CHAPTER V
PITFALLS
IN
PROJECT IMPLEMENTATION
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5.1. INTRODUCTION:

Project implementation is concerned with the realisation of the first part of the project intention, i.e., the provision of the physical facilities needed to generate the desired economic performance. Just as there is likely to be a carry-over of people from the preparation to the implementation stage, so there is an element of continuity in the organisational framework. This chapter is first concerned with the systems aspects of project implementation. It then considers some pitfalls of project control with particular reference to two major project criteria, time and cost.

5.2. SYSTEMS ASPECT OF IMPLEMENTATION:

A brief description of the implementation stage is desirable and it is perhaps most convenient if this is expressed in systems terms. Figure 5.1 illustrates the various constituents of this part of the total investment process. The implementation stage begins with the project brief and ends with the plant handover to the operating group which will commission the completed plant.

Project Implementation:

Fig 5.1 Simplified block diagram for project implementation
The Project Brief:

The project brief is the actuating mechanism of the implementation stage. Its format may be a standard document or a specific memorandum. It normally comes from the authorisation group and is addressed to the managers responsible for project implementation.

Project Organisational Planning:

The project which receives relatively prompt authorisation has the advantage of continuity. The project preparation group may not yet be disbanded and its members diverted to other tasks.

Technological Planning:

This stage is primarily concerned with engineering and design. The project technical objectives, to whatever extent established so far, have now to be defined in detail and fully developed.

Procurement:

Procurement consists of the acquisition of all plant, materials and external services required for a project. It involves the purchase of proprietary equipment, the negotiation of construction projects, indeed, anything which commits the firm in contrast, be it from a small fitting to a multi-million-rupee agreement.

Construction:

It is common project experience that as the planning work declines the centre of attention and activity shifts to the physical project execution - construction.
Construction covers all building and related activities from trial test boring on a new 'greenfield' factory site to the final landscaping.

**Plant Integration:**

This is to some extent a continuation of the construction stage, and its segregation may seem somewhat artificial. Yet this work has a different emphasis. The 'hardware' is there but it is now to be integrated into an overall production unit. In a very rough sense we can say that the construction stage is concerned with the 'brawn' of production, whereas this stage is associated with the 'brains' of the process.

**Plant Handover:**

It is the last phase of the project implementation stage, as defined. The capital expenditure has been incurred, a new production unit is physically ready to go into service. The handover, i.e., the change of responsibility, is from the project group to operating management. In most cases where there is this division of labour, members of the operating staff nevertheless take the opportunity to acquaint themselves with the new plant during the latter stages of construction and plant integration. The nearer the plant gets to the operational stage the more relevant become operational aspects and the participation of the operating groups.

**5.3. PROJECT CONTROL:**

Project implementation is an objective to be achieved within the constraints of technical and operational specifications, a project budget and timetable. The aim of project control is to ensure that these set boundaries are not overstepped. If, because of
some unforeseen event, these limits have to be breached then it will be the function of the control system to warn and to inform so that steps may be taken to minimise such deviations

5.3.1. **Cost Control** is an obvious requirement in managing projects. It stresses on careful planning and allocation of resource commitments to an appropriate policy of management. Cost control traditionally consists of recording costs in a budget which itself is an earliest forecast of cost. The primary objective of control is economy and the efforts of management must be so directed to maximise profitability. This demands the accurate anticipation of future costs and taking appropriate action in time to avoid overhead costs. Management should therefore feel responsible while committing resources and justify the huge spending.

The essentials of a cost control system are that

- it should be simple and easy to understand,
- it should not consume excessive resources,
- it must encourage honesty and commitment amongst the team,

Taking corrective action after iterative modifications is the sole prerogative of line management but in project management where activities are performed once-for-all, only mistakes can be prevented as much as possible and cannot be reworked. It is therefore, necessary in projects that the underlying causes of failures and mistakes be properly diagnosed and that all available options to revise schedules, cost and performance are thoroughly examined before determining an optimal solution. No exposition on control
action can be prescriptive because the nature of problems and their criticality will vary significantly from one project to that of the other. This suggests a structured approach to option identification and analysis by considering trade-offs within and between project parameters to control costs.

