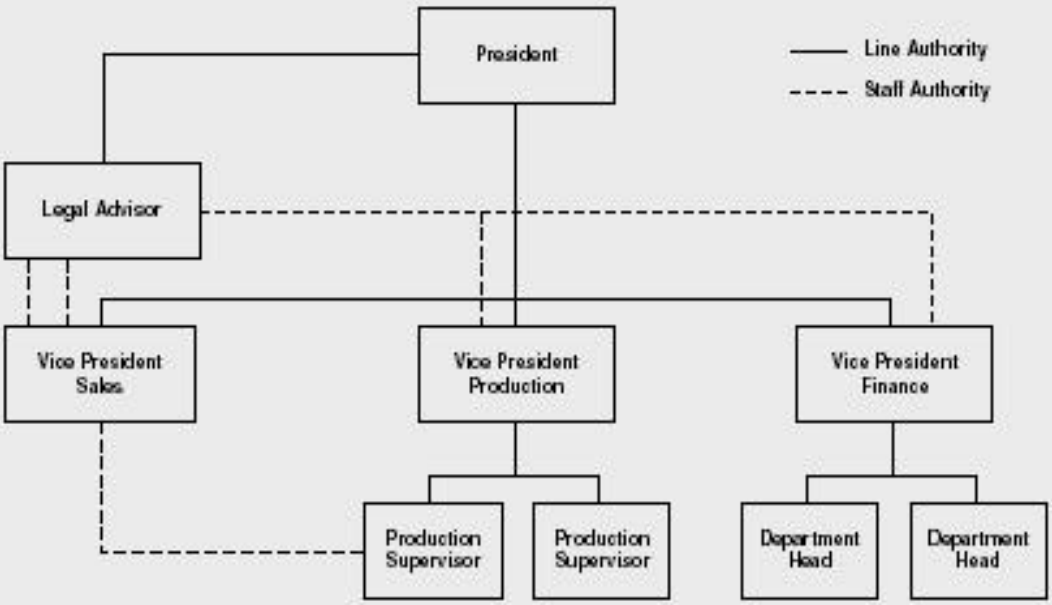
a) Line and staff organization
b) Divisional organisation
c) Matrix organisation

Line and staff organisation

In this form of organization, a person is appointed with the primary responsibility of coordination the work of the people in the functional departments. Such a person referred to commonly as the project coordinator, acts essentially in a staff position to facilitate the coordination of line management in functional departments. The project coordinator does not have authority and direct responsibility of the line management. He serves as a focal point for receiving project related information and seeks to promote the cause of the project by rendering advice, sharing information and providing assistance. He may gently coax line executives to strive for the fulfillment of project goals. Deprived of formal organizational

authority, he may find it difficult to exert leadership and feel unsure of his role. His influence would depend on his professional competence, closeness to top management, and persuasive abilities. Clearly, this is a weak form of organization which may be employed mostly for small projects- it is certainly not suitable for large projects.

Figure 1
Line-and-Staff Organization



Divisional organisation

Under this form of project organization, a separate division is set up to implement the project. Headed by the Project Manager, this division has its complement of personnel over whom the project manager has full line of authority. In effect, this form of organization implies the creation of a separate goal oriented division of the company, with its own functional departments and typically manage their own hiring, budgeting and advertising. Divisions are more autonomous, each with its own top executive. While the project manager still has the problem of coordinating the inputs of the organizations involved in the project, he has total formal control over the division he heads.

Advantages:

- It is a very strong form of project organization.

- It facilitate the process of planning and control
- It brings better integration of efforts
- It strengthens the commitment of project related personal to the objective of the project, and
- It considerably improves the prospect of fulfilling the time and budget targets.

Limitations:

- It may entail an inefficient use of the resources of the firm.
- It may result in an unnecessary duplication of specialist in the company, because of the necessity to allocate them in total to each project.
- It may be difficult to achieve higher degree of specialization of experts because the divisional project organization may have to be managed with, say, one mechanical engineer, rather than two specialists.

Matrix organisation

The line and functional form of organization is conducive to an efficient use of resources but is not suitable for an effective realization of project objectives. The divisional form of organization, on the other hand, is suitable for an effective realization of project objectives but is not conducive to an efficient use of resources. The matrix form of organization, the third form of project organization, seeks to achieve the twin objectives of efficient use of resources and effective realization of project objectives-at the cost of greater organizational complexity of course.

