CHAPTER - III
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CAPITAL EXPENDITURE

In the previous chapter, a review of the literature available on the subject is attempted. The present chapter discusses the basic concepts of capital expenditure.

Capital expenditure may be defined as any expenditure other than operating expenditure that represents a large sum of money, the benefits of which extend over a period of time exceeding one year. The key characteristic of a capital expenditure is that at least a major part of the expenditure is made at one point of time and the benefits are realised at different points in time. The benefits expected are basically the inflows of income or advantages resulting from the investment. Benefits may take the form of cost saving, additional revenue or profit. The method of computing benefits may depend upon the method of evaluation used(1).

Capital Expenditure involves long term commitment of resources to realise future benefits. Hence capital expenditure reflects basic company objectives and have a long term and significant effect on the economic well being of the firm. Effective planning and controlling of such

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(1) Moustafa H. Abdelsamad; A Guide To Capital Expenditure Analysis; op cit. p.7
Expenditures are particularly important because of the following reasons:

1. The long term commitment increases financial risk.
2. The magnitude of expenditure may be very high and the penalties for unwise decision are usually severe.
3. The decision made in this area provide the structure that supports the operating activities of the firm.
4. Capital expenditure is the vitamin given to improve the growth of the industrial activity.

Capital expenditure has attracted the attention of top management for quite some time. This attention is to be properly placed since capital expenditure decisions affect the whole firm and its direction, and they can be evaluated properly only at the highest managerial level in the organisation. Even when some of these decisions are delegated, top management usually makes it mandatory to subject capital expenditure proposals to sufficient tests to assure that investments are made in the best interests of the company. Many business failures can be traced to inadequate capital expenditure. The hypothesis of this research work is that capital expenditure decisions in public sector industries are inferior in quality to the decisions in the private sector and that it is the main reason for the failure of the public sector industries.
3.1. WHY DO WE NEED CAPITAL EXPENDITURE?

Efficiency of any system deteriorates with time. Plant and equipment follow the same universal rule. The life cycle of an equipment or a plant is shown in Exhibit 3.1. The breakdown or non availability of a plant or an equipment for production is very high during the initial period of its life. This may be due to initial adjustment or alignment problems or due to initial commissioning problems. In the case of human being, this is called infant mortality period. After this period, the youthful life of the plant or equipment starts. If proper preventive maintenance is done the youthful life can be extended further and further. What ever may be the preventive maintenance, a period will come from there after no type of maintenance will improve the availability. This period is called the wear out period. That means that deterioration has already started and hence the equipment has to be replaced. Therefore main need for capital expenditure is for replacement of an equipment or facility when it becomes beyond economic repair. Deterioration can be defined as the decline in the performance of an equipment or facility compared to the original one. The effect of deterioration are the following:

[1] Maintenance cost is on the increase
[2] Production quality is getting reduced day by day
[3] Rate of production is on the decreasing trend
[4] Production labour cost is on the increase
[5] Efficiency of the equipment is getting reduced
EXHIBIT - 3.1

LIFE CYCLE OF A PLANT OR AN EQUIPMENT
Another reason for replacement of an equipment is obsolescence. The equipment will become obsolete due to the development of newer and better equipment day by day. The unwarranted manufacturing costs arising from obsolete equipment will reduce the profits and seriously affect the competitive power of the product. Therefore that equipment or plant which has become obsolete has to be replaced.

When an existing equipment becomes inadequate or insufficient to meet the challenges of making new products or existing products in large quantities due to changing market conditions the question of replacement arises.

As the community now-a-days is more exposed to the awareness regarding pollution an equipment or plant which is producing more pollution problem like more sound, more dust and more fumes is to be replaced with a modern equipment or plant which in no way will be hazardous compared to the old equipment. Therefore the four important reasons for replacement of an equipment or plant are

[1] Deterioration of the equipment or plant.
[2] Obsolescence of the equipment due to the development of modern equipment.
[3] Inadequacy as mass production is the order of the day
[4] Improved working condition

In addition to replacement which is the conventional need for capital expenditure, the other need for capital expenditure are the following
[2] Providing pollution control equipment or plant.

3.1.1. Adding New Facility:

As days are passing by, products which are having product life cycle will vanish from the horizon and new and new products will emerge. To meet this challenge always new facilities are continuously to be added to the existing system.

3.1.2. Providing Pollution control equipment or plant:

Community around any plant is now a days becoming more and more aware of the pollution hazards created by the operation of the plant. Therefore every industry is allocating every year a good amount of capital expenditure either for providing new equipment which will create less hazardous conditions compared with the existing system or for providing equipment which will purify the hazardous waste which is already produced.

3.1.3. Providing safety protection equipments:

Safety takes a very important role in the modern industrial set up. Cost of an accident or injury is not only the compensation paid to the employee but also includes the cost of medical help, cost of direct manhours lost and above all the cost of lost morale of other
employees of the organisation. Therefore every organisation provides certain amount in their Annual Capital Expenditure plan for providing engineering control so as to prevent the chance for an industrial accident or injury and also to protect the employees and equipment from accident or injuries.

3.1.4. Expansion or Modernisation:

Expansion or modernisation is the order of the day especially after our liberalisation and globalisation attempt. To become more competitive in the market, equipment which will provide better quality at less cost are always preferred. As the world is moving so fast, any industry has to run as fast as it can so as to be in the same position tomorrow as today compared to the competition in the field. Therefore all industries are doing modernisation or expansion in a small way or in a big way. This will take away the major portion of the capital expenditure every industry is planning in each year. In other words, capital expenditure can be broadly classified into two, namely routine capital expenditure and non routine capital expenditure. Routine capital expenditure can be further divided into three:

[1] Replacement

[2] Providing pollution protection

[3] Providing safety protection
Non routine can be divided into two

[1] Adding new facility
[2] Expansion or modernisation

3.2.0. **COST OF CAPITAL EXPENDITURE :**

Any capital expenditure project has to be financially viable, technically feasible, commercially profitable, economically desirable and managerially capable. For analysing a capital expenditure project to find out whether it is financially viable the cost of the project is to be compared with the benefits this particular project will generate.