In order to plan the costs and control the variances, four important influencing areas of projects need attention. They are captured hereunder:

![Influencing areas of control](image)

**5.3.2. Essentials of Project Control System:**

A well-designed control system generally encompasses the following project aspects,

1. Expenditure and commitments to date, giving both totals and breakdowns to specified project accounting codes. These are compared, as far as possible, with the budget forecasts for the level of progress reached.

2. Expenditure forecasts to project completion, giving details and reasons for any overruns.


4. Completion date forecast.
v Project developments which might affect the technical and operational prospects of the completed plant

vi Manpower/man-hour analysis of all staff employed on the project

5.4. PROJECT CONTROL IN SELECTED COMPANIES:

With most of the companies of the study the financial project control system was the most explicit Companies A and C (actual names are changed) incorporated their control requirements in their capital expenditure manuals Typically, project financial reports were required on a four weekly or monthly basis Aggregate reports on overall capital budgets and expenditures were similarly asked for from the various factories or cost centres Other facets of reporting such as on programme progress seemed less developed Many of the small to medium capital projects consisted of plant purchases where the company was hostage to delivery promises from suppliers With extended deliveries the monthly progress report had little to tell Major projects of a composite nature or with a substantial design/development content often had a specific progress reporting system linked with the monthly financial statements

A particular facet of the overall control system was the administrative procedure relating to individual project commitments For instance, with approved projects, company 'A' insisted that all factory purchase requisitions were checked by head office accountants against the project proposal plant list before orders could be placed Direct labour commitments were similarly verified by factory accountants Company 'D' required its factory chief accountants to make sure that prescribed practices relating to
engineering contracts were followed by the appropriate staff. These concerned the placing of orders, acceptance of invoices, the precise responsibilities for installation, erection and the commissioning of plant. For contracts over Rs 10,000 instructions referred to the terms of payment, price variation formulae as well as the terms of sub-contractors. Particular attention had also to be given to the procedure and authority for ordering and accepting contract modifications and additions, the provision of site facilities and rules covering hygiene, catering, union conditions, etc. These examples suggest that administrative procedures can operate as important project control devices. They also limit the discretion available to the project manager.

5.4.1. Indicators of Implementation Performance:

A review of the effectiveness of project implementation depends on supporting data. Such information is however hard to get. For a proper empirical study a set of implementation attributes would need to be established and a number of projects related to these. The great problem is to obtain the type of systematic information which provides the basis for inter-company generalisations. Samples cannot be chosen at random, the availability of data is the qualification for inclusion. The project sizes vary greatly, the politics of decision making cannot always be assumed away; behavioural aspects provide a set of variables which are difficult to isolate. We have all the complications of a multi-factor, dynamic situation. Nevertheless, despite all this some meaning can be attached to two specific indicators, time and money.
What follows is based on a more detailed scrutiny of the project accounts for twenty-eight new plant projects in four different companies. Projects ranged in value from just under Rs 20,000 to over Rs 3 million. The ratio of actual project cost/initial project authorisation was taken as the basic financial indicator. Values greater than 1 therefore indicate an overrun. The investigation was carried out at a time when the average annual rate of inflation in terms of the index of wholesale prices for mechanical engineering products was somewhat over 2 per cent.

The minimum observed ratio value was 0.672 and it was found here and in other cases where ratio values were appreciably below 1 that projects had been curtailed. It seems that with an extended project schedule and discrete plant units, a company could change the project scope without undue disturbance losses. In such cases project authorisations are revoked, cancelling financial provisions which had not yet become commitments.