They focus on project teams, bringing skilled individuals together from different parts of the organization. In a matrix organization, the personnel working on the project have a responsibility to their functional superior as well to the project manager. This means that the authority is shared between the project manager and the functional managers. The authority and influence of the project manager cut across the traditional vertical line of command. While the personnel maintain the departmental affiliation and are responsible to their functional superiors; they are responsible to the project manager as well.

The **advantages** of a pure matrix organizational form, to project management, include:

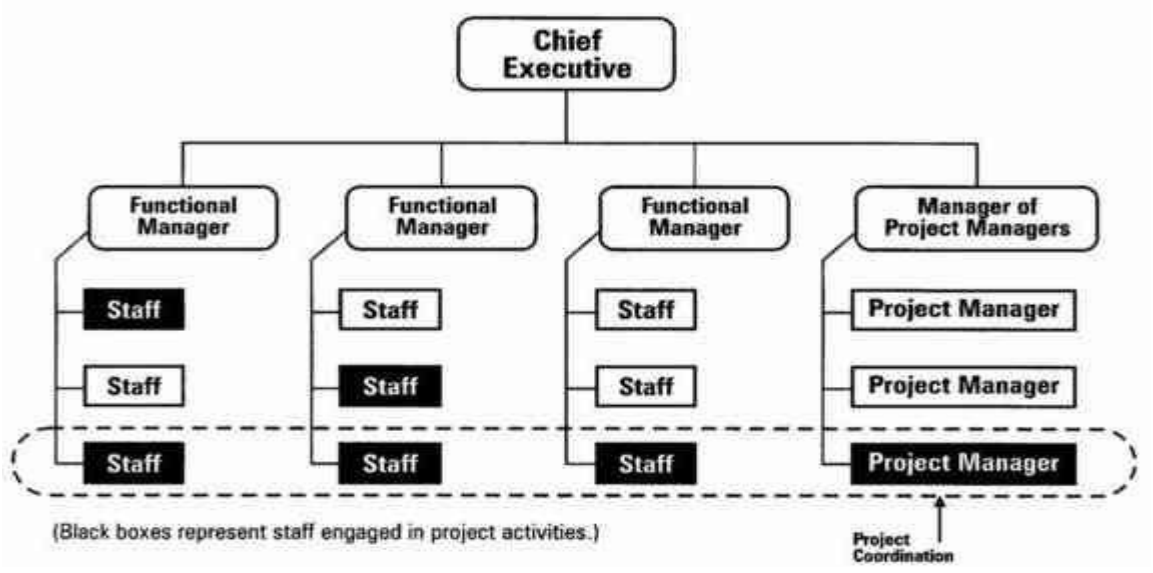
- Because key people can be shared, the project cost is minimized
- Conflicts are minimal, and those requiring hierarchical referrals are more easily resolved
- There is a better balance between time, cost and performance
- Authority and responsibility are shared
- Stress is distributed among the team

Limitations:

- There is dual subordinations
- Responsibility and authority are not commensurate
- The hierarchical principle is ignored.

This is clearly implies that the matrix form of organization involves greater organizational complexity and creates an inherently conflictful situation. Yet it seems to be better vehicle for simultaneous pursuit of the twin objectives-efficient utilization of resources and effective attainment of project objectives.

Typical Matrix organization



Project Planning

Projects involving few activities, resources, constraints and inter-relationships can be visualized easily by the human mind and planned informally. However, when a project crosses a certain threshold level of size and complexity, informal planning has to be substituted by formal planning. The need for formal planning is indeed much greater for project work than for normal operations. Without effective planning there may be chaos.

Functions of planning

Planning, a vital aspect of management, serves several important functions.

i. It provides a basis for organizing work on the project and allocating responsibilities to individuals.

ii. It is a means of communication and coordination between all those involved in the project.

iii. It induces people to look ahead.

iv. It instills a sense of urgency and time consciousness.

v. It establishes the basis for monitoring and control.

Areas of planning

Comprehensive project planning covers the following:

a) Planning the Project work: the activities relating to the project must be spelt out in detail. They should be properly scheduled and sequenced.
b) Planning the manpower and organization: the manpower required for the project must be estimated and the responsibility for carrying out the project work must be allocated.
c) Planning the money: the expenditure of money in a time phased manner must be budgeted.
d) Planning the information system: the information required for monitoring the project must be defined.