The cost of any capital expenditure project (small to large) may be divided into the following categories.

3.2.1. **Cost of Land :**

This cost may be subdivided into

[a] Agreed value of land
[b] Hidden value of land
[c] Legal expenditure for land purchasing
[d] Site development charges
[e] Fencing and landscaping expenditure
[f] Cost of internal road

3.2.2. **Cost of Building :**

This cost may be divided in to

[a] Cost of constructing factory building
[b] Cost of constructing laboratory building, R&D building, Quality centre building etc.
3.2.3. **Plant and machinery**:

This cost may be subdivided into

- [a] Imported FOB value if imported
- [b] Import duty
- [c] Shipping freight, insurance etc
- [d] Clearing and forwarding
- [e] Loading and unloading
- [f] Commissioning
- [h] Spares

3.2.4. **Technical/Collaboration fee**:

This cost may be subdivided into

- [a] Fee for technology transformer
- [b] Cost of training
- [c] Design and drawing

3.2.5. **Miscellaneous expenses**:

This cost can be subdivided into

- [a] Cost of furniture
- [b] Cost of office machinery
- [c] Cost of cars, jeep, trucks etc
- [d] Cost of recreational facilities
- [e] Cost of effluent collection, treatment and disposal
3.2.6. **Preliminary and pre-operating expenses:**

These expenses can be subdivided into

- [a] Capital issue expenses
- [b] Interest on loan
- [c] Administrative expenses (Including salary)
- [d] Mortgage expenses
- [e] Consultant expenses
- [f] Commitment charges

3.2.7. **Cost of advertising and marketing:**

This may be for the new products or for improving the sales of the existing products.

3.2.8. **Contingency:**

Normally 10% of the total cost is considered as contingency to meet a nominal unforeseen variation in cost.

Normal capital expenditure plan includes all the above mentioned items if it is a project by itself. If it is a running plant, one or more items mentioned above may become a part of the annual capital expenditure plan of the organisation.
3.3.0 **SOURCE OF FUND:**

Sources of fund available with any organisation to meet the above expenditure are mainly the following two

3.3.1. **Own fund:**

This can again be subdivided into

[a] Equity
   i) Ordinary shares
   ii) Preference share
   iii) Reserves
   iv) Convertible debentures
   v) Capital incentives
   vi) Developmental loans

[b] Unsecured loan from friends and relatives

3.3.2. **Borrowed fund:**

This can be subdivided into

[a] Term loan (5 years and above)
[b] Debenture and bonds
[c] Fixed deposit
[d] Secured loan
[e] Leasing
[f] Supplier credit
[g] Secured deposit
3.4.0. **COST OF FUND (CAPITAL):**

Cash for any capital expenditure project can be generated from the above two sources mainly own fund and borrowed fund. The process of obtaining the required capital from the different sources at the optimum cost is called capital gearing. The cost of this investment may vary depending upon the source. The borrowed fund will have interest rates that again may vary from source to source. Cost of own fund is generally the dividend a particular company is paying. This depends upon the paying capacity of a particular company. The weighted average cost of own fund and borrowed fund of a particular company is called the cost of capital. Any investment decisions as far as capital expenditure is concerned depends upon the cost of capital to be employed and the return this particular investment will yield over a period of time. Therefore, the cost-benefit analysis of an investment is the key factor in evaluating an investment proposal.

Exhibit 3.2 shows the relationship of capital and cost of capital (2). The marginal cost of capital is the cost of the firm for obtaining various amounts of capital. The marginal cost of capital is a gradually rising function because most firms are required to pay a higher cost to obtain increasing amounts of capital. When a firm borrows funds, the more it borrows the greater is the risk that it

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EXHIBIT - 3.2

MARGINAL COST OF CAPITAL

(RELATIONSHIP BETWEEN CAPITAL AND COST OF CAPITAL)

<table>
<thead>
<tr>
<th>INVESTMENT</th>
<th>RATE OF RETURN (%)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

CAPITAL
(RS M10)
may fail to repay the lender. To compensate for taking that additional risk, the lender must cash a higher return which is, accomplished by increasing the interest rate charged to the firm. The exhibit shows that the firm will make investments 1, 2 and 3 because the rate of return exceed the cost of capital of these projects.

Exhibit 3.3 shows the relationship between cost of capital and gearing ratio. Cost of debt increases as the ratio of debt to asset increases. Similarly, cost of equity also increases with the increase in debt to asset ratio. But it can be seen that average cost of capital is declining as the percentage of capital is raised as debt increases. It shows that average cost of capital (a) declines at a faster rate as the firm moves from zero debt to positive amount of debt (b) hits a minimum and then (c) rises as an increase in the level of debt drives the firms risk portion beyond acceptable levels Thus there is an optimum amount of debt for each firm i.e an amount of debt which minimises the cost of capital and thereby maximises the value of the firm.