The maximum ratio value of 2,150 concerned a project with a heavy development content. Other cases of overrun also indicated development complications. Interestingly, these are not always within the company. They may be the immediate responsibility of an equipment supplier but still involve the company in consequential costs. Overall, the observations suggest that as the technical development content increases, project cost prediction also becomes more difficult. The closer a project comes to a research and development proposition, the more opposite are Mansfield's findings about the divergence between estimated and actual project costs. The technical risks are
greater and this shows in project cove overruns One might argue that with fuller project preparation such costs might be reduced Admittedly, the project accounts can gain but this does not necessarily yield much of an overall saving to the company

Irrespective of cause, project delays increased the chances, of excess project costs, quite apart from inflation effects The spread of project ratio values within a company also sheds light to its investment activities For instance, the nine projects from one company had value ratios from 0.950 to 1.060 The company had a tight system of project financial control.

Apart from one major factory scheme, however, most of its projects were of modest value, comparatively short duration and constituted mainly proprietary equipment With a given level of organisational effectiveness, the nearer projects comes the 'shopping basket' type, the closer should be outturn be to the original estimate

As an indicator of implementation effectiveness, project costs are a useful guide provided allowance is made for,

i late invoices and contingent liabilities ,

ii changes in project content,

iii interrelated projects where cost transfers are sometimes made for 'in-house' reasons

5.4.2. The Project Time Scale:

Earlier in this chapter we included in the project implementation stage all those constituents from the project brief to the plant handover The time lapse from the
beginning of the former to the end of the latter would then constitute the project time scale. It is this parameter of project performance which we wish to consider further, both in terms of intention and of achievement.

One project had no time schedule. It was authorised only near the end of the physical plant construction process. Commitments were undertaken on the basis of personal understandings between senior executives of the main contracting companies and their client. Work proceeded on that basis, authorisation and formal confirming orders came only towards the close of the work tasks. The detailed project correspondence left no doubt about the commitment and the implied contract, inferable from the conduct of the parties, would have been sustained in law. Whilst, perhaps, this was the most outstanding example of 'pre-authorisation commitment', similar tendencies were also noted with some other projects. Such informal commitment, before the actual Board decision, reveals interesting aspects of organisational behaviour.

A further complication arose with some plant development and construction projects. In technical terms it was difficult to draw the line between development work before authorisation and the full equipment design subsequent to it. Project time scale definition became even more difficult when subsequently some of the pre-authorisation development costs were capitalised as part of the project costs. The project starting point could thus be redefined retrospectively.

At the other end of the project period technical and operating problems at the commissioning stage were the source of further difficulties. The periods of project
execution and plant commissioning could overlap, particularly with those large projects where handover to production could be on a stage-by-basis. Failure or troubles at commissioning might force the project team and contractors to spend further time on plant modification, in some instances after they had already left the construction/installation site. Where there were no formal 'handover' documents, it was necessary to infer from the withdrawal of construction/installation labour that the project was physically complete for operational purposes.

It should not be inferred, of course, that every project time scale has such problems. However, it is important to be on one's guard when generalising from such data.

5.4.3. The scheduled project period:

In the evaluation of the scheduled project period it is important to remember the background of a project. Where the project is confined to plant aspects and is unhampered by other time considerations, then the project schedule becomes a timetable for technological planning, procurement and installation work. The project schedule may however be affected by non-project factors.

For instance, one project concerned major plant modifications the costs of which were capitalised. An important operational requirement was to maintain at all times, adequate production capacity to meet the company's sales commitments. There had to be sufficient excess plant to production requirements to release machines for modification. Because of the nature of the product and its distribution costs such excess plant could not necessarily be aggregated on a group basis, i.e., a particular factory had to be able to
release a given machine. It was this which governed the project time scale, not the actual work content.

Another extraneous influence on the project time schedule is capital rationing. In one project all the plant could have been procured and installed within a few months. However, project cash release was determined by overall cash flow considerations and thus more than doubled the project period.

Apart from this type of extra-project factor one can broadly relate the scheduled project period to the following:

1. the project size,
2. its technical and development content,
3. the delivery periods of key equipment,

For the reasons already stated, such relationships can only be regarded as approximate.