Project Objectives and policies

Often, the focus of project planning is on questions like who does what and when. Before such operational planning is done, the objectives and policies guiding the project planning exercise must be articulated. The questions to be answered in this context are: What are the technical and performance objectives? What are the time and cost goals? To what extent should the work be given to outside contractors? How many contractors should be employed? What should be the terms of contract?

Well-defined objectives and policies serve as the framework for the decisions to be made by the project manager. Throughout the life of the project, he has to seek a compromise between the conflicting goals of technical performance, cost standard, and time target. A clear articulation of the priorities of management will enable the project manager to take expeditious actions.

Work -break down structure

The work breakdown structure, as its name suggests, represents a systematic and logical breakdown of the project into its component parts. It is constructed by dividing the project into its major parts, with each of these being further divided into sub parts. This is continued till a breakdown is done in terms of manageable units of work for which responsibility can be defined, thus the work breakdown structure helps in:

- Effective planning: by dividing the work into manageable elements, which can be planned, budgeted and controlled.
- Assignment of responsibility for work elements to project personnel and outside agencies.
- Development of control and information system.

Work Breakdown Structure and Project Organization: The project organization represents formally how the project personnel and outside agencies are going to work. The work breakdown structure defines the works to be done in a detailed manner. To assign responsibility for the tasks to be done, the work breakdown structure has to be integrated with the project organization structure. This calls for blending the vertical breakdown of the work

(as arrived in the work breakdown structure) with the project organization structure. The result of delineation of a project tasks which are the specific responsibilities of organizational units/managers. The technical name given to such a project task is cost account. A cost account represents a unit of work (i) which is defined in fairly concrete terms, (ii) foe which a single person is responsible, and (iii) for which a budget of expenditure and manpower requirement can be prepared meaningfully.

Life cycle of a project

The important stages in the life cycle of a project are:

- Project development and preliminary engineering
- Bidding and contract negotiation
- Engineering design
- Purchase and procurement
- Construction
- Commissioning

In planning these stages, one has to bear in mind two concepts: the rolling wave concept and the integration concept. According to the rolling wave concept, when detailed planning is done for project development and preliminary engineering, summary planning would be done for the remaining steps. When the actual work on project development and preliminary engineering commences, detailed planning would be done for the next stage which is concerned with bidding and contract negotiation, and so on. According to the integration concept, planning for all stage must be integrated, even though detailed planning would be done in accordance with the rolling wave concept. The need for integrative planning stems from the inter-relationship among various stages of project work. This need is further reinforced when the compulsion to reduce the project duration leads to overlap at least partial, of various stages of the project.

Tools of project planning

The oldest formal planning tool is the bar chart, also referred to as the Gantt chart or the multiple activity charts. In the last five decades, network techniques have received considerable attention. This section briefly describes the nature of these tools of planning.

Bar Chart: This is a pictorial device in which the activities are represented by horizontal bars on the time axis. The left-hand end of the bar shows the beginning time, the right-hand end the ending time. The duration of the activity is indicated by the length of the bar. The manpower required for the activity is shown by a number of the bar.

The advantages of the bar chart are:

i. It is simple to understand;
ii. It can be used to show progress; and
iii. It can be used for manpower planning.

The bar chart, however, suffers from some disadvantages which limit its usefulness:

i. It cannot show interrelationship among activities on large, complex projects;
ii. There may be a physical limit to the size of the bar chart, which may limit the size of the project that can be planned with this technique; and
iii. It cannot easily cope with frequent changes or updating

Network Techniques: These are more sophisticated than the traditional bar chart. In these techniques, the activities, events, and their inter-relationships are represented by a network diagram, also called an arrow diagram. (Show the network diagram).

The advantages of network techniques are:

i. They can effectively handle inter-relationships among project activities;

ii. They identify that activities which are critical to the completion of the project on time and indicate the float (or spare time) for other activities;

iii. They can handle very large and complex projects; and

iv. They can be easily computerised and updated.

While the network techniques are a superior tool for project planning, they suffer from several drawbacks. These are:

i. Being more complicated than the traditional bar chart they are not easily understood by the project personnel; and

ii. They do not define an operational schedule which tells who does what and when.

PERT chart (Program Evaluation Review Technique)

A PERT chart is a project management tool used to schedule, organize, and coordinate tasks within a project. PERT stands for *Program Evaluation Review Technique*, a methodology developed by the U.S. Navy in the 1950s to manage the Polaris submarine missile program. A similar methodology, the *Critical Path Method* (CPM) was developed for project management in the private sector at about the same time.

