

Project Management

DMGT521

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LOVELY
PROFESSIONAL
UNIVERSITY



PROJECT MANAGEMENT

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SYLLABUS

Project Management

Objectives: To develop critical thinking and knowledge in project Management's theory and practice. To help students develop the competence of analyzing the feasibility of the project. To provide the student with analytical skills for solving problems relating to project management.

Sr. No.	Topics
1.	Definition of a Project, Why Project Management, The Project Life Cycle
2.	Strategic Management and Project Selection, Project Selection and Criteria, The Nature of Project Selection Models, Analysis under Uncertainty, Project Proposal and Project Portfolio Process
3.	Functions, Roles and Responsibilities of a Project Manager, Delegation of Authority, Building Project Team, Project Organisation, Pure Project Organisation, Matrix Organisation, the Project Team and Human Factors
4.	Generation and Screening of Project ideas – Procedure for Idea Generation, Monitoring the Environment, Corporate Appraisal, Project Rating Index
5.	Market and Demand Analysis, Situational Analysis, Conduct of Market Survey, Demand and Forecasting, Technical Analysis, Social Cost Benefit Analysis, Rationale for SBCA, UNIDO Approach, Saving Impact and its Values, Little Mirrlees Approach
6.	Financial Estimates and Projections – Cost of a Project, Means of Finance, Estimates of Sales and Production, Working Capital Requirement, Cost of Capital, Projected Cash Flow Statement, Projected Balance Sheet, Financing of a Project, Equity, Debentures, Term Loans, etc.
7.	Measuring Project Profitability – Payback Period, Accounting Rate of Return, NPV, Internal Rate of Return and BCR Method, Assessment of Various Methods
8.	Project Cash Flow, Elements of a Cash Flow Stream, Cash Flow for a Replacement Project, the Cost of Capital, WACC, Optimal Capital Budget
9.	Need and Importance of Work Break Down Structure, Project Execution Plan (PEP), Network Techniques of Project Management, CPM, PERT, Time Estimation
10.	Conflict and Negotiation, The Nature and Type of Negotiation, Project Review and Administrative Aspects, Post Completion Audits, Abandonment Analysis

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Unit 1: Introduction to Projects

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Objectives

After studying this unit, you will be able to:

- Know Project Manager and his responsibilities
- Understand Selection of a Project Manager
- Know about the phases of Project Management
- Describe Evolution of Sales Department

Notes

Introduction

A project is a group of unique, interrelated activities that are planned and executed in a certain sequence to create a unique product or service, within a specific time frame, budget and the client's specifications. Some of the characteristics of the tasks that qualify to be a project are: uniqueness, specificity of goal, sequence of activities, specified time and interrelatedness. Projects are carried out under many resource constraints and their success depends on the ability of the manager to manage these constraints effectively. Project management is the application of the knowledge, skills, tools and techniques to project activities in order to meet or exceed stakeholder needs and expectations.

Every project has a set of activities that are unique, which means it is the first time that an organization handles that type of activity. These activities do not repeat in the project under similar circumstances i.e., there will be something different in every activity or even if the activity is repeated, the variables influencing it change every time.

1.1 Definition of Project Management

Project management is the discipline of organizing and managing resources in such a way that these resources deliver all the work required to complete a project within defined scope, time, and cost constraints. A project is a temporary and one time endeavor undertaken to create a unique product or service. This property of being a temporary and one time undertaking contrasts with processes, or operations, which are permanent or semi-permanent ongoing functional work to create the same product or service over-and-over again. The management of these two systems is often very different and requires varying technical skills and philosophy, hence requiring the development of project management first challenge of project management is ensuring that a project is delivered within the defined constraints. The second, more ambitious, challenge is the optimized allocation and integration of the inputs needed to meet those predefined objectives. The project, therefore, is a carefully selected set of activities chosen to use resources to meet the predefined objectives.

As a discipline, Project Management developed from several different fields of application, including construction, mechanical engineering, military projects, etc. In the United States, the forefather of project management is Henry Gantt, called the father of planning and control techniques, who is famously known for his use of the "bar" chart as a project management tool, for being an associate of Frederick Winslow Taylor's theories of scientific management, and for his study of the work and management of Navy ship building. His work is the forerunner to many modern project management tools, including the work breakdown structure and resource allocation. The 1950's mark the beginning of the modern project management era. Again, in the United States, prior to the 1950s, projects were managed on an ad hoc basis using mostly Gantt Charts, and informal techniques and tools. At that time, two mathematical project scheduling models were developed:

1. The "Program Evaluation and Review Technique" or PERT, developed as part of the United States Navy's Polaris missile submarine program; and
2. The "Critical Path Method" (CPM) developed in a joint venture by both DuPont Corporation and Remington Rand Corporation for managing plant maintenance projects.

In 1969, the Project Management Institute (PMI) was formed to serve the interest of the project management industry. The premise of PMI is that the tools and techniques of project management are common even among the widespread application of projects from the software industry to the construction industry. In 1981, the PMI Board of Directors authorized the development of what has become the Guide to the Project Management Body of Knowledge, containing the standards and guidelines of practice that are widely used throughout the profession.

1.1.1 Various Definitions of Project Management

Notes

"Project management is the application of knowledge, skills, tools and techniques to a broad range of activities in order to meet the requirements of the particular project. A project is a temporary endeavor undertaken to achieve a particular aim. Project management knowledge and practices are best described in terms of their component processes. These processes can be placed into five Process Groups: Initiating, Planning, Executing, Controlling and Closing."

scrc.ncsu.edu/public/DEFINITIONS/P%20-%20R.html

"The leadership role which plans, budgets, coordinates, monitors and controls the operational contributions of property professionals, and others, in a project involving the development of land in accordance with a client's objectives in terms of quality, cost and time."

narains.com/glossary.htm

"A controlled process of initiating, planning, executing, and closing down a project."

www.cbu.edu/lschmitt/I351/glossary.htm

"Both a process and set of tools and techniques concerned with defining the project's goal, planning all the work to reach the goal, leading the project and support teams, monitoring progress, and seeing to it that the project is completed in a satisfactory way."

www.shapetomorrow.com/resources/p.html

"The application of modern management techniques and systems to the execution of a project from start to finish, to achieve predetermined objectives of scope, quality, time and cost, to the equal satisfaction of those involved."

oit.osu.edu/projmanage/glossary.html

"Project management is concerned with the overall planning and coordination of a project from inception to completion aimed at meeting the client's requirements and ensuring completion on time, within cost and to required quality standards. Project management is typically carried out either by a private consultant or an employee of the project client."

www.ecbp.org/glossary.htm

"Manages the production of projects with schedules and tasks associated with the project. It often involves detailed expertise in many of the following areas: planning, cost management, contract negotiations/procurement, technical writing (proposals, etc.), research, technical development, information/computer management, business development, corporate/administrative management, time management, and others."

www.organized-living.com/industryterms.html

"The methods and disciplines used to define goals, plan and monitor tasks and resources, identify and resolve issues, and control costs and budgets for a specific project."

www.bridgefieldgroup.com/glos7.htm

"May be used in a project manufacturing environment for production scheduling or in a variety of one off projects throughout all types of organisation."

www.homercomputer.com.au/homer_software_guide/glossary.htm

"The action of managing a project. It can involve many activities, from scheduling to communication. Project Management in TOC is outcomes based as opposed to activity based, and TPACC software is an ideal tool used to measure the progress toward the financial outcome."

www.tpacc.com/knowledge_base_dictionary.htm

Notes	<p>"Approach used to manage work with the constraints of time, cost and performance targets." www.mccombs.utexas.edu/faculty/Linda.Bailey/glossary.htm</p> <p>"This is managing the resources needed to ensure that a project is finished on time and within budget and to the satisfaction of the end user. Project managers use tools such as PERT and Gantt charts for scheduling all the tasks that need to be completed. They are conscious of managing time, scope and resources for a project. To reduce time to complete a project the manager might decide to employ more workers which would increase costs."</p> <p>michaelmnz.tripod.com/dictionary.htm</p> <p>"The planning, control and coordination of all aspects of a project, and the motivation of all those involved in it, in order to achieve the project objectives."</p> <p>www.ams.mod.uk/ams/content/docs/ils/ils_web/glossary.htm</p> <p>"Project management is the discipline of defining and achieving targets while optimizing the use of resources (time, money, people, space, etc). Thus, it could be classified into several models: time, cost, scope, and intangibles."</p> <p>en.wikipedia.org/wiki/Project management</p>
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Task With the help of Internet, find out the history of project management.

1.2 Project Management

The successful project management is all about structure, control, sufficient attention to detail and continuously driving action. The role of the project manager is to understand enough project management to apply its structure and ensure that project is successfully completed within the time and cost required. The things you must do as a project manager are:

1. Ensure there is a clear understanding why a project is being done, and what it will produce.
2. Plan the project – to understand how long it will take and how much it will cost.
3. Manage the project – to ensure that as the project progresses, it achieves the objectives you have defined within the time and cost specified.
4. Complete the project properly – to make sure everything produced by the project is of the quality expected and works as required.



Caution A clear understanding of the project is necessary before a project is initiated and implemented.

Project Management has emerged because the characteristics of our turn-of-the-century society demand the development of the new methods of management. Of the many forces involved, three are paramount:

1. The exponential expansion of the human knowledge;
2. The growing demand for a broad range of complex, sophisticated, customized goods and services; and

3. The evolution of worldwide competitive markets for the production and consumption of goods and services.

Notes

All three forces combine to mandate the use of terms to solve problems that used to be solvable by individuals. These three forces combine to increase greatly the complexity of goods and services produced plus the complexity of the process used to produce them and all this in turn leads to the need for more sophisticated systems to control both outcomes and processes.

As the techniques of project management were developed, the use of project organization began to spread. Private construction firms found that project organization was helpful on smaller projects, such as the building of a warehouse or an apartment complex. Automotive companies used project organization to develop new automobile models. Both General Electric and Pratt & Whitney used project organization to develop new jet aircraft engines for airlines, as well as the Air Force. Project management has even been used to develop new models of shoes and ships.

More recently, the use of project management by international organizations, and especially organizations producing services rather than products, has grown rapidly. Advertising campaigns, global mergers, and capital acquisitions are often handled as projects, and the methods have spread to the non-profit sector. Functions, weddings, fund drives, election campaigns, parties, recitals etc all make use of the principles of project management. Most striking has been the widespread adoption of project management techniques for the development of computer software.

1.3 Project Manager and his Responsibilities

According to Project Management Institute (PMI): "*Project Management is the application of knowledge, skills, tools and techniques to project activities in order to meet or exceed stakeholder needs and expectations*".

Project Management is quite often the province and responsibility of an individual project manager. This individual seldom participates directly in the activities that produce the end result, but rather strives to maintain the progress and productive mutual interaction of various parties in such a way that overall risk of failure is reduced.

A project manager is often a client representative and has to determine and implement the exact needs of the client based on knowledge of the firm he/she is representing. The ability to adapt to the various internal procedures of the contracting party, and to form close links with the nominated representatives, is essential in ensuring that the key issues of cost, time, quality and above all client satisfaction, can be realized. Any type of product or service - buildings, vehicles, electronics, computer software, financial services, etc. - may have its implementation overseen by a project manager and its operations by a product manager.

The project manager needs to be an HRD expert who can motivate the workforce by training and promoting leadership among them, and boost their morale by incentives and promotions. He has to be conversant with the principles of organisation, and be a good judge of people who has the ability to place the right man in the right job at the right time.

Social issues: A project can only be successful when there is no conflict between the management and the local populace. Right from the acquisition of the project land to recruitment to organisation to infrastructural facilities, the management has to interact with the social fabric of the locale. It can only ensure a smooth functioning at the project site if there is a 'cooperative', and not a 'confrontational' environment. The management can display its cordiality to the locals by, for instance, recruiting 'the sons of the soil' in the workforce, which will not only be conducive to reciprocal cordiality of the populace, but might actually make good business sense in employing labour that is familiar with the locale and the conditions prevalent at the project site.

Notes



Caution Project manager should be an HRD expert to motivate the workforce and avoid any conflict between the management and the workforce.

1.3.1 Functions of Project Manager

The functions are as follows:

1. Developing a unique product or process and manage change.
2. Identification of the need for project.
3. Finding different alternatives of the project.
4. Developing a plan of action.
5. Training operators.
6. Establishment of quality assurance cell to control quality.
7. Incorporation of changes as and when needed while implementing project.
8. Selection of suitable equipment.
9. Finding suitable financial resources.
10. Assessment of alternatives and obtaining approval to proceed.
11. Measuring performance of the project.
12. Transfer of material, funds and settling all accounts after completion of project.
13. Monitoring progress and reporting to higher authorities.
14. Closing all records, submission of final report and transfer of responsibility after completion of specified project.

Self Assessment

Fill in the blanks:

1. The successful is all about structure, control, sufficient attention to detail and continuously driving action.
2. A project can only be successful when there is no conflict between the and the local populace.
3. Project Management is quite often the province and responsibility of an individual
4. The project manager needs to be an expert who can motivate the workforce by training and promoting leadership among them.
5. companies used project organization to develop new automobile models.

1.4 PM as a Profession

Not all project managers are equally competent. Not all project managers have the ability to run programs, establish PMOs, strategically align project portfolio's, recover big projects, or manage

risk effectively. Not every doctor is capable of heart surgery. But doctor's get paid for being doctor's, have demonstrated considerable training and understanding, have spent thousands of hours mastering their jobs. Doctor's are professionals.

Notes

By any definition, Project Management is a profession.

It should be obvious to the reader that project management is a demanding job. Planning and controlling the complexities of a project's activities, schedule, and budget would be difficult even if the project had the highest claim on the parent organization's knowledge and resources, and if the PM had full authority to take any action required to keep the project on course for successful completion. Such is never the case, but all is not lost because there are tools available to bring some order to the chaos of life as a PM—to cope with the difficulties of planning and the uncertainties that affect budgets and schedules. Also, as we have indicated, it is possible to compensate for missing authority through negotiation. Mastering the use of project management tools requires specialized knowledge that is often acquired through academic preparation, which is to say that *project management is a profession*. The profession comes complete with career paths and an excellent professional organization.

The Project Management Institute (PMI) was founded in 1969. By 1990, the PMI had 7500 members. It grew to 17,000 by 1995, but five years later membership had exploded to more than 64,000. By November 2009, the PMI had more than 300,000 members worldwide. The exponential growth of the PMI is the result of the exponential growth in the use of projects and PMs as a way of getting things done.



Example: A senior vice president of an international chemical firm installed project management as a way of controlling the workloads on his technical specialists and on a few overloaded facilities—project management having tools to handle the allocation of scarce resources. In another instance, a new CEO of a large hospital mandated that all non-routine, one time operations be managed as projects so that she could have information on the nature and status of all such activities.

1.5 Selection of a Project Manager

The Selection of Project Manager depends on following points:

Problem Solving Skills

1. Does this person have a history of being able to solve complex problems?
2. Does this person have the attitude that a problem is an opportunity to learn?

Personal Leadership Style

1. Does this person have the communications and people skills appropriate for the mix of people who will be required on this project?
2. Will this person encourage project team members to bring up problems rather than play the blame game?
3. Does this person have excellent time management skills?

Organizational Experience

1. Does this person know how work gets done in this organization?

- Notes**
2. Is this person experienced in working in similar organizations and is that experience transferable to this project?
 3. Does this person know the politics of our organization and have the savvy to navigate these situations?

Skills and Knowledge

1. Does this person have adequate knowledge about the subject of this project?
2. If some of these skills are weak is there support available in the organization to offset the problem?
3. Does this person have adequate technical skills for this project?
4. Does this person have the skills understand the root causes of potential problems and keep them from reoccurring?

Project Management Experience

1. Has this person led projects of similar scope, size, length and priority?
2. Is this person on a growth track to lead more complex projects?

1.6 Fitting Projects into Parent Organisation

Earlier in this unit we referred several times to problems caused by the way projects are organized and fit in as a part of the parent organization. It is now time to deal with this subject. It would be most unusual for a PM to have any influence over the interface between the project and the parent organization. This arrangement is a matter of company policy and usually is decided by senior management. The nature of the interface, however, has a major impact on the PM's life, and it is necessary that the PM understand why senior managers make what appears to be the worst of all possible choices for the interface.

More on “Why Projects?”

Before examining the alternative ways in which a project can interface with the organization, it is useful to add to our understanding of just why organizations choose to conduct so much of their work as projects. We spoke above of project-oriented firms. In addition to the managerial reasons that caused the rapid spread of such organizations, there were also strong economic reasons. First, devising product development programs by integrating product design, engineering, manufacturing, and marketing functions in one team not only improved the product, it also allowed significant cuts in the time-to-market for the product.



Example: In the 1990s, Chrysler Motors (now owned by Fiat) cut almost 18 months from the new product development time required for design-to-street and produced designs that were widely rated as outstanding. This brought new Chrysler models to market much faster than normal in the automotive industry. Quite apart from the value of good design, the economic value of the time saved is immense and derives from both reduced design labor and overhead, plus earlier sales and return on the investment – in this case amounting to hundreds of millions of dollars. The same methods were used to enable General Motors to redesign and reimagine their Cadillac and Buick models in response to the sharp decline in demand during the steep business downturn of 2008. This same process also allows a firm to tailor special versions of standard products for individual clients.

1.7 Project Management Team

Notes

We have mentioned the project team several times in the foregoing sections. Effective team members have some characteristics in common. Only the first of these is usually taken into account:

1. They must be *technically competent*. This is so obvious that it is often the only criterion applied. While the functional departments will always remain the ultimate source of technological problem solving for the project, it requires a technically competent person to know exactly when additional technical knowledge may be required by the project.
2. Senior members of the project team must be *politically sensitive*. It is rarely possible to complete a project of reasonable size and complexity without incurring problems that require aid from the upper echelons of executive row; that is, from a *project champion* (Pinto and Slevin, 1989). Getting such aid depends on the PM's ability to proceed without threatening, insulting, or bullying important people in the functional groups. To ensure cooperation and assistance, there is a delicate balance of power that must be maintained between the project and the functional departments, and between one project and others.
3. Members of the project team need a strong *problem orientation*. This characteristic will be explained in more detail shortly. For now, take the phrase to mean that the team's members should be concerned about solving any problems posed by the project, not merely about those sub problems that concern their individual academic or technical training.
4. Team members need a strong *goal orientation*. Projects are uncomfortable environments for people with a 9 to 5 view of work. In particular, neither project teams nor PMs can succeed if their focus is on activity rather than results. On the other hand, the project will not be successful if the project team dies from overwork. One project team member of our acquaintance was bemoaning a series of 60+ hour weeks. "They told me that I would work about 50 hours in an average week. I've been on this project almost 18 months, and we haven't had an average week yet."
5. Project workers need *high self-esteem*. Project members who hide mistakes and failure are disasters waiting to happen. Team members must be sufficiently self-confident and have sufficient trust in their fellow team members (Lencioni, 2002) that they can immediately acknowledge their own errors and point out problems caused by the errors of others. PMs should note that "shooting the messenger" who brings bad news will instantly stop the flow of negative information. The result is that the golden rule we stated above, "Never let the boss be surprised," will be violated, too.



Did u know? Are you doing a project? A project is a temporary endeavour with a specific result or objective. If your project has no end in sight and/or no clear scope, then whatever it is you're doing may be important, but it's not a project. You'll have a hard time showing your team that they're being successful.

Self Assessment

State True or False:

6. The Project Management Institute (PMI) was founded in 1989.
7. Project Management Team must be physically competent.
8. Senior members of the project team must be *politically sensitive*.

1.8 Phases of Project Management

Dividing a project into phases makes it possible to lead it in the best possible direction. Through this organisation into phases, the total work load of a project is divided into smaller Components, thus making it easier to monitor. The following paragraphs describe a phasing model that has been useful in practice. It includes six phases:

1.8.1 Initiation Phase

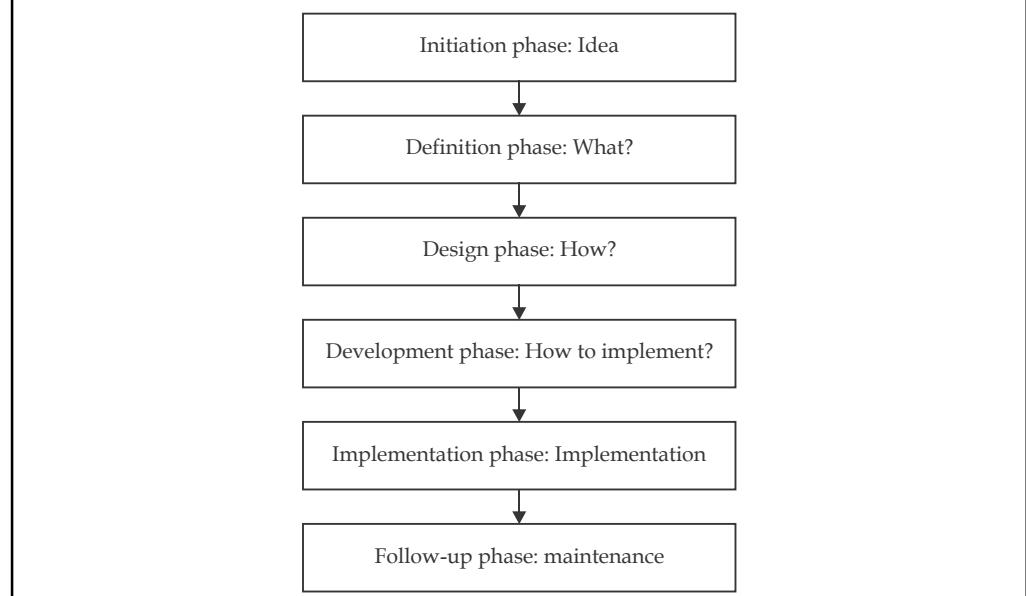
The initiation phase is the beginning of the project. In this phase, the idea for the project is explored and elaborated. The goal of this phase is to examine the feasibility of the project. In addition, decisions are made concerning who is to carry out the project, which party (or parties) will be involved and whether the project has an adequate base of support among those who are involved.

In this phase, the current or prospective project leader writes a proposal, which contains a description of the above-mentioned matters. Examples of this type of project proposal include business plans and grant applications. The prospective sponsors of the project evaluate the proposal and, upon approval, provide the necessary financing. The project officially begins at the time of approval.

Questions to be answered in the initiation phase include the following:

- (a) Why this project?
- (b) Is it feasible?

Figure 1.1: Project Management in Six Phases, with the Central Theme of Each Phase



- (c) Who are possible partners in this project?
- (d) What should the results be?
- (e) What are the boundaries of this project (what is outside the scope of the project)?

In the initiation phase, the project partners enter a (temporary) relationship with each other. To prevent the development of false expectations concerning the results of the project, it makes sense to explicitly agree on the type of project that is being started:

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- (a) a research and development project;
- (b) a project that will deliver a prototype or 'proof of concept'; and
- (c) a project that will deliver a working product.

The choice for a particular type of project largely determines its results.

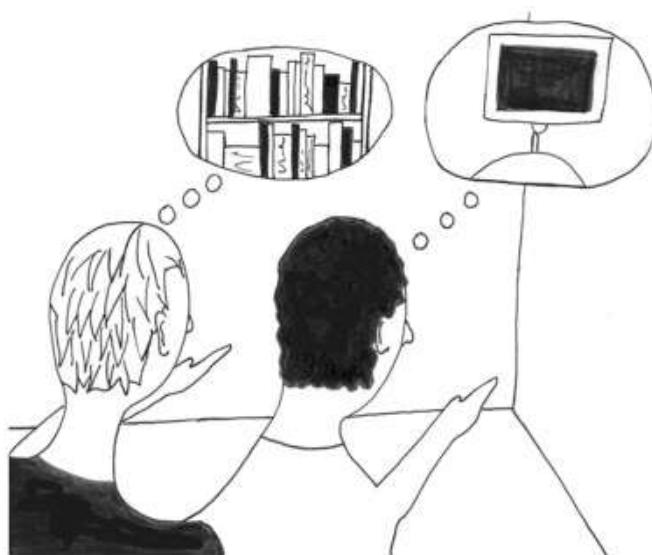


Example: A research and development project delivers a report that examines the technological feasibility of an application. A project in which a prototype is developed delivers all of the functionalities of an application, but they need not be suitable for use in a particular context (e.g. by hundreds of users). A project that delivers a working product must also consider matters of maintenance, instructions and the operational management of the application.

1.8.2 Definition Phase

After the project plan (which was developed in the initiation phase) has been approved, the project enters the second phase: the definition phase. In this phase, the requirements that are associated with a project result are specified as clearly as possible. This involves identifying the expectations that all of the involved parties have with regard to the project result. How many files are to be archived? Should the metadata conform to the Data Documentation Initiative format, or will the Dublin Core (DC) format suffice? May files be deposited in their original format, or will only those that conform to the Preferred Standards be accepted? Must the depositor of a dataset ensure that it has been processed adequately in the archive, or is this the responsibility of the archivist? Which guarantees will be made on the results of the project? The list of questions goes on and on.

Figure 1.2: Expectations of a Project



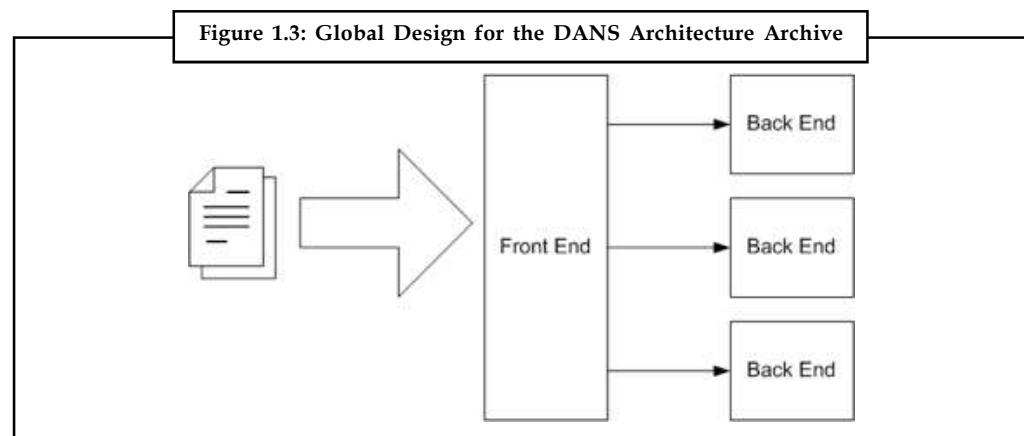
'After the brainstorming session, all of the members of the "New Archive" project team were in agreement about the desired outcome'.

Source: Rachèl Harmsen

Notes

1.8.3 Design Phase

The list of requirements that is developed in the definition phase can be used to make design choices. In the design phase, one or more designs are developed, with which the project result can apparently be achieved. Depending on the subject of the project, the products of the design phase can include dioramas, sketches, flow charts, site trees, HTML screen designs, prototypes, photo impressions and UML schemas. The project supervisors use these designs to choose the definitive design that will be produced in the project. This is followed by the development phase. As in the definition phase, once the design has been chosen, it cannot be changed in a later stage of the project.



In a young, very informal company, the design department was run by an artist. The term design department was not accurate in this case; it was more a group of designers who were working together. In addition, everyone was much too busy, including the head of the department.

One project involved producing a number of designs, which were quite important to the success of the project. A young designer on the project team created the designs. Although the head of the design department had ultimate responsibility for the designs, he never attended the meetings of the project team when the designs were to be discussed. The project leader always invited him, and sent him e-mails containing his young colleagues sketches, but the e-mails remained unanswered. The project leader and the young designer erroneously assumed that the department head had approved the designs. The implementation phase began. When the project was nearly finished, the result was presented to the department head, who became furious and demanded that it be completely redone. The budget, however, was almost exhausted.

1.8.4 Development Phase

During the development phase, everything that will be needed to implement the project is arranged. Potential suppliers or subcontractors are brought in, a schedule is made, materials and tools are ordered, and instructions are given to the personnel and so forth. The development phase is complete when implementation is ready to start. All matters must be clear for the parties that will carry out the implementation.

In some projects, particularly smaller ones, a formal development phase is probably not necessary. The important point is that it must be clear what must be done in the implementation phase, by whom and when.

1.8.5 Implementation Phase

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The project takes shape during the implementation phase. This phase involves the construction of the actual project result. Programmers are occupied with encoding, designers are involved in developing graphic material, contractors are building, and the actual reorganization takes place. It is during this phase that the project becomes visible to outsiders, to whom it may appear that the project has just begun. The implementation phase is the doing phase, and it is important to maintain the momentum.

In one project, it had escaped the project teams' attention that one of the most important team members was expecting to become a father at any moment and would thereafter be completely unavailable for about a month. When the time came, an external specialist was brought in to take over his work, in order to keep the team from grinding to a halt. Although the team was able to proceed, the external expertise put a considerable dent in the budget.

At the end of the implementation phase, the result is evaluated according to the list of requirements that was created in the definition phase. It is also evaluated according to the designs.



Example: Tests may be conducted to determine whether the web application does indeed support Explorer 5 and Firefox 1.0 and higher. It may be determined whether the trim on the building has been made according to the agreement, or whether the materials that were used were indeed those that had been specified in the definition phase. This phase is complete when all of the requirements have been met and when the result corresponds to the design.

1.8.6 Follow-up Phase

Although it is extremely important, the follow-up phase is often neglected. During this phase, everything is arranged that is necessary to bring the project to a successful completion. Examples of activities in the follow-up phase include writing handbooks, providing instruction and training for users, setting up a help desk, maintaining the result, evaluating the project itself, writing the project report, holding a party to celebrate the result that has been achieved, transferring to the directors and dismantling the project team.

The central question in the follow-up phase concerns when and where the project ends. Project leaders often joke among themselves that the first ninety per cent of a project proceeds quickly and that the final ten per cent can take years. The boundaries of the project should be considered in the beginning of a project, so that the project can be closed in the follow-up phase, once it has reached these boundaries.

It is sometimes unclear for those concerned whether the project result is to be a prototype or a working product. This is particularly common in innovative projects in which the outcome is not certain. Customers may expect to receive a product, while the project team assumes that it is building a prototype. Such situations are particularly likely to manifest themselves in the follow-up phase. Consider the case of a software project to test a very new concept.

There was some anxiety concerning whether any results would be produced at all. The project eventually produced good results. The team delivered a piece of software that worked well, at least within the testing context. The customer, who did not know much about IT, thought that he had received a working product. After all, it had worked on his office computer. The software did indeed work, but when it was installed on the computers of fifty employees, the prototype began to have problems, and it was sometimes unstable.

Notes



Caution Follow-up being the last stage of the project should not be ignored and should be taken seriously till the project is completed successfully.



Notes Initiation is the first phase of the Project Management Life Cycle. In the initiate phase you define the project objectives, purpose, scope and deliverables, and get people and other resources for your project.

1.9 Project Environment

Today, there is a growing awareness and concern for the impact of infrastructure and facility construction on the physical environment. Fortunately, today's technological disciplines responsible for such work are becoming attuned to the idea of mitigating the adverse impacts of their projects. Certainly the project manager needs to be similarly concerned about the project's technology, and manage accordingly. This applies to both the implementation and shorter term practical construction impacts of the project as well as its conceptual development and consequent long term impacts. However, today's project manager also needs to be attuned to the cultural, organizational and social environments of the project. Understanding this environment includes identifying the project stakeholders and their ability to affect its successful outcome. This means working with people to achieve the best results, especially in the highly technical and complex environments such as those involving modern day construction projects. Therefore, it is essential that the project manager and his or her project team are comfortable with, and sympathetic towards, their cultural, organizational and social surroundings.

This leads to the possibility of influencing the project environment in a positive way, for the better reception of the change which the project is designed to introduce.



Example: Peoples' typical resistance to change will no doubt be evident amongst some of the stakeholders. Others may have vested interests or personal or group agendas which are only indirectly related to the project. If these can be identified in good time, they may be dealt with proactively and in such a way that the corresponding risks, which are otherwise likely to undermine the success of the project, can be significantly reduced. Failure to take such an approach will inevitably lead to a less than optimum project outcome.

1.9.1 Dimensions of the Project Environment

For convenience, and working outwards, the project environment may be thought of in terms of the project time environment, the internal project culture, the original corporate culture, and the external social surroundings. For those who have not had experience of a construction project "in the trenches" so to speak, it is sometimes difficult to capture the feeling of pressure, stress and ultimate satisfaction of a project well.



Did u know? Gantt Charts have been around for over a hundred years. The discipline of project management has evolved and been refined for longer than you might suspect.

1.10 The 7S of Project Management

Notes

A recent (2008) update on the McKinsey 7S model is a short podcast on the creation of McKinsey 7S model by Lowell Bryan, a director in McKinsey's New York office, involved in creating and applying the 7S framework. He describes how it was introduced in the late 1970s to address the critical role of coordination, rather than structure, in organizational effectiveness.

We reference the McKinsey 7S model in the E-consultancy Managing an E-commerce team report as a method of reviewing the internal capabilities of an organisation to manage digital channels. Some of the key issues that require management are shown in the table below:

Table 1.1: Key Issues that Require Management		
Element of 7S Model	Application to Digital Marketing Team	Key Issues from Practice and Literature
Strategy	The significance of digital marketing in influencing and supporting organisations' strategy	<ul style="list-style-type: none"> Gaining appropriate budgets and demonstrating/delivering value and ROI from budgets. Annual planning approach. Techniques for using digital marketing to impact organisation strategy. Techniques for aligning digital strategy with organisational and marketing strategy.
Structure	The modification of organizational structure to support digital marketing.	<ul style="list-style-type: none"> Integration of team with other management, marketing (corporate communications, brand marketing, direct marketing) and IT staff. Use of cross-functional teams and steering groups. Insourcing vs. outsourcing.
Systems	The development of specific processes, procedures or information systems to support digital marketing	<ul style="list-style-type: none"> Campaign planning approach-integration. Managing/sharing customer information. Managing content quality. Unified reporting of digital marketing effectiveness. In-house vs. external best-of-breed vs. external integrated technology solutions.
Staff	The breakdown of staff in terms of their background and characteristics such as IT vs. Marketing, use of contractors/consultants, age and sex.	<ul style="list-style-type: none"> Insourcing vs. outsourcing. Achieving senior management buy-in/involvement with digital marketing. Staff recruitment and retention. Virtual working. Staff development and training.
Style	Includes both the way in which key managers behave in achieving the organizations' goals and the cultural style of the organization as a whole.	<ul style="list-style-type: none"> Relates to role of digital marketing team in influencing strategy – it is it dynamic and influential or conservative and looking for a voice.
Skills	Distinctive capabilities of key staff, but can be interpreted as specific skill-sets of team members.	<ul style="list-style-type: none"> Staff skills in specific areas: supplier selection, project management, Content management, specific e-marketing approaches (SEO, PPC, affiliate marketing, e-mail marketing, online advertising).
Superordinate goals	The guiding concepts of the digital marketing organisation which are also part of shared values and culture. The internal and external perception of these goals may vary.	<ul style="list-style-type: none"> Improving the perception of the importance and effectiveness of the digital marketing team amongst senior managers and staff it works with (marketing generalists and IT).

Notes



Task Find out the situations where 7s McKinsey Model can be used. Explain the method, how the method is used.

Self Assessment

Fill in the blanks:

9. The of initiation phase is to examine the feasibility of the project.
10. The takes shape during the implementation phase.
11. There is a growing awareness and concern for the impact of infrastructure and facility construction on the environment.
12. The use these designs to choose the definitive design that will be produced in the project.

1.11 Summary

- A project is a group of unique, interrelated activities that are planned and executed in a certain sequence to create a unique product or service.
- The successful project management is all about structure, control, sufficient attention to detail and continuously driving action.
- Plan the project – to understand how long it will take and how much it will cost.
- Project Management is quite often the province and responsibility of an individual project manager.
- A project manager is often a client representative and has to determine and implement the exact needs of the client based on knowledge of the firm he/she is representing.
- Project Management Institute (PMI) was founded in 1969.
- The payback period for a project is the initial fixed investment in the project divided by the estimated annual cash inflows from the project.
- The initiation phase is the beginning of the project.
- The project takes shape during the implementation phase.

1.12 Keywords

Comparative Benefit Model: For this situation, assume that an organization has many projects to consider, perhaps several dozen. Senior management would like to select a subset of the projects that would most benefit the firm.

Definition Phase: In this phase, the requirements that are associated with a project result are specified as clearly as possible.

Implementation Phase: This phase involves the construction of the actual project result.

Initiation Phase: The initiation phase is the beginning of the project. In this phase, the idea for the project is explored and elaborated.

Operating Necessity: If a flood is threatening the plant, a project to build a protective dike does not require much formal evaluation.

Notes

Payback Period: The payback period for a project is the initial fixed investment in the project divided by the estimated annual cash inflows from the project.

Social Issues: A project can only be successful when there is no conflict between the management and the local populace.

1.13 Review Questions

1. Define the term “Project Management”.
2. Explain about the responsibilities of a project Manager.
3. Discuss about Project Management as a Profession.
4. Describe about the selection of a Project Manager.
5. Explain about fitting projects in the parent organisation.
6. Discuss about Project Management Team.
7. What are the phases of Project Management?
8. Discuss about the Project Environment.
9. Describe about the 7S of Project Management.

Answers: Self Assessment

- | | |
|-----------------------|-------------------------|
| 1. Project Management | 2. Management |
| 3. Project Manager | 4. HRD |
| 5. Automotive | 6. False |
| 7. False | 8. True |
| 9. Goal | 10. Project |
| 11. Physical | 12. Project Supervisors |

1.14 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House

Notes



Online links

- www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf
- [www.pma-india.org/ - Trinidad and Tobago](http://www.pma-india.org/)
- www.nickjenkins.net/prose/projectPrimer.p
- www.mpug.com/Pages/WhatisProjectManagement.aspx
- www.mindtools.com/pages/main/newMN_PPM.htm
- www.freelancer.com/jobs/Project-Management/

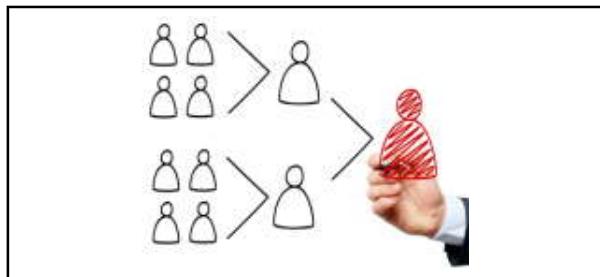


Case Study

Notes

Who is the Project Manager?

Assigning Project Management Responsibility for Success



A project manager's prime task is managing a project to success. The products of the project need to be picked up by the line organisation, and if this involves change in the organisation or ways of working, the changes must be made to 'stick'. By ensuring that the responsibilities for project management and business change are well assigned in a project there is an increased chance of success.

The Dilemma

In all projects assigning the correct project manager is crucial. The choice is often not simple. I have experienced this in the form of a dilemma: do we appoint someone who is an experienced project manager or someone who will champion the change? Very often the experienced project manager will come from a technical background, e.g. IT, and will not have authority to make changes in the organisation or processes. On the other hand the change champion will have credibility with the business unit, but often not have the project skills required. If you can always find all of this in one person, then good luck to you; you don't need the rest of this article!

When is This a Problem?

There can be a problem in a project that is not part of a programme. Let's look at the differences between programmes and projects. I'll use MSP™ (Managing Successful Programmes of the OGC) to illustrate. MSP clearly differentiates between projects - that deliver outputs - and programmes - that deliver outcomes. The main difference is that a project that is not part of a programme delivers the output to the line organisation; the line management is subsequently responsible for achieving the benefits (outcomes). A programme, on the other hand, is also responsible for the benefits realisation of the projects within the programme.

I have noticed, in our organisation at least, that projects are expected to deliver the change in the organisation, so the outcome is not achieved if the project only delivers the output.

How Does it go Wrong?

To ensure a good mix of business change and project management, for IT projects, we have in the past staffed projects with a project manager from the customer, a "business PM" or BPM, and an experienced project manager from IT, the "IT PM", reporting to them. This can work well, depending on the individuals and how well they cooperate and complement

Contd...

Notes

each other. But if the BPM doesn't have the required project management capabilities there can be a conflict of authority: the BPM is in charge - the "boss" - but the IT PM needs to tell them what to do and how to do it. Hoping that the BPM and IT PM will complement each other and work well together is not enough, we have seen this go bad a large number of times. Roles and responsibilities, especially for the project management tasks, is the foundation of a project and if that goes wrong it is very difficult to correct. So it's best to get it right at the start. Having more than one person in a project with a role of "project manager" is confusing. There should only be one. This can be resolved by only giving the overall project manager this role and the IT PM is called an "IT work stream lead" or "IT team lead". Some IT project managers have great difficulty accepting this; after all it says "Project Manager" on their business card, and they expect that to appear as their role in every project as well. Of course a project role and a job title are completely different things, but we have found that this "role inflation" has crept into the way people see project roles. My goal was to ensure that when a project was setup, it had a good foundation to be successful. Of course the project team members still need to work together well to be successful, but giving the team a good foundation allows them to focus on delivering together, instead of trying to work out who they should listen to. I started looking for a solution to this dilemma.