5.4.4. Time Schedule performance:

As with project costs a similar ratio can be used for the time dimension. It will now be the ratio of the actual to the scheduled project period. The scheduled project periods ranged from three to thirty-six months. The longest actual period noted came to sixty months but as work on it and finance for it were intermittent, the project was somewhat of a special case. About 60 per cent of all the projects were completed to schedule. The best time ratio of 0.667 reflected project curtailment. When overruns took place they were substantial in actual and in ratio terms. Time ratios of 2.5 and 2.4 were
noted for specialist but proven proprietary equipment and thus exceeded the overruns of in company development-type plant projects. Three of the four projects with major development content exceeded their schedules.

With small samples only tentative conclusions are possible. As with costs, it seems, however, that an increase in project development content makes schedule prediction more difficult. Also, delays with suppliers and contractors, irrespective of technical task content, can at times be seriously underestimated.

5.5. TIME AND COST OVERRUNS:

Time overrun simply refers to spending more time on a project than scheduled for it. The delays in implementing by consuming more time than that of planned and scheduled for the given task. These delays may be attributable mainly to two causes, internal and external or controllable and uncontrollable. Internal causes mostly are controllable such as managerial incompetence or lack of co-ordination and co-operation on the part of team members. Whereas the external causes often are uncontrollable such as natural calamities, political pressures and changes in the competitive market situation. Cost overrun is simply the excess of actual cost incurred on a project over the budgeted or planned cost. For instance, if the project cost is estimated (or Current Cost Estimate) to be Rs 100 crores whose completion time is 5 years and if the project gets completed in 7 years time with a total cost of Rs 150 crores, then the project is said to be cost and time overrun. One of the yester year projects like Srisilm Dam whose stone was laid by the late First Prime Minister Pt Jawaharlal Nehru and was scheduled to be completed by the
mid 1970s was simply overrun by a decade only when Mrs Indira Gandhi during 1981, the then Prime Minister of India, inaugurated the tunnel of Dam which was partially complete. Some of the prominent international projects that were susceptible to cost and time overruns were BART project of San Francisco, Opera House of Sydney, Channel tunnel, Oosterscheld, Concorde Aircraft project etc.

Fig. 5.3. Diagram of Time & Cost Overrun

\[
\text{Time overrun} = \frac{\text{ATWP} - \text{STWP}}{\text{STWP}}
\]

Where

\( \text{ATWP} = \text{Actual time taken for work performed} \)

\( \text{STWP} = \text{Standard time needed for work performed} \)

\[
\text{Cost overrun} = \frac{\text{ACWP} - \text{BCWP}}{\text{BCWP}}
\]

Where

\( \text{ACWP} = \text{actual cost of work performed} \)

\( \text{BCWP} = \text{budgeted costs of work performed} \)

5.5.1. Reasons for such Overrun

The following are some of the vital reasons for cost and time overruns that occur at various phases of project life cycle.

a. Managerial Reasons

- Lack of timely co-ordination amongst project team and inability to cope with pace of project plans and schedules.
• Lack of 'dynamism and dedication' on the part of team members and exercising poor leadership styles by project authorities.

• Poor feed-back system on costs and schedules from time-to-time.

• Selecting a contractor on rigid notions of 'lowest quotation bidder' basis ignoring the financial soundness of contractor -

• Poor monitoring and expediting project implementation.

b. Financial and Cost Reasons

• Unrealistic estimates and budgets based on incorrect interpretations of past budget figures.

• Cost estimations performed by inexperienced estimators.

• Inability to anticipate future financial crunch and manage funds accordingly.

• Too many financial commitments simultaneously without resorting to priority criteria.

• Inability to get timely release of funds from the sources (either by management or by financial institution).

• Poor working capital management and cash flows.

• Choosing costly sources of funds where interest on borrowing occupies a significant portion in the total project cost.

c. Design Reasons

• Frequent changes in design specifications.