A PERT chart presents a graphic illustration of a project as a network diagram consisting of numbered *nodes* (either circles or rectangles) representing events, or milestones in the project linked by labelled *vectors* (directional lines) representing tasks in the project. The direction of the arrows on the lines indicates the sequence of tasks. In the diagram, for example, the tasks between nodes 1, 2, 4, 8, and 10 must be completed in sequence. These are called *dependent* or *serial* tasks. The tasks between nodes 1 and 2, and nodes 1 and 3 are not dependent on the completion of one to start the other and can be undertaken simultaneously.

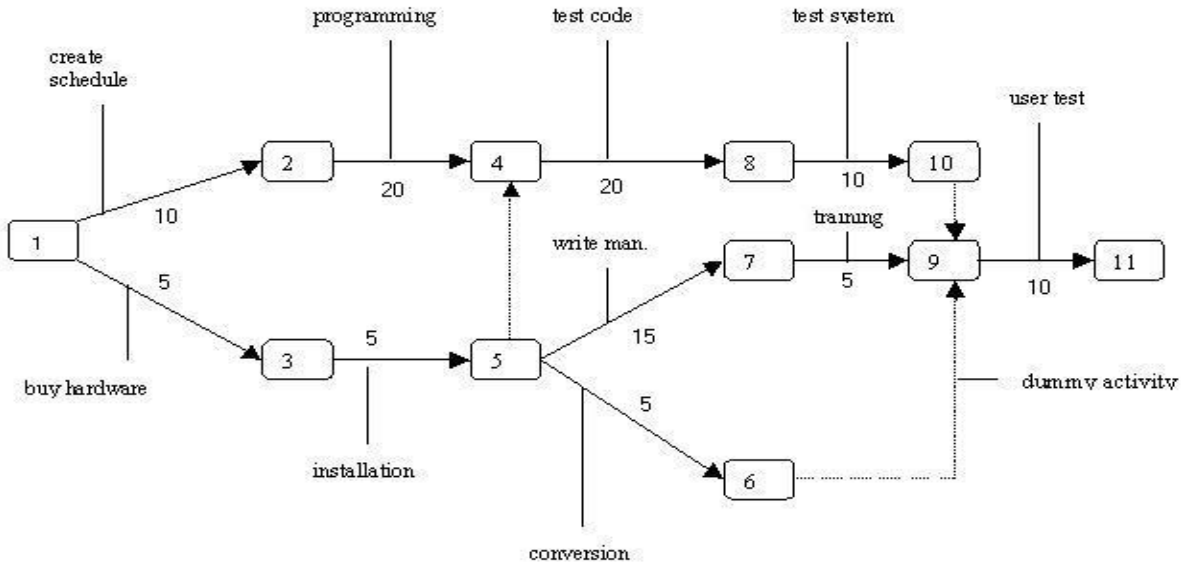


Fig. 1:
PERT Chart

* Numbered rectangles are nodes and represent events or milestones.
* Directional arrows represent dependent tasks that must be completed sequentially.
* Diverging arrow directions (e.g. 1-2 & 1-3) indicate possibly concurrent tasks
* Dotted lines indicate dependent tasks that do not require resources.

Project Control

Project control involves a regular comparison of performance against targets, a search for the causes of deviation, and a commitment to check adverse variances. It serves two major functions:

i. It ensures regular monitoring of performance; and

ii. It motivates project personnel to strive for achieving project objectives.

Reasons for ineffective control

Effective control is critical for the realization of project objectives. Yet, control of projects in practice tends to be ineffective. There seems to be three reasons for poor control of projects.

a) ***Characteristics of the project***: Most of the projects are large, complex undertakings involving many organizations and people. This renders the task of control difficult because:

i. Keeping track of physical performance and expenditure on hundreds or thousands (or tens of thousands) of activities which are often non-routine is a stupendous task.

ii. Coordination and communication problems multiply when several organizations are involved in the project.

b) **People Problem**: To control a non-routine project, a manager requires an ability to monitor a wide range of disparate factors, sensitivity to symptoms indicative of potential problems, and a faculty for comprehending the combined effect of multiple forces. Naturally most of the operational mangers, used to the steady rhythm of normal operations and routine work lack the experience, training, competence and inclination to control projects.