What did I Find?

My analysis led me to the conclusion that we needed a capable and experienced project manager to be responsible for the project management, and someone with the right authority and "organisational credit" to be responsible for the change in the business. As the experienced project managers available for our IT projects are nearly always from IT they do not have the authority or credit in the customer's organisation. And the main customer contacts, the potential candidates for the BPM role, often don't have the project management capabilities. Looking at how MSP describes the programme structure, the key players are the SRO (Senior Responsible Owner), the Programme Manager and the BCM (Business Change Manager). The key here is that the BCM does not report to the Programme Manager or vice versa; and that the Programme Manager is responsible for the day-to-day management of the programme while the BCM is responsible for delivering change and benefits. Why couldn't this work in a project as well? With a team of project managers I worked through the roles and responsibilities in a typical project, with the aim of making this work. The project managers were motivated in this too, as they had experienced the problem first hand! The result was a proposed project structure as shown in figure 1.

Figure 1: Proposed Project Structure

```

graph TD
    CM[Corporate Management] --- PSG[Project Steering Group]
    PSG --- SU[Senior User]
    PSG --- SP[Sponsor]
    PSG --- SS[Senior Supplier]
    PSG --- BCM[BCM]
    PSG --- PM[PM]
    CA[Change Agents] --- TM[Team Members]
    SU --- CA
    SP --- CA
    SS --- CA
    CA --- TM
    
```

The diagram illustrates the proposed project structure. At the top level is 'Corporate Management'. Below it is the 'Project Steering Group' which includes 'Senior User', 'Sponsor', and 'Senior Supplier'. To the left of the steering group is the 'BCM' (Business Change Manager) and to the right is the 'PM' (Programme Manager). Below the steering group are 'Change Agents' and 'Team Members', with arrows indicating a relationship between the steering group members and the change agents, and between the change agents and the team members.

Legend:

- Light grey box = from the customer
- Dark grey box = from the supplier(s)
- White box = delivery specialists

Contd...

To explain to the Steering Group, other stakeholders, the project manager and BCM how the responsibilities are split over the project manager and BCM, we have also developed a RACI matrix and a standard role description. These are then discussed by the project manager and BCM, and if necessary the sponsor, at the start of the project. They are then tailored for the specific project, but have proven to be an 80-90% fit at the start.

Notes

Does This Work?

We have now started a number of projects this way, and the project manager finds that it gives clarity on the main roles at the start of the project. Also, there is little chance that the BCM will try and run the project, normally they have their hands full with the business change anyway! So the BCM is happy to know that there is someone else responsible for the day-to-day running of the project. A number of projects that started with this structure have completed, and the feedback from the customers has been good. On review the project managers feel that this approach works well, and also gives enough room for tailoring to the needs of the individual project.

In Summary

This problem only occurs in projects that are not part of a programme, but in my team we have a large number of these. Having a project manager and a BCM, with clear responsibilities and the capabilities to match, greatly increases the chance of success in the project team. I am aware that this is probably not the only way to solve this dilemma, and would like to hear from people who have other ideas and experiences, even if they are contradictory to mine!

Question:

1. Analyse the case and discuss the case facts.

Source: <http://www.projectsmart.co.uk/who-is-the-project-manager.html>

Unit 2: The Project Life Cycle

CONTENTS

- Objectives
- Introduction
- 2.1 Concept of Project Management
- 2.2 Project Life Cycle
 - 2.2.1 Interdependencies
 - 2.2.2 Uniqueness
 - 2.2.3 Purpose
 - 2.2.4 Conflict
 - 2.2.5 Delivery and Deliverables
 - 2.2.6 Overlapping of Activities
 - 2.2.7 Sharing of Resources
- 2.3 Project Classification Extended and Project Life Cycle
- 2.4 Summary
- 2.5 Keywords
- 2.6 Review Questions
- 2.7 Further Readings

Objectives

After studying this unit, you will be able to:

- Discuss about Concept of Project Management
- Define Project Life Cycle
- Describe about Extended Project Life Cycle
- Explain about Project Classification

Introduction

Essentially, a project is a task with a known end point. For example, building a new house is a project, the end point being when the house is built. Similarly, creating a new piece of computer software is a project, as is launching a new product for a business. Projects can be used to complete many different types of tasks.

Usually the term ‘project’ is applied to tasks with some degree of complexity. Projects fulfil some clear predefined objective, in a planned period of time, and to a planned cost. Once the project is complete something will have changed – for example, you have a new house, a new computer system or a new product.

The Project Management Institute defines a project as “*a temporary endeavor undertaken to create a unique product or service*”. There is a rich variety of projects to be found in our society. Although some may argue that the construction of the Tower of Babel or the Egyptian pyramids was some

of the first projects, it is probable that cavemen formed a project to gather the raw material for mammoth stew. Modern project management, however, is usually said to have begun with the Manhattan Project. In its early days, project management was used mainly for very large, complex Research and Development (R&D) projects like the development of the Atlas Intercontinental Ballistic Missile and similar military weapon systems. Massive construction programs were also organized as projects the construction of dams, ships, refineries, and freeways, among others.

Notes

2.1 Concept of Project Management

Project management is a formal discipline for managing projects. Project management has been developed over the past few decades as it has become apparent that without a structured approach, people are not very good at completing projects successfully. The aim of project management is to ensure that projects are completed and that the end point (the new house, computer system or new product) is achieved. More than this, project management is about reaching that end point predictably, which usually means to a given cost and within a planned amount of time.

The successful project management is all about structure, control, sufficient attention to detail and continuously driving action. The role of the project manager is to understand enough project management to apply its structure and ensure that project is successfully completed within the time and cost required. The things you must do as a project manager are:

1. Ensure there is a clear understanding why a project is being done, and what it will produce.
2. Plan the project – to understand how long it will take and how much it will cost.
3. Manage the project – to ensure that as the project progresses, it achieves the objectives you have defined within the time and cost specified.
4. Complete the project properly – to make sure everything produced by the project is of the quality expected and works as required.

Project Management has emerged because the characteristics of our turn-of-the-century society demand the development of the new methods of management. Of the many forces involved, three are paramount:

1. The exponential expansion of the human knowledge;
2. The growing demand for a broad range of complex, sophisticated, customized goods and services;
3. The evolution of worldwide competitive markets for the production and consumption of goods and services.

All three forces combine to mandate the use of terms to solve problems that used to be solvable by individuals. These three forces combine to increase greatly the complexity of goods and services produced plus the complexity of the process used to produce them and all this in turn leads to the need for more sophisticated systems to control both outcomes and processes.

As the techniques of project management were developed, the use of project organization began to spread. Private construction firms found that project organization was helpful on smaller projects, such as the building of a warehouse or an apartment complex. Automotive companies used project organization to develop new automobile models. Both General Electric and Pratt & Whitney used project organization to develop new jet aircraft engines for airlines, as well as the Air Force. Project management has even been used to develop new models of shoes and ships.

More recently, the use of project management by international organizations, and especially organizations producing services rather than products, has grown rapidly. Advertising

Notes	campaigns, global mergers, and capital acquisitions are often handled as projects, and the methods have spread to the non-profit sector. Functions, weddings, fund drives, election campaigns, parties, recitals etc all make use of the principles of project management. Most striking has been the widespread adoption of project management techniques for the development of computer software.
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Did u know? Each project phase is marked by completion of one or more deliverables. A *deliverable* is a tangible, verifiable work product. The conclusion of a project phase is generally marked by (a) completion and review of both key deliverables and project performance to date, to (b) determine if the project should continue into its next phase and (c) detect and correct errors cost effectively.

Self Assessment

Fill in the blanks:

1. The successful is all about structure, control, sufficient attention to detail and continuously driving action.
2. Project management is a formal discipline for projects.
3. Projects with functional departments for resources and personnel.
4. construction firms found that project organization was helpful on smaller projects, such as the building of a warehouse or an apartment complex.
5. The role of the is to understand enough project management to apply its structure and ensure that project is successfully completed within the time and cost required.

2.2 Project Life Cycle

Like organic entities, projects have life cycles. From a slow beginning they progress to a buildup of size, then peak, begin a decline, and finally must be terminated. Some projects end by being phased into the normal, ongoing operations of the parent organization.

2.2.1 Interdependencies

Projects often interact with other projects being carried out simultaneously by their parent organization; but projects always interact with the parent organization's standard, ongoing operations. Although the functional departments of an organization (marketing, finance, manufacturing, and the like) interact with one another in regular, patterned ways, the patterns of interaction between projects and these departments tend to be changeable. Marketing may be involved at the beginning and end of a project, but not in the middle. Manufacturing may have major involvement throughout. Finance is often involved at the beginning and accounting at the end, as well as at periodic reporting times. The PM must keep all these interactions clear and maintain the appropriate interrelationships with all external groups.

2.2.2 Uniqueness

Every project has some elements that are unique. No two construction or R&D projects are precisely alike. Though it is clear that construction projects are usually more routine than R&D

projects, some degree of customisation is a characteristic of projects. In addition to the presence of risk, as noted earlier, this characteristic means that projects, by their nature, cannot be completely reduced to routine. The PM's importance is emphasized because, as a devotee of management by exception, the PM will find there are a great many exceptions to manage by.

Notes

2.2.3 Purpose

A project is usually a one time activity with a well-defined set of desired end results. It can be divided into subtasks that must be accomplished in order to achieve the project goals. The project is complex enough that the subtasks require careful coordination and control in terms of timing, precedence, cost, and performance. Often, the project itself must be coordinated with other projects being carried out by the same parent organization.



Caution Simultaneous projects often interact with other projects in terms of the functional departments. Thus, the project manager must keep all these interactions clear and maintain the appropriate interrelationships with all external groups.

2.2.4 Conflict

More than most managers, the PM lives in a world characterized by conflict. Projects compete with functional departments for resources and personnel. More serious, with the growing proliferation of projects, is the project versus project conflict for resources within multi-project organizations. The members of the project team are in almost constant conflict for the project's resources and for leadership roles in solving project problems. If the characteristics listed above define a project, it is appropriate to ask if there are non-projects. There are. The use of a manufacturing line to produce a flow of standard products is a non-project. The production of weekly employment reports, the preparation of school lunches, the delivery of mail, the flight of Delta, 1288 from Dallas to Dulles, checking your e-mail, all are non-projects.

Now we know that a project is a specific, finite task to be accomplished. Whether large or small scale or whether long or short run is not particularly relevant. What is relevant is that the whole project should be taken as a single unit. There are, however, some attributes that characterize projects.

Every project goes through various stages in its development. These stages vary depending on the type of project. For example, a project to build a new car has different stages compared to a project to develop an advertising campaign for a new type of washing detergent. However, at a generic level projects must go through common steps such as:

1. Specifying in detail what the project is for.
2. Planning the project and working out how it will be done.
3. Doing the project and creating the deliverables according to the plan.
4. Checking that the deliverables are as you originally wanted and meet the needs.
5. Closing the project down.

These five steps defined are a simple project lifecycle. The lifecycle is a skeleton framework which you can build your project around. From a slow beginning, they progress to a buildup of size, then peak, after that a decline, and finally they are terminated. Some projects end up by being phased out into the normal, ongoing operations of the parent organization.

Notes



Caution A project is a complex activity and thus, its end-term project objectives. Thus, careful coordination and control is required for successful completion of the project.

2.2.5 Delivery and Deliverables

There is a word that project managers and people involved regularly in projects use all the time; it is delivery. Delivery in the context of projects simply means getting the things done you set out to do. The role of a project manager is therefore to deliver the project. Delivery is a useful piece of jargon as it saves having to write 'completing the project to the expected time and cost with the desired outcome' again and again!

Deliverables are what is delivered by a project so taking the examples above, the deliverables from the respective projects are a new house, a new computer system or a new product. In a project the deliverables wanted are defined at the start of the project, and your success as a project manager is in delivering them in the planned time and to the expected cost.



Did u know? The aim of project management is to ensure that projects are completed and that the end point (the new house, computer system or new product) is achieved.

2.2.6 Overlapping of Activities

Projects often interact with other projects being carried out simultaneously by their parent organization; but projects always interact with the parent organization's standard, ongoing operations. Although the functional departments of an organization (marketing, finance, manufacturing, and the like) interact with one another in regular, patterned ways, the patterns of interaction between projects and these departments tend to be changeable. Marketing may be involved at the beginning and end of a project, but not in the middle. Manufacturing may have major involvement throughout. Finance is often involved at the beginning and accounting at the end, as well as at periodic reporting times. The PM must keep all these interactions clear and maintain the appropriate interrelationships with all external groups.



Notes Project Initiation is the first phase in the Project Life Cycle and essentially involves starting up the project. You initiate a project by defining its purpose and scope, the justification for initiating it and the solution to be implemented. You will also need to recruit a suitably skilled project team, set up a Project Office and perform an end of Phase Review.

2.2.7 Sharing of Resources

More than most managers, the PM lives in a world characterized by conflict. Projects compete with functional departments for resources and personnel. More serious, with the growing proliferation of projects, is the project versus project conflict for resources within multi-project organizations. The members of the project team are in almost constant conflict for the project's resources and for leadership roles in solving project problems.

There is much discussion about whether there is only one 'true' model of a project life cycle or many, and whether any of these are reasonably accurate descriptions of what happens in real

life. Some writers include the feasibility study as part of the project life cycle; others believe that the project proper only begins once the feasibility study is completed and the proposal accepted, or only when cost codes and a budget for the project are defined by the company accountants. We will use the point of conception, even though the actual circumstances can make that gestation period rather cloudy or uncertain. The practical starting point is often considered to be the birthday, since management normally give approval after they have been presented with the feasibility study and decided to go ahead with further work. If you find it helpful, you can think of the work needed to carry out a feasibility study as being a mini-project in its own right.

Notes

Task Find out two differences between delivery and deliverables.

Even with the best of plans and most stringent of controls, real life is always more chaotic than the models we apply to it; the same is true of projects. Nevertheless, in the case of projects, models are useful to help us recognize different ways of moving from the project's beginning to its end, and the broad phases where the activities that take place change from one type to another. Each activity will be undertaken using a known procedure at a given level of formality, starting with a number of inputs from preceding activities that are the basis for further work. On completion of an activity there may be one or more outputs, which are known as deliverables (because they are needed for other activities). So, the order in which these activities are carried out is called a **life cycle**, which outlines the overall process for a given project. A **phase** is the term used to describe a set of interrelated activities that are needed to achieve a particular outcome or deliverable. When a life cycle includes a number of phases, it is usually because some form of evaluation or review is needed to decide when each phase is completed.

There is no single life cycle that applies to all projects, although certain types of project will be associated with a particular life cycle. We begin by describing a basic life cycle and then discuss some variations, which may provide an appropriate model for a given situation. We will use the characteristics of software to illustrate that a project's outcome is more than just a physical object.

In practice, the description of a life cycle may be very general or very detailed: some might only suggest what to do, while others might prescribe what must be done. Highly detailed descriptions might involve numerous forms, models, checklists and so on which have been associated with the term *project management methodology* (see, for example, PMI, 2004).



Caution Projects compete with functional departments for resources and personnel. More serious, with the growing proliferation of projects, is the project versus project conflict for resources within multi-project organizations.

Self Assessment

Fill in the blanks:

6. Projects often interact with other projects being carried out simultaneously by their organization.
7. A project is usually a onetime activity with a well-defined set of end results.
8. The is a skeleton framework which you can build your project around.

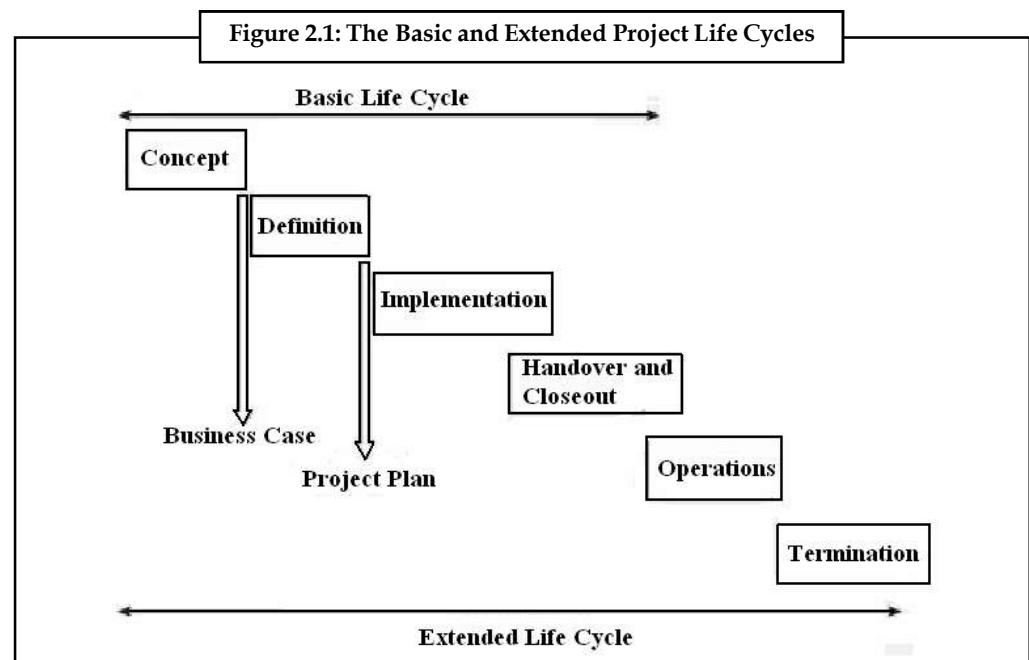
- | | |
|-------|--|
| Notes | 9. Every project has some elements that are |
| | 10. The PM must keep all these interactions clear and maintain the appropriate interrelationships with all groups. |
| | 11. Projects often interact with other projects being carried out simultaneously by their organization. |

2.3 Project Classification and Extended Project Life Cycle

Many writers use four phases when considering life cycles in relation to project management. Turner, for example, used the life cycle of a plant as an analogy to that of a project (1999).

Other writers, such as Weiss and Wysocki (1994), look at the core activities to come up with five phases such as define, plan, organise, execute and close. The change from one phase to the next is not necessarily abrupt. When there is significant overlap in time between activities in different phases (for example, when planning activities continue at the same time as the organisation is under way and execution may even have begun), we say that these activities exhibit **concurrence**. Since changes are an inevitable fact of project life, there will also be times when activities such as estimating or even recruiting or assigning work have to be done again in response to such changes. The overlapping of phases is also called *fast tracking* (PMI, 2004) as it allows the project to be completed in less time than following a strict sequence of phases.

The *basic life cycle*, which will fit many projects, is shown in Figure 2.1.



The *extended life cycle*, which is also known as a product life cycle, also shown in Figure 2.1 involves supporting and maintaining the deliverables in order to realise the project's intended benefits. The extended life cycle adds two more phases to the sequence (APM, 2006):

1. **Operations:** The period during which the completed deliverable is used and maintained in service for its intended purpose.
2. **Termination:** The disposal of the project deliverables at the end of their life.

Projects related to special events, such as an annual conference or a sporting event, make use of the extended life cycle.

Notes

When making a case for a new project, part of the work includes the choice of life cycle to use in order to achieve its goal and objectives. If an organisation has been using projects for some time, it is likely that it has developed a particular life cycle for the kinds of project that are approved. The simplest way to classify projects is by industry: for example, construction, mechanical engineering, software development, banking or health care.



Task Give an example of extended life cycle.

At the same time, it is also possible to think of projects in terms of their outcomes, which might be some form of product or service. However, the outcome of many projects has been a combination of products and services. For example, the National Health Service in the UK has sponsored a project for a new service that allows general practitioners to make hospital appointments for their patients in real time (service). In order to achieve the project's objectives, a new software application (product) was developed. Hence, we might consider that one way to classify a project is according to the particular result or outcome that we want to achieve. In addition, it is also reasonable to include a consideration of the means by which the desired outcome is to be achieved. By combining a consideration of means and ends (answering the *how?* and the *what?* questions) for a project, there would be four classes of project according to how much is known about what you are trying to achieve and how you are going to achieve it.

In practice, the two extremes permit a simple qualitative assignment of a project into one of four classes. The use of a metaphor for each class of project helps stakeholders engage in it, which Obeng (2003) employs as follows:

Table 2.1: Types of a Project

Type of project	Description	Example
Painting by numbers	Most stakeholders are sure of what to do and how it is to be done. The project proceeds linearly and sequentially.	Housing construction by a well-established building firm
Going on a quest	Most stakeholders are sure of what to do, but are rather unsure about how to achieve it. The project proceeds concurrently and converges according to particular deadlines.	Outcome based on prototypes (like research and development)
Making a movie	Most stakeholders are very sure of how to do the work, but not so sure about what is to be done. The project proceeds through a number of checkpoints where clarification is sought before moving on.	Developing new products for the market
Walking (or lost) in the fog	Most stakeholders are unsure of both what is to be done and how it is to be carried out. The project proceeds with care, 'one step at a time'.	Doing something new for the first time such as a quality or process improvement programme

Such a means of project classification is associated with the two main perspectives that are used to evaluate whether or not a project is successful.

Notes

Self Assessment

State True or False:

12. The National Health Service in the USA has sponsored a project for a new service that allows general practitioners to make hospital appointments for their patients in real time.
13. The simplest way to classify projects is by industry: for example, construction, mechanical engineering, software development, banking or health care.
14. Projects compete with functional departments for resources and personnel.
15. The members of the project team are in almost constant conflict for the project's resources and for leadership roles in solving project problems.

2.4 Summary

- Project management is a formal discipline for managing projects.
- Projects often interact with other projects being carried out simultaneously by their parent organization.
- Every project has some elements that are unique.
- Projects compete with functional departments for resources and personnel.
- The members of the project team are in almost constant conflict for the project's resources and for leadership roles in solving project problems.
- There is no single life cycle that applies to all projects, although certain types of project will be associated with a particular life cycle.

2.5 Keywords

Interdependencies: Projects often interact with other projects being carried out simultaneously by their parent organization but projects always interact with the parent organization's standard, ongoing operations.

Operations: The period during which the completed deliverable is used and maintained in service for its intended purpose.

Project: A project is usually a onetime activity with a well-defined set of desired end results. It can be divided into subtasks that must be accomplished in order to achieve the project goals.

Termination: The disposal of the project deliverables at the end of their life.

2.6 Review Questions

1. Discuss about the concept of Project Management.
2. What do you know about Project Life Cycle?
3. Explain about Interdependencies.
4. Describe about Uniqueness.
5. Explain about Delivery and Deliverables.
6. Discuss about Project Classification.
7. Define the term "Project Management."

Answers: Self Assessment

Notes

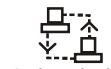
- | | |
|-----------------------|--------------|
| 1. Project Management | 2. Managing |
| 3. Compete | 4. Private |
| 5. Project Manager | 6. Parent |
| 7. Desired | 8. Lifecycle |
| 9. Unique | 10. External |
| 11. Parent | 12. False |
| 13. True | 14. True |
| 15. True | |

2.7 Further Readings



Books

- Clements/Gido, *Effective Project Management*, Thomson
Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill
Dennis Lock, *Project Management*, Ninth Edition, Gower
K. Nagarajan, *Project Management*, Third Edition, New Age International
P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons
Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill
Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

- www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf
www.pma-india.org/ - Trinidad and Tobago
www.nickjenkins.net/prose/projectPrimer.p
www.mpug.com/Pages/WhatisProjectManagement.aspx
www.mindtools.com/pages/main/newMN_PPM.htm
www.freelancer.com/jobs/Project-Management/

Notes

Case Study

HCL: When to do re-estimation?

A software company receives a web based development project from renowned client to develop vehicle tracking system for their organization.

The software company is well set to start the project and preparing the ground work. They have done the sizing exercise based on the requirements shared by the client using Function Point methodology and arrived the size of 200 FP. It is JAVA based technology and by using their organization productivity of 0.8 FP/day (of high skilled resource), the efforts required to complete the development of the project is 250 Person days.

Project manager started the project unfortunately he didn't get skilled resources. When the PM generates EV metrics for 1st week of the project, realized that the project is not going on track and there is 5% variance due to requirements delay from client.

At the end of the 2 weeks PM found that variance is increased to 40%. The reasons added here are resources are not skilled enough to understand the requirements and prepare design documents.

No of days estimated to complete the project = 250 Person Days

No of Months to complete the project allocating 4 resources= $250/(20*4) = 3.125$ PMs

After 2 weeks, when the project manager generates the following metrics:

PV	AC	EV	$CV = EV - AC$	$SV = EV - PV$	$CPI = EV/AC$	$SPI = EV/PV$
40	50	20	-30	-20	0.40	0.50

The project is over budget and behind the schedule (please refer to appendix - A for details on metrics)

PM able to calculate above metrics as he baselined the estimates and plan, compared actuals against baselined efforts.

The remaining size of the application to be developed = 184 FP

To complete 184 FP in 210 person days require = $184/210 = 1.14$ against the 0.8 productivity assumed for initial estimation.

Once the re-estimation done and baseline the Estimation, re-planning should follow and plan need to be baselined.

Re-estimation at end of the project Phase

An MNC awarded to develop employee leave details Portal

Initially project is sized to 100 FP. It is JAVA based technology and by using their organization productivity of 0.8 FP/day, the efforts required to complete the development of the project is 125 Person days.

At the end of the Requirements phase the size of the project is increased by 50 FP due to scope creep.

Contd...

Now the efforts required for 150 FP development, the efforts required are 187.5 person days. Re-planned based on the new estimates is required and adjust the efforts for the remaining phases appropriately.

This needs to be repeated after each phase of the project till the end of the project.

	% of Efforts Distribution in project phases	Requirements phase			Design phase		
		FP Size	Person days	Person Hours	FP Size	Person days	Person Hours
Requirements	15		18.75	150		28.125	225
Design	18		22.5	180		33.75	270
Coding	35	100	43.75	350	150	65.625	525
Testing	24		30	240		45	360
Implementation	8		10	80		15	120
Total		100	100	125	150	187.5	1500

Drawbacks if the re-estimation is not done and do not revise the estimation baseline

1. With the existing estimates and schedule, it is difficult to deliver the project for the asked functionalities.
2. The quality of the work may effect if the timelines are not changed.
3. Credibility is lost at the client.
4. Getting skilled resources may be a challenge.
5. If more resources are added, the productivity may reduce as the communicate channels increases and new resources may need time to understand application.

Question:

1. Analyse the case and discuss the case facts.

Notes

Source: <http://www.ifpug.org/ISMA6/Kamana%20ISMA6.pdf>

Notes

Unit 3: Strategic Management and Project Selection

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Anand Thakur, Lovely Professional University

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Objectives

After studying this unit, you will be able to:

- Define strategic management and project selection
- Discuss about project selection and criteria
- Describe about nature of project selection models

Introduction

A project is an allocation of capital and human resources to achieve time-specific objectives. Project management is the procedure and techniques used to achieve project objectives, which includes identifying, prioritising and scheduling tasks to systematically effect rapid change. Many companies are “managing organisations by projects,” using projects as a way to achieve business goals and strategic plans.

3.1 Selection Process of Project

Notes

An organisation might have dozens of prospective projects varying for limited resources.

3.1.1 Business Goals

This requires a selection process that maximises the efficiency of scarce business resources. When selecting between prospective projects, assess how each project ties to the organisation's goals and objectives. Base selections on the value each project lends to the organisation's strategic plans. Review the organisation's vision statements, mission statements and business goals against each project's objectives.

3.1.2 Selection Criteria

The process of evaluating individual projects or groups of projects for the purpose of choosing which to implement might include a number of factors. When selecting among competing project alternatives, additional project factors that might be reviewed and compared include costs, benefits and risks. While the exact parameters of these factors might not be known with certainty, estimates can be compared to evaluate differences.

3.1.3 Objectives Matrix

Top management might develop a matrix of objectives for projects that are expressly based on the organisation's business goals and strategies. Examples of objectives include improving the corporate brand with customers, expansion into a new market and growth of market share for a particular product or service, to name a few.

3.1.4 Achievable

A project should be assessed for realism, capability and cost. Thirty percent of all projects end midstream and half of completed projects end an average of 200 percent over schedule and over budget, according to a 2001 study by the Centre for Innovative Management. Unfinished projects are a significant waste of resources. A project that costs more than double its projected budget raises cost-benefit analysis questions.



Notes When selecting between prospective projects, assess how each project ties to the organisation's goals and objectives. Base selections on the value each project lends to the organisation's strategic plans.

3.2 Project Selection and Criteria

One of the biggest decisions that any organisation would have to make is related to the projects they would undertake. Once a proposal has been received, there are numerous factors that need to be considered before an organisation decides to take it up.

The most viable option needs to be chosen, keeping in mind the goals and requirements of the organisation. How is it then that you decide whether a project is viable? How do you decide if the project at hand is worth approving? This is where project selection methods come in use.

Notes Choosing a project using the right method is therefore of utmost importance. This is what will ultimately define the way the project is to be carried out.

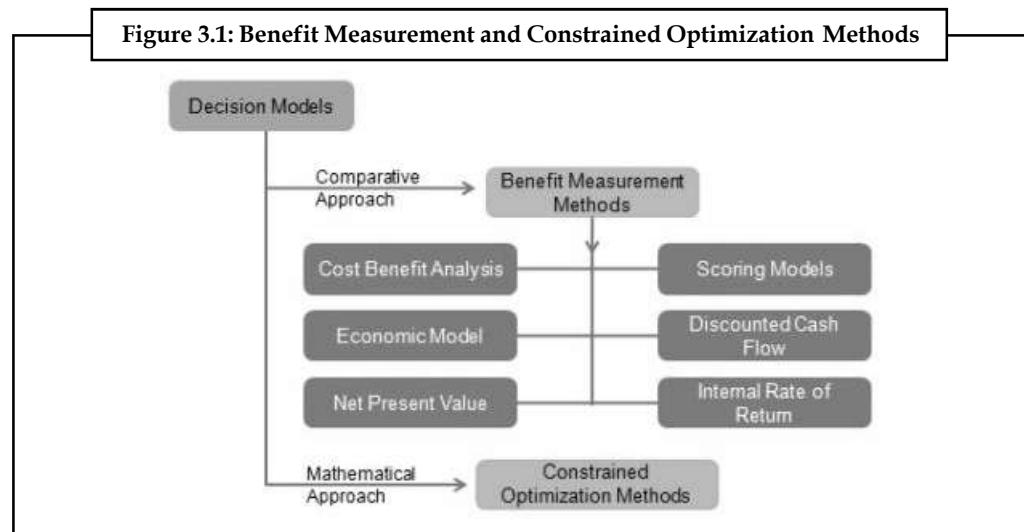
But the question then arises as to how you would go about finding the right methodology for your particular organisation. At this instance, you would need careful guidance in the project selection criteria, as a small mistake could be detrimental to your project as a whole, and in the long run, the organisation as well.

3.2.1 Selection Methods

There are various project selection methods practiced by the modern business organisations. These methods have different features and characteristics. Therefore, each selection method is best for different organisations.

Although there are many differences between these project selection methods, usually the underlying concepts and principles are the same.

Following is an illustration of two of such methods (Benefit Measurement and Constrained Optimisation methods).



As the value of one project would need to be compared against the other projects, you could use the benefit measurement methods. This could include various techniques, of which the following are the most common:

1. You and your team could come up with certain criteria that you want your ideal project objectives to meet. You could then give each project scores based on how they rate in each of these criteria, and then choose the project with the highest score.
2. When it comes to the Discounted Cash flow method, the future value of a project is ascertained by considering the present value and the interest earned on the money. The higher the present value of the project, the better it would be for your organisation.
3. The rate of return received from the money is what is known as the IRR. Here again, you need to be looking for a high rate of return from the project.

The mathematical approach is commonly used for larger projects. The constrained optimisation methods require several calculations in order to decide on whether or not a project should be rejected.

Cost-benefit analysis is used by several organisations to assist them to make their selections. Going by this method, you would have to consider all the positive aspects of the project, which is the benefits, and then deduct the negative aspects (or the costs) from the benefits. Based on the results you receive for different projects, you could choose which option would be the most viable and financially rewarding.

Notes

These benefits and costs need to be carefully considered and quantified in order to arrive at a proper conclusion. Questions that you may want to consider asking are in the selection process are:

1. Would this decision help me to increase organisational value in the long run?
2. How long will the equipment last for?
3. Would I be able to cut down on costs as I go along?

In addition to these methods, you could also consider Choosing based on opportunity cost - When choosing any project, you would need to keep in mind the profits that you would make if you do decide to go ahead with the project.

Profit optimisation is therefore the ultimate goal. You need to consider the difference between the profits of the project you are primarily interested in, and the next best alternative.

3.2.2 Implementation of the Chosen Method

The methods mentioned above can be carried out in various combinations. It is best that you try out different methods, as in this way you would be able to make the best decision for your organisation considering a wide range of factors rather than concentrating on just a few. Careful consideration would therefore need to be given to each project.



Task Discuss Selection Models.

3.3 Nature of Project Selection Models

The Nature of models is as follows:

1. Models turn inputs into outputs
2. Managers decide on the values for the inputs and evaluate the outputs
3. The inputs never fully describe the situation
4. The outputs never fully describe the expected results
5. Models are tools
6. Managers are the decision makers

There are two basic types of project selection models, numeric and non-numeric. Both are widely used. Many organisations use both at the same time, or they use models that are combinations of the two. Non-numeric models, as the name implies, do not use numbers as inputs. Numeric models do, but the criteria being measured may be either objective or subjective. It is important to remember that the qualities of a project may be represented by numbers, and that subjective measures are not necessarily less useful or reliable than objective measures.

Notes Before examining specific kinds of models within the two basic types, let us consider just what we wish the model to do for us, never forgetting two critically important, but often overlooked facts.

- Models do not make decisions – people do. The manager, not the model, bears responsibility for the decision. The manager may “delegate” the task of making the decision to a model, but the responsibility cannot be abdicated.
- All models, however sophisticated, are only partial representations of the reality they are meant to reflect. Reality is far too complex for us to capture more than a small fraction of it in any model. Therefore, no model can yield an optimal decision except within its own, possibly inadequate, framework.

We seek a model to assist us in making project selection decisions. This model should possess the characteristics discussed previously and, above all, it should evaluate potential projects by the degree to which they will meet the firm’s objectives. To construct a selection/evaluation model, therefore, it is necessary to develop a list of the firm’s objectives.

A list of objectives should be generated by the organisation’s top management. It is a direct expression of organisational philosophy and policy. The list should go beyond the typical clichés about “survival” and “maximising profits,” which are certainly real goals but are just as certainly not the only goals of the firm. Other objectives might include maintenance of share of specific markets, development of an improved image with specific clients or competitors, expansion into a new line of business, decrease in sensitivity to business cycles, maintenance of employment for specific categories of workers, and maintenance of system loading at or above some percent of capacity, just to mention a few.

A model of some sort is implied by any conscious decision. The choice between two or more alternative courses of action requires reference to some objective(s), and the choice is thus, made in accord with some, possibly subjective, “model.” Since the development of computers and the establishment of operations research as a subject in the mid-1950s, the use of formal, numeric models to assist in decision making has expanded. Many of these models use financial metrics such as profits and/or cash flow to measure the “correctness” of a managerial decision. Project selection decisions are no exception, being based primarily on the degree to which the financial goals of the organisation are met. As we will see later, this stress on financial goals, largely to the exclusion of other criteria, raises some serious problems for the firm, irrespective of whether the firm is for profit or not-for-profit.

When the list of objectives has been developed, an additional refinement is recommended. The elements in the list should be weighted. Each item is added to the list because it represents a contribution to the success of the organisation, but each item does not make an equal contribution. The weights reflect different degrees of contribution each element makes in accomplishing a set of goals.

Once the list of goals has been developed, one more task remains. The probable contribution of each project to each of the goals should be estimated. A project is selected or rejected because it is predicted to have certain outcomes if implemented.

These outcomes are expected to contribute to goal achievement. If the estimated level of goal achievement is sufficiently large, the project is selected. If not, it is rejected. The relationship between the projects expected results and the organisation’s goals must be understood. In general, the kinds of information required to evaluate a project can be listed under production, marketing, financial, personnel, administrative, and other such categories.

Some factors in this list have a one-time impact and some recur. Some are difficult to estimate and may be subject to considerable error. For these, it is helpful to identify a range of uncertainty. In addition, the factors may occur at different times. And some factors may have thresholds,

critical values above or below which we might wish to reject the project. We will deal in more detail with these issues later in this Unit.

Notes

Clearly, no single project decision needs to include all these factors. Moreover, not only is the list incomplete, it also contains redundant items. Perhaps more important, the factors are not at the same level of generality: profitability and impact on organisational image both affect the overall organisation, but impact on working conditions is more oriented to the production system. Nor are all elements of equal importance.

Change in production cost is usually considered more important than impact on current suppliers. Shortly, we will consider the problem of generating an acceptable list of factors and measuring their relative importance. At that time we will discuss the creation of a Decision Support System (DSS) for project evaluation and selection.

Although the process of evaluating a potential project is time-consuming and difficult, its importance cannot be overstated. A major consulting firm has argued (Booz, Allen, and Hamilton, 1966) that the primary cause for the failure of Research and Development (R & D) projects is insufficient care in evaluating the proposal before the expenditure of funds. What is true for such projects also appears to be true for other kinds of projects, and it is clear that product development projects are more successful if they incorporate user needs and satisfaction in the design process (Matzler and Hinterhuber, 1998). Careful analysis of a potential project is a sine qua non for profitability in the construction business. There are many horror stories (Meredith, 1981) about firms that undertook projects for the installation of a computer information system without sufficient analysis of the time, cost, and disruption involved.

Later, we will consider the problem of conducting an evaluation under conditions of uncertainty about the outcomes associated with a project. Before dealing with this problem, however, it helps to examine several different evaluation/selection models and consider their strengths and weaknesses. Recall that the problem of choosing the project selection model itself will also be discussed later.



Did u know? Expert judgement is one of the technique used, in project management to accomplish various tasks, including project selection.

Self Assessment

Fill in the blanks:

1. A project is an allocation of and human resources to achieve time-specific objectives.
2. requires a selection process that maximises the efficiency of scarce business resources.
3. A project should be assessed for, capability and cost.
4. The most option needs to be chosen, keeping in mind the goals and requirements of the organisation.
5. analysis is used by several organisations to assist them to make their selections.
6. There are basic types of project selection models, numeric and non-numeric.
7. The process of a potential project is time-consuming and difficult, its importance cannot be overstated.

- Notes**
- 8. A project is selected or rejected because it is predicted to have certain outcomes if

3.4 Types of Project Selection Models

Of the two basic types of selection models (numeric and non-numeric), non-numeric models are older and simpler and have only a few subtypes to consider. We examine them first.

3.4.1 Non-Numeric Models

These include the following:

- 1. ***The Sacred Cow:*** In this case the project is suggested by a senior and powerful official in the organisation. Often the project is initiated with a simple comment such as, "If you have a chance, why don't you look into . . .," and there follows an undeveloped idea for a new product, for the development of a new market, for the design and adoption of a global database and information system, or for some other project requiring an investment of the firm's resources. The immediate result of this bland statement is the creation of a "project" to investigate whatever the boss has suggested. The project is "sacred" in the sense that it will be maintained until successfully concluded, or until the boss, personally, recognises the idea as a failure and terminates it.
- 2. ***The Operating Necessity:*** If a flood is threatening the plant, a project to build a protective dike does not require much formal evaluation, which is an example of this scenario. XYZ Steel Corporation has used this criterion (and the following criterion also) in evaluating potential projects. If the project is required in order to keep the system operating, the primary question becomes: Is the system worth saving at the estimated cost of the project? If the answer is yes, project costs will be examined to make sure they are kept as low as is consistent with project success, but the project will be funded.
- 3. ***The Competitive Necessity:*** Using this criterion, XYZ Steel undertook a major plant rebuilding project in the late 1960s in its steel bar manufacturing facilities near Chicago. It had become apparent to XYZ's management that the company's bar mill needed modernisation if the firm was to maintain its competitive position in the Chicago market area. Although the planning process for the project was quite sophisticated, the decision to undertake the project was based on a desire to maintain the company's competitive position in that market. In a similar manner, many business schools are restructuring their undergraduate and Masters in Business Administration (MBA) programs to stay competitive with the more forward looking schools. In large part, this action is driven by declining numbers of tuition paying students and the need to develop stronger programs to attract them.

Investment in an operating necessity project takes precedence over a competitive necessity project, but both types of projects may bypass the more careful numeric analysis used for projects deemed to be less urgent or less important to the survival of the firm.