3.5.0. CAPITAL EXPENDITURE ANALYSIS AS A SYSTEM:

Capital expenditure analysis may be regarded as a system because it has a specific purpose, is a part of larger system and is interdependent with the other systems. Capital expenditure analysis may be viewed as a sub

EXHIBIT - 3.3

COST OF CAPITAL AND GEARING RATIO

(AVERAGE COST OF CAPITAL)
system of the financial management system which in turn is a sub system of the firm, which again is a part of the industry system. The objective of capital expenditure system is to provide information necessary for the effective management of capital expenditure. A system is essentially a set of relationship. The relationships are shown in Exhibit 3.4 (4)

The absolute essentials of a basic system model consists of an input, a process and an output. Feedback and control components are essential for the effective monitoring of the system. In considering any capital expenditure proposal, the inputs may include such information as capacity, cost, expected cash inflows, timing of cash flow information about alternatives and the accuracy of estimates. The process represents what is done with the input until it becomes an output. It includes all administrative and economic evaluation aspects of capital expenditure analysis like establishing priorities for the order in which proposals are to be analysed, the method or combination of methods and techniques of evaluating capital expenditures used and evaluation report and their distribution. The output of the capital expenditure analysis system contains information about the proposal like the probability of the proposed investment, recommendations for its approval or rejection, the best timing for its implementation and some indication of the type of risk involved.

EXHIBIT - 3.4

SYSTEMS RELATIONSHIP

(CAPITAL EXPENDITURE SYSTEM'S MODEL)
The advantages of viewing capital expenditure analysis as a system are:

[1] For improving the system, change in the inputs or in the process are needed. This means that lack of perfection in the estimate (input) does not justify using inefficient methods of evaluation (process)

[2] The output is dependent upon the inputs. Using wrong estimates of cash flows will result in the wrong measure of the economic worth of the proposed investment.

[3] The value of the output should exceed the value of the input.

Feedback is required so that inputs can be adjusted to ensure that the output is an effective input to the next related system. A concept of control is needed to ensure that the necessary adjustments are made in the input side.

3.6.0. RULES & GUIDELINES AND FALLACIES WITH RESPECT TO CAPITAL EXPENDITURE ANALYSIS

The following are the general rules, guidelines and common fallacies with respect to capital expenditure analysis.

3.6.1. Capital expenditure includes more than fixed asset

Capital expenditure may be defined as any large expenditure for which benefits are expected to be realised over a long period of time (more than one year). This means that the expenditure must be large. The exact minimum
amount may vary from organisation to organisation like operating expenditure for which the benefits extend over a short period of time, the benefits from a capital expenditure extend over a number of years. As a corollary to this, a capital expenditure is distinguished by being irreversible, in the sense that once a decision is made, it can not be reversed or it can be reversed only at a very high cost. So defined a capital expenditure does not have to result in an increase in a fixed asset. This means that an expenditure for a major advertising campaign should be treated as a capital expenditure as long as it is above the established minimum amount and the benefits are expected to be realised over a period longer than a year. Other examples include research and development programmes, long term training and development programmes and early retirement of long term debt.

3.6.2. Capital expenditure Analysis includes Administrative and Economic Aspects:

Capital expenditure analysis is generally divided into Administrative procedure and Economic evaluation. Administrative procedures include written policies and procedures, authorisation and approval levels, establishment of minimum amount for considering an item as a capital expenditure, post audit, preparation of capital budget and training in capital expenditure analysis. Administrative procedures may differ from one company to another but a good administrative set up is prerequisite to an effective capital expenditure evaluation system.
The purpose of economic evaluation is to provide information that indicates the economic consequences of investment decisions. This information pertains to alternatives consisting of the proposed expenditure with other plans of the company and its goals, an evaluation of the reality of the estimate provided, the degree to which the proposal meets the established financial criteria and the possible consequences of failure of the proposal to realise its estimated benefits.

The four major steps of economic evaluation are:

1) Project generation
2) Project evaluation
3) Project selection and
4) Project execution

Every department at the time of initiation of capital expenditure proposal will generate many proposals, may be a "Wish list". This wish list, a possible list of proposals, are to be selected for further study. At the project evaluation step, not only the quantitative methods but also the qualitative methods and judgement methods are used to evaluate various proposals. The execution step is concerned with the carrying out of the project, the method of dealing with any deviation from plans and follow up reports. Post audits provide the feedback link necessary to assume continuous improvement of the capital expenditure analysis system through identifying past mistakes and areas that needs corrective action.
3.6.3. **Classify capital expenditures whenever possible:**
Classification of the capital expenditure is the process of grouping similar capital expenditures into separate categories or classes. This type of classification allows grouping similar items together which helps in summarising the expenditure for budgeting purposes.

3.6.4. **Consider future cost and not sunk cost:**
Sunk cost is the cost which is already incurred and hence it is irrevocable. Any sunk cost of past decision should not be considered for evaluation of capital expenditure proposals, but only future costs are relevant.

3.6.5. **Consider only future benefits and not past benefits:**
Benefits are inflows of income or advantages resulting from an investment like cost saving, additional revenue, or profit. Economic conditions, competitors' strategies, consumers' tastes and the state of technology are only a few of the many facts that should be considered when estimating benefits. Regardless of the form of benefits for capital expenditure analysis purpose, the only relevant benefits are future benefits and not the past benefits.

3.6.6. **Make computation on an after tax basis:**
Income tax is a reality and must be included in any analysis of capital expenditure proposals that needs to be meaningful. Tax treatments are not always identical from one proposal to another and hence ignoring taxes could lead to wrong conclusion, about the profits or the true worth of an investment.
3.6.7 **Consider the time value of money:**

The concept of the time value of money, which means simply that one rupee received today is more valuable than one rupee to be received tomorrow or any time later, is to be considered in evaluating capital expenditure proposals.