c) ***Poor control and information system***: One of the factors which inhibit effective control is the poor quality of control and information system. Some of the weakness observed in the control and the information system are:

i. *Delay in reporting performance*: Often there is a delay in the reporting of performance. This prevents effective monitoring of the project and initiation of timely action to check adverse developments.

ii. *Inappropriate level of details*: Generally cost information for control is collected in terms of cost codes found in the company's cost accounting system, irrespective of the level of detail employed for project planning and budgeting. Consider an extreme example wherein cost and volume of work done are reported for the project as a whole. What is the value of such information for identifying where slippages are occurring and who is responsible for them?

iii. *Unreliable information*: One of the major problems in project control is unreliable and inaccurate data and information. Often project managers receive reports which suggest that "everything is okay" or things are "reasonably within control" when the reality is otherwise. Further, for months

after the project is completed, costs dribble in to change a favorable variance into an unfavorable one or to aggravate an unfavorable variance.

Variance Analysis Approach

The traditional approach to project control involves a comparison of the actual cost with the budgeted cost to determine the variance. An example of variance analysis follows:

Costs	Activity -A	Activity-B
Budgeted cost in the period	50,000	30,000
Cumulative budget to date	200,000	75,000
Actual cost in the period	55,000	28,000
Cumulative actual cost to date	240,000	80,000
Variance for the period	(5,000)	2,000
Cumulative variance to date	(40,000)	(5,000)

The variance analysis approach is inadequate for project control for the following reasons:

i. *It is backward looking rather than forward looking*: It tells only what happened in the past but does not answer the following questions: What will happen in future? Is the rate of work accelerating or decelerating?

ii. *It does not use the data effectively to provide integrated control*: The traditional variance analysis shows whether in the time period under analysis more or less resources were expended than budgeted. However, it does not indicate the value of work done. This information is vital for purpose of control.

Performance Analysis: Modern Approach to Control

Effective control over a project requires systematic ‘Performance Analysis’. This calls for answering the following questions:

- Is the project as a whole (and its individual parts) on schedule, ahead of schedule, or behind schedule? If there is a variation, where did it occur, why did it occur, who is responsible for it, and what would be its implications?
- Has the cost of the project as a whole (and its individual parts) been as per budget estimates, less than the budget estimates, or more than the budget estimates? If there is a variation, where did it occur, why did it occur, who is responsible for it, and what would be its implications?
- What is the trend of performance? What would be the likely final cost and completion date for the project and its individual parts?

For small and simple projects, the project managers would do performance analysis for the project as a whole, or for its major components. As the project becomes larger and more complex, performance analysis needs to be done for individual segments of the projects which are referred to as 'cost account'. A 'cost account' is a logical management centre.

Methods of Analysis: For analyzing the performance at cost account and higher levels of the work breakdown structure, we employ a method of analysis which takes in to account the value of work that has been done. In the traditional methods of analysis, the project manager measured the actual progress against the predetermined schedule and the actual cost against the budget estimate. This did not enable him to know systematically whether the expenditure incurred was commensurate with progress. He perhaps relied on subjective estimates.

Performance analysis seeks to remove this subjectivity by employing an analytical framework based on the following terms.

- BCWS (Budgeted cost for work scheduled): It represents the total of three components (i) budgets for all work packages, scheduled to be completed (ii) budgets for the portion in-process work, scheduled to be accomplished and (iii) budgets for the overheads for the period.
- BCWP (Budgeted Cost for Work Performance): This is equal to the sum of three components (i) Budgets for work packages actually completed (ii) budgets applicable to the completed in-process work and (iii) overhead budgets

- ACWP (Actual Cost of Work Performed): This represents the actual cost incurred for a accomplishing the work performed during a particular time period.
- BCTW (Budgeted Cost for Total Work): This is simply the total budgeted cots for the entire project work.
- ACC (Additional Cost for Completion): This represents the estimate for the additional cost required for completing the project.

Given the above terms, the project may be monitored along the following lines:

Cost Variance: = BCWP – ACWP

Schedule variance in cost term: = BCWP-BCWS

Cost performance Index: = BCWP/ACWP

Scheduled performance Index: = BCWP/BCWS

Estimate cost performance Index: = BCTW/(ACWP+ACC)

Performance Analysis: An Illustration

A project was begun on 1st January 2008 and was expected to be completed by 30th September 2008. The project is being reviewed on June 30th 2008 when the following information has been developed.