- 4. ***The Product Line Extension:*** In this case, a project to develop and distribute new products would be judged on the degree to which it fits the firm's existing product line, fills a gap, strengthens a weak link, or extends the line in a new, desirable direction. Sometimes careful calculations of profitability are not required. Decision makers can act on their beliefs about what will be the likely impact on the total system performance if the new product is added to the line.
- 5. ***Comparative Benefit Model:*** For this situation, assume that an organisation has many projects to consider, perhaps several dozen. Senior management would like to select a

subset of the projects that would most benefit the firm, but the projects do not seem to be easily comparable. For example, some projects concern potential new products, some concern changes in production methods, others concern computerisation of certain records, and still others cover a variety of subjects not easily categorised (e.g., a proposal to create a daycare center for employees with small children).

Notes

The organisation has no formal method of selecting projects, but members of the selection committee think that some projects will benefit the firm more than others, even if they have no precise way to define or measure "benefit."

The concept of comparative benefits, if not a formal model, is widely adopted for selection decisions on all sorts of projects. Most United Way organisations use the concept to make decisions about which of several social programs to fund. Senior management of the funding organisation then examines all projects with positive recommendations and attempts to construct a portfolio that best fits the organisation's aims and its budget.

3.4.2 Numeric Models

As noted earlier, a large majority of all firms using project evaluation and selection models use profitability as the sole measure of acceptability. We will consider these models first, and then discuss models that surpass the profit test for acceptance. These include the following:

1. **Payback Period:** The payback period for a project is the initial fixed investment in the project divided by the estimated annual net cash inflows from the project. The ratio of these quantities is the number of years required for the project to repay its initial fixed investment. For example, assume a project costs \$100,000 to implement and has annual net cash inflows of \$25,000. Then

$$\text{Payback period} = \$100,000 / \$25,000 = 4 \text{ years}$$

This method assumes that the cash inflows will persist at least long enough to pay back the investment, and it ignores any cash inflows beyond the payback period. The method also serves as an (inadequate) proxy for risk. The faster the investment is recovered, the less the risk to which the firm is exposed.

2. **Average Rate of Return:** Often mistaken as the reciprocal of the payback period, the average rate of return is the ratio of the average annual profit (either before or after taxes) to the initial or average investment in the project. Because average annual profits are usually not equivalent to net cash inflows, the average rate of return does not usually equal the reciprocal of the payback period. Assume, in the example just given, that the average annual profits are \$15,000.

Neither of these evaluation method is recommended for project selection, though payback period is widely used and does have a legitimate value for cash budgeting decisions. The major advantage of these models is their simplicity, but neither takes into account the time-value of money. Unless interest rates are extremely low and the rate of inflation is nil, the failure to reduce future cash flows or profits to their present value will result in serious evaluation errors.

3. **Discounted Cash Flow:** Also referred to as the Net Present Value (NPV) method, the discounted cash flow method determines the net present value of all cash flows by discounting them by the required rate of return (also known as the hurdle rate, cutoff rate, and similar terms) as follows:

To include the impact of inflation (or deflation) where pt is the predicted rate of inflation during period t , we have Early in the life of a project, net cash flow is likely to be negative, the major outflow being the initial investment in the project, A_0 . If the project is successful,

Notes

however, cash flows will become positive. The project is acceptable if the sum of the net present values of all estimated cash flows over the life of the project is positive. A simple example will suffice. Using our \$100,000 investment with a net cash inflow of \$25,000 per year for a period of eight years, a required rate of return of 15 percent, and an inflation rate of 3 percent per year, we have.

Because the present value of the inflows is greater than the present value of the outflow—that is, the net present value is positive—the project is deemed acceptable.



Example: PsychoCeramic Sciences, Inc. (PSI), a large producer of cracked pots and other cracked items, is considering the installation of a new marketing software package that will, it is hoped, allow more accurate sales information concerning the inventory, sales, and deliveries of its pots as well as its vases designed to hold artificial flowers.

The Information Systems (IS) department has submitted a project proposal that estimates the investment requirements as follows: an initial investment of \$125,000 to be paid up-front to the Pottery Software.

Corporation, an additional investment of \$100,000 to modify and install the software; and another \$90,000 to integrate the new software into the overall information system. Delivery and installation is estimated to take one year; integrating the entire system should require an additional year.

Thereafter, the IS department predicts that scheduled software updates will require further expenditures of about \$15,000 every second year, beginning in the fourth year. They will not, however, update the software in the last year of its expected useful life.

The project schedule calls for benefits to begin in the third year, and to be up to a particular speed by the end of that year. Projected additional profits resulting from better and more timely sales information are estimated to be \$50,000 in the first year of operation and are expected to peak at \$120,000 in the second year of operation.

Project life is expected to be 10 years from project inception, at which time the proposed system will be obsolete for this division and will have to be replaced. It is estimated, however, that the software can be sold to a smaller division of PsychoCeramic Sciences, Inc. (PSI) and will thus, have a salvage value of \$35,000. The Company has a 12 percent hurdle rate for capital investments and expects the rate of inflation to be about 3 percent over the life of the project. Assuming that the initial expenditure occurs at the beginning of the year and that all other receipts and expenditures occur as lump sums at the end of the year, we can prepare the Net Present Value analysis for the project.

The Net Present Value of the project is positive and, thus, the project can be accepted. (The project would have been rejected if the hurdle rate were 14 percent.) Just for the intellectual exercise, note that the total inflow for the project is \$759,000, or \$75,900 per year on average for the 10 year project. The required investment is \$315,000 (ignoring the biennial overhaul charges). Assuming 10 year, straight line depreciation, or \$31,500 per year, the payback period would be: A project with this payback period would probably be considered quite desirable.

4. **Internal Rate of Return (IRR):** If we have a set of expected cash inflows and cash outflows, the internal rate of return is the discount rate that equates the present values of the two sets of flows. If A_t is an expected cash outflow in the period t and R_t is the expected inflow for the period t , the internal rate of return is the value of k that satisfies the following equation (note that the A_0 will be positive in this formulation of the problem). The value of k is found by trial and error.

5. **Profitability Index:** Also known as the benefit-cost ratio, the profitability index is the net present value of all future expected cash flows divided by the initial cash investment. (Some firms do not discount the cash flows in making this calculation.) If this ratio is greater than 1.0, the project may be accepted.
6. **Other Profitability Models:** There are a great many variations of the models just described. These variations fall into three general categories. These are:
- Those that subdivide net cash flow into the elements that comprises the net flow.
 - Those that include specific terms to introduce risk (or uncertainty, which is treated as risk) into the evaluation.
 - Those that extend the analysis to consider effects that the project might have on other projects or activities in the organization.

Notes

Caution Senior management would like to select a subset of the projects that would most benefit the firm, but the projects do not seem to be easily comparable.

3.5 Analysis under Certainty

3.5.1 Certainty Assumption

- Certainty means that although future flows must be forecast or estimated, the estimated amounts will be received at the times they are expected to occur.
- Certainty makes the decision simple to model, and the outcome easy to accept.
- Under the assumption of certainty, future cash flows are to be discounted at a rate which represents the time value of money.



Example: Project Alpha requires an initial outlay of \$900, will have cash inflows of \$300 in year 1, \$400 in year 2 and \$600 in year 3. The discount rate is 8% per annum. The calculation is:

$$\begin{aligned} \text{NPV} &= -900 + \frac{300}{(1.08)^1} + \frac{400}{(1.08)^2} + \frac{600}{(1.08)^3} \\ &= \$197.01 \end{aligned}$$

This positive result means that, by undertaking the project, the firm's wealth will increase by \$197.01. Based on the NPV decision rule, the project should be undertaken.

We have made several assumptions in formulating and using this NPV model and decision:

- the amounts of the initial cash outflow and all future cash flows are known with certainty
- the discount rate is constant and known with certainty
- the initial capital outlay occurs at the beginning of year 1 and all operating cash flows occur at year end
- cash outflows from the firm are treated as negative; cash inflows are treated as positive
- there are no constraints on the supply of capital, or on other resources
- the firm will accept all positive NPV projects.

Notes

Self Assessment

State True or False:

9. The organisation has no informal method of selecting projects.
10. The concept of comparative benefits, if not a formal model, is widely adopted for selection decisions on all sorts of projects.
11. Decision makers can act on their beliefs about what will be the likely impact on the total system performance if the new product is added to the line.
12. Capital in an operating necessity project takes precedence over a competitive necessity project.

3.6 Summary

- An organisation might have dozens of prospective projects vying for limited resources.
- The process of evaluating individual projects or groups of projects for the purpose of choosing which to implement might include a number of factors.
- Top management might develop a matrix of objectives for projects that are expressly based on the organisation's business goals and strategies.
- A project should be assessed for realism, capability and cost.
- One of the biggest decisions that any organisation would have to make is related to the projects they would undertake.
- The most viable option needs to be chosen, keeping in mind the goals and requirements of the organisation.
- There are various project selection methods practiced by the modern business organisations.
- Cost-benefit analysis is used by several organisations to assist them to make their selections.
- In this case the project is suggested by a senior and powerful official in the organisation.
- Certainty means that although future flows must be forecast or estimated, the estimated amounts will be received at the times they are expected to occur.

3.7 Keywords

Competitive Necessity: Using this criterion, XYZ Steel undertook a major plant rebuilding project in the late 1960s in its steel bar manufacturing facilities near Chicago.

Cost Benefit Analysis: Cost-benefit analysis is used by several organisations to assist them to make their selections.

Discounted Cash Flow: It determines the net present value of all cash flows by discounting them by the required rate of return.

Discounted Cash Flow Method: The future value of a project is ascertained by considering the present value and the interest earned on the money.

IRR: The rate of return received from the money.

Operating Necessity: If a flood is threatening the plant, a project to build a protective dike does not require much formal evaluation, which is an example of this scenario

Product Line Extension: In this case, a project to develop and distribute new products would be judged on the degree to which it fits the firm's existing product line, fills a gap, strengthens a weak link, or extends the line in a new, desirable direction.

Notes

Profitability Index: It is the net present value of all future expected cash flows divided by the initial cash investment.

3.8 Review Questions

1. Describe about strategic management and project selection.
2. Explain about project selection and criteria.
3. Which method is a better model: discounted cash flow model or IRR? Explain, why?
4. Describe what Project Selection Models are?
5. What do you know about "The Sacred Cow"?
6. Explain about the product line extension.
7. Discuss about analysis under certainty.
8. List and explain the numeric models of project selection.
9. Explain the non-numeric models of project selection.

Answers: Self Assessment

- | | |
|-----------------|-------------------|
| 1. Capital | 2. Business Goals |
| 3. Realism | 4. Viable |
| 5. Cost-Benefit | 6. 2 |
| 7. Evaluating | 8. Implemented |
| 9. False | 10. True |
| 11. True | 12. False |

3.9 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House

Notes



Online links

www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf

www.pma-india.org/ - Trinidad and Tobago

www.nickjenkins.net/prose/projectPrimer.p

www.mpug.com/Pages/WhatisProjectManagement.aspx

www.mindtools.com/pages/main/newMN_PPM.htm

www.freelancer.com/jobs/Project-Management/

www.freelancer.com/jobs/Project-Management/



Case Study

Green Projects

We discussed the effect that the current economy is having on projects and project management in an article entitled "Project Management in Tight Times." In that article we made the case that although some projects are being put on hold, others are going forward with increased scrutiny.

Projects that are environmentally "friendly" by virtue of their ability to reduce pollution, reduce fossil fuel consumption, or some other positive effect on the environment are definitely among those projects that are going forward. So project managers should increase their focus and awareness on these areas. These projects have spawned a new vocabulary. Terms such as "Green Project" and "Green Collar Jobs" are examples. Project managers should be aware of this shift in focus and add some of the new terms to their resumes to attract interest. Project management on these projects may demand a slightly different skill set than on other types of projects though.

Tyler Hamilton, reporting in the Friday, June 19, 2009 edition of the Toronto Star says that developers of large scale solar farms in Ontario, Canada, are preparing to battle the provincial government over its restrictions on where solar farms can be placed. Solar farms are vast areas of solar panels which supply electricity to a power grid. Solar power companies either lease or buy existing farms to install the panels. The ideal place for these farms is as close to the power grid as possible. That placement will reduce the length of transmission lines and reduce the cost of the project. The problem with that strategy is that government agriculture policy states that farms with class 1, 2, or 3 soils (soils are rated on a scale with 1 being the highest fertility) are not suitable for purposes other than agriculture. Averting any farmland that falls into class 1, 2, and 3 would potentially add considerable cost to any solar farm project.

Solar farm projects are attractive because they fall into the "green" class of project because they reduce dependency on electricity generated by plants that use fossil fuels. Solar farm projects are obviously also attractive to the solar power companies that initiate them because of their ability to generate profit. The increase in infrastructure costs that the additional transmission lines would have could potentially reduce the profit to the point that they would incur a loss with a project because their electricity prices must be competitive with existing sources.

According to Tyler Hamilton's article in the Star, Ontario's Energy and Infrastructure Minister George Smitherman said that rules expected to result from Green Energy and Green Economy Act would put restrictions on where solar farms could be placed. He said that farms with class 1, 2, or 3 soil would not qualify for development (including solar farms) in Ontario. Smitherman believes that there is enough farm land available that doesn't fall into class 1, 2, or 3 and that solar farms should not compete for the more fertile farm land. Some advocacy groups backed by the Ontario Federation of Agriculture for Environment Law and Policy are solidly behind this government policy.

The Canadian Solar Industries Association is fighting the policy with its own public relations campaign on several fronts. They say that they would only be consuming class 1, 2, or 3 farmland at the rate of 0.11% over 20 years. The Association also claims that without the ability to lease or buy this farmland they would be unable to initiate the large projects which would bring manufacturers of solar panels and other related industries to the

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Contd...

Notes	<p>province. These industries would bring what are termed “green collar” jobs to the province, an especially appealing prospect in a province bleeding manufacturing jobs.</p> <p>The Association claims that using the farms for solar use will not harm the fertile farmland. The farms will guard against soil erosion because of the cover the panels provide. Allowing the land to lay fallow while being used for solar farms would also provide an opportunity for nutrients to build up in the soil making it even more fertile if it were to be returned to agricultural usage.</p> <p>The reporter spoke with a farmer, Ray Roth of New Hamburg, Ontario, Canada who is a farmer trying to develop solar farms. Mr. Roth pointed out that it would be contradictory for the province to implement restrictions on the solar farms because it already provides indirect subsidies to farmers who grow corn and other crops used for ethanol production. The corn and other crops must be trucked to a plant which consumes fossil fuels, so replacing a corn farm with a solar farm would reduce fossil fuel consumption because the power would go directly on the grid.</p> <p>Projects are always influenced by stakeholders who are not customers, clients, sponsors, or members of the project team. They may not all be as influential as the government is in this case, but must have their considerations taken into account in any case. The higher the public profile of a project, the greater the number of public interest groups that will take an interest in the outcome. The ideal time to identify these stakeholders is at the outset of the project. Demonstrating the value of a “green project” to these stakeholders becomes much easier when the groups are consulted with during initiation. The project manager must take ownership of this effort, identify the interest groups, and engage them early on in the project. Look for ways to demonstrate the benefit of the project to the public, paying special attention to the interests representing by the group in question. Associations or organisations may be available to manage these issues. Where these don’t exist, the sponsor or project manager may need to engage the services of a public relations firm to state the benefits of their project.</p> <p>The benefits of the solar farms for the provinces economy (“green collar” jobs) has been demonstrated by the Canadian Solar Industries Association. They have also demonstrated the benefit to the environment, a reduction in fossil fuel consumption to produce electricity. The problem they face is the backlash from farming groups who aren’t directly affected by the demand for farmland for solar farms. These groups don’t directly benefit from either of the two benefits stated above, and above all won’t benefit financially from the sale or leasing of their farms for the purpose of building solar farms. But they do vote, a fact that George Smitherman won’t miss. The Association faces a challenge from the government before it can hope to get the farmland it wants and it will have to influence the government to change their position on solar farms. Perhaps the best way of doing this would be to provide a benefit to the farm groups backing the government’s position.</p>
	<p>Question:</p> <ol style="list-style-type: none">1. Analyse the case and discuss the case facts.

Source: <http://www.projectsmart.co.uk/green-projects.html>

Unit 4: Project Analysis and Selection

Notes

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 - 4.9.1 What makes a good proposal?
 - 4.9.2 Required Format
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- 4.12 Review Questions
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Objectives

After studying this unit, you will be able to:

- Know about project initiation and resource allocation
- Understand market analysis and demand analysis
- Know about the technical analysis

Notes

Introduction

A project should earn sufficient return on the investment. The very idea of promoting a project by an entrepreneur is to earn attractive returns on investment on the project. Projects sponsored/undertaken by Government may take into account social cost benefits of the proposed project and in such cases, financial return alone needs not be the criterion. But for such Government projects, all other projects have the prime motive of getting maximum return on investment. If there are many alternative projects, all of which, *prima facie*, appear to be more or less equal in profit earning capacity, the investor should make a comparative study of the return on the different alternative proposals before choosing one.

4.1 Project Initiation and Resource Allocation

The purpose of Project Initiation is to begin to define the overall parameters of a project and establish the appropriate project management and quality environment required to complete the project.

Development of the Project Charter is a pivotal starting point for the project, establishing the project definition that will serve as the foundation for all future efforts. The completion of this process is marked by the Project Kick-off Meeting, in which the Project Manager presents the Project Charter.

Successful projects begin with a detailed project definition that is understood and accepted by Stakeholders. Putting everything down in writing helps ensure a commitment among Project Team members and between the team and the Stakeholders. As part of Project Initiation, an initial Project Plan is developed, which comprises the Project Charter, Cost/Scope/Schedule/Quality (CSSQ) documents, and preliminary risk identification list. These documents, once approved, ensure a consistent understanding of the project, help to set expectations, and identify resources necessary to move the project to the next level of detailed planning. Potential problems are identified so that they can be addressed early in the project.

Also during Project Initiation, a high-level Project Schedule is developed as the roadmap to more detailed Project Planning and Project Execution and Control. This high-level schedule will be refined over time, and will serve as the primary source of information regarding project status and progress. An accurate, realistic, and complete schedule, rigorously maintained, is essential to the success of a project.



Notes Sponsorship of the project must be confirmed or gained during Project Initiation. Having a Project Sponsor, and securing approval early in the project management lifecycle, helps to ensure a commitment to the project.

4.2 Resource Allocation

Resource allocation is the distribution of resources - usually financial - among competing groups of people or programs. When we talk about allocation of funds for healthcare, we need to consider three distinct levels of decision-making:

Level 1: Allocating resources to healthcare versus other social needs.

Level 2: Allocating resources within the healthcare sector.

Level 3: Allocating resources among individual patients.

Notes



Example: A community receives a gift of \$100,000 from a wealthy donor to spend on healthcare, education and housing. The funds can be distributed among the three areas or dedicated to a single area, such as healthcare.

Level 1: At this level, community members consider how to distribute the funds among one, two or three of the competing programs.



Example: For example, should the funding be split in three equal portions or should one program, possibly under-funded in the past, get all or most of the money?

Level 2: Assuming that healthcare gets a portion of the \$100,000, the next decision community members face is how best to direct the spending among competing healthcare interests. Should most or all of the funds go to hospital care and medical equipment? What about the public education program that promotes healthy lifestyles and behaviors (like exercise or immunizations) that prevent disease? Or, community members could decide to spend the money to purchase health insurance for those who can't afford it.

Level 3: The next level of decision making involves distributing the financial resources among individuals. Most communities have policies and guidelines to insure fairness in these situations. Decisions at this level include: Who gets the next available heart for transplant? And, who sees the doctor first when there are many people waiting in an emergency room?



Did u know? The wants and needs of a project or business are unlimited but the resources to satisfy these wants are limited. Thus, resource allocation is a mandatory activity.

4.3 Why is Resource Allocation Needed?

Because of increasing demand for healthcare services and rising costs to provide those services, Americans must choose how to allocate healthcare dollars.

4.3.1 Rising Cost of Healthcare

Resources spent on healthcare have increased over the last century. Americans are spending far more resources on healthcare than do citizens of any other industrialized nation. Why?

1. Continued medical advances have lead to more accurate diagnoses and better treatments, but also have increased the cost of healthcare.
2. The aging population is growing. Nearly 36 million Americans (more than the entire population of Canada) are age 65 or older and account for a majority of healthcare expenditures.
3. More people are living with chronic disease and disabilities, including AIDS.

4.3.2 Healthcare Rationing

Rationing refers to the conscious decision to exclude certain people from a service or treatment that they need. Rationing takes many forms. Rationing occurs when a state determines who is eligible for Medical Assistance insurance. It also occurs when deciding which patient on the waiting list gets an organ transplant. Rationing is also utilized when prices are set for health insurance and health services that some people cannot afford.

Notes

4.3.3 Oregon Health Plan

Oregon has implemented an innovative health plan that rations health care by developing a prioritized list of treatments. A cut off line is then set to determine which services would be covered and which would not. The plan serves to increase access to health care for more Oregon residents but cuts down on the range of services covered.

This plan allows Oregon to provide health care access to a greater percentage of its residents, but it raises a number of ethical considerations. If ranking health care services is based on improving quality of life rather than medical or biological outcomes, how do we evaluate quality of life? Is it ethical to refuse to medical care based on cost-effective rankings? Does the method of ranking by quality of life discriminate against people with disabilities?



Caution Successful projects begin with a detailed project definition that is understood and accepted by Stakeholders.

4.4 Market Analysis and Demand Analysis

Forecast vs. Prediction: Forecast is an estimate of future events and trends and is arrived at by systematically combining past data and projecting it forward in a predetermined manner. Prediction is an estimate of future events and trends in a subjective manner without taking into account the past data. The subjective considerations may not emerge from any predetermined analysis or approach.

Time Horizon of Demand Forecasting: Market and demand analysis of various types are undertaken to meet specific requirements of planning and decision making.



Example: Short-term decisions in production planning, distribution etc. and selling individual products would require short-term forecast, up to one year time horizon, which must be fairly accurate for specific product items. For long-term planning, time horizon being four to five years, information required from demand analysis would be for broad product groups for facilitating choice of technology, machine tools and other hardwares and their location.

Longer-term forecasting is also undertaken to determine trends in technology development so as to choose the technology for backing up and funding its research and development.

4.4.1 Need for Demand Forecasting

All business planning starts with forecasting Capital investment, like procurement of raw materials and production planning, has to relate to demand forecasting. High volume high technology mass production systems have further highlighted the importance of accurate demand forecasts. Even in a batch type production, any major mismatch between forecast and manufacture will lead to higher capital tied up in finished products which are slow in selling.

4.4.2 Uncertainties in Demand Forecasting

Demand forecasting is the estimate of future demand. As the future is always uncertain, forecasting cannot be completely fool proof and correct. However, the very process of forecasting demand in future involves evaluating various forces and factors which influence demand. This exercise is very rewarding in itself as it enables the personnel to know about various market forces, currents, cross-currents and under-currents relevant to the demand behavior.

4.4.3 Levels of Demand Forecasting

Notes

Demand forecasting can be at the level of a firm or an industry or at the national or national or international level:

1. **Firm Level:** If the exercise aims at forecasting demand of firms products locally at state, region or national level, it is a micro-level of demand forecasting. Sometimes, forecasts are required for company products in specific industry or market segment.
2. **Industry Level:** Such a demand forecasting exercise focuses on an industry as a whole for the region and/or national level. These forecasts may be undertaken by a group of companies or by industry/trade associations.
3. **National Level:** Demand forecasts at national level include parameters like national income, expenditure, index of industrial and/or agricultural production etc. Estimating aggregate demand of products at national level facilitates governmental decisions for imports, exports, pricing policy, etc.
4. **International Level:** Companies operating in multinational markets would require similar forecasting of demands for its products, trends in consumption, etc. at international level. Managerial Economists play a leading role in masterminding these forecasts at firm, industry, national and international levels. Time horizon of these demand forecasts usually varies from 1 to 5 years and in rare instances up to 10 years.



Did u know? Demand forecasting is the activity of estimating the quantity of a product or service that consumers will purchase. Demand forecasting may be used in making pricing decisions.

Self Assessment

Fill in the blanks:

1. is also utilized when prices are set for health insurance and health services that some people cannot afford.
2. is also undertaken to determine trends in technology development so as to choose the technology for backing up and funding its research and development.
3. Rationing occurs when a state determines who is eligible for Assistance insurance.
4. and demand analysis of various types are undertaken to meet specific requirements of planning and decision making.
5. exercise should not be expensive in terms of efforts and costs.

4.5 Criteria for a Good Forecasting Method

A good forecasting method should have the following attributes:

1. **Accuracy in forecast:** Accuracy in forecast is measured in terms of past forecasts against current sales and by the percentage of deviation from actual demand. It is important to not only check the accuracy of past forecasts but also the validity of assumptions in practice. Forecasts being future-oriented, cannot be always accurate although accuracy is the most important criterion.

- Notes**
2. **Plausibility of forecasts:** Forecasts of demand must be reasonable, consistent and plausible. Assumptions made should stand scrutiny and techniques adopted must be commensurate. Explanatory note on these aspects must be available in the write-up on methods and methodology employed in forecasting.
 3. **Economy of forecasts:** Forecasting exercise should not be expensive in terms of efforts and costs. Additional costs of ways and means for improving the accuracy of forecasts should not exceed the extra gain expected.
 4. **Quick Results:** Method of forecasting chosen should be capable of yielding quick and useful results. If method selected takes fat too long a time to yield accurate forecast, it may not be conducive for taking quick and effective decisions. Always remember not to make best enemy of 'good'.
 5. **Availability and Timeliness:** Methodology of forecasting should be such that it can easily be updated when changes occur in the demand relationships.
 6. **Durability:** Demand forecasts should not be changed frequently. Durability of forecast is subject to the followings:
 - (a) Simple and reasonable relationship between price and demand, advertisement and sales, level of income and volume of sales etc.
 - (b) Stability of relationship between the above variables.
 7. **Flexibility:** Flexibility of forecast is an added advantage. It is desirable to be able to adjust 'coefficient' of variables from time to time to cope with the changing conditions.

4.5.1 Methods of Forecasting Demand

To facilitate proper and reliable appraisal of investment proposal, we require a reasonably accurate forecast of demand. Starting with qualitative methods like survey of collective opinions, buyers' intention, Delphi approach and its variant, a number of quantitative methods are used for compiling and computing demand forecasts as detailed below:

1. **Collective Opinion Survey:** Sales personnel are closest to the customers and have an intimate feel of the market. Thus they are most suited to assess consumers' reaction to company's products. Herein each salesperson makes an estimate of the expected sales in their respective area, territory, state and/or region. These estimates are collated, reviewed and revised to take into account changes in design/features of products, changes in selling prices, projected advertising and sales promotion campaigns and anticipated changes in competitors: marketing policies covering product, people, price, promotion and place. Opinions of all managers involved at various levels of sales organisation are also included in the survey. Thus "collective opinion survey forms the basis of market analysis and demand forecasting.

Although this method is simple, direct, first hand and most acceptable, it suffers from following weaknesses:

- (a) Estimates are based on personal judgment which may not be free from bias.
- (b) Adding together demand estimates of individual salespersons to obtain total demand of the country maybe risky as each person has knowledge about a small portion of market only
- (c) Salesperson may not prepare the demand estimates with the requisite seriousness and care

		Notes
(d)	Owing to limited experience, usually in their employment, salesperson may not have the requisite knowledge and experience	
	This method may be useful for long-term forecasts. It is also used for new products or new variants of existing products.	
2.	Survey of Customers Intention: Another method of demand forecasting is to carry out a survey of what consumers prefer and intend to buy. If the product is sold to a few large industrial buyers, survey would involve interviewing them. If it is a consumer durable product, a sample survey is carried out for questioning a few representative consumers about what they are planning or intending to buy. It is neither realistic nor desirable to query all consumers either through direct contact or through printed questionnaire by mail.	
	These surveys serve useful purpose in establishing relationships between:	
(a)	demand and price	
(b)	demand and income of consumers	
(c)	demand and expenditure on advertisement etc.	
	This method is preferred when bulk of the sales is to institutions and industrial buyers and only a few of them have to be contacted.	
	Disadvantages are that customers may not know total requirements; in some cases they are not certain about quantity to be purchased. Besides during shortages there is a tendency to inflate their requirements. Survey method is not useful for households - interviewing them is not only difficult but also expensive. They are not able to give precise idea about their intentions particularly when alternative products are available in the market.	
3.	Delphi Method of Demand Forecasting: Delphi method is a group process and aims at achieving a consensus of the members. Herein experts in the field of marketing research and demand forecasting are engaged in analyzing economic conditions carrying out sample surveys of market conducting opinion polls.	
	Based on the above, demand forecast is worked out in following steps:	
(a)	Coordinator sends out a set of questions in writing to all the experts co-opted on the panel who are requested to write back a brief prediction.	
(b)	Written predictions of experts are collated, edited and summarized together by the Coordinator.	
(c)	Based on the summary, Coordinator designs a new set of questions and gives them to the same experts who answer back again in writing.	
(d)	Coordinator repeats the process of collating, editing and summarizing the responses.	
(e)	Steps 3 and 4 are repeated by the Coordinator to experts with diverse backgrounds until consensus is reached.	
	If there is divergence of opinions and hence conclusions, Coordinator has to sort it out through mutual discussions. Coordinator has to have the necessary experience and background as he plays a key role in designing structured questionnaires and synthesizing the data.	
	Direct interaction among experts is avoided nor their identify is disclosed. Procedure also avoids inter-personnel conflicts nor strong-willed experts are able to dominate the group. This method is also used for technology forecasting.	

Notes



Task Discuss about Delphi Method or Demand Forecasting.

Self Assessment

State True or False:

6. Indirect interaction among experts is avoided nor their identify is disclosed.
7. Delphi method is a group process and aims at achieving a consensus of the members.
8. Coordinator repeats the process of collating, editing and summarizing the responses.
9. Forecasts of supply must be reasonable, inconsistent and plausible.
10. Sales personnel are closest to the customers and have an intimate feel of the market.

4.6 Technical Analysis

For manufacturing a product/service often two or more alternative technologies are available.
For example:

1. Steel can be made either by the Bessemer process or the open hearth process.
2. Cement can be made either by the dry process or the wet process.
3. Soda can be made by the electrolysis method or the chemical method.
4. Paper, using bagasse as the raw material, can be manufactured by the Kraft process or the soda process or the Simon Cusi process.
5. Vinyl chloride can be manufactured by using one of the following reactions: acetylene on hydrochloric acid or ethylene on chlorine.
6. Soap can be manufactured by the semi-boiled process or the fully boiled process.

4.6.1 Choice of Technology

The choice of technology is influenced by a variety of considerations. These are explained below:

1. **Plant Capacity:** Often, there is a close relationship between plant capacity and production technology. To meet a given capacity requirement perhaps only a certain production technology may be viable.
2. **Principal Inputs:** The choice of technology depends on the principal inputs available for the project. In some cases, the raw materials available influence the technology chosen.



Example: The quality of milestones determines whether the wet or dry process should be used for a cement plant.

3. **Investment Outlay and Production Cost:** The effect of alternative technologies on investment outlay and production cost over a period of time should be carefully assessed.
4. **Use by Other Units:** The technology adopted must be proven by successful use by other units, preferably in India.

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| <p>5. Product Mix: The technology chosen must be judged in terms of the total product mix generated by it, including saleable by products.</p> <p>6. Latest Developments: The technology adopted must be based on the latest developments in order to ensure that the likelihood of technological obsolescence in the near future, at least, is minimised.</p> <p>7. Ease of Absorption: The ease with which a particular technology can be absorbed can influence the choice of technology. Sometimes a high-level technology may be beyond the absorptive capacity of a developing country which may lack trained personnel to handle that technology.</p> | Notes |
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4.6.2 Appropriateness of Technology

Appropriate technology refers to those methods of production which are suitable to local economic, social, and cultural conditions. In recent years, the debate about appropriate technology has been sparked off mainly by Schumacher and others. The advocates of appropriate technology urge that the technology should be evaluated in terms of the following questions:

1. Whether the technology utilises local raw materials?
2. Whether the technology utilises local man power?
3. Whether the goods and services produced cater to the basic needs?
4. Whether the technology protects ecological balance?
5. Whether the technology is harmonious with social and cultural conditions?

4.6.3 Technical Arrangements

Satisfactory arrangements must be made to obtain the technical know how needed for the proposed manufacturing process. When collaboration is sought, *inter alia*, the following aspects of the agreement must be worked out in detail:

1. The nature of support to be provided by the collaborators during the designing of the project, selection and procurement of equipment, installation and erection of the plant, operation and maintenance of the plant, and training of the project personnel.
2. Process and performance guarantees in terms of plant capacity, product quality, and consumption of raw materials and utilities.
3. The price of technology in terms of one time licensing fee and periodic royalty fee.
4. The continuing benefit of research and development work being done by the collaborator.
5. The period of the collaboration agreement.
6. The assistance to be provided and the restrictions to be imposed by the collaborator with respect to exports.
7. The level of equity participation and the manner of sharing management control, especially if the technical collaboration is backed by financial collaboration.
8. Assignment of the agreement by either side in case of change of ownership.
9. Termination of the agreement or other remedies when either party fails to meet its obligation.
10. Approach to be adopted in *force majeure* situations.

Notes



Task Discuss about Technical Analysis in Project Management.

4.7 Material Inputs and Utilities

An important aspect of technical analysis is concerned with defining the materials and utilities required, specifying their properties in some detail, and setting up their supply programme. There is an intimate relationship between the study of materials and utilities and other aspects of project formulation, particularly those concerned with location, technology, and equipments.

Material inputs and utilities may be classified into four broad categories: (i) raw materials, (ii) processed industrial materials and components, (iii) auxiliary materials and factory supplies, and (iv) utilities.

Raw Materials

Raw materials (processed and/or semi processed) may be classified into four types: (i) agricultural products, (ii) mineral products, (iii) livestock and forest products, and (iv) marine products. These are explained below:

1. ***Agricultural Products:*** In studying agricultural products, the quality must first be examined. Then, an assessment of the quantities available, currently and potentially, is required. The questions that may be raised in this context are: What is the present marketable surplus? What is the present area under cultivation? What is the likely increase in yield per acre?
2. ***Mineral Products:*** In assessing mineral raw materials, information is required on the quantum of exploitable deposits and the properties of the raw materials. The study should provide details of the location, size, and depth of the deposits and the viability of open cast or underground mining. In addition, information should be generated on the composition of the ore, level of impurities, need for beneficiation, and physical, chemical and other properties.
3. ***Livestock and Forest Products:*** Secondary sources of data on livestock and forest products often do not provide a dependable basis for estimation. Hence, in general, a specific survey may be required to obtain more reliable data on the quantum of livestock produce and forest products.
4. ***Marine Products:*** Assessing the potential availability of marine products and the cost of collection is somewhat difficult. Preliminary marine operations, essential for this purpose, have to be provided for in the feasibility study.

Processed Industrial Materials and Components

Processed industrial materials and components (base metals, semi processed materials, manufactured parts, components, and sub-assemblies) represent important inputs for a number of industries. In studying them the following questions need to be answered: In the case of industrial materials, what are their properties? What is the total requirement of the project? What quantity would be available from domestic sources? What quantity can be procured from foreign sources? How dependable are the supplies? What has been the past trend in prices? What is the likely future behaviour of prices?

Auxiliary Materials and Factory Supplies

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In addition to the basic raw materials and processed industrial materials and components, a manufacturing project requires various auxiliary materials and factory supplies like chemicals, additives, packaging materials, paint, varnishes, oils, grease, cleaning materials, etc. The requirements of such auxiliary materials and supplies should be taken into account in the feasibility study.

Utilities

A broad assessment of utilities (power, water, steam, fuel, etc.) may be made at the time of the input study though a detailed assessment can be made only after formulating the project with respect to location, technology, and plant capacity. Since the successful operation of a project critically depends on the adequate availability of utilities, the following questions should be raised while conducting the inputs study. What quantities are required? What are the sources of supply? What would be the potential availability? What are the likely shortages/bottlenecks? What measures may be taken to augment supplies?



Did u know? Experts of marine products have been erratic and on a declining trend which can be owed to the adverse market conditions in the EV and US markets.

4.8 Basis of Government Regulatory Framework

Government of India recognizes that there are significant shortcomings in the availability of critical infrastructure in the country at central as well as state and local level and that this is hindering rapid economic development. In addition, the development of infrastructure requires very large investment that may not be possible out of the budgetary resources of government of India alone. In order to remove these shortcomings and to bring in private sector resource as well as techno-managerial efficiencies, the government is committed to promoting Public Private Partnerships (PPPs) in infrastructure development.

It is also recognized that infrastructure projects have a long gestation period and may not all be fully financially viable on their own. On the other hand, financial viability can often be fully financially viable on mechanism that provides government support to reduce project costs. The government of India therefore proposes to set up a special facility to provide such support to PPP projects. This support is generically termed as 'viability gap funding' throughout this document. This facility will be housed in the department of economic affairs (DEA). Suitable budgetary provisions will be made on a year basis.

4.9 Project Proposal and Project Portfolio Process

A technical proposal, often called a "Statement of Work," is a persuasive document. Its objectives are to:

1. Identify what work is to be done
2. Explain why this work needs to be done
3. Persuade the reader that the proposers (you) are qualified for the work, have a plausible management plan and technical approach, and have the resources needed to complete the task within the stated time and cost constraints.

Notes

4.9.1 What makes a Good Proposal?

One attribute is appearance. A strong proposal has an attractive, professional, inviting appearance. In addition, the information should easy to access.

A second attribute is substance. A strong proposal has a well-organized plan of attack. A strong proposal also has technical details because technical depth is needed to sell your project.

Remember: A proposal is a persuasive document.

4.9.2 Required Format

One aspect of layout is the incorporation of illustrations. In your proposal, each illustration should have a name and be formally introduced in the text. Illustrations consist of figures and tables. Figures include photographs, drawings, diagrams, and graphs. Each figure should have a stand-alone caption, and the key points and features should be labelled. Tables are arrangement of words and numbers into rows and columns. Use tables to summarize lists that the audience will try to find later (the budget, for instance).

Department of Information Technology supports R&D projects in industries (public and private Sector), academic institutes, research labs in the identified thrust area related to Information Technology (Hardware/Software), Information and Broadcasting, Industrial Electronics, Consumer Electronics, Microelectronics and Photonics, Capital Good Development, Strategic Electronics, Communications, Rural Application, Health and Biotechnology, Components including microwaves and millimeter waves and Materials.

According to Max Wideman, author of *A Management Framework for Project, Program, and Portfolio Integration*, the project portfolio life span consists of the following steps:

1. Identification of needs and opportunities
2. Selection of best combinations of projects (the portfolios)
3. Planning and execution of the projects (project management)
4. Product launch (acceptance and use of deliverables)
5. Realization of benefits

Many organizations focus only on Step 3, which involves the planning and execution of projects. However, from a project portfolio management point of view, the focus should be placed on the entire process and not on a single step.

Let's talk about each step and then discuss how the entire process fits together to deliver the best value for an organization.

First, ideas, opportunities, and needs are evaluated based on a predetermined screening process. This screening process starts with the creation of your organization's mission, vision, strategy, goals, and objectives. Once the baseline is established, the ideas, opportunities, and needs are measured against the baseline. Do these new ideas align with corporate strategy? Will solving a defined need improve the value proposition for your business?

Second, once an idea is validated, it continues through the screening process in order to create the best combination of projects for the company. Which of the many good ideas should the organization pursue? Which of all the opportunities will provide the most value for the organization? In this stage, the ideas, opportunities, and needs identified in Step 1 are put through an additional filter to select the best projects for the portfolio. This concept phase weeds out the good projects in order to select the best projects.

Third, now that a portfolio of projects has been selected and evaluated, it is time to start planning and executing on the projects. At this point, project managers will identify the individual tasks of the project, create a Gantt chart, allocate resources, and oversee the completion of the project. This project management phase is normally where most of the focus is placed due to the time and money involved in making sure that the project is delivered as specified.

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Fourth, once the projects have been completed, it is time to launch the product or service. Whether the product is a new piece of software or a new building, the Sponsors of the individual projects need to accept and then use the deliverables of the projects. Did the projects satisfy the predetermined objectives or were they over budget and late? This is the time to reflect upon the projects themselves. Did the organization receive the benefits that it intended to receive?

Fifth, realize the benefits of the projects. Assuming that the projects were successful, now is the time to sit back and reap the benefits of the hard work. The company should be seeing a positive ROI from the portfolio and hopefully hand out bonuses to all of the executives, project managers, and project teams that worked together to produce a great product.

Of course all of this sounds a lot easier than it actually is. Managing the entire process and keeping everybody in the loop can be as challenging as executing on any one of the above tasks. How do you keep the birds eye view while being in the trenches at the same time? How does the Team Member know the objectives of the Planning Committee? What if something goes wrong? Is there a process in place to fix the problem? At what point does a “good” project become a loss? And finally, is there a tool that can be used by the Planning Committee, the Project Managers, and the Team Members that can facilitate this process?

The answer to these questions can be complicated and deserve their own articles, but suffice it to say that it can be done and organizations that learn how to do it will be more effective, innovative, and competitive.