3.6.8 **Quantify whenever possible, but do not over do it:**

An attempt should be made to estimate cost and benefits quantitatively, but the quantitative analysis should not be forced upon every person without regard to whether or not the resulting estimates are meaningful. Generally capital expenditure proposals will contain information in narrative form under the following heads:-

a) **Present situation** This explains what is the present situation, what is wrong with the present situation, how and why it is inefficient, why it is unsatisfactory and what is the problem of continuing the present situation.

b) **Proposed project** This describes purpose, scope and background of the proposed project and its relationship to the long range plans of the organisation.

c) **Alternatives** Here the possible alternatives are tested and it is to be mentioned out why they were rejected in favour of the chosen plan.

d) **Timing** This should caution the consequences of delaying the project for some time, in terms of cash flow return on investment etc.

e) **Economic justification:** Generally, a capital expenditure project should have an economic justification. If not,
the reason for not including the economic justification is to be included.

3.6.9. **Avoid excessive necessity type of expenditure**:

A necessity type of project should be the exception rather than the rule. It is always suggested to take care of the excessive type of the necessity classification as a way of "beating the system". Capital expenditure proposals so classified should be reviewed carefully to assure that they are in reality necessary, urgent and indispensible and to guard against using the necessity classification as a free pass for unprofitable "pet" proposals.

3.6.10. **Do not subscribe to the profit illusion**:

The general concept is that if a firm is making satisfactory profit, the capital expenditure evaluation system of that firm is perfect, is not necessarily true. It is possible for a firm to have an obsolete and ineffective capital expenditure analysis system and yet to be profitable. The profit might have achieved because of excellence in other areas. Profitability and the adequacy of a capital expenditure analysis system are not synonymous; one can exit without the other.

3.6.11. **Benefits from the analysis should exceed costs**:

The cost of analysis should be less than the expected benefits to be derived through selecting better proposals because of the additional information. Therefore extensive study and more detailed analysis are usually needed for major projects, routine and minor projects need not be
given the same extensive treatment. This does not mean that inefficient ways of analysing proposals for minor projects are advocated, but rather that the analysis should not be carried beyond its marginal returns.

3.6.12. Do not shy away from profit maximisation:

Common objectives of capital expenditure proposals are
1) Maximising short term and long term profits
2) Maximising opportunities
3) Increasing the market share of the company
4) Achieving the highest possible return to share holders' investment.
5) Maximising the present value of the share holders' wealth
6) Assuming the social responsibilities of a good community citizenship
7) Building a good company image
8) Boosting employee morale etc.

Objectives of capital expenditure vary from organisation to organisation. The general criteria to be considered for the evaluation of capital expenditure proposal are:-

1) Long range objectives
2) Government regulations
3) Capacity
4) Cost and financial returns
5) Personal considerations
The overall objective of capital expenditure is usually profit so as to stay in business. The word "usually" is inserted here to allow for undertaking investment that contribute in intangible ways (i.e., employee morale) and investments required by outside authorities like Pollution Control Board, Factories Inspectorate, Electrical Inspectorate etc.

3.6.13. **Consider alternatives whenever possible.**

In every internal situation there are at least two alternatives, do something or do nothing. The study of alternatives may reveal opportunities or guard against mistakes. The analysis should concentrate on the most promising alternatives to enable the decision maker to select the best and eliminate unnecessary effect of considering the obviously poor or far less promising alternatives.

3.6.14. **The use of project concept whenever possible.**

The project concept means that all investments that are to be undertaken together or that are part of a larger project should be studied as one unit.

3.6.15. **Use a multitalent approach whenever possible.**

Capital expenditures, by their very nature, may require many talents to evaluate their worth. The bigger and more involved in the project, the more the need for different talents to evaluate it. Very large projects may require the help of outside consultant.
3.6.16. **Capital expenditure analysis is both an art and a science:**

It is a science as there is a well established body of theory and techniques that can be employed. It is an art as it is not a purely scientific exercise in a controlled experiment. The excellence of an analysis depends in large part on the subjective judgement of the decision maker on his experience, on his ability to raise the right questions and on his way of integrating all the piece meal data before reaching a decision.

3.6.17 **There is no substitute for good judgement:**

All methods and techniques of the capital expenditure evaluation are intended to enhance the judgement of operating managers and decision makers, they are in no way a substitute for it, but rather they complement it. An individual's knowledge in the theory of investment analysis will not give him a lead role in the analysis without some experience in actual practice. Of course a person with adequate knowledge of the theory could acquire the necessary experience in a short time.

3.6.18. **Do not overtake the human side of the enterprise:**

No system, no matter how perfect it is, can work without the co-operation and support of the people involved. The resistance to change may be reduced by participative management and an explanation of why a change is needed. Human relations cannot be overlooked in any job that involves dealing with people.
3.7.0. **CAPITAL EXPENDITURE EVALUATION:**

All capital expenditure proposals involve cash outflows for procuring or constructing an asset. It will start returning the cash, called cash inflows once the production is started with this asset. Therefore every capital expenditure has got cash outflows and cash inflows. Selecting one proposal from various proposals available is done by evaluating the benefits of various proposals and identifying one proposal which will give maximum benefits to the organisation. The following are the evaluation methods used to appraise the capital expenditure proposals.

1) Pay back method
2) Accountant rate of return method
3) Discounted cashflow method
4) Net present value method
5) MAPI method

3.7.1. **PAY BACK METHOD:**

Pay back method is the most commonly used method of investment analysis, not only among the small and less proficiently managed firms, but also among the largest and most successful corporations.

The pay back method (also known as the year to pay back, the pay off, the pay out, the cash recovery period, and the return period) is used for measuring the attractiveness of a capital expenditure proposal. The time needed to receive the benefit equivalent to the initial investment is the pay back period. In other words, given a certain amount of investment, the pay back period is simply
the time required to recover this investment through the expected stream of benefits. From various similar proposals, a proposal with the shortest pay back period is often selected.