Items	Acronym	Cost in Birr
Budgeted cost for work scheduled	BCWS	1,500,000
Budgeted cost for work performed	BCWP	1,400,000
Actual cost of work performed	ACWP	1,600,000
Budgeted cost for total work	BCTW	2,500,000
Additional cost for completion	ACC	1,200,000

Analysis:

Cost variance:	BCWP-ACWP = (1,400,000 – 1,600,000) = - 200,000
Schedule variance in cost terms:	BCWP-BCWS = (1,400,000-1,500,000)= -100,000
Cost performance index:	BCWP/ACWP = 1,400,000/1,600,000 = 0.8075
Schedule performance index :	BCWP/BCWS = 1,400,000/1,500,000 = 0.933
Estimated cost performance index:	BCTW/(ACWP+ACC) =2,500,000/(1,600,000+1,200,000) = 0.893

Human Aspects of Project Management

A satisfactory human relations system is essential for the successful execution of a project. Without such a system, the other systems of project management, however sound they may be by themselves, are not likely to work well. While technical problems can often be solved with additional investment of resources, people's problems may not be amenable to a satisfactory solution on the short span of the project life.

To achieve satisfactory human relations in the project setting, the project manager must successfully handle problems and challenges relating to:

- Authority
- Orientation
- Motivation
- Group functioning

Authority

Except in the divisional organisation, the project manager whose activities cut across functional lines of command lacks the desired formal authority over project-related personnel. Without conventional leverage of hierarchical authority, the project manager has to coordinate the efforts of various functional groups (within the organisation) and outside agencies. While he often has formal control emanating from contracts and agreements, as far

as outside agencies involved in the project work are concerned, in his own organisation he has to contend with split authority and dual subordination.

Since the project manager works largely with professionals and supervisory personnel, the basis of the authority would be different from that found in simple superior-subordinate relationships. For exercising leadership and influence over professional people, he has to explain the logic and rational for the project activities; show receptivity to the suggestions made by others; avoid unilateral imposition of decision; eschew/avoid dogmatic postures; and search for areas of agreement which can be the basis of acceptable solutions.

His effective authority would stem from his ability to develop a rapport/understanding or (bond) with the project personnel, his skill in resolving conflict among various people working on the project, his professional reputation and stature, his skills in communication and persuasion, and his ability to act as a buffer between the technical, engineering, financial, and commercial people involved in the project.

Orientation

Most of the managers working for the project are usually engineers (or technologists). Typically, an engineer:

- Work with physical laws, characterised by mathematical precision, as his tools.
- Adopts a structured, mechanical approach to his problems.
- Seeks an enduring solution to his problem.
- Attaches a high value on technical perfection.

When an engineer assumes managerial responsibilities, he faces a very difficult world in which he is supposed to:

- Perform the tasks of planning, organising, directing, and controlling the resources of the firm in a world of uncertainty.
- Adopt more creative approach to solve non-programmed and unstructured problems.

- Attach greater importance to efficient utilisation of resources and resolution of human relation problems.

Thus the project manager has to strengthen the managerial orientation of project personnel so that the project goals and objectives can be efficiently achieved within the constraint of time and budget. Clearly for achieving this task he must himself be an accomplished engineer-manager.

Motivation

The project manager functions within the boundaries of a socio-technical system. Most of the factors of this system-organisational structure, technical requirements, and competencies of project personnel-are more or less 'given' for him. The principal behavioural factor which he can influence is the motivation of the project personnel. In this context, he should bear in mind the following:

- Human beings are motivated by a variety of needs: physiological needs, social needs, recognition needs, and self-actualisation needs. Individuals differ greatly in the importance they attach to various need satisfaction. Further, their attitudes tend to change with time and circumstances, and are significantly influenced by their peers and superiors.

- The traditional approach to management was based on the assumption that human beings regard work as unpleasant, shirk responsibility, and ordinarily employ inefficient and wasteful methods. Such a conception of human behaviour suggests that a great deal of pressure has to be applied. Behavioural research, however, has shown that while some pressure is beneficial, an excess of it is undesirable. Beyond a certain point, pressure is dysfunctional.

- Motivation trends to be strong when the goal set is challenging, yet attainable. If the goal is too demanding, it results in frustration and conflict; if too lax, it induces complacency.

- Expectation of reward, rather than fear of punishment, has a greater bearing on individual behaviour. Further, the effectiveness of reward or punishment depends on how quickly it is administered.

- In a project setting where hygiene factors (like pay, physical working conditions, etc.) are reasonably taken care of, the principal motivators would be a sense of accomplishment and professional growth. In this setting, the project manager should rely more on participative methods of management.