Self Assessment

Fill in the blanks:

11. The chosen must be judged in terms of the total product mix generated by it, including saleable by products.
12. sources of data on livestock and forest products often do not provide a dependable basis for estimation.
13. viability can often be fully financially viable on mechanism that provides government support to reduce project costs.

4.10 Summary

- A project should earn sufficient return on the investment.
- Rationing refers to the conscious decision to exclude certain people from a service or treatment that they need.
- Oregon has implemented an innovative health plan that rations health care by developing a prioritized list of treatments.
- Forecast is an estimate of future events and trends and is arrived at by systematically combining past data and projecting it forward in a predetermine a manner.
- Market and demand analysis of various types are undertaken to meet specific requirements of planning and decision making.

- Notes**
- Demand forecasting is the estimate of future demand.
 - Demand forecasting can be at the level of a firm or an industry or at the national or international level.
 - Accuracy in forecast is measured in terms of past forecasts against current sales and by the percentage of deviation from actual demand.
 - Forecasts of demand must be reasonable, consistent and plausible.

4.11 Keywords

Healthcare Rationing: Rationing refers to the conscious decision to exclude certain people from a service or treatment that they need. Rationing takes many forms.

Mineral Products: In assessing mineral raw materials, information is required on the quantum of exploitable deposits and the properties of the raw materials.

Oregon Health Plan: Oregon has implemented an innovative health plan that rations health care by developing a prioritized list of treatments.

Project Initiation: The purpose of Project Initiation is to begin to define the overall parameters of a project and establish the appropriate project management and quality environment required to complete the project.

Resource Allocation: Resource allocation is the distribution of resources – usually financial – among competing groups of people or programs.

4.12 Review Questions

1. Describe about Project Initiation and Resource Allocation.
2. Why is Resource Allocation Needed?
3. What do you mean by Healthcare Rationing?
4. Explain about Market Analysis and Demand Analysis.
5. Describe about Time Horizon of Demand Forecasting.
6. Describe the need for Demand Forecasting.
7. What are the levels of Demand Forecasting?
8. Discuss about the criteria for a Good Forecasting Method.
9. What are the methods of forecasting demand?
10. Discuss about the Delphi method of Demand Forecasting.

Answers: Self Assessment

- | | |
|----------------|--------------------------|
| 1. Rationing | 2. Long Term Forecasting |
| 3. Medical | 4. Market |
| 5. Forecasting | 6. False |
| 7. True | 8. True |
| 9. False | 10. True |

		Notes
11.	Technology	
13.	Financial	

4.13 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf

www.pma-india.org/ - Trinidad and Tobago

www.nickjenkins.net/prose/projectPrimer.p

www.mpug.com/Pages/WhatisProjectManagement.aspx

www.mindtools.com/pages/main/newMN_PPM.htm

www.freelancer.com/jobs/Project-Management/

Notes



Case Study

Corporate Social Responsibility (CSR) and Project Management

Corporate Social Responsibility (CSR) has gained significant momentum in recent years. The push is on to identify projects that reflect the corporation's sense of social responsibility and to tailor projects to reflect that sense. This is perhaps a step in the right direction when it comes to the corporation's position in the host community, but is extremely difficult and complex in its implementation. There are two key factors that contribute to its difficulty:

1. Corporations' main goal is still profits; they owe this to their shareholders. Although profits and social responsibility are not necessarily mutually exclusive, there is frequently a price tag associated with CSR projects and this creates a conflict: choose the CSR project, or tailor the project to meet CSR objectives OR focus on increased ROI? Where a project meets both objectives, the conflict is eliminated but you know intuitively that this won't always be the case and indeed there are more and more news reports about cases where this wasn't the case.
2. How does the corporation determine what is socially responsible and what isn't? This is seldom clear cut and in many cases different social groups have goals and objectives that are opposed to one another. The corporation can't satisfy the objectives of both groups and will be seen as irresponsible when it chooses one or the other.

These issues are compounded when a corporate citizen of one country engages in work in another with different social values. The chances of a conflict between two social groups who are stakeholders in the venture increase because of the cultural differences between the stakeholders in the home community and those in the foreign country. Companies have invested millions of dollars developing their CSR persona only to see it destroyed by one ugly conflict that gets media exposure. The results achieved by the CSR investment are not newsworthy while the single incident that tarnishes that image is.

Take the recent debate over the behaviour of Canadian mining companies overseas and in South America for example. The media exposure was triggered by a private members bill (C-300) proposed by a member of the Canadian parliament. The bill asks that the federal government assume the power to investigate complaints that any Canadian mining company failed to comply with international human rights and environmental standards. On the face of it, there doesn't seem to be anything a socially responsible mining company could object to. The problem is that the bill can't guarantee that the accused mining company would have the ability to confront their accuser to answer the charges and that is what the association representing Canadian mining companies is objecting to.

The debate on the bill has spawned two stories in the Toronto Star about potential problems with mining operations in Ecuador, Argentina, and Papua New Guinea. The stories include responses from spokespeople of the mining companies involved, but the exposure of these allegations in a national newspaper has tarnished the CSR reputation built up by the mining companies mentioned. I won't mention those companies here because none of the allegations has been proven. Some of the mining companies have gone to great lengths and expense to build a reputation as socially, economically, and ethically responsible corporate citizens, only to see that reputation threatened by these stories. Now, I'm not suggesting that the allegations are all false. I have no idea as to their validity. What I do

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know is that in some cases the situation quoted was a no-win situation for the mining company involved. Let's take the example of a Canadian company operating in Ecuador as an example.

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According to the article by staff reporter Brett Popplewell in the Monday, November 23, 2009 edition of the Toronto Star, the company is engaged in a project to build an open pit copper mine in Ecuador. The mine has provided jobs for one Ecuadorian community and is popular with it as a result. Another community is fiercely opposed to the project because they fear the mine will negatively impact their small farms and this has led to conflict between the two communities. The Ecuadorian ministry of mines is on-side with the project but apparently has done nothing to quell the conflict between the two communities. Allegations have been made by members of the opposed community that the guards hired by the mining company have used excessive force in dealing with protests against the mine. The guards, or course, are Ecuadorian citizens. Another story in the same paper quotes an accusation of gang rape at a mine in Papua New Guinea, again unproven. The latter allegation is so serious that the paper did not mention the mining company the accusation was leveled at (they did mention the company involved in the Ecuadorian accusations). A third allegation involved a company operating in Argentina. The allegation is that the company used threats to force an Argentine government official out of office.

The companies claim to have followed all the mining laws, rules, regulations, and standards of the countries they are operating in. They further claim to have followed their own code of ethics. These ethics have been developed and implemented at significant expense in some cases. In some cases the spokesperson answering the allegations on behalf of the companies is the Vice President of Corporate Responsibility which is some indication of the emphasis placed on ethical behaviour by these companies. Whether or not these companies have been effective in adhering to the laws of the countries they operate in and their own codes, it is apparent to me that they have honestly tried to do so. What went wrong then?

The problems these companies are currently encountering can be traced back to the factors previously mentioned. Implementing the code of ethics crafted by their CSR organisations will inevitably inflate costs at some point during some projects. Is it possible for a corporation to have two organisations that are in conflict? You bet. Remember we're dealing with people here and as everyone who has worked with others knows, a working relationship leads to differences of opinion. For a team working on a project, the project manager will ask the team members to forsake personal agendas for the good of the project. When the conflicts are operational and conducted at the executive level this approach doesn't always work.

The initiation of the mining project, in the case of the Ecuadorian mine, was enough to initiate a conflict between the two communities in the area of the mine. One suspects that there may have been issues between the two that pre-date the mine. So how does all this concern the project manager? The issues the Canadian mining companies are experiencing demonstrate the difficulties it is possible to face when doing business in a foreign country. These examples are probably extreme. I'm sure that not many software projects will lead to a corporation facing allegations of physical abuse or rape. On the other hand, the underlying factors will affect any project. The question is what can a project manager do to address these factors?

The first step is for the project manager to understand all the issues that can affect the project, including preexisting local issues. Is it reasonable to expect a project manager to have foreseen the conflict between the two communities involved in the Ecuadorian

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Notes	<p>dispute? I would say given enough education on local issues and the likelihood that the project would only directly financially benefit residents of one of the two communities, the dispute could have been foreseen. How to address the issue is another story. There may or may not have been something the mining company could have done to avoid the conflict but they should at least have anticipated the risk of this happening and if no mitigation strategy was feasible they could then have decided whether they wanted to assume the risk. The object lesson for project managers here is that the exercise of risk identification must be expanded to include not only the risks of a culture clash between the foreign country hosting the project and the corporation's country, but those of different stakeholder groups within the host country. So how would a project manager go about identifying those risks? The answer is that the investigative work required surpasses the activities we normally associate with risk identification. Speaking to members of both communities would have revealed pre-existing conflicts, examining back issues of local newspapers and interviews with local officials would be other sources for the information. The lesson here is that you may have to expand your risk identification exercise to include mining the information that would help you identify risks.</p> <p>There is another issue that has plagued corporations doing business in foreign countries long before anyone ever heard of CSR, namely the issue of a clash between the laws governing the corporation in the country of origin and the laws and cultural norms of the country hosting the project. The classic example of this clash is the solicitation and payment of bribes. In many countries outside of North America and Europe the solicitation of bribes is not only legal, but is actually encouraged by the local governments. Laws in North America make it illegal for corporations to pay bribes even in foreign countries where doing so is not illegal. This creates a Catch-29 situation for these corporations. If they fail to pay a bribe when one is solicited, they risk incurring costs that might far exceed the bribe solicited. Let's take the case of a bribe solicited to pass imported equipment through customs. The bribe doesn't violate local laws or norms. Failure to pay the bribe will mean that the equipment languishes on a loading dock or customs shed until the project manager either finds an alternative solution that doesn't require the equipment or the project fails. In either case the effect on the project budget is catastrophic. Alternatively, the project manager could pay the bribe and incur criminal charges in North America, which will probably include fines the corporation has to pay. So what do you do if you find yourself in this situation?</p> <p>The answer is simple; don't find yourself in that situation. The situation described above is untenable and no project manager should be asked to expose themselves to that level of risk, regardless of your views on bribes. You can avoid this situation by investing a little time during the initiation phase of your project to investigate the risks. What are the applicable laws of the country the project, or portion of the project, will be performed in? Will the project call for the importation of any equipment? What are the laws in the corporate headquarters country pertaining to conducting business in a foreign country? What are the international laws pertaining to labour and human rights? Perhaps the best way to approach the investigation is to look at the project scope and your project management approach and determine which questions you should ask. Know the risks going in. Normally, we think of risk identification as a project planning process, but there are some risks which will have a bearing on whether the corporation wants to undertake the project, or whether you want to undertake managing the process. These are the risks that will be identified by asking the right questions. Once the risk has been identified, such as the risk of being solicited for a bribe, you can then make the decision as to whether there is a mitigation strategy that might work. If you can't identify a workable mitigation strategy, does the corporation want to undertake the project? Do you want to undertake</p>
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managing the project? Sometimes the situation calls for you to ask the right questions of the right people before you commit to the project.

Project managers must become knowledgeable about their corporation's Corporate Social Responsibility policies so that the goals and objectives of their projects conform to these policies, but they must go further than that. They must determine how well those policies conform to international law and the laws, standards, and social customs in the country where the project work will be undertaken. They must also investigate all the possible stakeholders in the host country to determine if there are any conflicts with the corporation's CSR policies or with each other. There really isn't anyone in a better position to do this when you think about it. The project manager has the best grasp of the project goals and objectives and management approach so is the best qualified person to identify risks to the project.

The suggestions in this article are not meant to contradict the best practices for risk management taught by project management courses such as PMP courses or other PMP exam preparation training, but rather to augment them. The strategy you use to quantify, qualify, monitor, and control the risks once you have identified them should be the same ones espoused in these courses.

Question:

1. Analyse the case and discuss the case facts.

Notes

Source: <http://www.projectsmart.co.uk/corporate-social-responsibility-and-project-management.html>

Notes

Unit 5: Functions of a Project Manager

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Objectives

After studying this unit, you will be able to:

- Define functions of a Project Manager
- Discuss about Roles and Responsibilities of a Project Manager
- Describe about Delegation of Authority
- Explain about Building Project Team
- Discuss about Pure Project Organisation
- Explain about Matrix Organisation

Introduction

Notes

A project is an allocation of capital and human resources to achieve time-specific objectives. Project management is the procedure and techniques used to achieve project objectives, which includes identifying, prioritising and scheduling tasks to systematically effect rapid change. Many companies are “managing organisations by projects,” using projects as a way to achieve business goals and strategic plans.

5.1 Functions of a Project Manager

The functions are as follows:

1. A project manager has to deliver the performance with better success rates.
2. He is responsible for keeping in touch with the clients who have assigned the project to his company and make them aware of the status of the work finished.
3. He should be able to lead his team and bring out the best in them.
4. A project manager is also responsible for developing a good dialog and communication with the team member for the success of the project.
5. It is his responsibility to perform efficiently and honestly.
6. By the virtue of being a manager, he has to maintain confidentiality.
7. He is responsible for establishing easy communication between the employees and the higher authority.
8. In case of emergency, he should be able to solve problems for his team members.
9. He is responsible for good team building, which is defined by success.
10. He is responsible for accomplishing project objectives and the outcome (success or failure) of the project.

5.2 Roles and Responsibilities of a Project Manager

Project Manager Duties and responsibilities are closely related to each other. The terms go hand in hand with a fine line of distinction. A project manager’s role in the growth of a company is a significant one. Find in this article a detailed information on the duties and responsibilities of the project manager.

A manager is someone who manages the five Ms of a business, namely men, material, machine, money and motivating factors. A project manager receives formal project management training to deal with any project, closely related with construction, architecture, telecommunications and other infrastructural projects. Project managers also manage projects related to the fields of design, sales and services. Basically, the job description of a project manager is to manage the project that he is assigned with. Hence, he becomes accountable for both, starting the project as slated, and finishing it on time.

5.2.1 Difference between Duty and Responsibility

Duties and responsibilities go hand in hand. However, there is a fine line of distinction between the two. Duty is a task performed by a person out of his job profile and responsibilities are obligations for which he is accountable. All duties may not be responsibilities, but all responsibilities are duties. For example, it is a manager’s duty to manage the task, but it is not

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his responsibility to pay for someone's mistake. Project management is associated with imparting the duties and responsibilities for a manager. The duties and responsibilities of a project manager have been studied by many management experts and are made to suit business in the most effective ways. Those aspiring to be project managers have to learn to be on an eternal vigil, develop a vision, take proactive decisions and understand the diversity in training. Project management is a discipline of planning, organising and managing a specific task and bring about its completion with Excellency.



Notes A project manager is the person who takes ownership of a project within the boundaries set by the project committee, the donors and the trustees.

Self Assessment

Fill in the blanks:

1. Project Manager and responsibilities are closely related to each other.
2. A manager is someone who manages the five Ms of a, namely men, material, machine, money and motivating factors.
3. Project managers also manage projects related to the fields of, sales and services.
4. Duty is a task performed by a person out of his profile and responsibilities are obligations for which he is accountable.
5. The duties and responsibilities of a project manager have been studied by many experts and are made to suit business in the most effective ways.

5.3 Delegation of Authority

Authority is the key to managerial job. It denotes the right to make decision and command subordinates to confirm these decisions. When the office manager is over burdened with official assignments, he may allocate or divide it among the subordinates to get the work done by them. The process of allocation of office work among the subordinates is called delegation of authority. So delegation of authority means giving the subordinate authority to do something which the executives do not have time to do. The process of delegation gives a gain to the subordinates because they become closer with the supervisor.

Delegation of authority involves:

1. Assigning of duties to subordinates.
2. Delegating required amount of authority to the subordinate to enable them to discharge the duties assigned to them.
3. Assumption of responsibility by the subordinates.



Task Discuss about Delegation of Authority.

5.4 Building Project Team

Notes

If we are building a project team we should keep following points in our mind:

Suppose that you as a manager have been asked to form a team for the life of a particular project. How should you set about choosing your people and forming them into a well functioning group?

5.4.1 Selecting Your Team

Take care to choose the right people. Pick them for their skills and abilities as they apply to your particular project. You don't necessarily need the person most qualified in absolute terms, but you need the person most qualified for your specific project. Concentrate on the skills you need for the job in hand. Don't be seduced by reams of paper qualifications that you will never need.

You almost certainly need a mixture of team members each with a different set of skills and abilities, rather than a series of clones all with identical skills. Ensure that taken as a group they together represent all the skills you need in the proportions that you need them.

Don't overlook the need to choose people who can all get along with each other and work together as a team. A group of prima donnas is the last thing you want.

5.4.2 Set the Tone and the Ground Rules

Do this at your very first team meeting. Make sure that you call this at the very start of your project and that everyone in your team comes to the meeting. Don't be late yourself and don't allow lateness in others.

This is the meeting where you have to make it clear who is in charge and what you expect from your team. This is where the team hierarchies and reporting structures are restated. This is the time to remove any ambiguities or potential conflicts. Make sure everyone is clear about his role and responsibilities. Delegate tasks as appropriate and make it clear who hold the delegated authority.

5.4.3 Setting Clear Goals

You must set clear achievable goals. You must set them for your team as a whole and you must set them for the individuals within your team. They must be unambiguous and they must be mutually attainable. That is to say, no one individual's goal should in any way conflict with that of another individual. In fact you want it to be in everybody's interest that each individual achieves his own goal. Design the goals accordingly. You must try to build a team that works together with common aims, all working towards the same final goal.

5.4.4 Achievable Early Goals

Make use of your goals to build team spirit and enthusiasm. Do this by setting small, easily-attainable goals early on in your project while your team is still bedding-in and settling down. Make them worthwhile goals, but goals that you are almost certain can be reached. In this way your team will notch up some early successes, which will certainly boost morale and establish a sense of pride in the achievement. Later goals that you set can (and should) be more taxing and testing, but the early successes will do wonders for the spirit of the team. This spirit will endure long into the future as the going gets tougher.

Notes



Caution The goals set should be clear in their objective and it should be set for the team as well as for every team member within the team.

5.4.5 Communication

It is almost impossible to exaggerate the importance of communication within any organisation, and in particular within a project team. Make it your duty to ensure that everyone within your team knows what is going on. Make sure that everyone knows of outside events that will affect the team. Make sure that everyone knows their own goals and objectives and those of the team as a whole. Make sure they know the objectives of those interfacing to them and of any potential conflicts. Make sure that a problem or a delay in one area is immediately communicated to those whom it may affect.

Encourage and foster cooperation, not competition. Make sure it is in no-one's interest to keep information to themselves. Communication will come naturally if it is in everyone's own interest - and this will be the case if you have earlier ensured that you all have common mutually interdependent goals.

These guidelines on their own are certainly not enough to guarantee a fully functional and successful team, but following them will go a long way towards creating one. On the other hand, if you don't follow them your chances of success will be minimal.



Did u know? It is almost impossible to exaggerate the importance of communication within any organisation, and in particular within a project team.

Self Assessment

Fill in the blanks:

6. is the key to managerial job. It denotes the right to make decision and command subordinates to confirm these decisions.
7. of authority means giving the subordinate authority to do something which the executives do not have time to do.
8. The process of delegation gives a gain to the subordinates because they become closer with the
9. It is almost impossible to exaggerate the importance of within any organisation, and in particular within a project team.

5.5 Project Organisation

Establishing the project organisation is one of the more important things to do at the start of a project. This is particularly so for any large project and *particularly* so for any green field site project where there is no project organisation in existence and no precedent to fall back on.

Setting up a large project from scratch is like setting up a new company. It requires much of the same entrepreneurial drive, skill and imagination. Something like 90% of UK companies employ less than 10 people. Starting up a large project is akin to setting up a company in the top ten percent of UK companies by size. If you were a senior executive and decided to set up a new

subsidiary company that will employ, say, 100 people would you choose a fairly junior manager with no experience of company set up who you don't even know and you don't even bother to interview to set that new company up for you?

Notes

And yet executives have been known to entrust the management of large IT projects – even projects with the potential to break the company - to junior managers who have no demonstrated ability to perform the task. And when was the last time you heard of a project board putting candidate project managers through a rigorous interviewing and selection process?

5.5.1 Project Organisation Chart

Why don't they? Well, if they want a Managing Director to set up a new subsidiary they know what questions to ask them; they know what they looking for; the new MD will be someone like them. But a project manager? They wouldn't know what to ask or what to look for. Anyway, surely anyone can manage a project?

And if you were setting up that new subsidiary would you pick someone whose only qualification was that they had been on a 5 day business management course and had a certificate to prove it? But he's done a 5 day project management course and got a certificate? Give him the job!

We read in the press about major companies that have significant and costly business problems because new IT systems don't work properly. The public sector has its own horror stories too. There are, as always, many causes for such problems but amongst them will be a lack of a proper project organisation, symptomatic of which are comments such as these from senior executives:

1. "the project is being done for us by the software house"
2. "the IT Director's in charge - isn't he?"
3. "the project manager? Some guy from IT, I think."
4. "we don't need a project manager - the software house is managing it for us."
5. "*my* responsibilities? How do you mean?"
6. "dedicate *our* people to the project? Why do you think we employed the software house?"

Project Organisation chart starts at the top. That is, the top of the company. If the Chief Executive does not hold anyone responsible for the project not only will a key - the key - accountability be missing, but accountability will probably not be assigned further down the project organisation hierarchy.

This course therefore covers not just the things that the project manager and team members should do and be accountable for. It starts at the top and addresses how to get proper accountability established at company board level and how this should be propagated down through the project organisation. And how the same kind of thought processes that would go into setting up the organisation of a new company should go into the setting up of a large project.

The course covers the things that each person in the project organisation should be accountable for and then goes on to examine the practicalities - the mechanics - of how they should do things like risk management, estimating, planning, reporting and a host of other things.



Notes Project organisation can be of the types listed as: functional, product line, geographical location, production process, types of customer, etc.

Notes

5.5.2 Example of Pure Project Organisational Structure

In organisational theory, nothing is “pure.” The pure types of organisation exist for the sake of analytical clarity, not as a description of how things work. A “pure project organisational structure” is one such “pure” form that does not really exist. However, many aspects of social and economic life come close to it. The pure organisation is applicable in both business and political life, though actual examples can be found mostly in the political arena.

Pure Organisation

A “pure project organisation” is a model of a business where project managers have total control over the project they oversee. Central control at the managerial level must be weak for this to occur. Put simply, a “pure project organisation” might also be termed a “task force.” In the case of a “pure project,” the leader of this task force would have to be given total authority for a limited period to solve a particular problem. In business, it is a great challenge to find an example of such purity.

The Task Force

In politics, the concept of a “task force” that approximates the total control over a specific project under a “manager” of sorts is not hard to find. In Latin America, poor and divided governments have struggled to control the drug lords who can outshoot and outspend the state. From the 1960s to 2011, Latin American states have dealt both with leftist terrorism and drug violence – occasionally the same thing, as in Peru – by either declaring a state of emergency or installing a military government.

Guatemala

On December 19, 2010, the president of the impoverished state of Guatemala, Alvaro Colom, declared a state of emergency in the northern state of Alta Verapaz. This area is heavily wooded and difficult to police and has become a major staging ground for Mexican drug gangs to gather their forces and ship cocaine to the United States. On the January 21, 2011, Colom extended the state of emergency in that state, placing all military and police control under Interior Minister Carlos Menocal. To some extent, Menocal is leading a multi-jurisdictional task force to wipe out the drug gangs from this state bordering Mexico. This comes very close to acting as a “pure project organisation.”

Menocal and Colom

This example, like most examples of a pure project structure, is political and is a response to an extreme emergency. Since 2000, the murder rates in northern Guatemala have doubled, reaching higher than the death rate during that country’s civil war. Menocal is, as of early 2011, declaring an early success, holding that drug flights bound for the U.S. have been almost totally halted. In January 2011, soldiers under the Interior Ministry had seized more than \$1 million worth of military equipment and drugs from criminal groups in that area. While it is true that Menocal does not have total, dictatorial power over the army as the “pure” form demands, he does have a large degree of temporary control over the deployment of troops for the time being. Hence, this is a good example of a “pure project structure” in the political arena.

5.6 Matrix Organisation

Notes

Matrix Organisation was introduced in USA in the early 1960s. It was used to solve management problems in the Aerospace industry. Matrix Organisation is a combination of two or more organisation structures. For example, matrix organisation include Functional Organisation and Project Organisation.

The organisation is divided into different functions, e.g. Purchase, Production, R&D, etc. Each function has a Functional (Departmental) Manager, e.g. Purchase Manager, Production Manager, etc.

The organisation is also divided on the basis of projects, e.g. Project A, Project B, etc. Each project has a Project Manager, e.g. Project A Manager, Project B Manager, etc.

The employee has to work under two authorities (bosses). The authority of the Functional Manager flows downwards while the authority of the Project Manager flows across (side wards). So, the authority flows downwards and across. Therefore, it is called “**Matrix Organisation**”.

An example of matrix organisation is shown in the following table:

		Table 5.1: Example of a matrix Organisation				
		Purchase Manager	Production Manager	R & D Manager	Marketing Manager	Finance Manager
Functions						
Projects	Project A Manager					
	Project B Manager					
	Project C Manager					
	Project D Manager					
	Project E Manager					

MATRIX ORGANISATION



Did u know? Employees in a matrix organisation report on day-to-day performance to the project managers whose authorities flow in horizontal directions.

5.6.1 Features of Matrix Organisation

The peculiarities or **characteristics** or features of a matrix organisation are:

1. **Hybrid Structure:** Matrix organisation is a hybrid structure. This is so, because it is a combination of two or more organisation structures. It combines functional organisation with a project organisation. Therefore, it has the merits and demerits of both these organisation structures.
2. **Functional Manager:** The Functional Manager has authority over the technical (functional) aspects of the project.

- Notes** The responsibilities of functional manager are:
- (a) He decides how to do the work.
 - (b) He distributes the project work among his subordinates.
 - (c) He looks after the operational aspects.
3. **Project Manager:** The Project manager has authority over the administrative aspects of the project. He has full authority over the financial and physical resources which he can use for completing the project.
- The responsibilities of project manager are:
- (a) He decides what to do.
 - (b) He is responsible for scheduling the project work.
 - (c) He coordinates the activities of the different functional members.
 - (d) He evaluates the project performance.
4. **Problem of Unity of Command:** In a matrix organisation, there is a problem of the unity of command. This is so, because the subordinates receive orders from two bosses viz., the Project Manager and the Functional Manager. This will result in confusion, disorder, indiscipline, inefficiency, etc. All this will reduce the productivity and profitability of the project.
5. **Specialisation:** In a Matrix organisation, there is a specialisation. The project manager concentrates on the administrative aspects of the project while the functional manager concentrates on the technical aspects of the project.
6. **Suitability:** Matrix organisation is suitable for multi-project organisations. It is mainly used by large construction companies that construct huge residential and commercial projects in different places at the same time. Each project is looked after (handled) by a project manager. He is supported by many functional managers and employees of the company.



Task Explain the benefits of Matrix Organisation.

5.6.2 Advantages of Matrix Organisation

The benefits or merits or advantages of a matrix organisation are:

- 1. **Sound Decisions:** In a Matrix Organisation, all decisions are taken by experts. Therefore, the decision are very good.
- 2. **Development of Skills:** It helps the employees to widen their skills. Marketing people can learn about finance, finance people can learn about marketing, etc.
- 3. **Top Management can concentrate on Strategic Planning:** The Top Managers can spend more time on strategic planning. They can delegate all the routine, repetitive and less important work to the project managers.
- 4. **Responds to Changes in Environment:** Matrix Organisation responds to the negative changes in the environment. This is because it takes quick decisions.

5. **Specialisation:** In a matrix organisation, there is a specialisation. The functional managers concentrate on the technical matters while the Project Manager concentrates on the administrative matters of the project.
6. **Optimum Utilisation of Resources:** In the matrix organisation, many projects are run at the same time. Therefore, it makes optimum use of the human and physical resources. There is no wastage of resources in a matrix organisation.
7. **Motivation:** In a matrix organisation, the employees work as a team. So, they are motivated to perform better.
8. **Higher Efficiency:** The Matrix organisation results in a higher efficiency. It gives high returns at lower costs.

Notes

5.6.3 Limitations of Matrix Organisation

The demerits or disadvantages or limitations of a matrix organisation are:

1. **Increase in Work Load:** In a matrix organisation, work load is very high. The managers and employees not only have to do their regular work, but also have to manage other additional works like attending numerous meetings, etc.
2. **High Operational Cost:** In a matrix organisation, the operational cost is very high. This is because it involves a lot of paperwork, reports, meetings, etc.
3. **Absence of Unity of Command:** In a matrix organisation, there is no unity of command. This is because, each subordinate has two bosses, viz., Functional Manager and Project Manager.
4. **Difficulty of Balance:** In a matrix organisation, it is not easy to balance the administrative and technical matters. It is also difficult to balance the authority and responsibilities of the project manager and functional manager.
5. **Power Struggle:** In a matrix organisation, there may be a power struggle between the project manager and the functional manager. Each one looks after his own interest, which causes conflicts.
6. **Morale:** In a matrix organisation, the morale of the employees is very low. This is because they work on different projects at different times.
7. **Complexity:** Matrix organisation is very complex and the most difficult type of organisation.
8. **Shifting of Responsibility:** If the project fails, the project manager may shift the responsibility on the functional manager. That is, he will blame the functional manager for the failure.



Notes In matrix organisation, a project manager is appointed to coordinate the activities of a project. Personnel are drawn from the various functional departments.

5.7 Project Team and Human Factors

The real critical success factor of any implementation project is the ability to break through “fixed ideas.” The extent to which this can be done will have a decided impact not only on the

Notes success of the implementation, but also the success of the system once it is in production. The importance of breaking through the fixed ideas. One example of this is just the view people adopt about the role of technology in an implementation. Whether you are talking about new roles – changing processes, using technology to work more effectively and efficiently, you are generally talking about breaking down fixed ideas.

One of these fixed ideas in project implementation is the concept that success lies in finding the perfect technology solution to the problem – nothing could be further from the truth. While consistently getting more focus, probably because they are more clear cut, the technology issues in an implementation are normally the more easily resolved in the typical project; while the less clear cut human factors are pushed to the back burner. In reality the success or failure of any project implementation rests on the ability of the principals involved to manage the “human factors” of the project. Another common example of fixed ideas is the adherence to procedures simply because that is the way “we have always done it”. Many opportunities are lost in system implementations because the people involved refuse to view the implementation as an opportunity to evaluate current processes and look for better ways of working.

If success is measured both in terms of bringing the project in on time and within budget as well as the satisfaction with and the ability of the users to use the new system, then managing these “human factors” is the real key to the success of any implementation. This puts a lot of pressure on the project leadership and/or perhaps even more pressure on those who appoint that leadership team.

Self Assessment

State True or False:

10. Establishing the project organisation is one of the more important things to do at the start of a project.
11. A “pure project organisation” is a model of a business where project managers have total control over the project they oversee.
12. Matrix Organisation was introduced in UK in the early 1960s.
13. Matrix organisation is a hybrid structure.
14. The Functional Manager has authority over the physical aspects of the project.
15. The Project manager has authority over the administrative aspects of the project.

5.8 Summary

- A project manager has to deliver the performance with better success rates.
- He is responsible for keeping in touch with the clients who have assigned the project to his company and make them aware of the status of the work finished.
- He should be able to lead his team and bring out the best in them.
- Project Manager Duties and responsibilities are closely related to each other.
- A manager is someone who manages the five Ms of a business, namely men, material, machine, money and motivating factors.
- A project manager receives formal project management training to deal with any project, closely related with construction, architecture, telecommunications and other infrastructural projects.

- | | |
|---|--------------|
| <ul style="list-style-type: none">• It is almost impossible to exaggerate the importance of communication within any organisation, and in particular within a project team.• Matrix Organisation was introduced in USA in the early 1960's.• Matrix organisation is a hybrid structure.• The Functional Manager has authority over the technical (functional) aspects of the project. | Notes |
|---|--------------|

5.9 Keywords

Delegation of Authority: Authority is the key to managerial job. It denotes the right to make decision and command subordinates to confirm these decisions.

Functional Manager: The Functional Manager has authority over the technical (functional) aspects of the project.

Hybrid Structure: It is a combination of two or more organisation structures.

Manager: A manager is someone who manages the five Ms of a business, namely men, material, machine, money and motivating factors.

Matrix Organisation: Matrix Organisation was introduced in **USA** in the early 1960's. It was used to solve management problems in the Aerospace industry. Matrix Organisation is a combination of two or more organisation structures.

Pure Organisation: A "pure project organisation" is a model of a business where project managers have total control over the project they oversee. Central control at the managerial level must be weak for this to occur.

Task Force: In politics, the concept of a "task force" that approximates the total control over a specific project under a "manager" of sorts is not hard to find. In Latin America, poor and divided governments have struggled to control the drug lords who can outshoot and outspend the state.

5.10 Review Questions

1. Discuss the functions of a project manager.
2. List the role and responsibilities of a project Manager.
3. What do you know about delegation of authority?
4. Explain about Building Project Team.
5. Discuss about Project Organisation.
6. Describe about Pure Project Organisation.
7. Explain about the matrix organisation.
8. Discuss about the Project Team and Human factors.

Answers: Self Assessment

- | | |
|---------------|--------------|
| 1. Duties | 2. Business |
| 3. Design | 4. Job |
| 5. Management | 6. Authority |

Notes	7. Delegation	8. Superior
	9. Communication	10. True
	11. True	12. False
	13. True	14. False
	15. True	

5.11 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf

www.pma-india.org/ - Trinidad and Tobago

www.nickjenkins.net/prose/projectPrimer.p

www.mpug.com/Pages/WhatisProjectManagement.aspx

www.mindtools.com/pages/main/newMN_PPM.htm

www.freelancer.com/jobs/Project-Management/

*Case Study*

What a Heart Surgeon could Learn from a Project Manager?

Driving into work one morning, I was listening to surgeon and author Atul Gawande talk about a study he's done at the Harvard Medical School. I found the NPR story titled, Atul Gawande's 'Checklist' for Surgery Success, interesting - I think you will too.

"Our great struggle in medicine these days is not just with ignorance and uncertainty," Gawande says. "It's also with complexity: how much you have to make sure you have in your head and think about. There are a thousand ways things can go wrong."

Because doctors are human (just like everyone else), they sometimes miss things. So Gawande looked at other fields that deal with complex circumstances and visited, among others, Boeing to see how they make things work. He cites the "pilot's checklist" as a good example of how other complex tasks are completed outside of medicine.

Unlike a pilot, there is no checklist in surgery, just the surgeon's experience and intuition that dictates how a procedure is performed. So as an experiment, he brought a two-minute checklist into the operating room of eight hospitals - after having worked with a team of folks that included Boeing to show them how to put the checklist together.

How did it work?

"We get better results," says Gawande. "Massively better results."

"We caught basic mistakes and some of the stupid stuff," Gawande reports. "We also found that good teamwork required certain things that we missed very frequently."

Something as simple as making sure that everyone in the operating room knew each other by name turned out to be incredibly valuable. Isn't it interesting how similar some of these issues sound to the work management issues project teams face every day?

Not unlike some project managers I have met, many of the surgeons weren't originally too keen on operating with a checklist. However, when all was said and done, 80% of the surgeons saw the value of the checklist. And, although 20% said they didn't need the checklist, 94% said that if they were going to have surgery they would want their surgeon to be using a checklist.

I realise that heart surgery and project based work don't have a lot in common. That said, the surgeon could learn a few things from project managers about how to create a sound work management (surgery management) methodology. Project managers could also learn from this study. "We caught basic mistakes and some of the stupid stuff," Gawande reports. "We also found that good teamwork required certain things that we missed very frequently."

Despite all the evidence, Gawande wasn't sure that using a checklist would help save the lives of his patients-after all, he was from Harvard. However he started using the checklist and says, "I was in that 20%. I haven't gotten through a week of surgery where the checklist has not caught a problem."

Like surgery, capturing best practices and formalising processes are critical for success. Like the surgeon's checklist, the right project management tools can help. Fortunately,

Notes*Contd...*

Notes	there is a lot we can learn from Dr. Gawande's study. As well as what a heart surgeon could learn from a project manager. If you were going into surgery, would you feel more comfortable if you knew the operating team was using a checklist to make sure nothing got missed? I think I would.
Question:	1. Analyse the case and discuss the case facts.

Source: <http://www.projectsmart.co.uk/what-a-heart-surgeon-could-learn-from-a-project-manager.html>

Unit 6: Generation and Screening of Project Ideas

Notes

CONTENTS

- Objectives
- Introduction
- 6.1 Procedures for Idea Generation
- 6.2 Monitoring the Environment
- 6.3 Corporate Appraisal
- 6.4 Project Definition Rating Index
- 6.5 Summary
- 6.6 Keywords
- 6.7 Review Questions
- 6.8 Further Readings

Objectives

After studying this unit, you will be able to:

- Know about Generation and Screening of Project Ideas
- Understand Procedures of Idea Generation
- Know about Monitoring Environment
- Understand about Corporate Appraisal
- Know about Project Rating Index

Introduction

Project ideas are generated through different sources like customers, competitors and employees. Sometimes they are discovered through accident. Project manager should try to enhance people's creativity, scan the entire business environment and appraise the company's strengths and weaknesses to generate a large number of ideas. Techniques like attribute listing, brainstorming, and delphi technique are useful for improving the creativity at individual and group level.

The project managers should analyze the business environment that consists of the economic sector, the governmental sector, the technological sector, the socio-demographic sector, the competition sector and the supplier sector. Once a pool of ideas has been generated, the project manager should carefully screen them. The Project Rating Index method helps managers.

6.1 Procedures for Idea Generation

"We need to think differently!"

"This needs some fresh ideas!"

"We have got to be more creative around here!"

Notes

Are messages like these popping up more and more in your workplace? Faced with complex, open-ended, ever-changing challenges, organizations realize that constant, ongoing innovation is critical to stay ahead of the competition.

This is why we need to be on the lookout for new ideas that can drive innovation, and it's why the ability to think differently, generate new ideas, and spark creativity within a team becomes an important skill. You need to work actively on building and cultivating this skill, and it can be done!

Often, though, we make the mistake of assuming that good ideas just happen. Or worse still, we get caught in the mind trap that creativity is an aptitude; some people have it, others don't. Then there is the other self-defeating belief – "I am not intelligent enough to come up with good ideas."

These assumptions are rarely true. Everyone can come up with fresh, radical ideas – you just need to learn to open your mind and think differently. This article shows you how to do so.

1. **How to Generate New Ideas:** Standard idea-generation techniques concentrate on combining or adapting existing ideas. This can certainly generate results. But here, our focus is on equipping you with tools that help you leap onto a totally different plane. These approaches push your mind to forge new connections, think differently and consider new perspectives.

A word of caution – while these techniques are extremely effective, they will only succeed if they are backed by rich knowledge of the area you're working on. This means that if you are not prepared with adequate information about the issue, you are unlikely to come up with a great idea even by using the techniques listed here.

Incidentally, these techniques can be applied to spark creativity in group settings and brainstorming sessions as well.



Notes Ideation is the creative process of generating, developing and communicating new ideas, where an idea is understood as a basis of element of thought that can be either visual, concrete, or abstract.

2. **Breaking Thought Patterns:** All of us can tend to get stuck in certain thinking patterns. Breaking these thought patterns can help you get your mind unstuck and generate new ideas. There are several techniques you can use to break established thought patterns:

- (a) **Challenge assumptions:** For every situation, you have a set of key assumptions. Challenging these assumptions gives you a whole new spin on possibilities.

You want to buy a house but can't since you assume you don't have the money to make a down payment on the loan. Challenge the assumption. Sure, you don't have cash in the bank but couldn't you sell some of your other assets to raise the money? Could you dip into your retirement fund? Could you work overtime and build up the kitty in six months? Suddenly the picture starts looking brighter.

- (b) **Reword the problem:** Stating the problem differently often leads to different ideas. To reword the problem look at the issue from different angles. "Why do we need to solve the problem?", "What's the roadblock here?", "What will happen if we don't solve the problem?" These questions will give you new insights. You might come up with new ideas to solve your new problem.

In the mid 1950s, shipping companies were losing money on freighters. They decided they needed to focus on building faster and more efficient ships. However, the problem persisted.

Then one consultant defined the problem differently. He said the problem the industry should consider was "how can we reduce cost?" The new problem statement generated new ideas. All aspects of shipping, including storage of cargo and loading time, were considered. The outcome of this shift in focus resulted in the container ship and the roll-on/roll-off freighter.