• Poor designing based on faulty engineering and specifications.
Employing an untested design process

Lack of co-ordination amongst technical team, managerial team and contractors while executing the project

d. **Contractual Reasons**

- Ambiguous contractual agreements
- Deliberate attempt of contractors in underrating costs to bag the contracts
- Changes of site or locations frequently
- Susceptible to wrong or inappropriate equipment and insufficient supplies

e. **Political and Environmental reasons**

- Changes in the inflationary trends due to fluctuating trade cycles
- Changes in the exchange value of basic currency
- Changes in political framework due to change of leaders
- Unforeseen actions of God such as untimely floods, earthquakes and storms near the project site

5.5.2. Overrun vs. Life-cycle Phases (Kerzner)

<table>
<thead>
<tr>
<th>Life Cycle Phase</th>
<th>Prominent Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptual</td>
<td>• Failure to understand basic requirements of a project</td>
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<td></td>
<td>• Unrealistic appraisal of in-house capabilities</td>
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<td>• Underestimating time requirements</td>
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Planning

<table>
<thead>
<tr>
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<th>Prominent Reasons</th>
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<tbody>
<tr>
<td></td>
<td>• Omissions</td>
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<td></td>
<td>• Inaccuracy of the work breakdown structure</td>
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<tr>
<td></td>
<td>• Misinterpretation of information</td>
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<td></td>
<td>• Use of wrong estimating techniques</td>
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<tr>
<td></td>
<td>• Failure to identify and concentrate on major cost elements</td>
</tr>
<tr>
<td></td>
<td>• Failure to assess and provide for risks</td>
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</tbody>
</table>
Negotiating

• forcing a speed compromise of agreements
• procurement ceiling costs
• negotiation team that must "win this one"

Contractual

• contractual discrepancies
• SOW different from RFP requirements
• proposal team different from project team

Design

• accepting customer requests without management approval
• problems in customer communication channels and data recues
• problems in design review meetings

Construction

• excessive material costs
• over road specifications
• manufacturing and engineering disagreements

Source Kerzner, op cit pp

5.5.3. S-Curve and Commitment Control:

One of the most frequently prepared graphical displays employed in project control is the S-curve. S-curve is an appearance of the plotted target costs with time on a two dimensional graph. In many small projects the targeted S-curve can be anticipated by a technique developed by Miller. He proposes two vital control points, one at the 1/3rd of time and 1/4th of cost and the other extreme at 2/3rds of time with 1/4th of cost. Between these two points, it is assumed that project expenditure will vary linearly and the first part of the curve is assumed to be parabolic. This can be seen in figure 5.4

It is a dynamic appraisal system of schedule commitment vis-a-vis actual commitment at any point of time in the project implementation. When the orders have been placed with contractors and suppliers, the project management would be committed
Commitment control can be depicted by 'S curve' as shown in Fig. 5.4

![S Curve of Commitment Control](image)

Fig. 5. 4. 'S' Curve of Commitment Control

The top management by studying the curve can immediately assess, identify the project status and can calculate the possible overrun thereby determining value of work commitment still to be executed. This helps management to take decision on remedial measures and correct them in order to complete the project within budgeted cost and time.

The assessment and precise recording of value of work done is crucial to project cost control. This is described by accountants as work in progress. For instance, design man-hours are usually measured weekly. The hours that have been booked can be evaluated at an average rate per man-hour, that rate being the actual cost involved in the project. Materials are delivered against a firm order where an order value is available. In all the above circumstances, realistic targets are established in order to make the analysis
meaningful. A low cost estimate often leads to a low estimate of the time required to carry out the work. The immediate target is not the final target.

A series of standard S-curves would be developed by major project sources such as the oil and gas industries and trace the performance of existing projects. These curves can be put to a number of uses including monitoring, reporting, and payment of project costs. The S-curve is identified and characterised by five important stages:

**Stage 1:** This is the start-up portion of the project, while the project manager plans, negotiates for staff, and generally sets things up. Costs accumulate slowly during this time unless expensive equipment is purchased.