In order to succeed in motivating project personnel, the project manager must be a perspective observer of human beings, must have the ability to appreciate the variable needs of human beings, must have still in several styles of management suitable to different situation, and must be sensitive to the reaction of people so that he can act supportively rather than threateningly.

Understandably, the project manager has a difficult task. In this endeavour, he can, however, count on one blessing: the stimulating and satisfying nature of project work. In established organisations many professional and supervisory personnel find it difficult to see how their efforts redound to the realisation of organisational goals. Separated from top management by several layers of organisational hierarchy, they are unable to relate their work to the missions of the firm (which themselves often may be blurred to them). In addition, the jobs in established organisations are somewhat dull and routine. All this creates a sense of alienation and frustration which dampens motivation. Fortunately, in a project setting, where the super ordinate goals are clearly defined and visible to all involved, where there is usually a great emphasis on participative style of management, where the layers in the organisational hierarchy are few, and where the jobs are more challenging, project personnel tend to have greater commitment. Being able to relate their work easily to the goals of the project, their motivation is usually high.

Group functioning

In a large complex project, many persons drawn from different functions, departments, and organisations are involved. This leads to formation of groups, formal and informal. In a typical project organisation many interlocking and interdependent groups are formed.

The group formed in a project setting may be of three types: vertical groups, horizontal groups and mixed groups. A *vertical group* consists of people drawn from different levels in the same department, or function, or company. A *horizontal group* consists of people drawn from different functions, departments, and companies, but occupying similar hierarchical

positions. A *mixed group* consists of people drawn from different levels from various functions, departments and companies.

A vertical group tends to form most naturally because of departmental/functional/ organisational affinities. However, the existence of such groups may lead to a pronounced "we/they" attitude and accentuate conflicts. A horizontal group is a useful instrument in linking the overall project organisation. The members of the horizontal group, occupying key positions in their respective fields, serve as channels of communication. By their influence, they can strengthen the commitment to the project. The mixed group tends to promote greater cohesion of the total project organisation. It is very conducive to creating a 'project' attitude and developing an overriding commitment for the project. Hence the project manager should strive to establish a mixed group as the principal group of the project. However, it is difficult to establish such a group because of the temporary nature of a project-when members of a group know that the group would be dissolved sooner or later, they retain strong links with their parent company or department.

Building Effective Group: An effective group consists of members who are satisfied and committed and who strive for the attainment of project objectives, without dissipating their energies in inter-personal and inter-group conflicts. The manifest signs of an effective group are: *esprit de corps*, pride in the project, supportive behaviour, coordinated endeavour, mutual respect, and resilience during trying periods. An ineffective group, on the other hand, consists of disgruntled members who are more involved in inter-personal and inter-group rivalries and less concerned about project goals. Such a group is characterised by apathy, animosity, mutual bickering, disjointed efforts, cynical attitudes, and low morale.

How can effective groups be established? Studies in group dynamics suggest several stages, which are partially overlapping, in the formation of an effective group:

- Development of mutual trusts
- Diminution of offensive behaviour
- Openness and candour in communication.
- Cooperation and supportive behaviour.

- Resolution of differences by mutual negotiation.

For building an effective group, the firm must pursue a genuinely participative style of management. With this managerial philosophy, the project manager can facilitate the development of mutual trust and acceptance, open communication, cooperation, and project attitude. In this task, he needs leadership capabilities, sensitivity to human nature, perceptiveness, concern for welfare of others, maturity, and impartial approach. Clearly this is a difficult and challenging task.

Pre-requisites for successful project implementation:

Time and cost over-runs a project are very common in Ethiopia, particularly in the public sectors. Due to such time and cost over-runs, projects tend to become uneconomical, resources are not available to support other projects and economic developments are adversely affected.

What can be done to minimize time and cost over-runs and thereby improve the prospects of the successful completion of projects? While a lot of things can be done to achieve this goal, the most important ones appear to be as follows.

- Adequate formulation.
- Sound project organization
- Proper implementation planning.
- Advance action
- Timely availability of funds.
- Judicious equipment tendering and procurement.
- Better contract management.
- Effective monitoring.

Adequate formulation

Often project formulation is defiant because of one or more of the following shortcomings:

- Superficial field investigation
- Cursory assessment of input requirements
- Slip-shod method used for estimating costs and benefits.
- Omission of project linkages
- Flawed judgments because of lack of experience and expertise
- Undue hurry to get started
- Deliberate over-estimation of benefits and under-estimation of costs.