Notes

- (c) *Think in reverse:* If you feel you cannot think of anything new, try turning things upside-down. Instead of focusing on how you could solve a problem/improve operations/enhance a product, consider how could you create the problem/worsen operations/downgrade the product. The reverse ideas will come flowing in. Consider these ideas – once you've reversed them again – as possible solutions for the original challenge.
- (d) *Express yourself through different media:* We have multiple intelligences but somehow, when faced with workplace challenges we just tend to use our verbal reasoning ability. How about expressing the challenge through different media? Clay, music, word association games, paint, there are several ways you can express the challenge. Don't bother about solving the challenge at this point. Just express it. Different expression might spark off different thought patterns. And these new thought patterns may yield new ideas.
3. **Connect the Unconnected:** Some of the best ideas seem to occur just by chance. You see something or you hear someone, often totally unconnected to the situation you are trying to resolve, and the penny drops in place. Newton and the apple, Archimedes in the bath tub; examples abound.

Why does this happen? The random element provides a new stimulus and gets our brain cells ticking. You can capitalize on this knowledge by consciously trying to connect the unconnected.

Actively seek stimuli from unexpected places and then see if you can use these stimuli to build a connection with your situation. Some techniques you could use are:

- (a) *Use random input:* Choose a word from the dictionary and look for novel connections between the word and your problem.
- (b) *Mind map possible ideas:* Put a key word or phrase in the middle of the page. Write whatever else comes in your mind on the same page. See if you can make any connections.
- (c) *Pick up a picture:* Consider how you can relate it to your situation.
- (d) *Take an item:* Ask yourself questions such as "How could this item help in addressing the challenge?", or "What attributes of this item could help us solve our challenge?"



Did u know? Seeking stimuli and building connection between the stimuli sought and the situation can help in generating better ideas.

4. **Shift Perspective:** Over the years we all build a certain type of perspective and this perspective yields a certain type of idea. If you want different ideas, you will have to shift your perspective. To do so:
- (a) *Get someone else's perspective:* Ask different people what they would do if faced with your challenge. You could approach friends engaged in different kind of work, your spouse, a nine-year old child, customers, suppliers, senior citizens, someone from a different culture; in essence anyone who might see things differently.

- Notes**
- (b) *Play the "If I were" game:* Ask yourself "If I were ..." how would I address this challenge? You could be anyone: a millionaire, Tiger Woods, anyone.
- The idea is the person you decide to be has certain identifiable traits. And you have to use these traits to address the challenge. For instance, if you decide to play the millionaire, you might want to bring traits such as flamboyance, big thinking and risk-taking when formulating an idea. If you are Tiger Woods you would focus on things such as perfection, persistence and execution detail.
5. **Employ Enablers:** Enablers are activities and actions that assist with, rather than directly provoke, idea generation. They create a positive atmosphere. Some of the enablers that can help you get your creative juices flowing are:
- (a) *Belief in yourself:* Believe that you are creative, believe that ideas will come to you; positive reinforcement helps you perform better.
 - (b) *Creative loafing time:* Nap, go for a walk, listen to music, play with your child, take a break from formal idea-generating. Your mind needs the rest, and will often come up with connections precisely when it isn't trying to make them.
 - (c) *Change of environment:* Sometimes changing the setting changes your thought process. Go to a nearby coffee shop instead of the conference room in your office, or hold your discussion while walking together round a local park.
 - (d) *Shutting out distractions:* Keep your thinking space both literally and mentally clutter-free. Shut off the Blackberry, close the door, divert your phone calls and then think.
 - (e) *Fun and humor:* These are essential ingredients, especially in team settings.:)



Caution The project manager should be positively reinforced. It will help him perform better. He should believe that he is creative.

6. **Key Points:** The ability to generate new ideas is an essential work skill today. You can acquire this skill by consciously practicing techniques that force your mind to forge new connections, break old thought patterns and consider new perspectives.

Along with practicing these techniques, you need to adopt enabling strategies too. These enabling strategies help in creating a positive atmosphere that boosts creativity.

6.2 Monitoring the Environment

Organizational environment consists of both external and internal factors. Environment must be scanned so as to determine development and forecasts of factors that will influence organizational success. Environmental scanning refers to possession and utilization of information about occasions, patterns, trends, and relationships within an organization's internal and external environment. It helps the managers to decide the future path of the organization. Scanning must identify the threats and opportunities existing in the environment. While strategy formulation, an organization must take advantage of the opportunities and minimize the threats. A threat for one organization may be an opportunity for another.

Internal analysis of the environment is the first step of environment scanning. Organizations should observe the internal organizational environment. This includes employee interaction with other employees, employee interaction with management, manager interaction with other managers, and management interaction with shareholders, access to natural resources, brand awareness, organizational structure, main staff, operational potential, etc.

Also, discussions, interviews, and surveys can be used to assess the internal environment. Analysis of internal environment helps in identifying strengths and weaknesses of an organization.

Notes

As business becomes more competitive, and there are rapid changes in the external environment, information from external environment adds crucial elements to the effectiveness of long-term plans. As environment is dynamic, it becomes essential to identify competitors' moves and actions. Organizations have also to update the core competencies and internal environment as per external environment. Environmental factors are infinite, hence, organization should be agile to accept and adjust to the environmental changes. For instance, Monitoring might indicate that an original forecast of the prices of the raw materials that are involved in the product are no more credible, which could imply the requirement for more focused scanning, forecasting and analysis to create a more trustworthy prediction about the input costs. In a similar manner, there can be changes in factors such as competitor's activities, technology, market tastes and preferences.

While in external analysis, three correlated environment should be studied and analyzed:

1. immediate/industry environment
2. national environment
3. broader socio-economic environment/macro-environment

Examining the industry environment needs an appraisal of the competitive structure of the organization's industry, including the competitive position of a particular organization and its main rivals. Also, an assessment of the nature, stage, dynamics and history of the industry is essential. It also implies evaluating the effect of globalization on competition within the industry. Analyzing the national environment needs an appraisal of whether the national framework helps in achieving competitive advantage in the globalized environment. Analysis of macro-environment includes exploring macro-economic, social, government, legal, technological and international factors that may influence the environment. The analysis of organization's external environment reveals opportunities and threats for an organization.

Strategic managers must not only recognize the present state of the environment and their industry but also be able to predict its future positions.



Task Assess the strengths and weakness of Corporate Appraisal.

6.3 Corporate Appraisal

Different types of resources (tangible, intangible that include all assets, capabilities, organisational processes, information, knowledge, etc.) lying with an organisation reflect certain type of behaviour (organisational behaviour). These resources as and when used as per need along with their behaviour develop synergy with an organisation. This determines their strength or weaknesses in their specific field of business. The resource based view of a firm can better discuss the internal environment of that organisation. The developed synergy elaborates the level of competency of a firm showing its capability which leads to its strategic advantage. The resources, behaviour, strengths and weaknesses, synergistic effects and competencies of an organisation determine the nature of its internal environment.

The assessment of strengths and weaknesses is an early stage in strategic thinking, and one where it is very easy to end up with meaningless lists of so-called strengths and weaknesses. The unit will explore five ways of looking at strengths and weaknesses: assessment by managers, often resulting in what many books call SWOT analysis; equilibrium analysis, which is one way of forcing managers to make a more careful consideration of strengths and weaknesses; a process

Notes to 'audit' the facts, drawing conclusions from a detailed analysis of the organisation; the critical success factor approach; and the core competency approach. For each method, the unit deals both with the concept and ways of operationalising it in a real situation.

So far we have examined the broader aspects of strategic management and has looked at the process of planning in relation to a changing environment. It is now time to concentrate on a very specific step in the process the assessment of corporate strengths and weaknesses. Planning literature refers to this important stage under various headings: the corporate appraisal, the position audit, and assessing the present position. The particular terminology used is not important: the action itself is vital.

The corporate appraisal should be one of the first steps in the process of preparing strategic plans, and should provide both the platform from which the corporate objectives are established and the baseline of the strategic plan.

One important reason for formulating marketing strategy is to prepare the company to interact with the changing environment in which it operates. Implicit here is the significance of predicting the shape the environment is likely to take in the future. Then, with a perspective of the company's present position, the task ahead can be determined. Study of the environment is reserved for a later article. This is devoted to corporate appraisal. An analogy to corporate appraisal is provided by a career counselor's job. Just as it is relatively easy to make a list of the jobs available to a young person, it is simple to produce a superficial list of investment opportunities open to a company. With the career counselor, the real skill comes in taking stock of each applicant; examining the applicant's qualifications, personality, and temperament; defining the areas in which some sort of further development or training may be required; and matching these characteristics and the applicant's aspirations against various options. Well-established techniques can be used to find out most of the necessary information about an individual. Digging deep into the psyche of a company is more complex but no less important. Failure by the company in the area of appraisal can be as stunting to future development in the corporate sense as the misplacement of a young graduate in the personal sense.



Did u know? In the process of preparing strategic plans, corporate appraisal should be one of the first steps.

Corporate appraisal refers to an examination of the entire organization from different angles. It is a measurement of the readiness of the internal culture of the corporation to interact with the external environment. Marketing strategists are concerned with those aspects of the corporation that have a direct bearing on corporate-wide strategy because that must be referred in defining the business unit mission, the level at which marketing strategy is formulated.

Self Assessment

Fill in the blanks:

1. The ability to generate new ideas is an work skill today.
2. refers to an examination of the entire organization from different angles.
3. One important reason for formulating is to prepare the company to interact with the changing environment in which it operates.
4. Strategic must not only recognize the present state of the environment and their industry but also be able to predict its future positions.
5. deep into the psyche of a company is more complex but no less important.

6.4 Project Definition Rating Index

Notes

The Project Definition Rating Index (PDRI) for Building Projects is a powerful and simple tool that helps meet this need by offering a method to measure project scope definition for completeness. It is adapted from the PDRI for Industrial Projects.

The PDRI offers a comprehensive checklist of 64 scope definition elements in an easy-to-use score sheet format. Each element is weighted based on its relative importance to the other elements. Since the PDRI score relates to risk, those areas that need further work can easily be isolated. (A PDRI score of 200 or less has been shown to greatly increase the probability of a successful project.)

The PDRI identifies and precisely describes each critical element in a scope definition package and allows a project team to quickly predict factors impacting project risk. It is intended to evaluate the completeness of scope definition at any point prior to the time a project is considered for development of construction documents and construction. Building type projects may include the following:

1. Offices
2. Schools (classrooms)
3. Banks
4. Research and laboratory facilities
5. Medical facilities
6. Stores and shopping centers
7. Institutional buildings
8. Apartments
9. Dormitories
10. Parking structures
11. Hotels and motels
12. Light assembly and manufacturing
13. Warehouses
14. Airport terminals
15. Recreational and athletic facilities
16. Public assembly and performance halls
17. Industrial control buildings



Notes The PDRI offers a comprehensive checklist of 64 scope definition elements in an easy-to-use score sheet format.

Benefits of PDRI

Effective early project planning improves project performance in terms of both cost and schedule. The majority of industry participants recognize the importance of scope definition during the

Notes early stages of a project and its potential impact on project success. Until now, however, the building industry has been lacking a practical, non-proprietary method for determining the degree of scope development on a project. The PDRI for buildings is the first publicly available tool of its kind in this sector. It allows a project planning team to quantify, rate, and assess the level of scope development on projects prior to beginning development of construction documents.

A significant feature of the PDRI is that it can be utilized to fit the needs of almost any individual project, small or large. Elements that are not applicable to a specific project can be zeroed out, thus eliminating them from the final scoring calculation.

The PDRI is quick and easy to use. It is a “best practice” tool that will provide numerous benefits to the building industry. A few of these include:

1. A checklist that a project team can use for determining the necessary steps to follow in defining the project scope
2. A listing of standardized scope definition terminology throughout the building industry
3. An industry standard for rating the completeness of the project scope definition package to facilitate risk assessment and prediction of escalation, potential for disputes, etc.
4. A means to monitor progress at various stages during the front end planning effort
5. A tool that aids in communication and promotes alignment between owners and design contractors by highlighting poorly defined areas in a scope definition package
6. A means for project team participants to reconcile differences using a common basis for project evaluation
7. A training tool for organizations and individuals throughout the industry
8. A benchmarking tool for organizations to use in evaluating completion of scope definition versus the performance of past projects, both within their organization and externally, in order to predict the probability of success on future projects.



Task Discuss the importance of PDRI.

Why should use the PDRI?

The PDRI can benefit facility owners such as NASA, as well as designers and constructors. NASA planners can use it as an assessment tool for establishing a comfort level at which they are willing to move forward with projects. Designers and constructors working with NASA can use it as a method of identifying poorly defined project scope definition elements. The PDRI provides a means for all project participants to communicate and reconcile differences using an objective tool as a common basis for project scope evaluation.



Caution The front end planning process of a PDRI should consider the following factors:

1. Feasibility
2. Concept
3. Detailed scope
4. Design and construction

Self Assessment	Notes
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Fill in the blanks:

6. A significant feature of the is that it can be utilized to fit the needs of almost any individual project, small or large.
7. Effective early improves project performance in terms of both cost and schedule.
8. The PDRI can benefit facility owners such as, as well as designers and constructors.
9. The PDRI provides a means for all project participants to communicate and reconcile differences using an objective tool as a common basis for project scope
10. A means for participants to reconcile differences using a common basis for project evaluation.

6.5 Summary

- Project ideas are generated through different sources like customers, competitors, and employees.
- The project managers should analyze the business environment that consists of the economic sector, the governmental sector, the technological sector, the socio-demographic sector, the competition sector and the supplier sector.
- Standard idea-generation techniques concentrate on combining or adapting existing ideas.
- Enablers are activities and actions that assist with, rather than directly provoke, idea generation.
- The ability to generate new ideas is an essential work skill today.
- Organizational environment consists of both external and internal factors.
- Internal analysis of the environment is the first step of environment scanning.
- Organizations should observe the internal organizational environment.
- One important reason for formulating marketing strategy is to prepare the company to interact with the changing environment in which it operates.
- Corporate appraisal refers to an examination of the entire organization from different angles.
- The Project Definition Rating Index (PDRI) for Building Projects is a powerful and simple tool that helps meet this need by offering a method to measure project scope definition for completeness.

6.6 Keywords

Corporate Appraisal: It refers to an examination of the entire organization from different angles.

Environmental Scanning: It refers to possession and utilization of information about occasions, patterns, trends, and relationships within an organization's internal and external environment.

- Notes**
- PDRI:** The Project Definition Rating Index (PDRI) for Building Projects is a powerful and simple tool that helps meet this need by offering a method to measure project scope definition for completeness.
- Project Manager:** A project manager is a professional in the field of project management. Project managers can have the responsibility of the planning, execution and closing of any project, typically relating to construction industry, architecture, Aerospace and Defence, computer networking, telecommunications or software development.
- Standard Idea-generation Techniques:** They concentrate on combining or adapting existing ideas.

6.7 Review Questions

1. Discuss about generation and screening of project Ideas.
2. What are the procedures for idea generation?
3. Explain about “Monitoring the Environment”.
4. What do you know about Corporate Appraisal?
5. Discuss about Project Rating Index.
6. Discuss about the benefits of PDRI.
7. Why should we use PDRI?
8. Explain about the strengths and Weakness of Corporate Appraisal.

Answers: Self Assessment

- | | |
|-----------------------|------------------------|
| 1. Essential | 2. Corporate Appraisal |
| 3. Marketing Strategy | 4. Managers |
| 5. Digging | 6. PDRI |
| 7. Project Planning | 8. NASA |
| 9. Evaluation | 10. Project Team |

6.8 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

Notes

- www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf
- www.pma-india.org/ - Trinidad and Tobago
- www.nickjenkins.net/prose/projectPrimer.p
- www.mpug.com/Pages/WhatisProjectManagement.aspx
- www.mindtools.com/pages/main/newMN_PPM.htm
- www.freelancer.com/jobs/Project-Management/

Notes



Case Study

Low-budget Guide for Web World

In the Web world, hearing businesses and freelancers alike complain about low-budget projects is not too uncommon. Let's say that a local coffee shop needs to update its Web presence and contacts you for a redesign. It also requires a blog so that it can announce new events and so on. However, during the course of the first meeting, the client mentions that they don't have a budget.

Being the inquisitive business person that you are, you say, "Well, we work with budgets of almost any size. What price range were you thinking of?" The owner of the coffee shop reveals that he has only \$1500 to spend on the website. Thinking it would be a waste of time, you walk away.

This is where our design studio found ourselves. We had potential projects all over the place, but the budgets were all smaller than we thought we could handle. In the Web world, demand for small websites is up. There are always start-up companies and small businesses around that need some form of a Web presence. And, as a Web design community, our job is to answer those needs in the most utilitarian way possible.

We began questioning our business practices. We knew that there was **money to be made on smaller projects**, but it wasn't until we sat down and did some simple math that we realized the business opportunity we had been missing.

Here's the simple premise on which we began to transform our business: if you turn away 10 to 15 small projects a year at \$1500 per project, that's declining between \$15,000 and \$22,500 every year.



Any amount of money adds up over time

Our company was a start-up business once, too, and it still is. Perhaps we were delusional in our belief that big projects grow on trees. We were struggling to find work. It became clear to us that we needed to take a serious look at our business practices, our development and design processes, and ourselves. We needed to find a way to make money. Let's take a few minutes to discuss how we overhauled our operations and started making a living off of small projects.

Contd...

(Smashing's side note: Have you already bought the Smashing Book #3? The book introduces the latest practical techniques and a whole new mindset for progressive Web design. Get your book today!)

Notes

It's All About the Process

As a Web community, we are well equipped to handle any low-budget projects that come our way. We have more frameworks and streamlined solutions than we've ever had access to in the past, such as WordPress, HTML5 Boilerplate and ThemeForest. Learning how to leverage these tools is key to understanding how to make money on small projects. And mastering these tools gives us the flexibility to stray from cookie-cutter solutions.

However, before you decide to take on a workload filled with small projects, let's stress a key point. Some clients are extremely demanding about their design process and the functionality of their websites. Be careful to set clear boundaries with the client so that you don't end up working for less than minimum wage. We'll cover a few techniques for this below.

Over the years, we've picked up knowledge from many different sources. One of the best summaries of how we try to systematize our own work flow comes from Bill Beachy over at Go Media. He recently released a short podcast episode discussing business systems, which I strongly encourage you to check out.

But first, let's look quickly at the various methods we use to cut down on our website build time.

Write Down Your Processes

During the course of working on projects, we've developed a master document that we call the *Low-Budget Guide*. It details every single step of building a website on a budget. We have sections on the fastest ways to deploy a test WordPress installation on various hosting providers, documentation on common WordPress settings, plugins and problems, as well our standard step-by-step process. We'll review this process in a case study later in the article.

The *Low-Budget Guide* helps us address several important aspects of our work. First, it prevents us from forgetting to do anything. Having a step-by-step guide eliminates any errors that might cost several hours of development time.



Mapping out your processes can save a lot of hassles down the road

Contd...

Notes	<p>Secondly, by having the <i>Low Budget Guide</i>, we're able to review which processes are efficient and which are time-consuming. Using this standard, we can minimize build time by adjusting our processes in certain areas. We're basically fine-tuning ourselves into the fastest website builders we can be. And lowering build time directly increases the profit margin.</p> <p>Finally, it ensures quality. Having a repeatable process means that every time you follow the guide, you become more proficient. This not only increases the speed at which you work, but decreases deviation from a tried and true standard. Practice makes you a whole lot better.</p> <p>Choose a Framework</p> <p>Or choose several frameworks and tailor them to specific website types. For example, if you want to quickly implement a custom design on a WordPress website, check out Carrington JAM (short for "just add markup"). It's a blank slate for custom WordPress themes, with a lot of the heavy lifting already handled. I personally use a version of Carrington JAM that I've converted to HTML5.</p> <p>If you're not using WordPress, I would recommend looking into the HTML5 Boilerplate. If you're adventurous, you can apply the Boilerplate to a Drupal, Joomla or ExpressionEngine theme. Then, when you deploy the content management system, your front-end framework will already be in place. Django is another fantastic and fast framework, if you're familiar with Python.</p> <p>Use a Theme</p> <p>There's no shame in using a pre-built theme to construct a website for a client. In fact, you should be proud of doing so if the budget demands it. Using a theme can cut build time by at least half, if not more. Instead of spending 30 hours coding a website, you would be spending 15 hours fine-tuning a theme, tailoring it to your client's branding and inserting content. At \$1500, you'd be getting paid \$100 per hour. How, from a business perspective, would turning an opportunity like that down be considered a good decision?</p> <p>That being said, always follow the licensing agreement that comes with your theme. Honest people put hours of effort into building themes. Never, never, never break the copyright, and always adhere to intellectual property laws.</p> <p>Work on a Modular Fashion</p> <p>What exactly is modular coding? Looking at various websites, you'll see that certain areas are common to all of them. WordPress serves as a good example of breaking a website down into "modules."</p> <p>At our studio, we have built a code library around modules. We have custom Twitter and Facebook widgets, custom post templates, image gallery widgets, the list goes on. When you write new code, think of it as a module that needs to be flexible enough to function on other websites with as little customisation as possible. For example, instead of having to write an image slider from scratch, we'd be able to pop in a tiny PHP function, pass along a few variables, set a few styles in CSS, and we'd be done in less than 20 minutes.</p> <p>Building a code library over months and years enables your business to cut down on major coding time. And if you refine the module every time you use it, you will ensure that the product grows ever higher in quality.</p>
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Get Familiar with Less

Less, in simple terms, makes CSS more like a coding language. We could argue whether style sheets should even do that, semantically speaking. But the fact of the matter is that it has shaved off at least 10% of the time that I spend writing CSS.

Question:

1. Analyse the case and discuss the case facts.

Notes

Source: <http://www.smashingmagazine.com>

Unit 7: Market and Demand Analysis

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Introduction
7.1 Need for Demand Forecasting
7.1.1 Market Identification
7.1.2 Business Cycle
7.2 Situational Analysis
7.2.1 Marketing Plan
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7.7 Keywords
7.8 Review Questions
7.9 Further Readings

Objectives

After studying this unit, you will be able to:

- Know about Market and Demand Analysis
- Understand about Situational Analysis
- Know conduct of Market Survey
- Understand Demand and Forecasting

Introduction

Emerging competition in market place is propelling managements to hear the voice of their customers. To survive in the market, management have to be forward-looking and carry out market and demand analyses of products and develop strategic business policies. However

when it comes to working out methods and methodologies of demand forecasting, it presents a strange dilemma. Demand Burke had said that, "You can never plan the future by the past", whereas Patrick Henry opines that, "I know of no way of judging the future but by the past".

Notes

As an essential part of project formulation and appraisal, market and demand analysis is vital so that capacity and facility location can be planned and implemented in line with the market requirements. A major error in demand forecast can throw painstaking capita expenditure on plant capacity and other hardware facility totally out of gear. Such decisions are not easily reversible. Metal Box of India, a premier company in the field of metal, plastic and cardboard packaging became kick owing to ill-timed diversification into manufacture of bearings.

7.1 Need for Demand Forecasting

All business planning starts with forecasting Capital investment, like procurement of raw materials and production planning, has to relate to demand forecasting. High volume high technology mass production systems have further highlighted the importance of accurate demand forecasts. Even in a batch type production, any major mismatch between forecast and manufacture will lead to higher capital tied up in finished products which are slow in selling.

Companies use market demand analysis to understand how much consumer demand exists for a product or service. This analysis helps management determine if they can successfully enter a market and generate enough profits to advance their business operations. While several methods of demand analysis may be used, they usually contain a review of the basic components of an economic market.

7.1.1 Market Identification

The first step of market analysis is to define and identify the specific market to target with new products or services. Companies will use market surveys or consumer feedback to determine their satisfaction with current products and services. Comments indicating dissatisfaction will lead businesses to develop new products or services to meet this consumer demand. While companies will usually identify markets close to their current product line, new industries may be tested for business expansion possibilities.

7.1.2 Business Cycle

Once a potential market is identified, companies will assess what stage of the business cycle the market is in. Three stages exist in the business cycle: emerging, plateau and declining. Markets in the emerging stage indicate higher consumer demand and low supply of current products or services. The plateau stage is the break-even level of the market, where the supply of goods meets current market demand. Declining stages indicate lagging consumer demand for the goods or services supplied by businesses.



Notes Companies will use market surveys or consumer feedback to determine their satisfaction with current products and services.



Did u know? Demand forecasts at national level include parameters like national income, expenditure, index of industrial and/or agricultural production etc.

7.2 Situational Analysis

Situation analysis is a method managers use to analyze both the internal and external environments of an organization in order to understand the firm's own capabilities, customers and business environment. As described by the American Marketing Association, a situation analysis is "the systematic collection and study of past and present data to identify trends, forces, and conditions with the potential to influence the performance of the business and the choice of appropriate strategies." The situation analysis consists of several methods of analysis: The 5Cs Analysis, SWOT analysis and Porter five forces analysis. A marketing plan is created to guide businesses on how to communicate the benefits of their products to the needs of potential customer. The situation analysis is the second step in the marketing plan and is a critical step in establishing a long term relationship with customers.

7.2.1 Marketing Plan

1. Introduction
2. Situation analysis
3. Objectives
4. Budgeting
5. Strategy
6. Execution
7. Evaluation

The situation analysis looks at both the macroenvironmental factors that affect many firms within the environment and the microenvironmental factors that specifically affect the firm. The purpose of the situation analysis is to indicate to a company about the organizational and product position, as well as the overall survival of the business, within the environment. Companies must be able to provide a summary of opportunities and problems that may be encountered within the environment in order to gauge an understanding of their own capabilities within the market.



Caution A Marketing Plan is created to guide businesses on how to communicate the benefits of their products to the needs of potential customer.

7.2.2 5C Analysis

While a situation analysis is often referred to as the "3C analysis", the extension to the 5C analysis has allowed businesses to gain more information on the internal, macroenvironmental and micro-environmental factors within the environment. The 5C analysis is considered to be the most useful and common method in analyzing the market environment due to the extensive information it provides to a business.

1. **Company:** The analysis of the company allows for the evaluation of the company's objectives, strategy and capabilities. These areas indicate to an organization about the strength of the business model or whether there are areas for improvement, as well as how well an organization will fit with the external environment.
 - (a) **Goals & Objectives:** An analysis on the mission of the business, the industry of the business and the stated goals required to achieve the mission.

- | | Notes |
|--|-------|
| (b) <i>Position:</i> An analysis on the Marketing strategy and the Marketing mix. | Notes |
| (c) <i>Performance:</i> An analysis on how effectively the business is achieving their stated mission and goals. | Notes |
| (d) <i>Product line:</i> An analysis on the products manufactured by the business and how successful it will be in the market. | Notes |
2. **Competitors:** The competitor analysis takes into consideration the competitors position within the industry and the potential threat it may pose to other businesses. The main purpose of the competitor analysis is for businesses to analyze both the current and potential nature and capabilities of a competitor in order to be prepared against competition. The competitor analysis looks at the following criterias:
- (a) *Identity competitors:* Businesses must be able to identify competitors within their industry. Identification of whether competitors provide the same service/products to the same customer base will be useful in gaining knowledge on direct competitors. Both direct and indirect competitors must be identified, as well as potential competitors that may enter the market.
 - (b) *Assessment of competitors:* The competitor analysis looks at competitor goals, mission, strategies and resources. This will allow for a thorough comparison on the goals and strategies of both competitors and organization.
 - (c) *Predict future initiatives of competitors:* An early insight into the potential activity of a competitor will help a company be prepared against competition.
3. **Customers:** Customer analysis can be vast and complicated. Some of the important areas that a company analyzes includes:
- (a) Demographics
 - (b) Advertising most suitable for the demographic
 - (c) Market size and potential growth
 - (d) Customer wants and needs
 - (e) Motivation to buy the product
 - (f) Distribution channels (online, retail, wholesale, etc.)
 - (g) Quantity and frequency of purchase
 - (h) Income level of customer
4. **Collaborators:** Collaborators are useful for businesses as they allow for an increase in the creation of ideas, as well as an increase in the likelihood of gaining more business opportunities. The following type of collaborators are:
- (a) *Agencies:* Agencies are the middlemen of the business world. When businesses need a specific worker who specializes in the trade, they go to a recruitment agency.
 - (b) *Suppliers:* Suppliers provide raw materials that are required to build products. There are 7 different types of Suppliers: Manufacturers, wholesalers, merchants, franchisors, importers and exporters, independent crafts people and drop shippers. Each category of suppliers can bring a different skill and experience to the company.
 - (c) *Distributors:* Distributors are important as they are the 'holding areas for inventory'. Distributors can help manage manufacturer relationships as well as handle vendor relationships.

- Notes**
- (d) *Partnerships:* Business partners would share assets and liabilities, allowing for a new source of capital and skills.
- Businesses must be able to identify whether the collaborator has the capabilities needed to help run the business as well as an analysis on the level of commitment needed for a collaborator-business relationship.
5. *Climate:* In order to fully understand the business climate/environment there are usually many different factors that can affect a business, and if researched well it will contribute to a company that can respond well to change. An analysis on the climate is also known as the PEST analysis. The types of climate/environment firms have to analyse are:
- (a) *Political and regulatory environment:* An Analysis of how active the government regulates the market with their policies and how it would affect the production, distribution and sale of the goods and services.
 - (b) *Economic Environment:* An Analysis of trends regarding macroeconomics, such as exchange rates and inflation rate, can prove to influence businesses.
 - (c) *Social/cultural environment:* Interpreting the trends of society; which includes the study of demographics, education, culture etc.
 - (d) *Technological analysis:* An analysis of technology will help improve on old routines and suggest for new methods in being more cost efficient. In order to stay competitive and gain an advantage over others, businesses must have sufficient knowledge on the technological advances.

SWOT

A SWOT Analysis is another method under the situation analysis that examines the *Strengths* and *Weaknesses* of a company (internal environment) as well as the *Opportunities* and *Threats* within the market (external environment). A SWOT analysis looks at both current and future situations, where they analyze their current strengths and weaknesses while looking for future opportunities and threats. The goal is to build on strengths as much as possible while reducing weaknesses. A future threat can be a potential weakness while a future opportunity can be a potential strength. This analysis helps a company come up with a plan that keeps it prepared for a number of potential scenarios.

7.3 Conduct of Market Survey

A market survey is one method of market research that is based on questioning an audience or segment of the market. Market surveys are conducted to gather information about companies, products and services in order to analyze and understand customers and prospects for business success. According to Edward F. McQuarrie in "The Market Research Toolbox," surveys and interviews are the most used forms of market research.

1. Develop or obtain a focused marketing research plan that includes what information is being sought from what audience, how to get the information, how much funding is available to gather the information and methods to use to get the information. Understand this can be a simple report developed by a person—as the first step in deciding whether to open a business and as an act of planning to gather information to do so—or a professional marketing research plan provided by a marketing consultant or a marketing team. Know that the market survey is one method of market research in a marketing research plan.
2. Write a comprehensive questionnaire about the survey topic in simple, easy-to-understand language targeted to the survey audience. Make sure the marketing research plan provides

a basis for what kind of questions and what audience to contact in the market survey. Understand if the marketing research plan states that information is needed for the company's products or services, make sure the survey asks questions about existing and prospective customers' needs, desires, purchases and use of the company's products or services, as well as similar products and services.

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3. Create a list or database of the survey audience to use in the survey, unless the survey will be a pop-up for visitors to a website. Use existing customer contact information or create a list of prospective customers from area phone listings or purchased mailing lists.
4. Implement the survey, by mail, e-mail, on a website or by telephone contact within a set time frame. Send it out to the audience, for example, for one week, three weeks or one month during which time responses will be accepted. Have a cut-off date after which time responses are no longer included. Organize the data gathered.
5. Sort and analyze the data. Start by counting the number of responses from categorized respondents, then filter through the data for individual questions, counting the number of like responses from the total. For example, if 550 out of 1,000 respondents said they liked the product and 450 said they didn't, that's an indication of a 55 percent approval rating, showing the company may want to invest in improving the product. Use the analyzed data to make business decisions and recommendations.

Businesses use market research to gather valuable information in their quest for success. Market research, for instance, can provide information and answer questions about a particular segment of the population, customer preferences, and geographic areas. There are two types of market research methods: secondary and primary market research.

What is the Difference between Secondary and Primary Market Research?

Secondary market research uses the information gathered from secondary sources, such as government agencies, trade journals, or the chamber of commerce. Since the results of these studies are not customized for a particular business, secondary market research is less accurate than primary market research, but it can provide general information.

Primary market research, on the other hand, produces specific results tailored to a particular business and offers a better assessment of the business' assumptions.

7.3.1 Performing Primary Market Research

Although a professional research company can perform primary market research, it is cheaper for a business to conduct its own study. The cost of paying a professional company usually ranges anywhere from \$3,000 to \$25,000, depending on the type of research performed. In most cases, a business can perform the research itself for significantly less. There are three ways to conduct primary market research: surveys and questionnaires, interviews, and focus groups.

7.3.2 Creating Surveys and Questionnaires

The use of surveys and questionnaires is a good way to gather information about potential customers. Before creating survey questions, it is necessary to formulate research questions to clarify what business goals a survey will address. Survey questions, therefore, should be drafted to meet the goals of the research. Common research goals may include the following: identifying the target customers, the types of products they buy, where they shop for a specific product, and how much they pay for a product.

Notes	There are various ways to distribute surveys. Surveys are sent through the mail, in e-mail, or are conducted through Web-based services. Online surveys are professional, easy to use, are distributed via e-mail or mobile phones, and are sometimes free. Upgrading, however, may provide the subscriber with access to advanced features like survey reporting, survey creation, and analysis tools.
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Did u know? Online surveys are professional, easy to use, are distributed via e-mail or mobile phones, and are sometimes free.

7.3.3 Conducting One-on-One Interviews

Gathering information from interviews is another good way to learn about potential customers and a particular industry. There are generally two ways to gather information through interviews:

1. **From experienced individuals in a relevant industry:** Consulting with individuals with knowledge and experience in a particular industry can help answer questions about target customers, competition, and industry practices and trends.
2. **From individuals within a target profile:** Conducting interviews with individuals in a customer profile is an effective way to gather information about potential customers. It may be necessary to conduct interviews at places where the targeted customers are likely to visit. Make it easy to answer questions by allowing for a simple "yes" or "no" answer.
3. **Obtaining Feedback from Focus Groups:** Conducting market research through a focus group is a valuable way to obtain feedback about a product or a service. A focus group, for instance, may be used to test the appeal and taste of a new food product in comparison to a competing product, or to test the usability of a new computer game. After participants watch a demonstration or presentation, feedback is collected through group discussion, from individual oral question and answer sessions, or from a written questionnaire or survey.

Keep in mind that obtaining feedback through a focus group may entail the added expense of renting a space large enough to accommodate the focus group.



Task Discuss about different types of Market Survey.

Self Assessment

Fill in the blanks:

1. The step of market analysis is to define and identify the specific market to target with new products or services.
2. Companies will use market surveys or consumer feedback to determine their satisfaction with products and services.
3. analysis is a method managers use to analyze both the internal and external environments of an organization in order to understand the firm's own capabilities, customers and business environment.
4. The analysis of the company allows for the evaluation of the company's objectives, strategy and

5. A is one method of market research that is based on questioning an audience or segment of the market.
6. Conducting market research through a focus group is a valuable way to obtain about a product or a service.

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7.4 Demand and Forecasting

Demand forecasting and estimation gives businesses valuable information about the markets in which they operate and the markets they plan to pursue. Forecasting and estimation are interchangeable terms that basically mean predicting what will happen in the future. If businesses do not use demand forecasting and estimation, they risk entering markets that have no need for the business's product.

Demand forecasting is the area of predictive analytics dedicated to understanding consumer demand for goods or services. That understanding is harnessed and used to forecast consumer demand. Knowledge of how demand will fluctuate enables the supplier to keep the right amount of stock on hand. If demand is underestimated, sales can be lost due to the lack of supply of goods. If demand is overestimated, the supplier is left with a surplus that can also be a financial drain. Understanding demand makes a company more competitive in the marketplace. Understanding demand and the ability to accurately predict it is imperative for efficient manufacturers, suppliers, and retailers. To be able to meet consumers' needs, appropriate forecasting models are vital. Although no forecasting model is flawless, unnecessary costs stemming from too much or too little supply can often be avoided using data mining methods. Using these techniques, a business is better prepared to meet the actual demands of its customers.

7.4.1 Understanding Consumer Demand

Demand Anomalies

In demand forecasting, as with most analysis endeavors, data preparation efforts are critical. Data is the main resource in data mining; therefore it should be properly prepared before applying data mining and forecasting tools. Without proper data preparation, the old adage of "garbage in, garbage out" may apply: useless data results in meaningless forecast models. Major strategic decisions are made based on the demand forecast results. Errors and anomalies in the data used to create forecast models may impact the model's ability to forecast. These errors give rise to the potential for bad forecasts, resulting in losses. With properly prepared data, the best possible decisions can be made.

There are several sources for problems with data. Data entry errors are one possible source of error that can adversely affect the demand forecasting efforts. Basic statistical summaries and graphing procedures can often make these types of error apparent. Artificial demand shifts are another error source. For example, consumer response to a promotional offer may temporarily boost sales of an item. Without a similar promotion, the same increase cannot be expected in the future. Some uncontrollable factors have the ability to influence consumer demand as well. A factor such as economic conditions may tend to impact demand. An unusually mild winter will likely cause lower energy demand. Accounting for these influences of demand can help fine tune forecast modelling.

Seasonal Fluctuations

Every business sees seasonal fluctuations. Holidays and weather changes influence products and services that consumers want. While it is extremely important to account for how seasonal

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changes affect demand, it may be possible to benefit further from this. Understanding how seasonal factors affect consumers helps businesses position themselves to take advantage.



Notes Data entry errors are one possible source of error that can adversely affect the demand forecasting efforts.

7.4.2 Forecasting Consumer Demand

Analysis Tools

A wide variety of analysis tools can be used to model consumer demand - from traditional statistical approaches to neural networks and data mining. Using these demand models enables estimation of future demand: forecasting. Possibly, a combination of multiple types of modeling tools may lead to the best forecasts.

Time series analysis is a statistical approach applicable for demand forecasting. This technique aims to detect patterns in the data and extend those patterns as predictions. The ARIMA model, or autoregressive integrated moving average, in particular is used both to gain understanding of the patterns in data and to predict in the series. Different parameters are used to detect linear, quadratic, and constant trends.

Other approaches for building forecast models are Neural Networks and Data Mining, which are capable of modeling even very complex relationships in data. Demand forecasting is a very complex issue for which these methods are well suited. Multilayer Perceptrons and Radial Basis Function neural networks, Multivariate Adaptive Regression Splines, Machine Learning, and Tree algorithms can all generate predictive models for this application.

StatSoft has a 35 part video series on data mining that demonstrates many of these approaches for model building. While the video series mainly uses credit risk data, the series can help with learning the concepts.

Systematic Patterns vs. Trends

Generally, demand patterns consist of some basic classes of components, seasonality, and trend. Seasonality refers to the portion of demand fluctuation accounted for by a reoccurring pattern. The pattern repeats systematically over time. Trend is the portion of behavior that does not repeat. For example, a trend may show a period of growth followed by a leveling off. In retail sales, seasonality will likely find patterns that repeat every year. With sufficient data, other seasonality trends may manifest across multiple years.

Forecasting Techniques

Once adequate predictive models are found, these models can then be used to forecast demand. A demand forecast model may actually be an ensemble of multiple models working together. This technique of combining models often results in better predictive accuracy. When one model gets off track, the ensemble as a whole counteracts.

As more data accumulate about consumer behavior, demand forecast models should be updated. This will be a continual effort monitoring and modeling demand in order to be constantly aware of changes. Failing to update forecast models and take advantage of all the information available will likely prove to be a costly mistake.

Inventory Management

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Using up-to-date demand forecast models, inventory management becomes a much simpler task. The forecast models offer insight into when shifts will occur, but more importantly, how big the shift will be. Using demand forecast models, inventory and human resources can be properly planned and managed well in advance and with fewer surprises.



Caution Once adequate predictive models are found, these models can then be used to forecast demand. A demand forecast model may actually be an ensemble of multiple models working together.

Self Assessment

State True or False:

7. Demand forecasting and estimation gives businesses valuable information about the markets in which they operate and the markets they plan to pursue.
8. Forecasting and estimation are interchangeable terms that basically mean predicting what will happen in the future.
9. In demand forecasting, as with most analysis endeavors, data preparation efforts are critical.
10. Forecasting is the main resource in data mining; therefore it should be properly prepared before applying data mining and forecasting tools.
11. Value series analysis is a statistical approach applicable for demand forecasting.

7.5 Technical Analysis

In this Section we will examine how the technical aspects of a typical project idea can be scrutinized in detail to evaluate its technical feasibility, as distinct from commercial, financial, economic and managerial feasibility. For the sake of comprehensiveness we will cover Environmental Impact Analysis (EIA) also, as a part of this analysis.

While the various aspects to be examined will obviously vary from project to project, the following summary covers the more common ones briefly:

1. **Objectives:** First, the project proposal must fall within the ambit of the stated mission of the sponsor(s). Next the proposal must be able to further the objectives and priorities of the sponsor(s). These must therefore be ascertained and clearly recorded, along with detailed specifications for the output (product/service). Together, these constitute the basic frame of reference for all future decisions.