**Stage 2:** This represents a rapid expenditure of funds as work proceeds quickly. A cost control system that cannot manage and control the expenditure during this time leaves the project manager vulnerable to missed objectives with inadequate resources of recoup.

**Stage 3:** This corresponds to the time when most of the work is done and attention is devoted to report writing, tying up loose ends, etc. Expenditures are made at a lower rate again.

**Stage 4:** This refers to the time when all explicit commitments have been met. Expenditures to this date should not equal the total budget because there are still post-accomplishment activities to be terminated and charged against the project budget.
Stage 5: This is the period when the project is finally terminated and minor ultimate costs dribble in. These last minute costs plus those that are incurred in accomplishing the project through stage 4, should not exceed the overall project budget as finally negotiated and approved.

Miller’s anticipated S-curve probably do not represent reality foremost of the mega projects. However, the S-curve is made to represent a project considering both the extreme dimensions of time. Therefore, the optimum curve is drawn by considering both the bordering S-curves. The optimum S-curve is the target curve as shown in the previous diagram.

5.5.4. Variance Analysis:

Variance analysis helps the project management to determine ‘trouble spots’ in the project and to take corrective action. There are precisely three areas which need
project manager's attention and control. These are the time, costs and quantities. The project manager will have to monitor the quality targets, using whatever standards that can be developed and by taking necessary steps to ensure that they are met.

In order to measure these variances, three important variables are noteworthy:

- **Budgeted Cost of Work Scheduled (BCWS)**
- **Budgeted Cost of Work Performed (BCWP)**
- **Actual Cost of Work Performed (ACWP)**

Cost Variance = BCWP - ACWP

Schedule Performance Variance = BCWP - BCWS

\[ \text{\% Overrun (Underrun)} = \frac{\text{ACWP} - \text{BCWP}}{\text{BCWP}} \]

- Actual cost of work performed. This is the amount reported as actually expended in completing the particular work accomplished within a given time period.
- Budgeted cost of work performed: This is the budgeted amount of cost for the work completed in a given time period, including support effort and allocated overhead. This is also labelled as "earned value of work" accomplished.
- Budgeted cost of work scheduled. This is the budgeted amount of cost of work scheduled to be accomplished in a given period of time (including support and allocated overheads).

Variance thresholds are also established that define the level of management within an organisation to which reports must be sent. By combining cost and schedule variances, an integrated cost/schedule reporting system can be developed. Often project managers are/wrapped up in tracking their projects using only BCWS (Budgeted Cost of Work Scheduled) and ACWP (Actual Cost of Work Performed). As long as they see no difference between what is planned to spend and what actually had been spent, they think the project is running smoothly. However, this may not be true, and the manager might be unable to spot a problem until it perhaps becomes serious. Many a time, it so happens that the project continues to exhibit a normal pace in accordance with that of scheduled and suddenly the project manager realises that the work is not getting done as required, and a big effort is applied to catch up. The usual result is that spending overshoots the planned target. This is illustrated in the figure 5.6.

![Sudden Overshoot of Expenditure](image-url)

Fig. 5.6.: Sudden Overshoot of Expenditure
5.5.5. Progress Payments:

In the planning and control system described, the cost figures in the network are estimated costs. Indirect costs and site overheads are treated separately, but these values on the network are still estimates. Progress claims, however, usually must be calculated against the contract prices in the Bill of Quantities, which include an amount for indirect costs or overheads, and for profit. The estimated costs can, of course, be adjusted by means of a standard percentage of progress payments since a retention amount is usually withheld in any case. If the preliminary and temporary works are separately itemised and paid for, the costed network can be used for progress claims as it stands. If the contract is one in which the cost of all temporary items is spread over the rest of the items on the bill (say on a percentage basis) then this distributed percentage must be added to the estimated activity costs before the price for the activity can be calculated. In either case the network can still serve as a basis for the calculation of progress claims. It is obvious that the internal costing periods and the periods for progress measurement must coincide periodically, although the former may be more frequent, for instance, the internal period may be one week, and the external period may be four weeks. This is because the costs, valuations and progress claims must be compatible, and so that clerical work duplication can be avoided.
5.5.6. CATS and RATS:

CAT and RAT refers to Committed and Reserved Activity Targets respectively. The CAT would always try to swallow RAT as usual, i.e., the project management should try to maintain a distance between the two till the end. Even these schedules can be exhibited graphically in S-curve form. The CAT schedule will be detailed and developed in squared network form where the RAT will be maintained in S-curve form only. This will avoid any possible confusion and also complacency that may develop in the mind of execution agencies if the RAT schedule were made public. The RAT schedule will contain only the key milestones whereas the CAT schedule will have all important activities and all milestones. However, the key milestones will be specially highlighted in the CAT schedule and these will be the targets which the project consultants would consider and make every effort to achieve. If the achievement of the key milestones is delayed beyond the RAT schedule, then only slippage will be accepted for reporting to financial institutions and the general public. The CAT and RAT schedules should be revised every time the cost estimates are revised so that a correspondence between cost and time schedule is maintained. With each revision, the gap between the CAT and RAT will get progressively reduced. The CAT schedule at each revision will be based on actual commitments and information as available up to that stage. The RAT schedule will add some allowance to the extent of inaccuracy anticipated at that stage. The Figure 5.7 presents CAT and RAT schedules.
5.5.7. Work Breakdown Structure

Often the project cost information strings to the work packages that are conveniently identified at each level. The roots of work break down structure philosophy can be traced to the instructions issued under DOD-NASA to the Air Force in 1964. The philosophy of WBS (work break down structure) states that the comprehensive project work is tracked down through several levels of work defining the scope of at each level microscopically and to which the costs can be directly attributed. These microscopic work packages can help in planning and controlling the resources as well as costs. This also enables the management to establish and allocate budgets at each fragmented task level from which a cumulative budget for the total project can be determined. Some of the essential features of work break down structure are given below:

- It represents the units of work at levels where work is performed.

- It is clearly distinguished from all other work packages.
• it is assignable to a single organisational element,
• it has scheduled start and complete dates,
• it has budget of assigned value expressed in monetary terms, man-hours or other measurable units,
• its duration is limited to a relatively short span of time, or it is subdivided by discrete value milestones to facilitate the objective measurement of work performed,
• it is integrated with detailed engineering, manufacturing or other schedules

The WBS concept is universally applicable in order to manage the costs as well define the responsibility of the project organisation. In this regard it is observed that a perfect matrix between the organisation break down structure (OBS) and work break down structure (WBS) is established in many of the current day projects.

5.6 PITFALLS IN PUBLIC SECTOR PROJECTS OF INDIA:

Public sector projects have been constantly facing significant challenges caused by rapid pace of change enshrined in new legislation and government directives. Public sector projects are under constant thrust from the three different angles such as government, management and the public and have to prove themselves upright by balancing through economy, efficiency and effectiveness in all these areas.

Some of the principal reasons why many major works failed to finish on time, and within budget include
• **Underestimation**: The complexity, the logistics and sheer difficulty of executing the work, had serious repercussions on the cost which is often underestimated on mega and defence sector projects. For example, Bofors gun dealings, Narmada Valley, Enron power project are some of the live projects of faulty estimations.

• **Technological advance and uncertainty**: The desire to incorporate latest technology and innovations caused problems particularly on the power and steel plant project during early 50s and 80s.

• **Late design changes**: These are often encountered on major projects, and can be reasoned to unfreezed designs.

• **Correction of design errors**: Frequent design changes that are fancied with over-designed and over-whelmed specifications are likely to invite problems of increased design costs.