The pay back period is a time concept. It does not measure profitability but rather how fast the investment will be recovered. The fact that one investment has a shorter pay back period than another investment does not guarantee that the former investment is more profitable than the later. If any generalisation is to be made, it is more sensible to assume that long lived investments could and should earn more than short lived investments. By its very nature, the pay back method has a built in bias against longer lived investments with initially small but constantly increasing benefits. In other words, use of pay back method could lead to investing capital in short lived investments at the expense of more profitable, long and intermediate lived investments.

The pay back period could be arrived at by a process of division or subtraction. The division method of computing pay back is acceptable, when the annual cash inflows are uniform. When cash inflows vary from year to year it is better to subtract the cash flows from the investment starting with the first year and proceeding until the declining investment figure reaches zero. The number of years required to get the investment back to zero is equal to the pay back period. Normally depreciation and other similar deductions from income that did not
result in cash outlays are added back to the figure of net income to arrive at cash flows.

The pay back period does not consider cash flows after the investment is recovered. Thus proceeds and any salvage value that occur after the payback period are usually ignored in the computations, although the profitability of an investment is dependent upon them.

The pay back method does not consider the time value of money. In our world where interest exists, a rupee recovered today should be treated as worth more than a rupee to be received tomorrow or any time later.

The pay back method may provide some indication of risk. The assumption here is that the longer the pay back period, the more chance that things would go wrong. In so far as providing one clue to indicate an element of risk, the pay back is useful. However to say that the pay back offers a full measurement of risk is incorrect.

3.7.1.1. Usefulness of pay back method:

The pay back method becomes an ideal measure of desirability of an investment in situation in which the speed of recovering the investment is critical. The other usefulness are the following:

1) When a company has cash problems.
2) When the product selling lasts for a short period of time.
3) When the proposed investment is known to have a high degree of obsolescence.
4) When the order for the product may be cancelled on short notice.
5) When the possibility of adverse government action exists.
6) When required to compare very poor or very good investments.
7) When the investments are small and the cost of using more sophisticated methods of analysis exceeds the possible benefits.
8) When the estimates of cash flows are unreliable and the life of the proposed investment is undeterminable.

3.7.1.2. Advantages of pay back method:

The advantages of pay back method, which is still a popular method of evaluation are the following
1) Easy to understand
2) Simple in use
3) Well known
4) Easy to sell to operating personnel
5) Easy to sell to top management
6) Low in cost
7) Easy to post audit
8) Requires few assumptions
9) Can be used for evaluating different types of investment proposals.

3.7.2. Accountant rate of return:

The accountant rate of return method which is designed to measure the attractiveness of a proposed capital expenditure is a measure of profitability whereas the payback method is a time concept. This method compares
the annual expected benefits from an investment with the amount to be invested in a project and expresses this relationship as a percentage return on investment. Accountant rate of return method is also known as simple rate of return method, average rate of return method, the average annual return on investment method etc. The two features commonly shared by all versions of accountant rate of return are, using accounting concepts in determining benefit and making no adjustments for the time value of money. The objective of using this method is to obtain a figure that represents the rate of return expected to be earned on a proposed investment. The rate is determined by dividing income figure by an investment figure. The accountant rate of return calculated by this method is considered superior to the pay back method, not only because it measures profitability, but also because it usually includes the proceeds after pay back and it allows ranking investments according to their respective returns. Further more, the computed return could be compared with an established minimum to determine the degree of attractiveness of a proposed investment.

There are at least 864 possible ways of computing the accountant rate of return. Differences exist because of the wide variance in ways of determining the benefits and the investment.

Benefits can be defined as first year's income, each year's income or an average income. Income may be before or after depreciation. The depreciation may be calculated
as straight line or declining balance method. The income may also be figured before or after deducting a financing cost for use of capital and before or after corporate taxes.

The investment may be defined as the original investment, the average investment for a given year or the average investment for the life of the project.

The salvage value of the old investment, as an after tax figure, should be deducted from the new investment to get the incremental cost of the new project.

To summarise, there are a number of ways of computing the accountant rate of return. No single approach is considered absolutely right or absolutely wrong. Once the decision is made to follow certain approach it should be continued.

The pay back reciprocal (average cash inflow divided by investment) is used by some firms to measure returns on investment. This is very similar to accountant rate of return but not exactly the same as the benefits usually refer to cash flows and not to accounting income.

Because of the differences between capital expenditure analysis (future oriented) and actual performance analysis (historically oriented) the accountant rate of return is not considered a generally acceptable method of evaluating capital expenditure proposals.
The time value of money is ignored by the accountant rate of return method. This represents a serious shortcoming of the method since all benefits regardless of timing are treated equally. Under unusual conditions of having uniform benefit and a short investment life, mistakes in computing rate of return are not critical. However highly unreliable results can occur when the life of the proposed investment is relatively long and the benefits from the proposal are not uniform. Moreover, the accountant rate of return (ARR) is not readily comparable with the cost of capital since it ignores the time value of money.

It is often agreed that ARR method makes the task of post auditing capital expenditures from the normally kept book of accounts an easy one. The books of accounts are usually designed for reporting events with reference to accounting period and for profit centres and they are not usually designed for reporting on single investment and thus the ease of post auditing projects evaluated by accountant rate of rate return method is more a myth than a reality.

3.7.2.1. **Advantages of ARR:**

1) Easy to understand
2) Simple to use
3) Very popular among accountant
4) Easy to sell to operating personnel
5) Easy to sell to top management
6) Easy to post audit (certain cases it is illusionary)
7) Low in cost
8) Can be used for evaluating different types of investment proposals
9) Analyses future data and not historical

3.7.2.2. **Weaknesses of ARR:**
1) Ignores time value of money
2) Depends excessively on accounting concept

3.7.3.0. **Discounted Cash Flow Rate of Return (DCFR)**

DCFR method is generally referred as one of the most theoretically advanced and efficient methods of evaluating capital expenditure. This discounted cash flow rate of return method is also called as discounted rate of return method, yield method, the investor's method, the initial rate of return method and the industrial rate of return method.