The private sector would usually expect a project to earn a high enough profit, i.e. a stated level of return on investment. Only for core projects (which are intended to basically support other highly profitable projects) may this requirement be relaxed. In contrast, the public sector generally has multiple objectives and profitability normally takes a back seat. In either case, it is essential for the project analyst to keep the organisation's objectives - a along with their inter-se priorities - in sharp focus, to ensure that his efforts follow the correct direction.

2. **Location and site:** Initially, as many locations as possible should be identified which meet the most fundamental operational requirements of the proposed project. These should

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then be evaluated and an optimum location selected using the criteria of material versus market orientation (see note below), quality standards, infrastructural status, local laws, and socio-economic and living conditions. Within the geographical location so selected, alternative sites are similarly identified and the most optimal one selected after considering factors like terrain, local climate land its impact on plant & equipment and their operation), availability and cost of land (plus its development), local infrastructural facilities and their costs (power; water; road/air/water transport; telecommunications; etc.), socio-economic conditions, availability and quality of labour and construction equipment, valid waste disposal alternatives and their costs, local living conditions, public policies, local law, and taxes, etc.



Notes Resource-oriented projects like mining of minerals involve items like geological analysis covering geological structure, hydrological conditions, characteristics of the resource, resource reserves, prospecting status, and expected geological problems.

The location decision should be made after giving due consideration to various benefits and incentives offered by governments or local bodies for setting up production or service facilities in certain specified areas. These may include assistance in the form of or in respect of capital loans and grants, tax, concessions, clearances, subsidies, infrastructure, etc. One way to do this is to evolve (or use available) Location Cost Indices (LCI) for different sites. If the cost (in a specified currency) of setting up a plant is CA at location A and CB at location B, the LCI for location A is defined as $100 \times CA/CB$. If reliable values of LCI for different locations, whether within one or more countries, are available, the selection of an appropriate location becomes a bit more easy. Such valuable information is however kept a closely guarded secret by a consulting company and is therefore difficult to come by.

3. **Plant Size:** Determination of an optimum plant size is critical to the success of a project. A plant represents sunk costs and any under utilization of its capacity means either reduced profits or, for levels below the Break-Even Point, losses.

The adverse impact of an extra-large capacity is felt all the more keenly during the early years when profits are all the more important for survival. It is therefore normally better to err on the lower side and to build a plant having a capacity that is likely to be fully utilized quickly, rather than to go in for a large capacity in the fond hope of a growing share of the market.

In a feasibility study, one begins by looking 'at projections of the demand-supply gap in the market and anticipated arrives' at the possible range of project sizes after considering various constants like availability of materials, technology, equipment, public policy (for example, a large company may be precluded from setting up capacities beyond a size) and finances, etc.. The best possible size of plant and equipment is then recommended after analysing the availability, economics, and practicability of different size options.

4. **Technology:** The same product or service can generally be obtained using quite different technologies. Electricity, for example, can be generated using solar panels, coal (thermal plants), hydraulic power plants, nuclear power plants and so on. Basic telephone Services can similarly be provided using manual, semiautomatic, or automatic exchanges. And, even the last-named category is available if various technological versions like Stronger, Crossbar, Analogue electronic and Digital electronic. Needless to say, the latest technologies usually represent many improvements over the existing or older ones. They

may also offer certain unique features. However, newly emerging technologies may have some inherent dangers as well.

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What is important for formulating a successful project is to weigh available alternative technologies and select the one that is most appropriate in the prevailing situation, rather than blindly adopt the latest, state-of-the-art technology assuming that it will work since it works elsewhere. A technology is considered appropriate only if it is assessed to be satisfactory, and relevant, vis-à-vis the following aspects in lie specific situation of the project.

- (a) Specifications of the task/product.
- (b) Task uncertainties and interdependence.
- (c) [Especially for public sector] Developmental imperatives (e.g. growth of employment; maximising use of local resources; reduction of disparities in income levels).
- (d) Required gestation period versus the time actually available of the project.
- (e) Source(s) and ease of availability. [Remember the Cray super computer deal between USA and India'?]
- (f) Indigenous availability of comparable technology.
- (g) Field validation status in comparable situations. If necessary, field trials may have to be set up.
- (h) Adaptability to the qualitative characteristics of the locally (or indigenously) available resources including energy and efficiency in their usage.
- (i) Dependence on nonrenewable sources of energy.
- (j) Capacity of the organisation to absorb/adopt the technology.
- (k) Required operational parameters of ambient environment. For example, a technology which has proven itself in cold climates may fail in tropics.
- (l) Timely availability of manpower with requisite skills for installation, operation and maintenance.
- (m) Cost of acquisition, installation, repairs and maintenance versus availability of funds (local/foreign).
- (n) Safety characteristics.
- (o) Requirement or availability of R & D facilities.
- (p) Environmental and socio cultural sensitivities.
- (q) Likelihood, and time frame, of obsolescence.

After the existing technologies have been ranked on the basis of the above point, these have to be further assessed vis-à-vis acquisitional aspects, viz., the available modes of procuring it and the associated costs in focal or foreign currencies. The important questions to be asked include: Is the technology available as a technical know-how, or through a technical collaboration, or a joint venture? Are patents, trademarks, or licensing involved? At what terms and with what legal obligations? Will it tie down the investor to procure equipment(s) as well from a specific country or company?

5. **Design, Layout and Plant and Machinery:** The feasibility study should broadly specify the recommended design of the processes and plant (giving essential assumptions and

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design calculations). It should also present a rough layout of various facilities and list out all the major equipments needed, with key specifications and available source(s) of supply. Moreover, it should consider, and evaluate, alternative equipments as well and give reasoned recommendations about them. The importance of thoroughness of planning at this stage of the feasibility study can hardly be overemphasized. Many delays, cost overruns, and even failures of projects can be avoided provided the design and physical formulation of the project are based on a sufficiently deep analysis and have the support of the owner at the highest level. Otherwise, the project is likely to encounter midstream changes, with untoward consequences. There is a general impression that "minor" midstream changes would not pose much of a problem. This is not so. A project is a multi-task entity with complex linkages and interrelationships between its various constituents, and even "small" changes, which may result in certain made-to-order procured equipments being rendered unsuitable and thus throw the project schedule and costs haywire. The aim of all the efforts at this stage is to design a viable operating entity which not only works, but works harmoniously (and with minimum costs) in relation to the stipulated inputs and local environment. Apparent as well as latent and relatively infrequent factors having a bearing on the effectiveness of the project must therefore be identified and considered. Neglect of climatic and geographical aspects (e.g. monsoons, floods, snowstorms, dust-storms, heat/cold-waves, earthquakes, typhoons, etc.) at this stage can prove quite costly later on. It is equally important to ascertain and give due consideration to local industrial and safety standards.

6. **Construction Process:** This needs to be tackled in the feasibility study in terms of its five aspects, First, the methodology to be followed - viz., capital intensive or otherwise and its feasibility under prevailing conditions. Second, whether the construction or installation is to be done in-house, or on a turnkey basis, or by farming out a number of contracts for different work packages, and their feasibility. A recommendation may also be made whether any special agency(ies) should be engaged as a part of backup or contingency arrangements for critical activity(ies). Third, the determination of such construction equipments, materials and other essential inputs (like cement, sand, steel, stores etc.) as are to be arranged by the owner, along with their alternatives, availability, source of supply (local/foreign), lead-times, and infrastructural requirements (like uninterrupted supply of power, clean water, gas, steam, etc). Fourthly, the recommended sequence and time schedule of different activities in the form of a bar chart/PERT network. Lastly, assessment of the financial implications of this phase based on the latest available unit costs and with provision for inflation and contingencies.
7. **Inputs:** These relate to the operation phase of the project, but need to be identified at this stage of the feasibility study to examine the technical feasibility of the proposed system(s). For this, classification of the inputs into following categories will be found useful:
 - (a) raw materials,
 - (b) processed materials,
 - (c) components and subassemblies,
 - (d) spares and wear and tear parts,
 - (e) water and steam,
 - (f) gas, fuels and electricity.

Next, their qualitative and quantitative requirements (including buffer stocks, where applicable), availability, feasibility alternatives and reliable sources of supply should be carefully ascertained and record. The problems involved in their storage and handling should be also assessed.

8. **Infrastructural Facilities:** Availability and characteristics of roads, bridges, railway facilities (like station, yards), air transportation, waterways, ports, etc. depending upon their relevance to the assessed requirements of the project at both implementation and operation stages need to be studied. After studying the appropriateness of the infrastructure existing around the project location, the infrastructural requirements at the project site itself. A large part of the land area is normally required to be reserved for service roads, storm water mains, railways, over-ground or overhead gas, steam, and air pipelines, water reservoirs, and even harbors for certain large-scale industrial projects. A detailed study of all such requirements, and of their implications in terms of time, resources, and approximate costs is necessary to avoid surprises later on.
9. **Manpower:** The availability in needed numbers, of manpower of requisite skills where and when required, has to be studied. This covers both the project implementation and the operation (and maintenance) phases. In case imparting of training is also involved, timely availability, and costs, of the training facilities have also to be assessed.

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7.5.1 Environment Impact Assessment (EIA)

This study-

1. identifies the environment in which a project is to be implemented,
2. assesses the short- and long-term impacts the former is likely to be subjected to as result of the project activities during construction as well as operation phases, and
3. generates preferred alternative courses of action, if possible.

Its inclusion at the feasibility study stage is necessary for certain projects since, under the Environmental Impact Assessment Notification, 1994, issued by the Ministry of Environment & Forests, Government of India, any expansion or modernisation of an existing activity which is likely to increase the pollution load, or setting up of a new project listed in Schedule I, ibid., is not permissible unless cleared by the Central Government. The Schedule covers about two and a half dozen projects including petroleum refineries, chemical fertilisers, bulk drugs, asbestos, thermal power plants, paper, cement, and even highway projects.

The EIA process can prove to be of immense benefit to the project promoter, if sincerely carried out, by ensuring that the natural resources are conserved or used efficiently and serious problems likely to arise out of any adverse effects on community or natural systems are duly anticipated and provided for at the planning stage itself. For identification of impacts, a list of parameters relevant to the project is drawn up, covering natural physical resources, natural biological/resources, and quality-of-life values including aesthetic and cultural values. For instance, for rail/road/highway project the following parameters have been identified:

1. surface water quality
2. air quality
3. seismology/geology
4. erosion
5. land quality
6. fisheries
7. forests
8. terrestrial wildlife

- | | |
|--------------|---|
| Notes | 9. noise
10. aesthetics
11. industries
12. archaeological/historical significance
13. public health
14. socio-economic factors |
|--------------|---|

For each of these, the resulting impacts, whether beneficial or otherwise, are then identified and a detailed Environmental Management Plan (EMP) prepared for such mitigation, protection and/or enhancement measures, as are considered necessary.

In the above paragraphs we have briefly covered the salient aspects of technical analysis. In reality, technical analysis rarely proceeds in a linear fashion covering these aspects. There is a great deal of interactive information exchange in respect of many of these aspects. At the end, however, it should result in -

1. a fairly comprehensive recommendation about the "technical" parts of the project package,
2. a precise recommendation, with or without conditionalities, about the technical feasibility of the package (stating the assumptions, made), and
3. detailed project specifications, which should form the basis for calling bids, etc. during the implementation phase.

Needless to say, the greater the thoroughness with which the technical analysis is carried out, the more reliable and complete the Project Specifications are, and the lesser the chances of major unforeseen problems cropping up and jeopardizing the project.

Self Assessment

State True or False:

12. Time series analysis is a statistical approach applicable for demand forecasting.
13. The Public sector would usually expect a project to earn a high enough profit.
14. Determination of an optimum plant size is critical to the failure of a project.
15. The adverse impact of an extra-large capacity is felt all the more keenly during the early years when profits are all the more important for survival.
16. The importance of thoroughness of planning at this stage of the feasibility study can hardly be overemphasized.

7.6 Summary

- Emerging competition in market place is propelling managements to hear the voice of their customers.
- All business planning starts with forecasting Capital investment, like procurement of raw materials and production planning, has to relate to demand forecasting.
- The first step of market analysis is to define and identify the specific market to target with new products or services.
- The analysis of the company allows for the evaluation of the company's objectives, strategy and capabilities.

- | | |
|---|--------------|
| <ul style="list-style-type: none">• A SWOT Analysis is another method under the situation analysis that examines the <i>Strengths</i> and <i>Weaknesses</i> of a company.• A market survey is one method of market research that is based on questioning an audience or segment of the market.• Secondary market research uses the information gathered from secondary sources, such as government agencies, trade journals, or the chamber of commerce.• Demand forecasting and estimation gives businesses valuable information about the markets in which they operate and the markets they plan to pursue.• Demand forecasting is the area of predictive analytics dedicated to understanding consumer demand for goods or services.• In demand forecasting, as with most analysis endeavors, data preparation efforts are critical. | Notes |
|---|--------------|

7.7 Keywords

Agencies: Agencies are the middlemen of the business world. When businesses need a specific worker who specializes in the trade, they go to a recruitment agency.

Distributors: Distributors are important as they are the 'holding areas for inventory'. Distributors can help manage manufacturer relationships as well as handle vendor relationships.

Economic Environment: An analysis of trends regarding macroeconomics, such as exchange rates and inflation rate, can prove to influence businesses.

Political and Regulatory Environment: An analysis of how active the government regulates the market with their policies and how it would affect the production, distribution and sale of the goods and services.

Situation Analysis: It is a method managers use to analyze both the internal and external environments of an organization in order to understand the firm's own capabilities, customers and business environment.

Social/cultural Environment: Interpreting the trends of society; which includes the study of demographics, education, culture etc.

Suppliers: Suppliers provide raw materials that are required to build products. There are 7 different types of Suppliers: Manufacturers, wholesalers, merchants, franchisors, importers and exporters, independent crafts people and drop shippers. Each category of suppliers can bring a different skill and experience to the company.

Technological Analysis: An analysis of technology will help improve on old routines and suggest for new methods in being more cost efficient. In order to stay competitive and gain an advantage over others, businesses must have sufficient knowledge on the technological advances.

7.8 Review Questions

1. Explain about Market and Demand Analysis.
2. Discuss about Situational Analysis.
3. Describe about "Conduct of Market Survey".
4. Discuss about Demand and Forecasting.
5. Discuss about Technical Analysis.

- Notes**
6. What is Environment Impact Assessment?
 7. Discuss about Inventory Management.
 8. Explain about Forecasting Techniques.

Answers: Self Assessment

- | | |
|------------------|-----------------|
| 1. First | 2. Current |
| 3. Situations | 4. Capabilities |
| 5. Market Survey | 6. Feedback |
| 7. True | 8. True |
| 9. True | 10. False |
| 11. False | 12. True |
| 13. False | 14. False |
| 15. True | 16. True |

7.9 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf

www.pma-india.org/ - Trinidad and Tobago

www.nickjenkins.net/prose/projectPrimer.p

www.mpub.com/Pages/WhatisProjectManagement.aspx

www.mindtools.com/pages/main/newMN_PPM.htm

www.freelancer.com/jobs/Project-Management/



Case Study

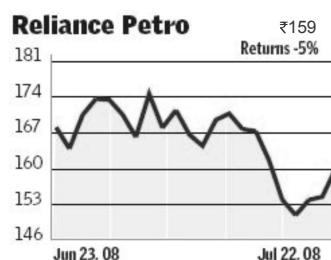
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Reliance Petro Jamnagar Refinery Ahead of Schedule



For the June quarter Reliance Petroleum Ltd has overshot its budget by ₹ 1,390 crore for setting up the Greenfield refinery at Jamnagar.

The refinery project is expected to be completed ahead of the December deadline. It has achieved 94 per cent overall progress in implementing the project, the company said in a BSE statement.



Reliance Petroleum is setting up the export oriented refinery, with a capacity to process 580,000 barrels a day of crude. It is also setting up a 900,000 tonnes a year polypropylene plant.

Reliance Petroleum in the statement said, "As on June 30, the company has utilised ₹ 25,515 crore for the project against a projected utilisation of funds of ₹ 24,125 crore. The variation is mainly due to payments in advance under project contracts for continued efficient and speedy implementation of the project."

The company added that the project engineering, procurement and contracting activities have been completed for the refinery.



Contd...

Notes	<p>Pre-commissioning Activities</p> <p>Construction activities are progressing rapidly to meet pre-commissioning requirements. Planning for project start-up is completed.</p> <p>The statement said the pre-commissioning activities are proceeding at a fast pace with necessary infrastructure facilities already under commissioning. The company has mobilised sufficient resources to sustain pre-commissioning and commissioning activities on fast track.</p> <p>The quarter witnessed close-out of procurement and contracting activities for equipment and bulk materials.</p> <p>Deliveries of equipment are nearly complete. Deliveries of bulk materials, including pipes, fittings, electrical and instrumentation bulks matched the pace of equipment deliveries and their installation at site. Focus has now shifted towards achieving a rapid close-out on this front, the statement added.</p> <p>Questions:</p> <ol style="list-style-type: none">1. Study and analyze the case.2. Write down the case facts.3. What do you infer from it?
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Source: <http://www.thehindubusinessline.in/2008/07/23/stories/2008072351730200.html>

Unit 8: Social Cost Benefit Analysis

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 - 8.1.1 Market Imperfection
 - 8.2 UNIDO Approach for Social Cost Benefit Analysis
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 - 8.3 Methods followed by Financial Institutions
 - 8.4 Little Mirrlees Approach
 - 8.5 Summary
 - 8.6 Keywords
 - 8.7 Review Questions
 - 8.8 Further Readings

Objectives

After studying this unit, you will be able to:

- Know about Rationale for Social Cost Benefit Analysis
- Understand UNIDO approach for Social Cost Benefit Analysis
- Know about the methods followed by Financial Institutions

Introduction

It refers to the study of feasibility of a project in terms of its total economic cost and total economic benefits. It means to compare total cost with total benefit if we add external cost with private cost, it's called total social cost if we add external benefit with private benefit, called total social benefit.

8.1 Rationale for Social Cost Benefit Analysis

Social Cost Benefits Analysis means to analyze the social cost and total social benefits if we accept any project. We all know that for completing the big project, we need big investment. In Social Cost Benefit Analysis (SCBA), we see whether return or benefits on this investment are more than its cost from point of view of society in which we are living.

In public investment, we analyze and compare government expenditure with total benefits to society through SCBA. It is also good technique of financial evaluation of a project because we leave that project whose benefits to society are less than total cost which will to society because all resources are from society.

Notes	Problems which can be solved by Social Cost Benefits Analysis.
	 <p><i>Notes</i> Social Cost Benefits Analysis means to analyze the social cost and total social benefits if we accept any project.</p>

1st Problem: Rationale for SCBA

1. **Market imperfection:** We will not analyze social cost benefit; we can not find market imperfections. After study of market rates following factors come in to our knowledge:
 - (a) **Rationing factor:** It means some of raw material prices are controlled by Govt. So, it may increase our project cost but its social benefit will go to poor community.
 - (b) **Regulation for providing minimum wage factor:** It also affects social cost and benefits of any project. Because company must have to pay this minimum wages.
 - (c) **Foreign Exchange Regulations factor:** Sometime, we have to deal at currency rate which is less than actual market rate due to regulation on FOREX. So, we should analyze this point also.
2. **Externalities:** Externalities are non-cash or benefits which an organization suffer or get if it starts the project.



Example: If govt. makes road near your project plant, you can get this facility without any payment. On the other side, if any other organization is polluting and spreading diseases, its cost may suffer due to absence of your employee for going to hospitals.

3. **Tax and Subsidies:** Tax is payment on the earning of the project and it will reduce our overall benefits. On the other hand, if govt. gives us subsidy for operating any project, it will count for our cost benefit analysis.

2nd Problem: What is net benefit to society from a project?

With UNIDO approach, we can evaluate net benefit from any project. Formula is given below:

	Amount (IN \$)
Estimated profitability from a project	XXXXXX
Add net benefits of project in the term of economy	XXXXXX
+/- Adjustment for the impact of project on saving and investment	XXXXXX
+/- Adjustment for the impact of project on income distribution	XXXXXX
Total net benefits to society with the project	XXXXXX

3rd Problem: To Know the Effect of using one more Unit of Resources

With shadow price, we know the effect of using one more unit of resources on the social cost and benefits. Shadow pricing is relating to decision of project manager. Before accepting the project, we have to find the price if we have to use extra unit of resources. Suppose, we have to use one more hour of labor, what will we pay and what will its effect on social benefits.

Economic Analysis	Notes
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A methodology developed for evaluating investment projects from the point of view of the society (or economy) as a whole.

Used Primarily for Public Investment

SCBA aids in evaluating individual projects:

1. Spells out broad national economic objectives
2. Allocation of resources to various sectors

SCBA is concerned with tactical decision making within the framework of broad strategic choices defined by planning at the macro level.

Rationale for SCBA

1. Focuses on the social cost and benefits of the project
2. Principle sources of discrepancy:
 - (a) Market Imperfection
 - (b) Externalities
 - (c) Taxes and Subsidies
 - (d) Concern for Savings
 - (e) Concern for redistribution
 - (f) Merit Wants

8.1.1 Market Imperfection

Market prices reflect social values only under condition of perfect competition (which are rarely realized by developing countries) Common sources of market imperfection in developing countries:

1. Rationing
2. Prescription of minimum wage rate
3. Foreign exchange regulation

Externalities

External benefit or cost created by the project.

Not usually included in the financial cost benefit analysis of the project.

In SCBA all external costs and benefits, irrespective to whom they accrue and whether they are paid for or not, are relevant.

Taxes and Subsidies

From private point of view:

1. Taxes are monetary costs

- Notes**
2. Subsidies are definite monetary gains
From social point of view taxes and subsidies are generally regarded as transfer payments and hence considered irrelevant.

Concern for Savings

Parts of benefit saved is deemed more valuable than the part of benefits consumed.

In SCBA higher valuation is placed on savings and a lower valuation is put on consumption.



Task Describe about Market Imperfection.

Self Assessment

Fill in the blanks:

1. Analysis means to analyze the social cost and total social benefits if we accept any project.
2. In public investment, we analyze and compare government expenditure with total benefits to society through
3. Externalities are non-cash or benefits which an organization suffer or get if it starts the
4. is payment on the earning of the project and it will reduce our overall benefits.
5. SCBA is concerned with tactical decision making within the framework of broad strategic choices defined by planning at the level.

8.2 UNIDO Approach for Social Cost Benefit Analysis

Two principle approach for SCBA:

1. UNIDO Approach
2. Little-Mirrlees Approach

UNIDO method involves five stages:

1. Calculation of financial profitability measured at market prices.
2. Obtaining the net benefit of the project measured in terms of economic (efficiency) prices.
3. Adjustment for the impact of the project on savings and investment.
4. Adjustment for the impact of the project on income distribution.
5. Adjustment for the impact of the project on merit goods and demerit goods.

Net benefit in terms of Economic (Efficiency) prices:

1. Also referred to as shadow prices.
2. Market prices represent shadow prices only under conditions of perfect markets.

3. So, shadow prices need to be developed and economic benefit need to be measured in terms of these prices.

Notes

8.2.1 Shadow Pricing

Choice of Numéraire

The unit of account in which the value of inputs or outputs is expressed:

1. What unit of currency (domestic or foreign)?
2. Current values or constant values.
3. With reference to which point – present or future.
4. In terms of consumption or investment.
5. With reference to which group.

UNIDO Numéraire: "net present consumption in the hands of people at the base level of consumption in the private sector in terms of constant price in domestic accounting unit."

8.2.2 Concept of Tradability

For tradable goods, the international price is a measure of its opportunity cost to the country:

1. Substitute import for domestic production and vice versa
2. Substitute export for domestic consumption and vice versa

Hence, the international price, also referred to as the border price, represent the 'real' value of the good in terms of economic efficiency.



Caution So, shadow prices need to be developed and economic benefit need to be measured in terms of these prices.

8.2.3 Sources of Shadow Prices

UNIDO approach suggests three sources of shadow pricing:

1. Increase or decrease the total consumption in the economy.
2. Decrease or increase production in the economy.
3. Increase or decrease export or import.

UNIDO approach is one of the methods of calculating Social Cost Benefit Analysis (SCBA). In fact very popular. Normally we calculate financial benefits from a project while evaluating it, but this method calculates economic benefits from the project. Although earlier it was commonly used by government organizations but now it is being used by private players also. In this analysis the monetary priced are replaced by shadow prices. Shadow prices are prices at perfect market conditions, also called as economic prices. Thus the market prices are replaced by the Economic prices and then the benefit or returns are calculated .in addition to this, adjustment is made for Externalities (+ve like road facility, hospital facility etc. or -ve externalities like pollution), savings (a rupee saved is valued more than a rupee consumed), redistribution of income (a rupee distributed to poor is valued more than a rupee distributed to rich), taxes are

Notes	not considered and merits. Then finally the economic rate of return is calculated by the same method as IRR is calculated.
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Self Assessment

State True or False:

6. Calculation of financial loss measured at market prices.
7. Obtaining the net benefit of the project measured in terms of economic (efficiency) prices.
8. Market prices represent shadow prices only under conditions of perfect markets.
9. UNIDO approach is one of the methods of calculating Social cost benefit analysis.

8.3 Methods followed by Financial Institutions

In the retail-banking sector, there is a constant threat from new financial institutions entering into the local market. The financial institutions already represented in India also constantly strive to attain competitive advantage over one another. As a result, financial institutions need to be able to implement innovative solutions with the minimum of delay to counteract these pressures. In consultation with the Project Managers at South Africa's leading financial institutions, these being ABSA Bank, First National Bank Metropolitan Delivery, Standard Bank and First National Bank Rural. It was found that the investment monetarily, was substantial, the total expenditure of these financial institutions being in excess of ₹ 500 million annually. It is therefore important that an effective strategy as regards building project management is in place. The strategy employed must be effective in terms of functionality and cost. This research will study how the financial institutions are conducting their building project management function, it will evaluate the relative effectiveness of that strategy. Through studying how the different financial institutions are undertaking their building project management function, this study will try to make meaningful recommendations to assist the financial institutions in the implementation of their building project management function.

Financial institutions face challenges relative to preserving the safety and soundness of the institution and its ability to manage earnings and capital. New technologies require increased diligence by financial intuitions. The FBI, in its 2001 report "Financial Institution Fraud and Failure Report," says Financial Institution Fraud (FIF) is a Tier 1 priority in its strategic plan and identifies bank failures, identify theft, check fraud, counterfeit negotiable instruments, check kiting, mortgage and loan fraud as its major areas of investigation and an increasing importance in its investigations related to emerging technologies and computer related banking. The FBI reports that throughout the 1980s and early 1990s most of the fraud was a result of abuse by insiders. Today, the dominant schemes result from outsiders. "The pervasiveness of check fraud and counterfeit negotiable instrument schemes, technological advances, as well as the availability of personal information through information networks, has fueled the growth in external fraud."

In addition to direct acts of fraud and abuse, financial institutions often become the instruments of money launders and illegal charitable contributions to terrorist.

The International Monetary Fund estimates that money laundering could be anywhere from 2-5% of the world's gross domestic product and has been called "the world's second largest underground economy." Both US and international organizations have placed a burden on financial institutions to detect and deter money laundering and the financing of terrorists. In the U.S., this is accomplished by using software to implement requirements of Section 314 of the Patriot Act and the Office of Foreign Assets Control (OFAC), Compliance Programs Division. When banks fail to provide adequate control over information technology, they can expect to

suffer operational damages from mass attacks launched against the Internet and the nation's critical infrastructure. In January 26, 2003, a "virus-like," worm attack against MS-SQL Server 2000 slowed Internet traffic worldwide and caused technical problems that brought down 13,000 ATM machines of the Bank of American and at Canadian Imperial Bank of Commerce. While these types of vulnerabilities often capture the negative attention of the public, they represent only a small portion of the business risks financial institutions must control.

Notes

The Office of the Comptroller of the Currency (OCC) has identified four of the nine categories in its risk framework to which technology-related products, services, delivery channels, and processes are most frequently exposed:

1. ***Transaction risks*** - The risks to earnings or capital arising from problems with service or product delivery, for example poorly configured or incompatible internal and external systems and processes.
2. ***Strategic risks*** - The risks to earnings or capital arising from adverse business decisions or improper implementation of those decisions.
3. ***Reputation*** - The risk to earnings or capital arising from negative public opinion.
4. ***Compliance*** - The risk to earnings or capital arising from violations or, non-compliance with prescribed practices or ethical standards.
5. Failure to meet regulatory guidelines can result in severe penalties for financial institutions. More recently the Office of Thrift Supervision (OTS), has grouped the technology risks faced by financial institutions in three categories:
 - (a) ***Information Integrity risks*** - Information must be available, accurate, complete, valid and secure.
 - (b) ***Business continuity risks*** - The institution's ability to adequately prepare and execute its responsibilities during a disaster.
 - (c) ***Vendor management risks*** - The risk that the service provider will not perform the contract terms and conditions as specified causing undesirable consequences for the institution's operations.

This reflects the going requirement for financial institutions to provide Internet-based services, utilize and oversee service providers, and prove, particularly the Board of Directors and Officers, due diligence in protecting customer information and meeting other regulatory requirements.

Management can reduce a bank's risk exposure by adopting and regularly reviewing its risk assessment plan, risk mitigation controls, intrusion response policies and procedures, and testing processes.

Financial institutions are heavily reliant on external service providers for Web sites and other core information systems. In addition financial institutions have a strong business requirement to analysis daily financial transactions in order to spot portfolio, lending, and financial market trends, customer requirements, and improve services. This requires moving data from multiple transaction-based systems to analytical database applications or data warehouses. MS-SQL server is often used by Service Providers because it is comparatively low in cost; more easily scaled with the introduction of Windows 2000 Data Center, and can be deployed rapidly. Market share for ISP and ASP of this product is on the rise. Additionally, financial institutions may find it more efficient to use the MS-SQL Server internally to retain possession of certain business data and make it easier to analysis legacy, historical or trend data, while contracting with an ASP to run larger mainframe and multi-tier, integrated applications or Internet sites. The Data Transformation Services (DTS) and other Back Office Products included with MSSQL Server make it very efficient for use in this manner.

Notes



Did u know? Both US and international organizations have placed a burden on financial institutions to detect and deter money laundering and the financing of terrorists.

8.4 Little Mirrlees Approach

The seminal work of Little and Mirrlees on benefit-cost analysis systematically develops a theoretical basis for the analysis and its underlying assumptions and lays down step-wise procedure for undertaking benefit-cost studies of public projects. The mathematical formulation is identical to the UNIDO method except for differences in assigning value to discount rates and accounting for imperfections and other market failures and social considerations.

Like UNIDO guidelines, the Little-Mirrlees method also suggests valuation of project investment at opportunity cost (shadow prices) of resources to correct distortions due to market imperfections. Both methods make use of border prices to correct distortions but with a major difference.

While Little and Mirrlees express the numeraire in terms of border prices in foreign currencies, the guidelines recommend that foreign exchange values be calculated in terms of domestic currency.

Little and Mirrlees have also suggested an elaborate methodology for calculating shadow prices of non-tradables. Use of detailed input-output tables is suggested with a view to tracing down the chain of all non-traded and traded inputs that go into their production. However, in the case of non-availability of detailed input/output tables, a conversion factor based on the ratio of domestic costs of representative items to world prices of these items could be used for approximation of shadow prices of non-traded resources. Little and Mirrlees believe that in all less developed countries, one of the major criteria for the choice of a project should be its ability to generate savings and, hence, the Little-Mirrlees method suggests the use of "accounting rate of interests" to calculate present worth of future annuities of savings and consumption. Guidelines, on the other hand, do not make any adjustment for consumption and saving impact of project investment. Unlike the five stages of UNIDO, the Little and Mirrlees procedure is relatively more practical, although, unlike guidelines, it does not provide sufficient insights by examining project investment from different angles.

There is a considerable similarity between the UNIDO approach and the L-M approach as both the approach call for:

1. Calculating shadow pricing.
2. Considering the factor of equity.
3. Use of DCF analysis.
4. But despite of these similarities there are some differences also.
5. The UNIDO approach measures cost and benefits in term of domestic rupees price whereas the L-M approach measures cost and benefit in terms of international prices.
6. The UNIDO approach measures cost and benefit in terms of consumption whereas the L-M approach in terms of uncommitted social income.
7. The stage by stage approach of UNIDO focus on efficiency, saving, and redistribution consideration in different stages. The L-M approach, however, take these consideration together.

Shadow Pricing Notes

1. **Traded goods and services :** The shadow prices of traded goods and services are the border price. If a good is exported its shadow price is the FOB price and if a good is imported its border price is the CIF price. If foreign demand is not perfectly elastic the marginal export revenue is substituted for the FOB and if foreign supply is not perfectly elastic, the marginal import cost is substituted for CIF prices.
2. **Non-traded goods and services:** Accounting prices for non-traded good are defined in terms of marginal social cost and benefit. The marginal social benefit is the value of an extra unit of good from social point of view and the marginal social cost of a good is the value in terms of accounting prices of the resources required to produce an extra unit of the good. To determine the accounting price of a non traded input the following formula is to be used: 2/3 marginal social cost + 1/3 marginal social benefit.
3. **Labour:** The L-M approach suggest the following formula for calculating the shadow wage rate

$$\text{SWR} = c' - 1/s (c-m)$$

Where SWR = shadow wage rate

C' = additional resources devoted to consumption

1/s = value of a unit committed resources

c = consumption

m = marginal product of wage earner

Self Assessment

Fill in the blanks:

10. The institutions already represented in India also constantly strive to attain competitive advantage over one another.
11. Financial institutions are heavily reliant on service providers for Web sites and other core information systems.
12. The Transformation Services (DTS) and other Back Office Products included with MSSQL Server make it very efficient for use in this manner.
13. to meet regulatory guidelines can result in severe penalties for financial institutions.
14. In addition institutions have a strong business requirement to analysis daily financial transactions in order to spot portfolio, lending, and financial market trends, customer requirements, and improve services.

8.5 Summary

- Social Cost Benefits Analysis means to analyze the social cost and total social benefits if we accept any project.
- In public investment, we analyze and compare government expenditure with total benefits to society through SCBA.
- We will not analyze social cost benefit; we can not find market imperfections. After study of market rates following factors come in to our knowledge.

- Notes**
- Externalities are non-cash or benefits which an organization suffer or get if it starts the project.
 - With shadow price, we know the effect of using one more unit of resources on the social cost and benefits.
 - UNIDO approach is one of the methods of calculating Social cost benefit analysis.
 - The financial institutions already represented in India also constantly strive to attain competitive advantage over one another.
 - Financial institutions face challenges relative to preserving the safety and soundness of the institution and its ability to manage earnings and capital.
 - In addition to direct acts of fraud and abuse, financial institutions often become the instruments of money launders and illegal charitable contributions to terrorist.

8.6 Keywords

Business Continuity Risks: The institution's ability to adequately prepare and execute its responsibilities during a disaster.

Compliance: The risk to earnings or capital arising from violations or, non-compliance with prescribed practices or ethical standards. For example Poorly configured or incompatible internal and external systems and processes.

Foreign Exchange Regulations Factor: Sometime, we have to deal at currency rate which is less than actual market rate due to regulation on FOREX. So, we should analyze this point also.

Information Integrity Risks: Information must be available, accurate, complete, valid and secure.

Rationing Factor: It means some of raw material prices are controlled by Govt. So, it may increase our project cost but its social benefit will go to poor community.

Regulation for Providing Minimum Wage Factor: It also affects social cost and benefits of any project. Because company must have to pay this minimum wages.

Reputation: The risk to earnings or capital arising from negative public opinion.

Strategic Risks: The risks to earnings or capital arising from adverse business decisions or improper implementation of those decisions.

Transaction Risks: The risks to earnings or capital arising from problems with service or product delivery.

UNIDO Approach: It is one of the methods of calculating Social Cost Benefit Analysis (SCBA).

Vendor Management Risks: The risk that the service provider will not perform the contract terms and conditions as specified causing undesirable consequences for the institution's operations.

8.7 Review Questions

1. Explain rationale for Social Cost Benefit Analysis.
2. Describe about Market Imperfection.
3. Discuss UNIDO approach for Social Cost Benefit Analysis.
4. What do you know about shadow pricing and sources of shadow pricing?

- | | |
|--|--------------|
| 5. Explain about the concept of Tradability. | Notes |
| 6. Discuss about the methods followed by financial institutions. | |
| 7. Write a short note on Little-Mirrlees method. | |
| 8. Mention the stages involved in UNIDO. | |

Answers: Self Assessment

- | | |
|---------------------------------|---------------|
| 1. Social Cost Benefit Analysis | 2. SCBA |
| 3. Project | 4. Tax |
| 5. Macro | 6. False |
| 7. True | 8. True |
| 9. True | 10. Financial |
| 11. External | 12. Data |
| 13. Failure | 14. Financial |

8.8 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf

www.pma-india.org/ - Trinidad and Tobago

www.nickjenkins.net/prose/projectPrimer.p

www.mpug.com/Pages/WhatisProjectManagement.aspx

www.mindtools.com/pages/main/newMN_PPM.htm

www.freelancer.com/jobs/Project-Management/

Notes

Case Study

GMR's Terminal 3 for Delhi Airport: A Successful Project Execution Model for Public-Private Partnership Initiatives

This case study discusses the infrastructure deficit in India and how the country was trying to overcome this problem with the help of the Public Private Partnership (PPP) model. The case details the 'Terminal 3 for Delhi Airport' project to explain the role and importance of PPP in overcoming infrastructure deficit. It also explains the different features of Terminal 3 (T3) which go to make it a world class airport terminal. In the end, the case study covers the limitations of the PPP model. The case study helps to understand the role of PPP and provides scope for discussions on how to overcome the limitations of PPP. It also provides ample scope for discussing how T3 was completed in just 37 months and what the upcoming infrastructure projects can learn from this project. This case is meant for MBA/MS students as a part of their Project Management curriculum.

Issues

- Understand the importance of Public-Private Partnership initiatives, especially in emerging markets, to bridge the infrastructure deficit.
- Understand the salient features of Delhi Airport's Terminal 3 (T3) project and analyze all the features that have contributed to the completion of T3 project in a record 37 months.
- Discuss and debate what T3's record completion in 37 months means for PPP initiatives and what best practices this project execution offers for future PPP initiatives in the infrastructure sector.

On July 14, 2010, the first flight touched down at India's newly built Terminal 3 (T3) of Delhi airport, the swankiest and largest in the country, opening a new chapter in the history of the airport and the Indian Aviation Industry. It was around 4:40 pm (IST) when the first commercial flight, the Air India flight from John F Kennedy International Airport, New York, touched down on the runway to be greeted by water cannon salutes from both sides. The 220 passengers and 18 crew members of AI-102 flight were warmly welcomed by the airport senior officers and staff and treated as special guests. They posed for media cameras and received gifts and certificates for being the first group of passengers to arrive at T3. Sunil Gupta (Gupta), Director of an IT firm in New York, who was among the first passengers, said, "The old terminal was shabby and barely had basic facilities. This one looks good and is up to international standards."

Not too long ago, Delhi airport had been known for its poor management and poor passenger services. Underinvestment in airport infrastructure since independence was a major cause for concern. Lack of funds and the expertise to develop and maintain the growing airport infrastructure needs of the country forced the government to invite private players to participate in infrastructure development under Public Private Partnership (PPP). It was in January 2006, that a consortium led by the GMR Group won the bid to develop the airport. Very soon, the PPP initiative yielded results, with two terminals being renovated and one new runway and terminal 1D being opened up for commercial operation (Refer to Exhibit I for different terminal of Delhi airport). However,

Contd...

revolutionary change, as the experts called it, came about when the T3 was inaugurated on July 3, 2010. At the inauguration of T3, Manmohan Singh (Singh), Prime Minister of India, said, "The Delhi airport has improved its rank sharply in terms of Air Service Quality (ASQ) performance, from 101 in 2007 to 21 in 2010. After the opening of this new terminal we are hopeful that the airport will shortly rank within the first 10 airports of the world."

About GMR Group

GMR Group (GMR), a Bengaluru, India-based leading Infrastructure group, had a stake in almost all types of infrastructure development activities including power, road, airport, and Urban Infrastructure. GMR was one of the first companies in India to take the initiative in infrastructure projects when they were thrown open to the private sector in the 1990.

PPPS in India's Infrastructure Development

Public Private Partnership (PPP) was a positive and sustainable solution to overcome infrastructure deficit, analysts said. The PPP model aimed at shifting the responsibility for financing, development.

GMR's T3 & Dial

Analysts cited GMR's T3 terminal as one of the successful PPP initiatives which had been completed significantly before the scheduled time. On the occasion of its grand opening.

The Limiting Factors

Experts stated that T3 would serve as an example for upcoming infrastructure projects. However, a few critics stated that the PPP model only provided profits to the private players through deals.