• **Increased safety requirements**: These problems are caused on the oil fields, nuclear power plant and nuclear installation and defence projects.

• **Poor industrial relations**: Poor and inadequate attention my management towards maintaining good relations amongst various groups in the projects have plagued most of the public sector projects on site.

• **Adverse site conditions**: Such problems are often encountered on piling, earthworks, or tunnelling projects of river dam constructions where seismic conditions play a dominant role.
Funding availability: This is exclusively a problem of developing countries where economic and social development the projects depend on World Bank or ADB for appropriate aid.

Site acquisition problems: This is a major cause of delay on some large office developmental projects or industrial developmental projects.

Quantity increases: This problem is witnessed particularly when the bills of quantity has been on inadequate information.

Shortages of materials: This again is observed mainly in developing countries where steel shortages were critical especially during 70s.

Contractors' financial difficulties: Lack of sufficient finance indeed affected some major contractors and forced them to cease their operations.

Inappropriate contract strategy: The significance of a suitable contract strategy was previously underestimated due to which major social projects such as hospitals, and schools, etc., were subjected to late design alterations and resulted in cost and time overruns.

Inflation and interest charges: The charges in economic structure will affect money market that in turn creates fluctuations in trade cycles and interest rates. Developing countries are highly vulnerable to such effects.

Exchange rates: Significant on overseas contracts when payment for work done is made in a devalued local currency but key materials and construction equipment.
are purchased from the home country with staff salaries also possibly guaranteed on fixed exchange rates

- **Civil unrest/political coups:** Projects that are undertaken on regions which are prone to constant threats of war and internal socio-political crisis such as Kuwait, Vietnam, Lebanon, Taliban, South Africa, Bangladesh, India etc are bound to go overboard from their initial expected estimations. This causes heavy burden on project sponsors to approach for additional resources.

### 5.7 CONCLUSION:

Performance are normally different from expectation. There are several deviations and impediments on the path of a successful project. It is unrealistic to expect total conformity to plan, cost and time. Modest deviations do not materially affect the feasibility of the project. The revisions can be incorporated and the project can be continued to attain the desired goals. When the deviations exceed the targets of time and cost, there are called as overruns.

Time and cost overruns have always caused worry to management as they impair the profitability of the project and upset the initial expectations. In the case of large projects, these can have serious implications for the country's economic progress. Higher capital costs lead to higher costs of production, higher prices for the consumers and inability to compete in international market.

While there are instances of cost and time overruns of projects in private as well as public sector, this malady is widespread in the case of public sector projects.
and cost overruns of public sector projects have been persisting and mounting despite repeated studies and reports highlighting the pitfalls to be avoided and the care to be taken in formulating, evaluating, selecting and implementing the projects. Unproductive investments of large magnitudes, with sizeable initial cost overruns and subsequent accumulation of losses cannot but result in huge budgetary deficits, retarding the nation's economic development.

The various pitfalls of projects are delay in finalising orders, procedural and administrative bottlenecks, commissioning delays, inadequate attention to initial designs, inflation, implementation delays, changes in project scope, omissions of certain essential factors during project preparation, inadequate provisions in project estimates, underestimation of project costs, excessive enthusiasm in indigenisation, lack of technical expertise, lack of attention to setting up organisation structure with appropriate skills to manage the project etc. All these pitfalls arise due to two main factors namely system deficiencies and enterprise deficiencies. It is also observed often that there is a tendency to ignore guidelines set out for preparing project estimates. Appraisal based on inadequate data can hardly be satisfactory.

Various research studies have affirmed that conflict in project team specially in complex and multi-disciplinary projects is also an important pitfall for project management. Computational complexity is another irritant in project management.

The nature of pitfalls and their eradication methodologies will vary from project to projects and from one project manager to another. The focus could be on
account management or cost control or on resource allocation and management, or on reporting requirement or on inter-personal relationship or on team building. The project management has to be alert, vigilant and make a right choice, taking note of his specific requirements.