DCFR is that rate of interest that discounts the expected proposal (may be called as the present value of inflows) to an amount equal to the initial investment. It is that interest rate that will equal the present value of cash inflows (benefits) with the present value of cash outflows (investment) thus making the net present value of all cash flows (present value of cash inflows less present value of cash out flows) equal to zero.

3.7.3.1. **Characteristics of DCFR:**
1) Time value of money. This means that a differentiation is made between cash flows received at different portion or period of time. Before adding cash flows to be received at different times they
are adjusted. This adjusting process is called discounting. In an economy in which interest and opportunities for investment exist, a rupee received today could be invested to earn money immediately. There is a price for waiting to receive benefits; the longer we have to wait, the more return we should expect on our money.

2) The process of trial and error The rate of return by the DCFR method is determined by trial and error method.

3) Cash flow and not accounting income An investment is basically an exchange of immediate Cash (expenditure) for a future stream of cash (benefit) that extends over a number of years to come. Until benefits are received in the form of cash they should not be considered as realised because, until they are received in cash they cannot be reinvested at face value. For DCFR purposes cash payments are all that matter and not accounts receivable or other transitory forms before cash is received.

4) Do not deduct depreciation Each cash flow includes a capital recovery and a return on the capital used. To deduct depreciation from cash flows would mean allowing for the recovery of the asset twice, once as part of the DCFR computation and again through deduction for depreciation.

5) Do not deduct charges for financing It is not necessary to deduct finance charge from the cash
inflows because that will result in double consideration of these charges, once when comparing the rate of return with the minimum cut off or desirable rate and again when figuring net cash flows.

6) Always deduct tax Cash flows should be determined net, after all taxes. Taxes have to be paid in cash there by qualifying as cash outflows.

3.7.3.2. Advantages of DCFR method:

1) Time value of money This method allows time value of money

2) Cash flows DCFR method is based on cash flows and not accounting income.

3) Ranking proposals: The use of DCFR method results in a consistent system of ranking and selecting investment proposals and hence it is easier to select from these proposals.

4) Mistakes in later years The discounting process reduces the inputs of errors in estimating very distant future values, such as cash flows in later years or salvage value.

5) Proper treatment of taxes Taxes affect cash flows and cash flows are used in the computations, consequently they are considered.

6) Comparability with the cost of capital The rate of return computed by the DCFR method may easily be compared with the cost of capital. This is found to be true because the DCFR method computes a rate of return and that rate is computed on the outstanding or used part of capital.
7) Familiarity with rate of return concept Top management and operating personnel are familiar with the rate of return language used in financial circles. It is similar to the amortization of debt. Also it is easier to interpret and understand a rate of return.

8) Easy to continue updating Initial cost of starting DCFR method is high but little effort and few costs are required to keep the system going once it is installed.

9) More complete analysis This method encourages more in depth analysis of capital expenditures.

3.7.3.3. Disadvantages of DCFR method:

1) Need for education and training Many people are uncomfortable with compound interest discount. Because of common resistance to change and the need not only to learn the new method but to unlearn the old, much time and effort are consumed.

2) Heavy demand on analysis staff personnel It is true that more time of the analysis staff are required for this method. But now a days, computers are available to do the job faster.

3) Difficult to compute with accounting data Since the accounting books are not usually kept on a cash flow basis or on a project basis, it is not easy to compare the actual with the external cash flows for an investment project.
4) Revising policies and procedures It is necessary to change forms, procedures and manuals to accommodate the introduction of the DCFR method.

5) Multiple Yields Under extreme conditions of having unconventional cash flows, DCFR may result in more than one rate of return on the same investment.

6) The reinvestment assumption DCFR is not a return on the initial investment but on the outstanding amount of investment.

7) Over emphasis on allocation of capital DCFR over emphasises the scarcity of capital where as capital is not so scarce to obtain.

8) DCFR cannot be used under all conditions DCFR does not always result in selection of the best investment when the alternative proposals have different lives. Also this does not result in the correct selection of projects from among mutually exclusive investments (if one is selected the others have to be rejected)

9) Inflation DCFR method does not deal with the problem of inflation.

3.7.3.4. **Mistakes of DCFR method**

1) Decision should not be based on small differences in rates of return among projects as DCFR is calculated based on estimates.

2) DCFR takes into account the time value of money but it does not consider the risk of the project.

3) Education and training if less, will beat this method.
4) All projects regardless of their nature cannot be evaluated by using DCFR.

3.7.4. **NET PRESENT VALUE METHOD:**

Net present value (NPV) method is similar to discounted cashflow rate of return (DCFR) method, but rather than finding the rate of return that equates the cash outflows with the cash inflows, it discounts the cash flows at an assumed (required or desired) rate of return. Through the discounting process the present value of the benefits is determined. Then the initial investment is subtracted from this present value to determine the net present value of the investment. A positive NPV indicates that the proposed investment is profitable. The net present value method is also known as net present worth method, present worth method and discounted cash flow by the present value method.

In terms of popularity, the NPV method may be placed after the pay back, accountant rate of return and DCFR method and before the MAPI method. Thus the NPV ranks fourth among the five commonly known methods of evaluating capital expenditure. From a theoretical viewpoint the NPV method is considered by many writers in the field (such as Harold Bierman and Seymour Smedt)\(^{(5)}\) to be more desirable than and far superior to the DCFR method. From a practical viewpoint, however NPV is less known and less commonly used than DCFR method. The net present value method expresses the attractiveness of a proposed

\(^{(5)}\) ibid. p.96
capital expenditure in rupee terms. The selected rate for
discounting the cash inflows may be some form of the cost
of capital to the firm or an arbitrary figure. That
represents the minimum return below which
an investment would be undesirable. If the NPV is positive
the investment is considered desirable. A negative net
present value indicates that the proposed investment would
not be able to generate the minimum rate required for
capital expenditure. The main difficulty associated with
using the net present value method lies in determining
the rate of discount to be used in calculations. A logical
rate to be used is the cost of capital.