Question:

1. Analyse the case and discuss the case facts.

Notes

Source: <http://www.icmrindia.org>

Unit 9: Financial Estimates and Projections

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Objectives

Notes

After studying this unit, you will be able to:

- Know about Financial Projections
- Understand Time Value of Money
- Know about cost of capital
- Understand about risk analysis in capital investment decisions

Introduction

A budget is an important concept in microeconomics, which uses a budget line to illustrate the trade-offs between two or more goods. In other terms, a budget is an organizational plan stated in monetary terms.

In summary, the purpose of budgeting is to:

1. Provide a forecast of revenues and expenditures, that is, construct a model of how our business might perform financially if certain strategies, events and plans are carried out.
2. Enable the actual financial operation of the business to be measured against the forecast.
3. Establish the cost constraint for a project, program, or operation.

9.1 Financial Projections

9.1.1 Cost of Project

Conceptually, the cost of project represents the total of all items of outlay associated with a project which are supported by long-term funds. It is the sum of the outlays on the following:

1. Land and site development
2. Buildings and civil works
3. Plant and machinery
4. Technical know how and engineering fees
5. Expenses on foreign technicians and training of Indian technicians abroad
6. Miscellaneous fixed assets
7. Preliminary and capital issue expenses
8. Pre-operative expenses
9. Margin money for working capital
10. Initial cash losses

9.1.2 Land and Site Development

The cost of land and site development is the sum of the following:

1. Basic cost of land including conveyance and other allied charges
2. Premium payable on leasehold and conveyance charges

- Notes**
- 3. Cost of levelling and development
 - 4. Cost of laying approach roads and internal roads
 - 5. Cost of gates
 - 6. Cost of tube wells

The cost of land varies considerably from one location to another. While it is very high in urban and even semi-urban locations, it is relatively low in rural locations. The expenditure on site development, too, varies widely depending on the location and topography of the land.

9.1.3 Buildings and Civil Works

Buildings and civil works cover the following:

- 1. Buildings for the main plant and equipment.
- 2. Buildings for auxiliary services like steam supply, workshops, laboratory, water supply, etc.
- 3. Godowns, warehouses, and open yard facilities.
- 4. Non-factory buildings like canteen, guest houses, time office, excise house, etc.
- 5. Quarters for essential staff.
- 6. Silos, tanks, wells, chests, basins, cisterns, hoppers, bins, and other structures necessary for installation of the plant and equipment.
- 7. Garages Sewers, drainage, etc.
- 8. Other civil engineering works.

The cost of the buildings and civil works depends on the kinds of structures required which, in turn, are dictated largely by the requirements of the manufacturing process. Once the kinds of structures required are specified, cost estimates are based on the plinth area and the rates for various types of structures. These rates, of course, vary with the location to some extent.



Notes The cost of land varies considerably from one location to another. While it is very high in urban and even semi-urban locations, it is relatively low in rural locations.

9.1.4 Plant and Machinery

The cost of the plant and machinery, typically the most significant component of the project cost, consists of the following:

Cost of Imported Machinery

This is the sum of (i) FOB (free on board) value, (ii) shipping, freight, and insurance cost, (iii) import duty, and (iv) clearing, loading, unloading and transportation charges.

Cost of Indigenous Machinery

This consists of (i) FOR (free on rail) cost, (ii) sales tax, octroi, and other taxes, if any, and (iii) railway freight and transport charges to the site.

9.1.5 Cost of Stores and Spares

Notes

Foundation and Installation Charges

The cost of the plant and machinery is based on the latest available quotation adjusted for possible escalation. Generally, the provision for escalation is equal to the following product: (latest rate of annual inflation applicable to the plant and machinery) \times (length of the delivery period).

Technical Know-how and Engineering Fees

Often it is necessary to engage technical consultants or collaborators from India and/or abroad for advice and help in various technical matters like preparation of the project report, choice of technology, selection of the plant and machinery, detailed engineering, and so on. While the amount payable for obtaining the technical know-how and engineering services for setting up the project is a component of the project cost, the royalty payable annually, which is typically a percentage of sales, is an operating expense taken into account in the preparation of the projected profitability statements.

Expenses on Foreign Technicians and Training of Indian Technicians Abroad

Services of foreign technicians may be required in India for setting up the project and supervising the trial runs. Expenses on their travel, boarding, and lodging along with their salaries and allowances must be shown here. Likewise, expenses on Indian technicians who require training abroad must also be included here.

Miscellaneous Fixed Assets

Fixed assets and machinery which are not part of the direct manufacturing process may be referred to as miscellaneous fixed assets. They include items like furniture, office machinery and equipment, tools, vehicles, railway siding, diesel generating sets, transformers, boilers, piping systems, laboratory equipment, workshop equipment, effluent treatment plants, firefighting equipment, and so on. Expenses incurred for the procurement or use of patents, licences, trade marks, copyrights, etc. and deposits made with the electricity board may also be included here.

Preliminary and Capital Issue Expenses

Expenses incurred for identifying the project, conducting the market survey, preparing the feasibility report, drafting the memorandum and articles of association, and incorporating the company are, referred to as preliminary expenses.

Expenses borne in connection with the raising of capital from the public are referred to as capital issue expenses. The major components of capital issue expenses are: underwriting commission, brokerage, fees to managers and registrars, printing and postage expenses, advertising and publicity expenses, listing fees, and stamp duty.

Pre-operative Expenses

Expenses of the following types incurred till the commencement of commercial production are referred to as pre-operative expenses: (i) establishment expenses, (ii) rent, rates, and taxes, (iii) travelling expenses, (iv) interest and commitment charges on borrowings, (v) insurance charges, (vi) mortgage expenses, (vii) interest on deferred payments, (viii) start-up expenses, and (ix) miscellaneous expenses.

Notes	Pre-operative expenses are directly related to the project implementation schedule. So, delays in project implementation, which are fairly common, tend to push up these expenses. Appreciative of this, financial institutions allow for some delay (20 to 25 percent) in the project implementation schedule and accordingly permit a cushion in the estimate for pre-operative expenses. Pre-operative expenses incurred up to the point of time the plant and machinery are set up may be capitalized by apportioning them to fixed assets on some acceptable basis. Pre-operative expenses incurred from the point of time the plant and machinery are set up are treated as revenue expenditure. The firm may, however, treat them as deferred revenue expenditure and write them off over a period of time.
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Provision for Contingencies

A provision for contingencies is made to provide for certain unforeseen expenses and price increases over and above the normal inflation rate which is already incorporated in the cost estimates.

To estimate the provision for contingencies the following procedure may be followed: (i) Divide the project cost items into two categories, viz., 'firm' cost items and 'non-firm' cost items (firm cost items are those which have already been acquired or for which definite arrangements have been made). (ii) Set the provision for contingencies at 5 to 10 percent of the estimated cost of non-firm cost items. Alternatively, make a provision of 10 percent for all items (including the margin money for working capital) if the implementation period is one year or less. For every additional one year, make an additional provision of 5 percent.

Margin Money for Working Capital

The principal support for working capital is provided by commercial banks and trade creditors. However, a certain part of the working capital requirement has to come from long-term sources of finance. Referred to as the 'margin money for working capital', this is an important element of the project cost.

The margin money for working capital is sometimes utilised for meeting over runs in capital cost. This leads to a working capital problem (and sometimes a crisis) when the project is commissioned. To mitigate this problem, financial institutions stipulate that a portion of the loan amount, equal to the margin money for working capital, be blocked initially so that it can be released when the project is completed.

Initial Cash Losses

Most of the projects incur cash losses in the initial years. Yet, promoters typically do not disclose the initial cash losses because they want the project to appear attractive to the financial institutions and the investing public. Failure to make a provision for such cash losses in the project cost generally affects the liquidity position and impairs the operations. Hence prudence calls for making a provision, overt or covert, for the estimated initial cash losses.

Self Assessment

Fill in the blanks:

1. A for contingencies is made to provide for certain unforeseen expenses and price increases over and above the normal inflation rate which is already incorporated in the cost estimates.

- | | |
|---|--------------|
| 2. The principal support for working capital is provided by banks and trade creditors. | Notes |
| 3. Most of the incur cash losses in the initial years. | |
| 4. The money for working capital is sometimes utilised for meeting over runs in capital cost. | |
| 5. expenses are directly related to the project implementation schedule. | |

9.2 Means of Finance

To meet the cost of the project the following means of finance are available:

1. Share capital
2. Term loans
3. Debenture capital
4. Deferred credit
5. Incentive sources
6. Miscellaneous sources

The means of finance in detail given below:

1. **Share Capital:** There are two types of share capital equity capital and preference capital. Equity capital represents the contribution made by the owners of the business, the equity shareholders, who enjoy the rewards and bear the risks of ownership. Equity capital being risk capital carries no fixed rate of dividend. Preference capital represents the contribution made by preference shareholders and the dividend paid on it is generally fixed.
2. **Term Loans:** Provided by financial institutions and commercial banks, term loans represent secured borrowings which are a very important source (and sometimes, the major source) for financing new projects as well as for the expansion, modernisation, and renovation schemes of existing firms. There are two broad types of term loans available in India: rupee term loans and foreign currency term loans. While the former are given for financing land, building, civil works, indigenous plant and machinery, and so on, the latter are provided for meeting the foreign currency expenditures towards the import of equipment and technical know how.
3. **Debenture Capital:** Akin to promissory notes, debentures are instruments for raising debt capital. There are two broad types of debentures: non-convertible debentures and convertible debentures. Non-convertible debentures are straight debt instruments. Typically they carry a fixed rate of interest and have a maturity period of 5 to 9 years. Convertible debentures, as the name implies, are debentures which are convertible, wholly or partly, into equity shares. The conversion period and price are announced in advance.
4. **Deferred Credit:** Many a time the suppliers of the plant and machinery offer a deferred credit facility under which payment for the purchase of the plant and machinery can be made over a period of time.
5. **Incentive Sources:** The government and its agencies may provide financial support as an incentive to certain types of promoters or for setting up industrial units in certain locations. These incentives may take the form of seed capital assistance (provided at a nominal rate of interest to enable the promoter to meet his contribution to the project), or capital subsidy (to attract industries to certain locations), or tax deferment or exemption (particularly from sales tax) for a certain period.

- Notes**
- 6. **Miscellaneous Sources:** A small portion of the project finance may come from miscellaneous sources like unsecured loans, public deposits, and leasing and hire purchase finance. Unsecured loans are typically provided by the promoters to bridge the gap between the promoters' contribution (as required by the financial institutions) and the equity capital the promoters can subscribe to. Public deposits represent unsecured borrowings from the public at large. Leasing and hire purchase finance represent a form of borrowing different from the conventional term loans and debenture capital.



Task Discuss about Incentive Sources.

9.2.1 Planning the Means of Finance

We have described the various means of finance that can be tapped for a project. How should you go about determining the specific means of finance for a given project? The guidelines and considerations that should be borne in mind for this purpose are as follows:

1. Norms of regulatory bodies and financial institutions
2. Key business considerations

Norms of Regulatory Bodies and Financial Institutions

In some countries, the proposed means of finance for a project must either be approved by a regulatory agency or conform to certain norms laid down by the government or financial institutions in this regard. The primary purpose of such regulations is to impart prudence to project financing decisions and provide a measure of protection to investors. In addition, the norms of financial institutions, which often provide substantial assistance to projects significantly shape and circumscribe project financing decisions.

Key Business Considerations

The key business considerations which are relevant for the project financing decision are: cost, risk, control, and flexibility.

1. **Cost:** In general the cost of debt funds is lower than the cost of equity funds. Why? The primary reason is that the interest payable on debt capital is a tax-deductible expense whereas the dividend payable on equity capital is not.
2. **Risk:** The two main sources of risk for a firm (or project) are: business risk and financial risk. Business risk refers to the variability of earnings before interest and taxes and arises mainly from fluctuations in demand and variability of prices and costs. Financial risk represents the risk arising from financial leverage. It must be emphasized that while debt capital is cheap it is also risky because of the fixed financial burden associated with it.
3. **Control:** From the point of view of the promoters of the project, the issue of control is important. They would ordinarily prefer a scheme of financing which enables them to maximise their control, current as well as potential, over the affairs of the firm, given their commitment of funds to the project.
4. **Flexibility:** This refers to the ability of a firm (or project) to raise further capital from any source it wishes to tap to meet the future financing needs. This provides maneuverability to the firm. In most practical situations, flexibility means that the firm does not fully

exhaust its debt capacity. Put differently, it maintains reserve borrowing powers to enable it to raise debt capital to meet largely unforeseen future needs.

Notes



Did u know? In some countries, the proposed means of finance for a project must either be approved by a regulatory agency or conform to certain norms laid down by the government or financial institutions in this regard.

9.3 Working Capital Requirement and its Financing

In estimating the working capital requirement and planning for its financing, the following points have to be born in mind:

1. The working capital requirement consists of the following: (i) raw materials and components (indigenous as well as imported), (ii) stocks of goods-in-process (also referred to as work-in-process), (iii) stocks of finished goods, (iv) debtors, (v) operating expenses and (vi) consumable stores.
2. The principal sources of working capital finance are: (i) working capital advances provided by commercial banks, (ii) trade credit, (iii) accruals and provisions, and (iv) long term sources of financing.
3. There are limits to obtaining working capital advances from commercial banks. They are in two forms: (i) the aggregate permissible bank finance is specified as per the norms of lending, followed by the lending bank, (ii) against each current asset a certain amount of margin money has to be provided by the firm.
4. The Tandon Committee has suggested three methods for determining the maximum permissible amount of bank finance for working capital. The method that is generally employed now is the second method. According to this method, the maximum permissible bank finance is calculated as follows:

Current assets as per the norms laid down by the Tandon Committee (0.75)

Non-bank current liabilities like trade credit and provisions

The implication of this norm is that at least 25 percent of current assets must be supported by long-term sources of finance.

5. The margin requirement varies with the type of current asset. While there is no fixed formula for determining the margin amount, the ranges within which margin requirements for various current assets lie are as follows:

Current Assets	Margin
Raw materials	10-25 percent
Work-in-process	20-40 percent
Finished goods	30-50 percent
Debtors	30-50 percent

9.3.1 Profitability Projections (or Estimates of Working Results)

Given the estimates of sales revenues and cost of production, the next step is to prepare the profitability projections or estimates of working results (as they are referred to by term lending

Notes	financial institutions in India). The estimates of working results may be prepared along the following lines:
A.	Cost of production
B.	Total administrative expenses
C.	Total sales expenses
D.	Royalty and know how payable
E.	Total cost of production (A + B + C + D)
F.	Expected sales
G.	Gross profit before interest
H.	Total financial expenses
I.	Depreciation
J.	Operating Profit (G - H - I)
K.	Other income
L.	Preliminary expenses written off
M.	Profit/loss before taxation J + K - L)
N.	Provision for taxation
O.	Profit after tax (M - N)
	Less Dividend on
	Preference capital
	Equity capital
P.	Retained profit
Q.	Net cash accrual (P + I + L)

These are explained below:

1. **Cost of Production:** This represents the cost of materials, labour, utilities, and factory overheads as calculated earlier.
2. **Total Administrative Expenses:** This consists of (i) administrative salaries, (ii) remuneration to directors, (iii) professional fees, (iv) light, postage, telegrams, and telephones, and office supplies (stationery, printing, etc.), (v) insurance and taxes on office property, and (vi) miscellaneous items.
3. **Total Sales Expenses:** The expenses included under this head are: (i) commission payable to dealers, (ii) packing and forwarding charges, (iii) salary of sales staff (which may be increased at 5 percent per annum), (iv) sales promotion and advertising expenses, and (v) other miscellaneous expenses.
4. **The selling expenses:** Depend mainly on the nature of industry and the kind of competitive conditions that prevail. Typically, selling expenses vary between 5 and 10 percent of sales. The experience of similar firms in the industry may be used as a basic guideline.
5. **Royalty and Know how:** Payable Royalty and know how payable annually may be shown here. The royalty rate is usually 25 per cent of sales. Further, royalty is payable often for a limited number of years, say 5 to 10 years.

6. **Total Cost of Production:** This is simply the sum of cost of production, total administrative expenses, total sales expenses, and royalty and know how payable.
7. **Expected Sales:** The figures of expected sales are drawn from the estimates of sales and production prepared earlier in the financial analysis and projection exercise.
8. **Gross Profit before Interest:** This represents the difference between expected sales and total cost of production.
9. **Total Financial Expenses:** Financial expenses consist of interest on term loans, interest on bank borrowings, commitment charges on term loans, and commission for bank guarantees. The principal financial expenses, of course, are interest on term loans and interest on bank borrowings.
10. **Depreciation:** This is an important item, particularly for capital intensive projects. In figuring out the depreciation charge, the following points should be borne in mind:
Contingency margin and pre operative expenses provided in estimating the cost of project should be added to the fixed assets proportionately to ascertain the value of fixed assets for determining the depreciation charge.
Preliminary expenses in excess of 2.5 per cent of the project cost (excluding working capital margin) should be added to fixed assets proportionately to ascertain the value of fixed assets for determining the depreciation charge.
The Income Tax Act specifies that the written down value method should be used for tax purposes. It further specifies the rate of depreciation applicable to different kinds of assets.
For company law (financial reporting) purposes, the method of depreciation may be either the Written Down Value (WDV) method or the straight line (SL) method. From 1988 onwards the depreciation rates under the Companies Act have been delinked from those under the Income Tax Act.
11. **Other Income:** This represents income arising from transactions not part of the normal operations of the firm.



Example: Examples of such transactions are: sale of machinery, disposal of scrap, etc. Except disposal of scrap, which can be reasonably anticipated and estimated, the effects of other non-operating transactions can hardly be estimated. Of course, when non-operating transactions result in a deficit, other income would be negative—put differently, there will be a non-operating loss.

12. **Write-off of Preliminary Expenses:** Preliminary expenses up to 2.5 per cent of the cost of project or capital employed, whichever is higher, can be amortised in ten equal annual instalments.
13. **Profit-Loss before Taxation:** This is equal to: operating profit + other income – write-off of preliminary expenses.
14. **Provision for Taxation:** To figure out the tax burden, a sound understanding of the Income Tax Act a complicated legislation and relevant case laws is required. While calculating the taxable income, a variety of incentives and concessions have to be taken into account. Once the taxable income, as per the Income Tax Act, is calculated, the tax burden can be figured out fairly easily by applying the appropriate tax rates.
15. **Profit after Taxation:** This is simply profit/loss before taxation minus provision for taxation. A part of profit after tax is usually paid out as dividend – dividend on preference capital and dividend on equity capital.

Notes

- Notes**
16. **Retained Profit:** The difference between profit after tax and dividend payment is referred to as retained profit. It is also called ploughed back earnings.
 17. **Net Cash Accrual:** The net cash accrual from operations is equal to: retained profit + depreciation + write off of preliminary expenses + other non-cash charges.

9.3.2 Projected Balance Sheet

The balance sheet, showing the balance in various asset and liability accounts, reflects the financial condition of the firm at a given point of time. The format of a balance sheet as prescribed by the Companies Act is given below:

Table 9.1: Format of Balance Sheet

Liabilities	Assets
Share capital	Fixed assets
Reserves and surplus	Investments
Secured loans	Current assets, loans and advances
Unsecured loans	Miscellaneous expenditures and losses
Current liabilities and provisions	

The liabilities side of the balance sheet shows the sources of finance employed by the business. Share capital consists of paid-up equity and preference capital. Reserves and surplus represent mainly the accumulated retained earnings. They are shown in different accounts like the capital reserve, the investment allowance reserve, and the general reserve. Secured loans represent the borrowing; of the firm against which security has been provided. The important components of secured loans are debentures, term loans from financial institutions, and loans from commercial banks. Unsecured loans represent borrowings against which no specific security has been provided. The important constituents are fixed deposits from public and unsecured loans from promoters. Current liabilities are obligations which mature in the near future, usually a year. These obligations arise mainly from items which enter the operating cycle: payables from acquiring materials and supplies used in production, and accruals of wages, salaries, and rentals. Provisions include mainly tax provision, provision for provident fund, provision for pension and gratuity, and provision for proposed dividends.



Caution The liabilities side of the balance sheet shows the sources of finance employed by the business. Share capital consists of paid-up equity and preference capital.

9.4 Time Value of Money

Money has time value. A rupee today is more valuable than a rupee a year hence. Why? There could be several reasons:

1. Individuals, in general, prefer current consumption to future consumption.
2. Capital can be employed productively to generate positive returns. An investment of one rupee today would grow to $(1 + r)$ a year hence (r is the rate of return earned on the investment).

3. In an inflationary period a rupee today represents a greater real purchasing power than a rupee a year hence.

Notes

9.4.1 Future Value of Single Amount

The process of investing money as well as reinvesting the interest earned thereon is called compounding. The future value or compounded value of an investment after n years when the interest rate is r percent is:

$$FV_n = PV(1 + r)^n$$

In this equation $(1 + r)^n$ is called the future value interest factor or simply the future value factor.

To solve future value problems you have to find the future value factors. You can do it in different ways.



Example: Suppose you invest ₹ 5,000 for three years in a savings account that pays 10 percent interest per year. If you let your interest income be reinvested, your investment will grow as follows:

<i>First year</i>	Principal at the beginning	5,000
	Interest for the year	500
	(₹ 5,000 × 0.10)	
	Principal at the end	5,500
<i>Second year</i>	Principal at the beginning	5,500
	Interest for the year	550
	(₹ 5,500 × 0.10)	
	Principal at the end	6,050
<i>Third year</i>	Principal at the beginning	6,050
	Interest for the year	605
	(₹ 6,050 × 0.10)	
	Principal at the end	6,655

Compound and Simple Interest

So far we have assumed that the money is invested at compound interest which means that each interest payment is reinvested to earn further interest in future periods. By contrast, if no interest is earned on interest, the investment earns only simple interest. In such a case the investment grows as follows:

$$\text{Future value} = \text{Present value} [1 + \text{Number of years} \times \text{Interest rate}]$$

Doubling Period

Investors commonly ask the question: How long would it take to double the amount at a given rate of interest? To answer this question we have to calculate the future value interest and we find that when the interest rate is 12 percent it takes about 6 years to double the amount, when the interest is 6 percent it takes about 12 years to double the amount, so on and so forth. Is there a rule of thumb which dispenses with the use of the future value interest factor table? Yes, there

Notes

is one and it is called the rule of 72. According to this rule of thumb the doubling period is obtained by dividing 72 by the interest rate. For example, if the interest rate is 8 percent, the doubling period is about 9 years ($72/8$). Likewise, if the interest rate is 4 percent the doubling period is about 18 years ($72/4$). Though somewhat crude, it is a handy and useful rule of thumb.

9.4.2 Present Value of a Single Amount

The process of discounting, used for calculating the present value, is simply the inverse of compounding. The present value formula can be readily obtained by manipulating the compounding formula:

$$FV_n = PV (1 + r)^n$$

Dividing both the sides of Eq. by $(1 + r)^n$, we get:

$$PV = FV_n [1/(1 + r)^n]$$

The factor $1/(1 + r)^n$ in Eq. (7.3) is called the discounting factor or the Present Value interest factor ($PVIF_m$).



Example: What is the present value of ₹ 1,000 receivable 6 years hence if the rate of discount is 10 percent?

The present value is:

$$\text{₹ } 1,000 \times PVIF, 10\%, 6 = \text{₹ } 1,000 (0.5645) = \text{₹ } 564.5$$

Present Value of an Uneven Series

In financial analysis we often come across uneven cash flow streams.

For example, the cash flow stream associated with a capital investment project is typically uneven. Likewise, the dividend stream associated with an equity share is usually uneven and perhaps growing.

The present value of a cash flow stream uneven or even may be calculated with the help of the following formula:

$$PV_n = \frac{A_1}{(1+r)^1} + \frac{A_2}{(1+r)^2} + \frac{A_3}{(1+r)^3} + \dots + \frac{A_n}{(1+r)^n}$$

where PV_n = present value of a cash flow stream

A_t = cash flow occurring at the end of year t

r = discount rate

n = duration of the cash flow stream

Future Value of Annuity

An annuity is a stream of constant cash flow (payment or receipt) occurring at regular intervals of time. The premium payments of a life insurance policy,



Example: In general terms the future value of an annuity is given by the following formula:

$$FVA_n = A (1+r)^{n-1} + A (1+r)^{n-2} + \dots + A$$

$$= A [1(1+r)^n - 1] / r$$

Notes

Where FVA_n = future value of an annuity which has a duration of n periods

A = constant periodic flow

r = interest rate per period

n = duration of the annuity

When the cash flows occur at the end of each period, the annuity is called an ordinary annuity or a deferred annuity. When the cash flows occur at the beginning of each period, the annuity is called an annuity due. Our discussion here will focus on a regular annuity the formulae of course can be applied, with some modification, to an annuity due.

Self Assessment

Fill in the blanks:

6. Akin to notes, debentures are instruments for raising debt capital.
7. margin and pre operative expenses provided in estimating the cost of project should be added to the fixed assets proportionately to ascertain the value of fixed assets for determining the depreciation charge.
8. expenses in excess of 2.5 per cent of the project cost.
9. The liabilities side of the shows the sources of finance employed by the business.
10. An is a stream of constant cash flow (payment or receipt) occurring at regular intervals of time.



Notes The items on the financing side of the balance sheet are called capital components. The major capital components are equity, preference, and debt.

9.5 Cost of Capital

Till now we have learnt that the cash flows of a capital investment may be viewed from various points of view and the discount rate applied to the cash flows must be consistent with the point of view adopted. We also mentioned that the standard practice in capital budgeting is to look at the cash flows from the point of view of explicit cost funds (referred to also as investor claims) and apply the weighted average cost of capital of the firm as the discount rate.

The items on the financing side of the balance sheet are called capital components. The major capital components are equity, preference, and debt. Capital, like any other factor of production, has a cost. A company's cost of capital is the average cost of the various capital components (or securities) employed by it. Put differently, it is the average rate of return required by the investors who provide capital to the company.

The cost of capital is a central concept in financial management. It is used for evaluating investment projects, for determining the capital structure, for assessing leasing proposals, for setting the rates that regulated organisations like electric utilities can charge to their customers, so on and so forth.

Now in this unit we will discuss how a company's cost of capital is calculated.

Notes**9.5.1 Concept of Average Cost of Capital**

A company's cost of capital is the weighted average cost of various sources of finance used by it, viz. equity, preference, and debt.

Suppose that a company uses equity, preference, and debt in the following proportions: 50, 10, and 40. If the component costs of equity, preference, and debt are 16 percent, 12 percent, and 8 percent respectively, the Weighted Average Cost of Capital (WACC) will be: $\text{WACC} = (\text{Proportion of equity}) (\text{Cost of equity}) + (\text{Proportion of preference}) (\text{Cost of preference}) + (\text{Proportion of debt}) (\text{Cost of debt})$

$$(\text{Proportion of preference}) (\text{Cost of preference})$$

$$(\text{Proportion of debt}) (\text{Cost of debt}) = (0.5)(16) + (0.10)(12) + (0.4)(8) = 12.4 \text{ percent}$$

Bear in mind the following in applying the preceding formula:

For the sake of simplicity, we have considered only three types of capital (equity; non-convertible, non-callable preference; and non-convertible, non-callable debt). We have ignored other forms of capital like convertible or callable preference, convertible or callable debt, bonds with payments linked to stock market index, bonds that are puttable or extendable, warrants, so on and so forth. Calculating the cost of these forms of capital is somewhat complicated. Fortunately, more often than not, they are a minor source of capital. Hence, excluding them may not make a material difference.

Debt includes long term debt as well as short term debt (such as working capital loans and commercial paper). Some companies leave out the cost of short term debt while calculating the weighted average cost of capital. In principle, this is not correct. Investors who provide short term debt also have a claim on the earnings of the firm. If a company ignores this claim, it will misstate the rate of return required on its investments.

Non-interest bearing liabilities, such as trade creditors, are not included in the calculation of the weighted average cost of capital. This is done to ensure consistency and simplify valuation. True, non-interest bearing liabilities have a cost. However, this cost is implicitly reflected in the price paid by the firm to acquire goods and services. Hence, it is already taken care of before the free cash flow is determined. While it is possible to separate the implicit financing costs of non-interest bearing liabilities from the cash flow, it will make the analysis needlessly more complex, without contributing to the quality thereof.

Rationale

The rationale for using the WACC as the hurdle rate in capital budgeting is fairly straightforward. If a firm's rate of return on its investment exceeds its cost of capital, equity shareholders benefit. To illustrate this point, consider a firm which employs equity and debt in equal proportions and whose cost of equity and debt are 14 percent and 6 percent respectively. The cost of capital, which is the weighted average cost of capital, works out to 10 percent ($0.5 \times 14 + 0.5 \times 6$). If the firm invests ₹ 100 million, say, on a project which earns a rate of return of 12 percent, the return equity funds employed in the project will be:

$$\frac{\text{Total return on the project} - \text{Interest on debt}}{\text{Equity funds}} = \frac{100(0.12) - 50(0.006)}{50} = 18 \text{ percent}$$

Since 18 percent exceeds the cost of equity (14 percent), equity shareholders benefit.

Company Cost of Capital and Project Cost of Capital

At the outset we must distinguish between the company cost of capital and the project cost of capital.

The company cost of capital is the rate of return expected by the existing capital providers. It reflects the business risk of existing assets and the capital structure currently employed.

Notes

The project cost of capital is the rate of return expected by capital providers for a new project or investment the company proposes to undertake. Obviously, it will depend on the business risk and the debt capacity of the new project.

If a firm wants to use its company cost of capital, popularly called the Weighted Average Cost of Capital (WACC), for evaluating a new investment, two conditions should be satisfied.

The business risk of the new investment is the same as the average business risk of existing investments. In other words, the new investment will not change the risk complexion of the firm.

The capital structure of the firm will not be affected by the new investment. Put differently, the firm will continue to follow the same financing policy.

Thus, strictly speaking the WACC is the right discount rate for an investment which is a carbon copy of the existing firm. This unit assumes that new investments will be similar to existing investments in terms of business risk and debt capacity.

9.5.2 Cost of Equity

SML Approach

A popular approach to estimating the cost of equity is the Security Market Line (SML) relationship. According to the SML, the required return on a company's equity is:

$$R_E = R_f + \beta_E (E(R_M) - R_f)$$

where

R_E = required return on the equity of company

R_f = risk free rate

β_E = beta of the equity of company

$E(R_M)$ = expected return on the market portfolio

The SML is regarded by many as a fairly rigorous and objective approach to determining the required return on equity. This approach, however, is based on the assumption that investors eliminate unsystematic risk by efficient diversification and hence require compensation only for systematic risk which is reflected in beta. Market imperfections may impede efficient diversification by investors, exposing them to unsystematic risk. When this occurs, investors will require compensation for unsystematic risk, a factor which is not found in the security market line relationship. Another shortcoming of the SML relates to the instability of the betas of individual securities. Studies have shown that individual securities have unstable betas. This makes the use of a historical beta as a proxy for the future beta somewhat questionable. Notwithstanding these shortcomings, the SML approach is a useful approach for estimating the required rate of return of equity stocks.

Bond Yield Plus Risk Premium Approach

Analysts who do not have faith in the SML approach often resort to a subjective procedure to estimate the cost of equity. They add a judgmental risk premium to the observed yield on the long term bonds of the firm to get the cost of equity:

Notes	Cost of equity = Yield on long term bonds + Risk premium The logic of this approach is fairly simple. Firms that have risky and consequently high cost debt will also have risky and consequently high cost equity. So it makes sense to base the cost of equity on a readily observable cost of debt. The problem with this approach is how to determine the risk premium. Should it be 2 percent, 4 percent, or n percent? There seems to be no objective way of determining it. Most analysts look at the operating and financial risks of the business and arrive at a subjectively determined risk premium that normally ranges between 2 percent and 6 percent. While this approach may not produce a precise cost of equity, it will give a reasonable ballpark estimate.
	Earnings-Price Ratio Approach According to this approach, the cost of equity is equal to: E_t / P_0 Where E_t = expected earnings per share for the next year P_0 = current market price per share E_t may be estimated as: $(\text{Current earnings per share}) \times (1 + \text{growth rate of earnings per share})$. This approach provides an accurate measure of the rate of return required by equity investors in the following two cases: <ol style="list-style-type: none">1. When the earnings per share are expected to remain constant and the dividend payout ratio is 100 percent.2. When retained earnings are expected to earn a rate of return equal to the rate of return required by equity investors.3. The first case is rarely encountered in real life and the second case is also somewhat unrealistic. Hence, the earnings-price ratio should not be used indiscriminately as the measure of the cost of equity capital.

9.5.3 Determining the Proportions

For calculating the WACC we need information on the cost of various sources of capital and the proportions (or weights) applicable to them. So far we discussed how to calculate the cost of specific sources of capital. We now look at how the weights should be established.

The appropriate weights are the target capital structure weights stated in market value terms. What is the rationale for using the target capital structure? What is the logic for using market values?

The primary reason for using the target capital structure is that the current capital culture may not reflect the capital structure that is expected to prevail in future or the capital structure the firm plans to have in future. While it is conceptually appealing to rely the target capital structure, there may be some difficulties in using the target capital structure. A company may not have a well defined target capital structure. Perhaps the changing complexion of its business or the changing conditions in the capital market may be it difficult for the company to articulate its target capital structure. Further, if the target capital structure is significantly different from the current capital structure, it may difficult to estimate what the component capital costs would be. Notwithstanding these difficulties, finance experts generally recommend that the weights must be based on the target capital structure.

In calculating the weights for the target capital structure, should one use book (balance t) values or market values. It is tempting to use the book value weights because they are easy to calculate, they are available for every company (whether it is traded or not), they are fairly stable.

Notes

Finance scholars, however, believe that market values, despite their volatility, are superior to book values, because in order to justify its valuation the firm must earn competitive returns for shareholders and debt holders on the current value (market value) of their investments.

9.5.4 Weighted Marginal Cost of Capital

At the outset we assumed, *inter alia*, that the adoption of new investment proposals will not change either the risk complexion or the capital structure of the firm. Does it mean that the weighted average cost of capital will remain the same irrespective of the magnitude of financing? Apparently not. Generally, the weighted average cost of capital tends to rise as the firm seeks more and more capital. This may happen because the supply schedule of capital is typically upward sloping as suppliers provide more capital, the rate of return required by them tends to increase. A schedule or graph showing the relationship between additional financing and the weighted average cost of capital is called the weighted marginal cost of capital schedule.

Factors Affecting the Weighted Average Cost of Capital

The cost of capital is affected by several factors, some beyond the control of the firm and others dependent on the investment and financing policies of the firm.

Factors Outside a Firm's Control

The three most important factors, outside a firm's direct control, that have a bearing on the cost of capital are the level of interest rates, the market risk premium, and the tax rate:

1. **Level of Interest Rates:** If interest rates in the economy rise, the cost of debt to firms increases and vice versa. Interest rates also have a similar bearing on the cost of preference and cost of equity. Remember that the risk free rate of interest is an important component of the CAPM, a model widely used for estimating the cost of equity. The general decline in interest rates in India from late 1990s to 2004 has lowered the cost of debt as well as the cost of equity.
2. **Market Risk Premium:** The market risk premium reflects the perceived risk of equity stocks and investor aversion to risk. A factor beyond the control of individual firms, market risk premium affects the cost of equity directly and the cost of debt indirectly (through a substitution effect).
3. **Tax Rates:** The tax policy of the government has a bearing on cost of capital. Corporate tax rate has a direct impact on the cost of debt as used in the weighted average cost of capital. The capital gains tax rate relative to the rate on ordinary income has indirect effect on the cost of equity relative to the cost of debt.

Factors within a Firm's Control

The cost of capital of a firm is affected by its investment policy, capital structure policy and dividend policy:

1. **Investment Policy:** To estimate the cost of capital, we start with the rates of required on the outstanding equity and debt of the firm. These rates reflect how risky firm's existing assets are. If a firm plans to invest in assets similar to those currently then its marginal cost of

Notes capital would be more or less the same as its current cash, capital. On the other hand, if the riskiness of its proposed investments is likely to be different from the riskiness of its existing investments, its marginal cost of capital should reflect the riskiness of the proposed investments.

2. **Capital Structure Policy:** To calculate the WACC we assumed a given target capital structure. Of course, a firm can change its capital structure and such a change is to affect the cost of capital because the post tax cost of debt is lower than the cost equity and equity beta, an input for calculating the cost of equity, is a function of financial leverage.
3. **Dividend Policy:** The dividend policy of a firm may affect its cost of equity.

9.5.5 Misconception Surrounding Cost of Capital

The cost of capital is a central concept in financial management linking the investment and financing decisions. Hence, it should be calculated correctly and used properly in investment evaluation. Despite this injunction, we find that several errors characterize the application of this concept. The more common misconceptions, along with suggestions to overcome them, are discussed here.

1. ***The concept of cost of capital is too academic or impractical:*** Some companies do not calculate the cost of capital because they regard it as 'academic', 'impractical', 'irrelevant', or 'imprecise.' These misgivings about cost of capital appear to be unjustified. Such reservation can be dispelled by emphasizing the following points:

The cost of capital is an essential ingredient of discounted cash flow analysis. Since discounted cash flow analysis is now widely used, cost of capital can scarcely be considered 'academic' or 'impractical'.

Out of the various inputs required for discounted cash flow analysis, viz. project life, project cash flows (consisting of initial investment, operating cash flows, and terminal cash flow) and cost of capital, the last one, viz. the cost of capital can perhaps be calculated most reliably and accurately. So a concern about its imprecision seems to be misplaced.

2. ***Current liabilities (accounts payable and provisions) are considered as capital components:*** Sometimes it is argued that accounts payable and accruals are sources of funding to be considered in the calculation of the WACC. This view is not correct because what is not provided by investors is not capital.

Current liabilities arise on account of an operating relationship of the firm with its suppliers and employees. They are deducted when the investment requirement of the project is determined. Hence, they should not be considered in calculating the WACC. Of course, current liabilities are not ignored in capital budgeting because they appear in the cash flows of the project. Put differently, current liabilities affect a project's cash flows, but not its WACC.

3. ***The coupon rate on the firm's existing debt is used as the pre tax cost of debt:*** The coupon rate on the firm's existing debt reflects a historical cost. What really matters in investment decision making is the interest rate the firm would pay if it issues debt today. Hence use the current cost of debt, not the historical cost of debt.
4. ***When estimating the market risk premium in the CAPM method, the historical average rate of return is used along with the current risk free rate:*** Consider the following information:
 - (a) Historical average return on common stocks = 19 percent
 - (b) Historical return on long term Treasury bonds= 10 percent

- | | |
|--|--------------|
| <p>(c) Current expected return on common stocks = 14 percent</p> <p>(d) Current return on long term Treasury bonds = 7 percent</p> | Notes |
|--|--------------|

Sometimes, the market risk premium is calculated as the difference between the historical average return on common stocks and the current return on long-term Treasury bonds. This is not correct.

To calculate the market risk premium, you can use the historical risk premium (19 percent 10 percent) or the current risk premium (14 percent 7 percent), but not the difference between the historical average return on common stocks and the current return on long-term Treasury bonds (19 percent 7 percent).

5. ***The cost of equity is equal to the dividend rate or return on equity:*** It appears that the cost of equity is often measured incorrectly. Sometimes it is measured as the current dividend rate (dividend per share as a percentage of face value per share) or as return on equity. Only by accident do these measures represent the cost of equity correctly.

It should be clearly understood that the cost of equity is the rate of return required by equity investors given the risk they are exposed to. It has nothing to do with the current dividend rate or return on equity, which are mere historical numbers.

6. ***Retained earnings are either cost free or cost significantly less than external equity:*** Often firms impute a negligible or low cost to retained earnings under the influence of wrong notions like "retained earnings have no cost because shareholders are satisfied with dividends" or "retained earnings are already with the firm and hence some nominal returns on them may suffice".

The error in such reasoning stems from ignoring the opportunity cost associated with retained earnings. When a firm retains a portion of its earnings, equity shareholders are denied dividends to that extent. If the same were distributed as dividends, equity shareholders can invest elsewhere to earn a rate of return comparable to the cost of equity. Hence the opportunity cost of retained earnings is more or less equal to the cost of equity funds.

7. ***Depreciation has no cost:*** Similar to the misconception that retained earnings are more or less cost free is the notion that depreciation generated funds are also virtually cost free. As one manager put it: "Depreciation is capital already in the company. Since it does not have to be raised, even in an indirect sense of retained earnings, it clearly has no cost."

To guard against such an error, invoke the opportunity cost principle once again. Theoretically, the firm can return the depreciation generated funds to its shareholders and lenders (the parties which provided the finance for asset acquisition) and they, in turn, can invest these funds elsewhere. Hence, the opportunity cost of depreciation generated funds is the average return the shareholders and lenders would earn on these funds by investing them elsewhere. And this would be more or less equal to the average cost of capital of the firm.

8. ***Book value weights may be used to calculate the WACC:*** Often firms use book value weights in the existing capital structure to calculate the WACC. This is not correct.

Weights should be based on market values, not book values. Ideally, the target capital structure (in market value terms) should determine the weights for the WACC. If the target capital structure is not specified, use the current market value weights.