Care must be taken to avoid the above deficiencies so that the appraisal and formulation of the project is through, adequate and meaningful.

Sound Project Organization

A sound organization for implementation of the projects is critical to its success; the characteristics of such an organization are:

- It is led by a competent leader who is accountable for the project performance.
- The authority of the project leads and his team is commensurate with their responsibility
- Adequate attention is paid to the human being in the project
- System and method are clearly defined
- Rewards and penalties to individuals are related to performance.

Proper implementation Planning

Once the investment decision is taken-and often even while the formulation and appraisal are being done-it is necessary to do detailed implementation planning before commencing the actual implementation. Such planning should, *inter alia*, seek to:

- Develop a comprehensive time plan for various activities like land acquisition, tender evaluation, recruitment of personnel, construction of buildings, erection of plant, arrangement for utilities, trial production run, etc.
- Estimate meticulously the resource requirements (manpower, materials, money, etc.) for each period to realize the time plan.
- Define properly inter-linkages between various activities of the project.
- Specify cost standards

Advance Action:

When the project appears *prima facie* to be viable and desirable, advance action on the following activities may be initiated:

i. Acquisition of land

ii. Securing essential clearance

iii. Identifying technical collaborators/consultants,

iv. Arranging infrastructure facilities ,

v. Preliminary design of engineering, and

vi. Calling of tenders.

To initiate advance action with respect to the above activities, some investment is required. Clearly, if the project is not finally approved, this investment would represent an in fructuous outlay. However, the substantial savings (in time and cost) that are expected to occur, should the project be approved. (a very likely event, given the *prima facie* desirability of the project) often amply justify the incurrence of such costs.

Timely availability of fund

Once a project is approved adequate funds must be made available to meet its requirements as per the plan of implementation-it would be highly desirable if funds are provided even before the final approval to initiate advance action.

It is a common observation that firms which have a comfortable liquidity position are, in general, able to implement projects expeditiously and economically. Such firms can initiate advance action vigorously, negotiate with suppliers and contractors aggressively, organize impute supplies quickly, take advantages of opportunities to effect economies, support suppliers in resolving their problems so that they can in turn redound to the successful completion of projects, and sustain the morale of project-related personnel at a high level.

Judicious equipment tendering and procurement

To minimize time over-runs, it may appear that a turnkey contract has obvious advantages. Since these contracts are likely to be bagged by foreign suppliers, when global tenders are floated, a very important question arises. How much should we rely on foreign suppliers and how much we depend on indigenous suppliers? Over-dependence on foreign suppliers, even though seemingly advantageous from the point of view of time and cost, may mean considerable outflow of foreign exchange and inadequate incentive for the development of indigenous technology and capability. Over-reliance on indigenous suppliers may mean delays and higher uncertainty about the technical performance of the project. A judicious balance must be sought which moderates the outflow of foreign exchange and provides reasonable fillip to the development of indigenous technology. In many case, the number of contract packages should be kept to a minimum in order to ensure effective coordination.

Better contact Management

Since a substantial portion of a project is typically executed through contracts, the proper management of contracts is crucial to the successful implementation of the project. In this context, the following should be done:

- The competence and capability of all contracts must be ensured-one weak link can jeopardize the timely performance of the contract.
- Proper discipline must be inculcated among contractors and suppliers by insisting that they should develop realistic and detailed resource and time plans which are congruent with the project plan.
- Penalties must be imposed for failure to meet contractual obligations. Likewise, incentives may be offered for good performance.

- Help should be extended to contractors and suppliers when they have genuine problems-they should be regarded as partners in a common pursuit.
- Project authorities must retain latitude to off-load contracts (partially or wholly) to other parties well in time where delays are anticipated.

Effective monitoring

In order to keep a tab on the progress of the project, a system of monitoring must be established. This helps in:

- Anticipating deviations from the implementation plan.
- Analysing emerging problems.
- Taking corrective action.

In developing a system of monitoring, the following points must be borne in mind:

- It should focus sharply on the critical aspects of project implementation.
- It must lay more emphasis on physical milestones and not on financial targets.
- It must be kept relatively simple. If made over-complicated, it may lead to redundant paper work and diversion of resources. Even worse, monitoring may be viewed as an end in itself rather than as a means to implement the project successfully.