A cash flow diagram showing the typical calculation of
NPV method for an investment of Rs.9500 (cost = Rs.8000 and
installation charges = Rs.1500) and cash inflow of Rs.2500
every year for 5 years is shown in Exhibit 3.5(6)

3.7.4.1 Characteristics of NPV method :

1) Base of computation Once the discount rate is
decided, computation of discounted cash inflows, cash
outflows and hence net present value is very easy.
2) Dependence on cost of capital NPV is calculated
based on a minimum rate of return. If this
minimum rate is the cost of capital the method
becomes more meaningful.

(6) Robert N.Anthony and James S.Reece; Accounting
Principles; Richard D Irwin Inc., Illinois.
1991. p.551
CASH FLOW DIAGRAM

CASH OUTFLOW
- COST 8000
- INSTALLATION 1500
- SALE OF OLD (500)
- TOTAL INVESTMENT 9000

CASH INFLOW
- YEAR
  1
  2
  3  8,853
  4
  5
- RESIDUAL VALUE 779
- YEAR-5
- TOTAL INFLOW 9,362
- DIFFERENCE=NET
- PRESENT VALUE=Rs. 362
3) NPV for different types of investment proposals:
Unlike DCFR, from which it is possible to obtain more than one rate of return on the same investment, there is only one NPV figure for an investment at a given discount rate or interest rate. NPV is used for evaluation even if there is an assorted combination of positive and negative cash flows. Also NPV method is far superior to the DCFR method for selecting among mutually exclusive investment proposals with significantly different useful lives. Projects that can be accepted or rejected regardless of the action taken on any other investment now or later are called independent investment. Projects that preclude one another, one project is accepted, the others become unavailable or inappropriate are called mutually exclusive projects. 

4) Time value of money
Time value of money is considered in evaluation.

5) Cash flows
NPV method uses the superior concept of cash flows (not accounting income) in the analysis.

6) The reinvestment assumption
The re-investment assumption poses no significant problem with the NPV method because the cash flows are discounted at the desired rate.

7) Difficulty of interpreting the profitability measure:
The NPV method measures the profitability of

a proposed investment. But the end is an amount as net present value and not a rate of return. Businessmen usually feel more at ease with a rate of return that can be compared with market rates, rather than amount.

8) Insensitivity to the required investment One of the main argument against the NPV method is that a net present value by itself may not tell the whole story about the profitability of a capital expenditure proposal. To overcome such an argument a profitability index was developed.

3.7.4.2. **The Profitability Index:**

The profitability index (P.I) also known as benefit-cost ratio, desirability index or discounted profitability index is the ratio of the present value of cash inflows (benefit) divided by the present value of the cash outflows (investment). By this method it is possible to compare one project with another. A profitability index of one means that the present value of benefit is exactly equal to the present value of investments. A P.I. of more than one indicates that the proposed investment is profitable and less than one indicates that the project is not profitable. A criticism against P.I.is that it is insensitive to the size of net benefits.

3.7.4.3 **Advantages of NPV method:**

1) Considers time value of money.
2) For evaluating different types of investment proposals
3) Accurate.
4) Analyses future data and not historical.

3.7.4.4. **Weaknesses of NPV method:**

1) Difficulty in selling to operating personnel.
2) Difficult to compare with accounting data.
3) Difficult to sell to top management.
4) Unnecessarily complicated.
5) Imposes heavy demands on analysis staff.

3.7.5. **MAPI METHOD:**

The Machinery and Allied Products Institute (MAPI) method, developed by George Terborgh in 1949 is one of the five basic methods of evaluating capital expenditure proposals. His objective has been to make it more effective, more useful and simple to use but at the same time he has sacrificed some simplicity for the sake of greater realism and comprehensiveness.

MAPI method is regarded as a sophisticated rate of return method and it computes an after tax return called the MAPI rate of return MAPIR. This after tax return is a measure of profitability. It measures the return on the average investment over the comparison period, most frequently one year. When one year comparison period is used, it measures the after tax rate of return if the investment is undertaken now versus the alternative of waiting one more year before making the investment. Proposals may be ranked according to their rate of return. Also the rate of return may be compared with the cost capital to determine the attraction of a proposed investment.
Effective management of capital expenditure requires a periodic review (usually annually) of the facilities for determining the time that a replacement is needed. It means that once a year the question to be asked is "Is it advisable to replace each investment now or wait for another year and repeat the analysis then?" Another reason for using the one year basis is that one year is the typical accounting period for financial reporting and capital budgets are usually prepared annually.

**MAPIR = Average benefit \[ \text{Average investments} \]

Generally MAPI method is used in evaluating minor capital expenditure projects.

