

# FM-E - Practical Financial Fundamentals and Project Investment Decision Making



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## **Short Description**

This manual commences with the basics of economics and gives you a solid understanding of the world order underpinning and driving the financial system. Basic accounting and finance terms are explained in simple English with an emphasis on the engineering and technology world. The issue of making appropriate investment decisions is then examined using such techniques as NPV and IRR. Finally capital budgeting and risk are discussed in an easy to understand manner.

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## **First Chapter**

### **Engineers, technicians and financial management**

#### 1. Engineers, technicians and financial management

##### 1.1 Introduction

A business wishing to increase its profitability must carefully assess a range of investment opportunities and select the most profitable options from those available. The increasing competitiveness of modern industry requires that considerable effort be given to reducing costs of existing processes, as well as to minimizing the cost of future processes. In order to do this, technocrats (particularly engineers and technicians in management positions) should be fully aware of the relationship between the technical and economical factors, in particular those factors that have the largest effect on profitability.

Technical people, who are the prime movers of any project, are usually involved mainly with the technical side of the project and have only superficial knowledge of the financial aspects. They tend to leave the financial issues to the finance specialists. Even the design engineers involved in making estimates of the capital and operating costs of process plants tend to leave the profitability assessment and investment decision making to others.

Formulating a company's capital budget is a vital task in the implementation of strategic management decisions. The capital budget determines the physical parameters within which the organization will have to operate and prosper for years into the future. All the systems that make up the infrastructure of any successful company in today's global marketplace are the result of a number of strategic management decisions made consistently and implemented through the capital budgeting process. In most cases, the implementation of these strategic decisions requires the technical advice and expertise of engineers who not only provide technical inputs, but also are often responsible for estimating and evaluating costs and benefits to be expected from various courses of action. Therefore it is essential that technocrats have a firm grasp of the basic principles of engineering economics to enable them to deal with different economic requirements. Furthermore, in order to be able to communicate effectively with their accountants and members of management, it is necessary to learn the language of accounting financial management.

In order to use accounting information properly, one must understand what the figures mean and, in order to do so, one must know something about the concepts, rules, and techniques of conventional accounting. Technical personnel who are to make intelligent use of accounting information must understand what a given accounting figure indicates, what its limitations are, and under what circumstances it may mean something different from the apparent indication that it gives. It is, however, not necessary to design, construct, operate or check the accuracy of an accounting system; that is why there are accountants.

Technical managers are generally required to deal with one or more of the four 'Ms', namely the 'materials', 'machines', 'money' and 'men' (or 'people', to be politically correct), though this seldom extends to the 'money' element. Yet, even though machines (capital equipment) and men (labor) might be the process drivers, money is the resource that drives the business. Technocrats, due to lack of management and financial skills, often fail to perform their duty business-wise. When working on a project, both the plant design and the cash flow should be kept in mind.

This course has been designed to arm technocrats with the basic knowledge of economics and financial management, so that they can evaluate and analyze capital investment proposals themselves before submitting proposals to management. It introduces accounting and financial management in engineering businesses as well as the principles of micro- and macroeconomics. It aims to develop the relationship between accounting and engineering work, the attributes required to manage or run small businesses, and the economic evaluation of engineering projects and operations. It also provides an overview of financial techniques utilized by practicing engineers to solve a variety of problems. These include present worth, rate of return, depreciation, and benefit-cost methods of determining prospective differences between or among design alternatives. Fixed and variable costs as well as capital budgeting issues are also covered. Other topics include the theory of production supply and demand analysis, markets and competition, financial statements and analysis, costing, budgeting, and management accounting.

## 1.2 The history of project finance

Project financing is not a new technique. Venture-by-venture financing of finite-life projects has a long history. It was, in fact, the rule in commerce until the 17th century. For example, in 1299 - some 700 years ago - the British Crown negotiated a loan from the Frescobaldi (a leading Italian merchant bank of that period) to develop the Devon silver mines. The loan contract provided that the lender would be entitled to control the operations of the mines for one year. The

lender could take as much refined ore as it could extract during that year, but it had to pay all costs of operating the mines. There was no provision for interest. The Crown did not provide any guarantees (nor did anyone else) concerning the quantity or quality of silver that could be extracted during that period. Such a loan arrangement was a forebear of what is known today as the *production payment loan*.

Project Financing discipline includes understanding the rationale for project financing, how to prepare the financial plan, assess the risks, design the financing mix, and raise the funds. In addition, one must understand the cogent analyses of why some project financing plans have succeeded while others have failed. A knowledge base is required of issues such as:

- The design of contractual arrangements to support project financing
- Issues for the host government legislative provisions
- Public/private infrastructure partnerships
- Public/private financing structures
- Credit requirements of lenders
- The project's borrowing capacity
- Cash flow projections and use them to measure expected rates of return
- Tax and accounting considerations
- Analytical techniques to validate the project's feasibility

### 1.3 The aim of this course

The aim of this course is to empower technical people with sufficient financial management skills to enable them to:

- Understand the basic concepts of financial accounting
- Calculate the economic and financial viability of expenditure proposals
- Explore cost categories and their control and understand how one can use these as financial tools
- Quantify the impact of risk and uncertainty when proposing new projects
- Appreciate the financial parameters influencing the profitability of a project
- Learn the critical difference between profit and cash flow and to control the same
- Decipher the financial statements of a business
- Rank alternative proposals and make prudent decisions with thorough analysis of all the costs and benefits
- Understand how to apply ratio analysis
- Prepare capital and operating budgets

- Communicate and work closely with financial managers

At the outset it needs to be emphasized that one can only acquire a superficial knowledge of all the above skills in two days. The objective of this course is nevertheless to make technical people knowledgeable enough with the subject in order to apply this in their respective work situations. On completion of this course they will be in a better position to focus on and specialize in any of the above skills, tailoring it to their job requirements.

This course will also aid the participants in understanding and managing their own personal financial matters. With the application of this knowledge, they will not only extend excellent service to their companies, but also will be able to manage their personal finance in a more professional way.

This course is for the engineers and technicians who normally identify a project and propose the same to management. It will make them 'business wise' and enable them to extend their knowledge of business cycles, the time value of money, the effects of inflation and the judicious use of debt to the projects under their jurisdiction.

Ultimately it boils down to only one thing - how to make every dollar (or whatever currency) of investment work to one's advantage in order to improve the 'bottom line'. The present-day engineer is responsible not just for identifying and executing a project, but also to ascertain that the proposed investment reaps returns by way of profit. Engineers must decide if the benefits of a project exceed its costs and must make this comparison within the framework of engineering economics.

Once the basics are understood, the engineer can really cater to the business need. It is rightly stated by the Accreditation Board of Engineering and Technology (ABET) that, 'Engineering is the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind.'

Any proposed project has to address a physical need, which may fall in one of the following categories:

- To set up a new production facility
- To add to the existing plant
- To augment the production capacity

- To automate a manual system
- To increase efficiency
- To decrease cost

The need is normally felt by production, engineering or some other personnel such as those in quality control, administration etc. Whoever may be the initiator, the engineer is the person who plans and proposes the investment. However, the physical need of an item or a project, which requires investment, also has to justify the expenditure. The justification is only one part of the investment decision process that has to undergo thorough analysis.

A machine or a system's performance is judged by its physical efficiency whereas the payback or return on the investment will justify the economic efficiency. In the final evaluation the economic efficiency normally takes precedence over the physical efficiency.

Undergraduate engineering training courses teach very little about this fact of life, which the technocrat has to face frequently in the present-day situation, where industries work on shoe-string budgets due to cut-throat competition and subsiding profits.

This workshop, due to time constraints, does not allow us to delve too deeply into a detailed analysis of investments, but hereafter the participant will have sufficient knowledge to contribute to the economic decision-making process to which his or her proposals will be subjected.