The above formula is modified by George Terborgh later and the 1967 model MAPI rate of return (after tax) may be expressed as follows:-

**MAPIR (after tax) = \( a + b - c - d \) \[ x \]

Where:
- \( a = \) next year or average operating advantage i.e., the sum of the increase in revenue and reduction in operating cost resulting from the project compared with the operating results that would be obtained in its absence.
- \( b = \) next year or average capital consumption avoided i.e., the difference between the initial investment
(If any) in the alternative and the amount remaining at the end of the year.

\[ c = \text{next year or average capital consumption incurred i.e., the amount by which the remaining use value (retention value) runs off during the year (the cost of the project being taken as the initial value)} \]

\[ d = \text{next year or average income tax adjustment i.e., the after tax return from a project is simply the pre tax return reduced by the tax percentage. The adjustment itself is the net increase in income tax resulting from the project.} \]

\[ x = \text{average net investment i.e., the average of the net investment at the beginning and at the end of the year. The initial net investment is the installed cost of the project less the initial investment in the alternative. The terminal net investment is the retention value of the project at the end of the year, less the disposal value of the alternative.} \]

The following are the useful information that the 1967 version of MAPI formula can give:

1) Amount of net gain i.e., after tax incremental profit if the project is undertaken.
2) Return on equity investment
3) The cash throw off i.e., the amount of investment that will be recovered in cash annually and pay back period.
3.7.5.1 **Characteristics of MAPIR**

The following are the key characteristics of MAPIR:

1) It is a measure of profitability.
2) It does take care of time value of money, but the comparison period being one year, the importance of discounting is not very serious.
3) This takes into consideration the factor of obsolescence in equipment through retention value.
4) It provides a more complete analysis of capital expenditure than that provided by payback and accountant rate of return methods.
5) This method is not generally considered biased towards immediate purchase of equipment.
6) Generally this method is accurate.
7) It analyses future data - not historical.
8) It forces management to think over investment ideas thoroughly.

3.7.5.2 **Weaknesses of MAPI method**:

The following are the weaknesses of MAPI method:

1) Difficult to sell to operating personnel
2) Unnecessarily complicated
3) Impose heavy demands on analysis staff
4) Difficult to sell to top management
5) Difficult to compare with accounting data
6) Places too much emphasis on estimates
3.7.6. **EVALUATION METHODS IN PRACTICE:**

Majority of firms use combination of those methods rather than one method exclusively. It can be said that DCFR is an accurate method and it takes care of the value of money. Also it analyses future data and can be used for evaluating different types of investment proposals. Except pay back method, all methods measure profitability. None of the method fully measure risk.

3.8. **SENSITIVITY ANALYSIS:**

Sensitivity analysis is a technique designed to measure the response or change in the profitability of a project as a result of changes in the key factors that effect a project's cash inflows and cash outflows. The first step is to identify key factor. The second step is to initiate some change in one key factor at a time and measure the effect of this change on the profitability of the investment. The third and final step is to summarise the findings in either tabular or graphic form. A key factor common to sensitivity studies is price level changes.

Sensitivity analysis can warn regarding very risky proposals where a small change in key elements would have large effect on the profitability of these proposals. Also it can help to identify areas where additional information is needed to improve the estimates of selected items.
3.9. **RISK ANALYSIS:**

Risk analysis is an extension of sensitivity analysis. Sensitivity analysis points out what would happen to the profitability of a proposal if some changes in the estimates of key factors occurred. It does not address itself to the question of the profitability of occurrence of such changes. Risk analysis is an extension of sensitivity analysis that explicitly takes into consideration the probability of changes in the estimate of key factors and the combined effect of these changes.

On the basis of the information collected through risk analysis it is possible to
1) Accept the proposal  
2) Reject the proposal and  
3) Collect additional information

Risk analysis techniques, by collecting information that helps to reveal the risks involved in different capital expenditure proposals, aid in classifying proposals according to their risk. Then proposals of similar risks may be grouped together and evaluated accordingly.

3.10. **POST AUDIT:**

Post audit is a comparative study of the estimated and actual results of capital expenditure projects. Post audit studies refer to
1) Collecting data on the actual results of the project
2) Comparing actual results with those estimated in the proposals and determining the difference between actual and forecast results and
3) Studying these differences

Post audits are also known as follow up studies, performance audit, post completion studies and post mortem.

3.10.1. Reasons for post audit:

1) Knowledge gained from past project provides a necessary feedback that helps to improve future decisions.
2) Post audits have psychological effect that encourages proponents of proposals to submit realistic estimates.
3) When it is known that results will be revealed, goals of proposals serve as a challenge for every one concerned to achieve them.
4) Post audits serve in evaluating the performance of operating management.
5) Audits help to identify good estimators and decision makers.
6) Post audits serve in detecting personal bias.
7) Post audit can pinpoint trouble areas and give warning when corrective action is required.
8) It may reveal other investment opportunities.
3.10.2 **Weaknesses of Post Audit:**

Weaknesses of post audit are the following:

1) If carried to an extreme, post audit may encourage submitting only fully realisable proposals, which can result in the loss of valuable opportunities.

2) Post audits are expensive and hence it is to be used only when it justify the cost.

3) Post audit is not a replacement for complete analysis of project.

4) Post audit can be subjected to manipulation.

5) The fear of using the results for punishment can hinder the success of any post auditing programme.

6) Accounting data is not suited for providing information required for post audit.

7) Post auditor should have thorough knowledge in the field.

8) Delayed post audit will not be realistic.

**CONCLUSION:**

The large value of the usual capital expenditure may be regarded as both an evil and a blessing. It is an evil in that mistakes made here are very expensive and can result in the failure of an enterprise. It is a blessing in that a very small percentage improvement can result in a large rupee saving. By the same token, the small percentage saving gained through improvement in capital expenditure evaluation can justify a large expenditure to modify the system. The cumulative effect of investment decisions by individual firms involves
employment, economic activity and economic growth. Thus a progressive programme of capital expenditure analysis in a business firm may not only shape the future of the individual firm, but also, affect the economy as a whole.

There are good many Indian companies which are following very strict discipline particularly in the area of capital expenditure. In public sector industries also, well discussed plans are made, but when it comes to practice, lot of delays, problems and road blocks are being faced. For the delays faced during implementation of capital expenditure, intelligent excuses are expressed at all levels for not getting the things done in time. In this research attempt, the difference in approaches to capital expenditure by public sector and private sector companies are being studied.

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