9. ***The cost of capital for a project is calculated on the basis of the specific sources of finance used for it:*** If a firm raises debt when it is investing in some project, it may regard the post tax cost of debt as the relevant cost of capital. Likewise, if it happens to raise equity when

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it is investing in some other project, it may consider the cost of equity as the relevant cost of capital. In both these cases, the error stems from calculating the WACC on the basis of the immediate sources of finance tapped.

The immediate sources of funds used for a project do not necessarily determine the hurdle rate. What matters is the contribution made by the project to overall debt capacity of the firm and not which sources of funds happen to be tapped when the project is being undertaken.

10. ***The project cost of capital is the same as firm's WACC:*** Many firms apply a uniform WACC to all projects, irrespective of differences in their risk characteristics. This practice is based on the following reasoning: "While a project may not have the same risk as the firm, its relevant cost of capital is still the firm's WACC because the investors are paid from the cash flows of the firm, not the cash flows of the project."

The above reasoning is flawed. The return that the investors require from a project is the same as what they would get from an alternative investment with the same risk profile and it has nothing to do with the return that they are currently getting from the firm. For example, if a firm currently engaged in petrochemical business sets up a retailing business, investors will require a return from the retailing business that reflects its riskiness. Note that it is not the WACC of a firm that determines the cost of capital of a project. Rather, it is the other way. Each project has its own cost of capital which reflects its riskiness and its debt capacity. The cost of capital of the firm is the weighted average of the capital costs of various projects undertaken by the firm.



Task Describe how the cost of capital for a project is being calculated?

9.6 Appraisal Criteria

Project appraisal is an exercise, which is required before a project is sanctioned. Appraisal means the act of working out the value, quality and/or condition of the project. The appraisal using ex ante feasibility analytical techniques is carried out at an early date in the pre-plan phase. At this time, the working life lies completely in the future. The future costs and benefit of the project are mere estimates based on certain technical relationship amongst the inputs. These estimates have to be brought back to the present time in order to take a decision on the worthiness of the project. Hence, at the formulation stage, appraisal needs to be carried out in order to help recommend a project strategy to the sanctioning authorities.

9.6.1 Market Appraisal

Secondary information, though useful, often does not provide a comprehensive basis for market and demand analysis. It needs to be supplemented with primary information gathered through a market survey, specific to the project being appraised.

The market survey may be a census survey or a sample survey. In a census survey, the entire population is covered. (The word 'population' is used here in a particular sense. It refers to the totality of all units under consideration in a specific study. Examples: All industries using milling machines, all readers of the Economic Times). Census surveys are employed principally for intermediate goods and investment goods when such goods are used by a small number of firms. In other cases a census survey is prohibitively costly and may also be infeasible. For example, it would be inordinately expensive in fact almost impossible to cover every user of Lifebuoy or every person in the income bracket ₹ 10,000-15,000.

Due to the above mentioned limitations of the census survey, the market survey, in practice, is typically a sample survey. In such a survey a sample of population is contacted or observed and relevant information is gathered. On the basis of such information, inferences about the population may be drawn.

Notes

The information sought in a market survey may relate to one or more of the following:

1. Total demand and rate of growth of demand
2. Demand in different segments of the market
3. Income and price elasticities of demand
4. Motives for buying
5. Purchasing plans and intentions
6. Satisfaction with existing products
7. Unsatisfied needs
8. Attitudes toward various products
9. Distributive trade practices and preferences
10. Socio-economic characteristics of buyers

Steps in a Sample Survey

Typically, a sample survey consists of the following steps:

Define the Target Population: In defining the target population the important terms should be carefully and unambiguously defined. The target population may be divided into various segments which may have differing characteristics. For example, all television owners may be divided into three to four income brackets.

Select the Sampling Scheme and Sample Size: There are several sampling schemes: simple random sampling, cluster sampling, sequential sampling, stratified sampling, systematic sampling, and non probability sampling. Each scheme has its advantages and limitations. The sample size, other things being equal, has a bearing on the reliability of the estimates – larger the sample size, the greater the reliability.

Develop the Questionnaire: The questionnaire is the principal instrument for eliciting information from the sample of respondents. The effectiveness of the questionnaire as a vice for eliciting the desired information depends on its length, the types of questions, and the wording of the questions. Developing the questionnaire requires a thorough understanding of the product and service and its usage, imagination, insights into human behavior, appreciation of subtle linguistic nuances, and familiarity with the tools of descriptive inferential statistics to be used later for analysis. It also requires knowledge of psychological scaling techniques if the same are employed for obtaining information relating to attitudes, motivations, and psychological traits. Industry and trade market surveys, in comparison to consumer surveys, generally involve more technical and specialised questions.

Since the quality of the questionnaire has an important bearing on the results of the market survey, the questionnaire should be tried out in a pilot survey and modified in the light of problems/difficulties noted.

Recruit and Train the Field Investigators: Recruiting and training of field investigators must be planned well since it can be time consuming. Great care must be taken in recruiting right kind of investigators and imparting the proper kind of training to them. Investigators involved in

Notes industry and trade market surveys need intimate knowledge the product and technical background, particularly for products based on sophisticated technologies.

Obtain Information as per the Questionnaire from the Sample of Respondents: Respondents may be interviewed personally, telephonically, or by mail for obtaining information. Personal interviews ensure a high rate of response. They are, however, expensive likely to result in biased responses because of the presence of the interviewer. Mail surveys by snail mail or e-mail are economical and evoke fairly candid responses. The response rate, however, is often low. Telephonic interviews, common in western countries, traditionally were not popular in India because of high telephone tariffs and low teledensity. Things, however, are changing with telecom revolution.

Scrutinise the Information Gathered: Information gathered should be thoroughly scrutinised to eliminate data which is internally inconsistent and which is of dubious validity. For example, a respondent with a high income and large family may say that he lives in a one room tenement. Such information, probably inaccurate, should be deleted. Sometimes data inconsistencies may be revealed only after some analysis.

Analyse and Interpret the Information: Information gathered in the survey needs to be analysed and interpreted with care and imagination. After tabulating it as per a plan of analysis, suitable statistical investigation may be conducted, wherever possible and necessary. For purposes of statistical analysis, a variety of methods are available. These may be divided into two broad categories: parametric methods and non-parametric methods. Parametric methods assume that the variable or attribute under study conforms to some known distribution. Non-parametric methods do not presuppose any particular distribution.

Results of the data based on the sample survey will have to be extrapolated to the target population. For this purpose, appropriate inflationary factors, based on the ratio of the size of the target population to the size of the sample studies, will have to be used.

The statistical analysis of data should be directed by a person who has a good background in statistics as well as economics.

It may be emphasized that the results of the market survey can be vitiated by: (i) non-representativeness of the sample, (ii) imprecision and inadequacies in the questions, (iii) failure of the respondents to comprehend the questions, (iv) deliberate distortions in the answers given by the respondents, (v) inept handling of the interviews by the investigators, (vi) cheating on the part of the investigators, (vii) slip shod scrutiny of data, and (viii) incorrect and inappropriate analysis and interpretation of data.

9.6.2 Characterisation of Market

Based on the information gathered from secondary sources and through the market survey, the market for the product/service may be described in terms of the following:

1. Effective demand in the past and present
2. Breakdown of demand
3. Price
4. Methods of distribution and sales promotion
5. Consumers
6. Supply and competition
7. Government policy

Effective Demand in the Past and Present Notes

To gauge the effective demand in the past and present, the starting point typically is apparent consumption which is defined as:

$$\text{Production} + \text{Imports} - \text{Exports} - \text{Changes in stock level}$$

The figure of apparent consumption has to be adjusted for consumption of the product by the producers and the effect of abnormal factors. The consumption series, after such adjustments, may be obtained for several years.

In a competitive market, effective demand and apparent consumption are equal. However, in most of the developing countries, where competitive markets do not exist for a variety of products due to exchange restrictions and controls on production and distribution, the figure of apparent consumption may have to be adjusted for market imperfections. Admittedly, this is often a difficult task.

Breakdown of Demand

To get a deeper insight into the nature of demand, the aggregate (total) market demand may be broken down into demand for different segments of the market. Market segments may be defined by (i) nature of product, (ii) consumer group, and (iii) geographical division.

1. **Nature of Product:** One generic name often subsumes many different products: steel covers sections, rolled products, and various semi-finished products; commercial vehicles, cover trucks and buses of various capacities; so on and so forth.
2. **Consumer Groups:** Consumers of a product may be divided into industrial consumers and domestic consumers. Industrial consumers may be sub divided industry wise. Domestic consumers may be further divided into different income groups.
3. **Geographical Division:** A geographical breakdown of consumers is helpful, particularly for products which have a small value-to-weight relationship and for products which require regular, efficient after sales service.

Why is segmental analysis required? Segmental information is helpful because the nature of demand tends to vary from one segment to another. The demand from consumers in high income brackets may not be sensitive to price variations whereas the demand from consumers in low income brackets may be very sensitive to price variations and different marketing strategies may be appropriate for different market segments.

Price

Price statistics must be gathered along with statistics pertaining to physical quantities. It may be helpful to distinguish the following types of prices: (i) manufacturer's price quoted as FOB (free on board) price or CIF (cost, insurance, and freight) price, (ii) landed price for imported goods, (iii) average wholesale price, and (iv) average retail price.

Methods of Distribution and Sales Promotion

The method of distribution may vary with the nature of the product. Capital goods, industrial raw materials or intermediates, and consumer products tend to have different distribution channels. Likewise, methods used for sales promotion (advertising, discounts, gift schemes, etc.) may vary from product to product.

Notes

The methods of distribution and sales promotion employed presently and their rationale must be specified. Such a study may explain certain patterns of consumption and highlight the difficulties that may be encountered in marketing the proposed products.

Consumers

Consumers may be characterized along two dimensions as follows:

Table 9.2	
Demographical and Sociological	Attitudinal
Age	Preferences
Sex	Intentions
Income	Habits
Profession	Attitudes
Residence	Responses
Social background	

Supply and Competition

It is necessary to know the existing sources of supply and whether they are foreign or domestic. For domestic sources of supply, information along the following lines may be gathered: location, present production capacity, planned expansion, capacity utilisation level, bottlenecks in production, and cost structure.

Competition from substitutes and near substitutes should be specified because almost any product may be replaced by some other product as a result of relative changes in price, quality, availability, promotional effort, and so on.

Government Policy

The role of the government in influencing the demand and market for a product may be significant. Governmental plans, policies, and legislations, which have a bearing on the market and demand of the product under examination, should be spelt out. These are reflected in production targets in national plans, import and export trade controls, import duties, export incentives, excise duties, sales tax, industrial licensing, preferential purchases, credit controls, financial regulations, and subsidies/penalties of various kinds.



Did u know? Competition from substitutes and near substitutes should be specified because almost any product may be replaced by some other product as a result of relative changes in price, quality, availability, promotional effort, and so on.

9.7 Risk Analysis in Capital Investment Decisions

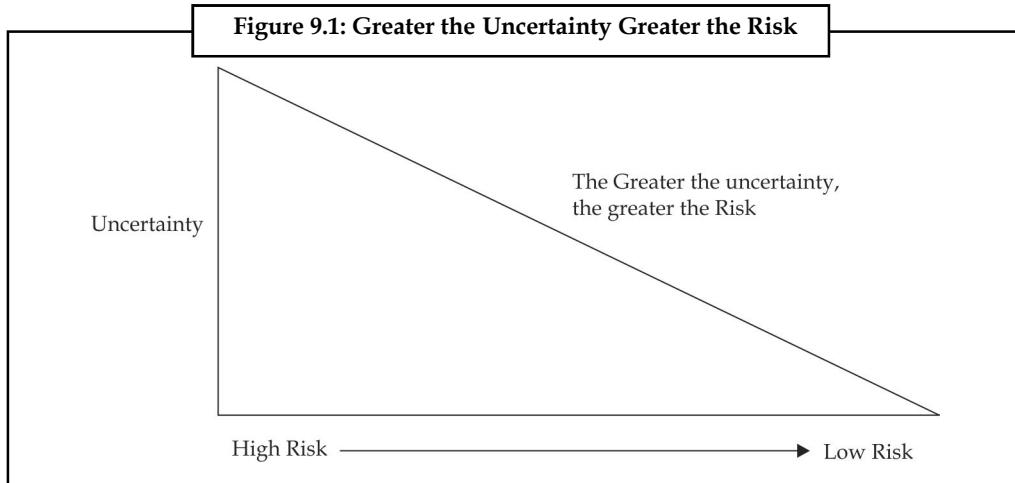
Design projects are inherently risky. Every project is different in some way and this carries with it uncertainties. In project management parlance, risk is the term used to describe the amount of uncertainty and number of threats (elements that threaten the success of the project) that exist or potentially exist in a project. The greater the amount of uncertainty and number of threats, the greater the risk (see Figure 9.1).

Notes

While it is not possible to alleviate all risks, some risks can be eliminated by thoughtful problem solving, while others can be successfully managed so their impact on the project is kept to a minimum.

When the coach of a football team relays the play to the quarterback and the quarterback calls the play in the huddle, a number of uncertainties exist. Will the play work? Will the center-quarter back exchange go smoothly? Will everyone block the way they are supposed to? Will the receiver get open? Will the quarterback throw the ball accurately? Will the receiver catch the ball? Will the pass receiver get tackled and fumble? Will the receiver or someone else on the team get hurt? There are many uncertainties. And there are many threats, too. The defensive team might blitz. A linebacker might anticipate a pass, fall back and play pass defense. A defensive back might intercept the football. A pass rusher might evade a blocker, tackle the quarterback, and fall on top of him. The quarterback might end up flat on his back, injured.

Figure 9.1: Greater the Uncertainty Greater the Risk



To increase the likelihood of the football team winning, the team is, first of all, composed of talented players and coaches who then plan and practice in advance. Every team member knows his role and responsibilities to the team. Plays are practiced over and over. Various scenarios are rehearsed: if this happens, then do this; if that happens, then do that. In football, talented players and coaches who plan and practice are the keys to winning because they reduce the risks that prevent winning.

9.7.1 Strategies for Controlling Risk

PMs must control the threats and uncertainties that could potentially adversely affect their projects. There are a number of strategies for doing this. They include:

1. **Prevention:** reduce the number of uncertainties and/or threats.
2. **Transference:** make some other party responsible for the uncertainties or threats.
3. **Mitigation:** lessen the impact of the uncertainties or threats should they occur.
4. **Contingency planning:** plan in advance for coping with uncertainties or threats should they happen.
5. **Assumption:** identify the uncertainties or threats and accept their potential impact on the project because the cost of prevention, mitigation, transference, and contingency planning are greater than their possible impact.

Notes These strategies are implemented through a variety of risk management procedures. The obvious ones include:

1. Accept only project types with which the firm has a proven and positive track record.
2. Work only for past clients where the relationship was successful and avoid working with new clients.
3. Use the same design team(s) on all projects because the team has proven it can work together successfully.

These strategies, however, can lead to a stilted practice that becomes so risk-free that it becomes bland, uninteresting, and unchallenging. Most design firms and design professionals want or need challenges. Challenging projects stretch the portfolio of design firms, design professionals, and PMs. Many design firms actively seek out projects that present greater and more rewarding challenges. Many design professionals and PMs seek out design firms with just that attitude. Of course, new, interesting, and challenging projects present risks. Risks directly associated with the design itself can only be alleviated by good design. The PM and design team should produce the very best design possible to meet the client's and project's needs. But there are other risks design professionals face as well. Surprisingly, many of them are related to the agreement between the owner and the design professional. Design is a challenging and risky enough endeavor as it is without being compounded by natty contractual risks. Fortunately, these can be controlled by employing a few basic risk management strategies, such as:

1. Use standardized contract forms whenever possible.
2. Understand the provisions of the contract.
3. Avoid contract language that increases risk.
4. Avoid unacceptable risks.
5. Use fee types appropriate for services provided.
6. Provide more comprehensive services.
7. Identify excluded as well as included services.
8. Specify how disputes will be resolved.

How can business executives make the best investment decisions? Is there a method of risk analysis to help managers make wise acquisitions, launch new products, modernize the plant, or avoid overcapacity? "Risk Analysis in Capital Investment" takes a look at questions such as these and says "yes"—by measuring the multitude of risks involved in each situation. Mathematical formulas that predict a single rate of return or "best estimate" are not enough. The author's approach emphasizes the nature and processing of the data used and specific combinations of variables like cash flow, return on investment, and risk to estimate the odds for each potential outcome. Managers can examine the added information provided in this way to rate more accurately the chances of substantial gain in their ventures. The article, originally presented in 1964, continues to interest HBR readers. In a retrospective commentary, the author discusses the now routine use of risk analysis in business and government, emphasizing that the method can—and should—be used in any decision-requiring situations in our uncertain world.

Of all the decisions that business executives must make, none is more challenging—and none has received more attention—than choosing among alternative capital investment opportunities. What makes this kind of decision so demanding, of course, is not the problem of projecting return on investment under any given set of assumptions. The difficulty is in the assumptions and in their impact. Each assumption involves its own degree—often a high degree—of uncertainty; and, taken together, these combined uncertainties can multiply into a total

uncertainty of critical proportions. This is where the element of risk enters, and it is in the evaluation of risk that the executive has been able to get little help from currently available tools and techniques.

Notes

There is a way to help the executive sharpen key capital investment decisions by providing him or her with a realistic measurement of the risks involved. Armed with this gauge, which evaluates the risk at each possible level of return, he or she is then in a position to measure more knowledgeably alternative courses of action against corporate objectives.

9.7.2 Need for New Concept

The evaluation of a capital investment project starts with the principle that the productivity of capital is measured by the rate of return we expect to receive over some future period. A dollar received next year is worth less to us than a dollar in hand today. Expenditures three years hence are less costly than expenditures of equal magnitude two years from now. For this reason we cannot calculate the rate of return realistically unless we take into account (a) when the sums involved in an investment are spent, and (b) when the returns are received.

Comparing alternative investments is thus complicated by the fact that they usually differ not only in size but also in the length of time over which expenditures will have to be made and benefits returned.

These facts of investment life long ago made apparent the shortcomings of approaches that simply averaged expenditures and benefits, or lumped them, as in the number-of-years-to-pay-out method. These shortcomings stimulated students of decision making to explore more precise methods for determining whether one investment would leave a company better off in the long run than would another course of action.

It is not surprising, then, that much effort has been applied to the development of ways to improve our ability to discriminate among investment alternatives. The focus of all of these investigations has been to sharpen the definition of the value of capital investments to the company. The controversy and furor that once came out in the business press over the most appropriate way of calculating these values have largely been resolved in favor of the discounted cash flow method as a reasonable means of measuring the rate of return that can be expected in the future from an investment made today.

Thus we have methods which are more or less elaborate mathematical formulas for comparing the outcomes of various investments and the combinations of the variables that will affect the investments. As these techniques have progressed, the mathematics involved has become more and more precise, so that we can now calculate discounted returns to a fraction of a percent.

But sophisticated executives know that behind these precise calculations are data which are not that precise. At best, the rate-of-return information they are provided with is based on an average of different opinions with varying reliabilities and different ranges of probability. When the expected returns on two investments are close, executives are likely to be influenced by intangibles—a precarious pursuit at best. Even when the figures for two investments are quite far apart, and the choice seems clear, there lurk memories of the Edsel and other ill-fated ventures.

9.8 Projected Cash Flow Statement

A projected cash flow statement is used to evaluate cash inflows and outflows to determine when, how much, and for how long cash deficits or surpluses will exist for a farm business during an upcoming time period. That information can then be used to justify loan requests,

Notes determine repayment schedules, and plan for short-term investments. This publication focuses on preparing and using a projected cash flow statement in managing the farm business.

A projected cash flow statement is best defined as a listing of expected cash inflows and outflows for an upcoming period (usually a year). Anticipated cash transactions are entered for the subperiod they are expected to occur. The length of the subperiod depends upon whether a monthly or quarterly cash flow statement is used. The word cash is crucial in this definition, because only cash items are included in a cash flow statement.

Cash inflows include cash operating and capital receipts and can include nonfarm as well as farm revenues. Cash outflows usually include such things as farm operating and capital outlays, family living expenses, and loan payments. However, if the farming operation is completely separate from the family, living expenses would not be included in the cash flow statement for the farming operation. An example of such an arrangement would be a farm that is incorporated and pays salaries to family members. Also included in the list of cash outlays are debt repayment commitments, both principal and interest.

1. What Information is Provided?

Operating expenses are usually not paid evenly over the course of a year for many farm enterprises. Also, marketing patterns for many farm products are not evenly distributed throughout the year. Therefore, revenues usually do not flow into the business, and expenses do not flow out of the business on an equal and regular basis during the year. This results in periods of cash deficits and surpluses.

Knowledge of the amounts of cash deficits and surpluses and the timing and duration of each aids tremendously in setting up a line of credit with a lender. The projected cash flow statement clearly identifies when loan funds will be needed and when the lender can expect to be repaid. This information is extremely useful in justifying loan requests, especially during financially stressful times.

In addition, a projected cash flow statement enables the user to identify the amount and duration of cash surpluses, which is useful when deciding among the various short-term deposit instruments currently available to the investor (i.e., 3-month certificates, 6-month money market certificates, money market funds, etc.).

Of course, the accuracy of the information provided by a projected cash flow statement depends upon the accuracy of revenue and expense projections, the detail included in the cash flow statement, and whether the statement is prepared for quarters, months, or even weeks. Even though it may lack accuracy be cause of being an estimate, a projected cash flow statement does provide a projection of expected cash deficits and surpluses, which can be updated as the year progresses.

2. How is the Statement Organized?

Perhaps the best way to understand how a projected cash flow statement is organized is to think in terms of a calendar, with the columns representing the subperiods for the planning period used in the projection. Usually the planning period is one year, but the subperiods can be as detailed as you desire. The subperiods can represent quarters, months, and even weeks.

The rows represent various categories for the beginning cash balance, cash receipts, cash expenses, borrowing, saving, and the ending cash balance. Of course, the beginning cash balance for each subperiod is the ending cash balance for the previous subperiod.

A very simplified cash flow statement has been adapted from a statement developed by Thomas L. Frey and Danny A. Klinefelter (*Coordinated Financial Statements for Agriculture*) and is used to explain how a projected cash flow statement is organized (handout 1). The

statement used here is a quarterly statement for one year and consists of 5 columns; a column for each of the 4 quarters plus one for projected annual totals. The number of lines necessary to list revenues and expenses depends upon the number needed to account for all revenue and expense items for the farming operation. The simple organization of this statement would make it inadequate in many farming operations. It is used here to teach the mechanics of cash flow budgeting.

Notes

Cash Available: The first line of any cash flow statement is usually the beginning cash balance for the period. That balance includes all readily available funds (i.e., checking accounts, cash, mutual funds with checkwriting privileges, or arrangements for transferring funds to a checking account, etc.).

The next section is the receipt section, which is divided into three subsections: operating receipts, capital receipts, and nonfarm income. Operating receipts include receipts from crops, livestock, custom work, government payments, hedging account withdrawals, and any other cash receipts to the farm business. Each projected cash receipt is entered in the quarter that the cash is expected. It is usually a good idea to include several blank lines throughout the form (for example), so that the statement can be tailored to meet your needs.

Capital receipts are cash inflows from the sale of capital items, such as breeding livestock, machinery, and equipment. Also, only the amount of cash expected to flow into the operation is entered. If farmer A expects to trade a boar to farmer B and receive \$50 in cash plus his new boar, only the \$50 is entered in farmer A's projected cash flow statement. That amount is entered in the quarter that the cash is expected.

Nonfarm income includes off-farm wages and cash received from interest payments, dividends, and other nonfarm sources. The total cash available for the quarter is then calculated by adding the beginning cash balance, operating receipts, capital receipts, and nonfarm income.

Cash Required: The expense section is divided into four subsections: operating expenses, livestock and feed purchases, capital expenditures, and other expenses. Operating expenses include such things as seed, fertilizer, breeding expenses, real estate and property taxes, insurance, utilities, and veterinary. The amount for each item is entered in the quarter when it is expected to be paid, which may be different from when you actually take possession of the item.

The next sub-section is labelled livestock and feed purchases and includes cash expenses for feeder livestock as well as for purchasing breeding livestock. Also included are cash outlays for feed.

The third sub-section is labelled capital expenditures and includes cash outlays to purchase machinery, equipment, buildings, and improvements. If the dealer is to be paid in full and you borrow the money from another lender (i.e., commercial bank, PCA, etc.), the entire amount to be paid is entered in the appropriate quarter. The cash flowing into the operation from the loan will be discussed later.

Other expenses can include hedging account deposits, gross family living withdrawals, nonfarm business expenditures, and income tax and social security payments. Also included in this section are principal and interest payments due for intermediate and long-term loans. The total cash required for the quarter is calculated by adding all expenses projected for the quarter.

The Cash Position: Subtracting total cash required from total cash available yields the cash position before borrowing and inflows from savings. If the cash position is negative

Notes

or below a specified amount, you can transfer any money available in savings to the checking account.

If the cash position before borrowing and after savings, is still negative or below some specified amount, you must borrow those funds needed to satisfy the deficit and/or maintain the minimum amount desired in the checking account. It provides a place to enter operating, intermediate, and long-term borrowing.

A line is also needed to schedule principal and interest payments for operating loans, which lenders usually require to be repaid during the upcoming 12 months from the proceeds of the enterprises financed. For example, if operating funds are borrowed in the spring to plant the corn crop, those funds are usually scheduled to be repaid when the corn is expected to be sold. Of course, if the corn is stored and expected to be sold the next year, then the payment should be scheduled the next year.

Two additional lines are needed to account for any cash remaining at the end of the period. First, when the amount of cash is greater than the minimum balance desired, the excess will likely be invested in a short-term security, money market fund, etc. Therefore, a line is needed to account for funds flowing out of the farm business and into some type of savings or short-term investment. This line is necessary since that amount of cash will not be available for use by the farm business until either the security matures or until the funds are withdrawn by the operator. It is the ending cash balance for the quarter. This is also the beginning cash balance for the next quarter.

The cash position for each quarter is then calculated sequentially as described above, until the ending cash balance for the last quarter is calculated. That amount then becomes the beginning cash balance for the first quarter of the next year's projected cash flow statement.

The last four enable the borrower to keep a running total of the various loan balances. The lines are labelled to distinguish between current year operating loans and operating loans remaining from a previous period. This information is extremely useful when applying for a line of credit from a lender, because the lender needs to know the maximum amount expected to be outstanding as well as amounts expected to be outstanding throughout the year. The balances for each period are increased or decreased as funds are disbursed and payments are made.

Intermediate and long-term loan balances are on a separate line and can be increased or decreased as additional funds are borrowed or payments made. The total loan balance outstanding each period can then be calculated by summing the loan balances outstanding for each type of loan.

3. An Example – Fred Farmer

To illustrate how a projected cash flow statement is prepared, an example is used to describe the anticipated cash transactions for a hypothetical farm operator, Fred Farmer. The information describing this farming operation is presented in handout 2. To understand the mechanics of completing a projected cash flow statement, the example will be used first to complete an annual projected cash flow statement. Therefore, the information from handout 2 will be entered in the column labelled Projected Totals.

9.9 Projected Balance Sheet

Unlike a past balance sheet that shows a business's actual, historical financial positions, a projected balance sheet communicates expected changes in future asset investments, outstanding liabilities and equity financing. Businesses may consider the creation of a projected balance sheet as a way to facilitate long-term, strategic planning. A business long-term plans often concern future asset

growth and how it may be supported by increased financing through both debt and equity. A projected balance sheet provides the most relevant financial information needed in the business planning process.

Notes

1. **Forecasting Balance Sheet:** A projected balance sheet, also referred to as proforma balance sheet, lists specific account balances on a business assets, liabilities and equity for a specified future time. A forecasting balance sheet is a useful tool for business planning in general, and it particularly benefits those individuals responsible for arranging and bringing in additional financing. Using a projected balance sheet, financial personnel can present lenders and investors with detailed financial information about planned future asset expansion, making it easier to persuade capital providers to supply the required financing.
2. **Making Forecast Assumptions:** To create a projected balance sheet, a business makes certain assumptions about how individual balance sheet items may change over time in the future. Business plans often focus on anticipated future sales. A projected balance sheet also starts with forecasting sales revenues. Certain balance sheet items, such as inventory, accounts receivable and accounts payable, exhibit relatively constant relationships to sales, and projections on those items can be made based on projected sales. Other balance sheet items, particularly fixed assets, debt and equity, change only in accordance with a business's policies and management decisions, independent of future sales.
3. **Projecting Asset Items:** Common asset items that are most relevant in a projected balance sheet include cash, accounts receivable, inventory and fixed assets. While the amount of cash expected to be generated from the forecast sales increase may accumulate at a comparable rate, cash balance shown on the balance sheet is not necessarily in proportion to the sales increase. A business may decide to reinvest part of the cash received, allowing cash holdings to grow at a lower projected rate. Both accounts receivable and inventory generally change in proportion to sales increase because more sales can leave more customers on account and require more inventory in stocks. Future changes in fixed assets are not likely to be in proportion to sales and often depend on a business's decision about future capital investments.
4. **Projecting Liability Items:** Major liability items in a projected balance sheet may include accounts payable, short-term debt and long-term debt. Accounts payable often are the result of accepting trade financing on inventory purchases. If more sales require more inventory, the increase in inventory likely leads to an increase in outstanding accounts payable. Thus, accounts payable likely change in proportion to sales. Projection on short-term debt, such as notes payable, often depends on a business's financing policy. To accommodate a sales increase, a business may choose to increase short-term financing at a certain rate each year. Long-term debt usually is left unchanged in initial projections and may change later if additional financing is needed.
5. **Projecting Equity Items:** Owners' equity and retained earnings are the two common sources of equity financing. Similar to projecting long-term debt, owners' equity is also left unchanged in initial balance-sheet projections. Whether or not a business expects to issue additional equity depends on future financing situations. If a shortfall in asset financing through other means exists, a business needs to project an increase in either owners' equity or long-term debt to make up the deficit. Projecting retained earnings essentially relies on the net-income projection in a projected income statement for the same future period.
6. **Projecting Discretionary Financing:** A projected balance sheet may not be balanced upon initial projections of various balance sheet items. Total projected assets may exceed total projected liabilities and equity, resulting in a fund shortage in future financing. On the other hand, if total projected assets are less than total projected liabilities and equity, a

Notes

fund surplus exists. A fund deficit or surplus in projected financing must be balanced out through discretionary financing by adjusting projections on long-term debt or equity. A projected balance sheet becomes balanced when the projected increase in long-term debt or equity equals the amount of fund deficit in initial financing projections. A projected balance sheet can also become balanced if a business uses the projected fund surplus to further increase asset investments or reduce initial financing projections.

9.10 Financing of a Project

Project finance is the long term financing of infrastructure and industrial projects based upon the projected cash flows of the project rather than the balance sheets of the project sponsors. Usually, a project financing structure involves a number of equity investors, known as *sponsors*, as well as a *syndicate* of banks or other lending institutions that provide loans to the operation. The loans are most commonly non-recourse loans, which are secured by the project assets and paid entirely from project cash flow, rather than from the general assets or creditworthiness of the project sponsors, a decision in part supported by financial modeling. The financing is typically secured by all of the project assets, including the revenue-producing contracts. Project lenders are given a lien on all of these assets, and are able to assume control of a project if the project company has difficulties complying with the loan terms.

Generally, a special purpose entity is created for each project, thereby shielding other assets owned by a project sponsor from the detrimental effects of a project failure. As a special purpose entity, the project company has no assets other than the project. Capital contribution commitments by the owners of the project company are sometimes necessary to ensure that the project is financially sound, or to assure the lenders of the sponsors' commitment. Project finance is often more complicated than alternative financing methods. Traditionally, project financing has been most commonly used in the extractive (mining), transportation, telecommunications and energy industries. More recently, particularly in Europe, project financing principles have been applied to other types of public infrastructure under Public Private Partnerships (PPP) or, in the UK, Private Finance Initiative (PFI) transactions (e.g., school facilities) as well as sports and entertainment venues.

Risk identification and allocation is a key component of project finance. A project may be subject to a number of technical, environmental, economic and political risks, particularly in developing countries and emerging markets. Financial institutions and project sponsors may conclude that the risks inherent in project development and operation are unacceptable (unfinanceable). To cope with these risks, project sponsors in these industries (such as power plants or railway lines) are generally completed by a number of specialist companies operating in a contractual network with each other that allocates risk in a way that allows financing to take place. "Several long-term contracts such as construction, supply, off-take and concession agreements, along with a variety of joint-ownership structures, are used to align incentives and deter opportunistic behaviour by any party involved in the project." The various patterns of implementation are sometimes referred to as "project delivery methods." The financing of these projects must also be distributed among multiple parties, so as to distribute the risk associated with the project while simultaneously ensuring profits for each party involved.

A riskier or more expensive project may require **limited recourse financing** secured by a surety from sponsors. A complex project finance structure may incorporate corporate finance, securitization, options (derivatives), insurance provisions or other types of collateral enhancement to mitigate unallocated risk.

Project finance shares many characteristics with maritime finance and aircraft finance; however, the latter two are more specialized fields within the area of asset finance.

Self Assessment

Notes

Fill in the blanks:

11. The of this approach is fairly simple. Firms that have risky and consequently high cost debt will also have risky and consequently high cost equity.
12. At the outset we assumed, inter alia, that the adoption of new investment proposals will not change either the risk complexion or the capital of the firm.
13. If interest rates in the rise, the cost of debt to firms increases and vice versa.
14. The risk premium reflects the perceived risk of equity stocks and investor aversion to risk.
15. Often firms use book value weights in the existing capital structure to calculate the
16. The cost of capital for a is calculated on the basis of the specific sources of finance used for it.

9.11 Summary

- A budget is an important concept in microeconomics, which uses a budget line to illustrate the trade-offs between two or more goods.
- Conceptually, the cost of project represents the total of all items of outlay associated with a project which are supported by long-term funds.
- The cost of land varies considerably from one location to another.
- The cost of the buildings and civil works depends on the kinds of structures required which, in turn, are dictated largely by the requirements of the manufacturing process.
- Services of foreign technicians may be required in India for setting up the project and supervising the trial runs.
- Fixed assets and machinery which are not part of the direct manufacturing process may be referred to as miscellaneous fixed assets.
- Expenses of the following types incurred till the commencement of commercial production are referred to as pre operative expenses.
- The principal support for working capital is provided by commercial banks and trade creditors.
- There are two types of share capital equity capital and preference capital.
- In general the cost of debt funds is lower than the cost of equity funds.
- The selling expenses depend mainly on the nature of industry and the kind of competitive conditions that prevail.

9.12 Keywords

Debenture Capital: Akin to promissory notes, debentures are instruments for raising debt capital.

Deferred Credit: Many a time the suppliers of the plant and machinery offer a deferred credit facility under which payment for the purchase of the plant and machinery can be made over a period of time.

Notes	<p>Expected Sales: The figures of expected sales are drawn from the estimates of sales and production prepared earlier in the financial analysis and projection exercise.</p> <p>Incentive Sources: The government and its agencies may provide financial support as an incentive to certain types of promoters or for setting up industrial units in certain locations.</p> <p>Miscellaneous Fixed Assets: Fixed assets and machinery which are not part of the direct manufacturing process may be referred to as miscellaneous fixed assets.</p> <p>Preliminary Expenses: Expenses incurred for identifying the project, conducting the market survey, preparing the feasibility report, drafting the memorandum and articles of association, and incorporating the company are, referred to as preliminary expenses.</p> <p>Preoperative Expenses: Expenses of the following types incurred till the commencement of commercial production are referred to as pre operative expenses.</p> <p>Provision for Contingencies: A provision for contingencies is made to provide for certain unforeseen expenses and price increases over and above the normal inflation rate which is already incorporated in the cost estimates.</p> <p>Share Capital: There are two types of share capital equity capital and preference capital. Equity capital represents the contribution made by the owners of the business, the equity shareholders, who enjoy the rewards and bear the risks of ownership.</p> <p>Term Loans: Provided by financial institutions and commercial banks, term loans represent secured borrowings which are a very important source (and sometimes, the major source) for financing new projects as well as for the expansion, modernization, and renovation schemes of existing firms.</p>
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9.13 Review Questions

1. Explain about Financial Projections.
2. What do you know about Preliminary and Capital Issue Expenses?
3. Describe about Pre-Operative Expenses.
4. Discuss about Norms of Regulatory bodies and Financial Institutions.
5. Explain about Working Capital Requirement and its financing.
6. Explain about time value of money.
7. What are the factors affecting the weighted average cost of capital?
8. Discuss about Appraisal criteria in Projects.
9. Discuss about risk analysis in capital Investment Decisions.
10. What are the strategies for controlling risk?

Answers: Self Assessment

- | | |
|------------------|----------------|
| 1. Provision | 2. Commercial |
| 3. Projects | 4. Margin |
| 5. Pre-Operative | 6. Promissory |
| 7. Contingency | 8. Preliminary |
| 9. Balance Sheet | 10. Annuity |

		Notes
11.	Logic	
13.	Economy	
15.	WACC	
12.	Structure	
14.	Market	
16.	Project	

9.14 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf

www.pma-india.org/ - Trinidad and Tobago

www.nickjenkins.net/prose/projectPrimer.p

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www.freelancer.com/jobs/Project-Management/

Notes



Case Study

Project Failures From the Top Down: Can Marchionne save Chrysler?

When Chrysler merged with Fiat on June 10, 2009, there was cause for hope and optimism. After an endless string of bad news, perhaps, the auto industry was not dead yet.

On paper it looked like a good deal for everyone. Fiat would return to the US market and sell its popular 500 (Cinquecento), Chrysler would acquire a line of cars that consumers might actually buy, and tens of thousands of workers would keep their jobs.

But the real prize might just be Sergio Marchionne, CEO of Fiat and now CEO of FiatChrysler.

When he first became CEO of Fiat in 2004, Marchionne inherited a company on the brink of failure. It manufactured a lackluster product line and had suffered more than \$12 billion in losses over the previous five years.

To transform the company he embarked on several strategic and operational projects. He fired senior managers, upended a bloated bureaucracy, and brought a team of young aggressive managers on board. Then, he reviewed all projects and killed those that could not pass the market test. And he hired new designers, and demanded a portfolio of exciting projects that would bring customers back to dealer showrooms.

In less than three years he succeeded in one of the most impressive turnarounds in automotive history.

Now, as part of his plan to grow Fiat into a global competitor he has taken on Chrysler. But, can he perform his magic again? Can he save yet another company whose circumstances in many ways, but not all, are strikingly similar to those faced by Fiat just five years ago? Can his leadership style as well as the Fiat 500 be successfully exported to the other side of the Atlantic?

If we look at Marchionne's record by itself, not only is it impressive, but it suggests that he might be the right person at the right time. But, before we can reach this conclusion, his ability to succeed must be considered in the context of what has happened to Chrysler in the last decade. In that case, success may not be assured.

Daimler Chrysler

In May 1998, Daimler-Benz merged with Chrysler. Jurgen Schrempp, CEO of Daimler-Benz, called it a "merger of equals." Robert Eaton, CEO of Chrysler, promised that "within five years we will be among the Big Three automotive companies in the world." Even bringing together two companies from Europe and the United States was not considered a hurdle; Robert A. Lutz, Vice-Chairman of Chrysler, argued that there was "definitely no culture clash here."

But behind this display of public enthusiasm and corporate kinship, Schrempp took complete control and his actions made it clear that this was indeed no "merger of equals." Eaton responded by deferring to Schrempp, often retreating to the safety of his office in Auburn Hills; his top managers responded by defecting to Ford and General Motors. Soon Chrysler was rudderless, projects were lackluster, and within just a few years not only was

Contd...

the product line in trouble but the merger was too. While there were many reasons for its failure, the one most frequently cited was a clash of corporate cultures.

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Cerberus

In 2007 DaimlerChrysler sold Chrysler to Cerberus Capital Management, a private equity firm with no experience in making cars. Bob Nardelli, former CEO of Home Depot, was chosen to head the company. For many, it was clear that the deal was strictly financial and few believed that Cerberus was committed to building a competitive company in an increasingly competitive auto industry plagued with too much capacity.

Nardelli was a “tough-as-nails” CEO. Business Week, in August 2007, said that he “alienated ... virtually all of the management he inherited.” While many thought that his military style was exactly what Chrysler needed, it didn’t work. In that Business Week article, a University of Michigan Professor, Gerald Meyers, said that Cerberus had the right idea, but Nardelli was the “wrong guy.”

Then, Chrysler was hit by the perfect storm. Oil rose to over \$140 per barrel, the economy went into a tailspin, and Chrysler was caught with a product line dominated by gas guzzlers no one wanted to buy.

Marchionne’s Challenge

It is within this context that Fiat has taken a 20 percent stake in Chrysler. Marchionne inherits an organisation shattered by the distant, yet dominant, style of Schrempp and the “tough-as-nails” style of Nardelli. He inherits a workforce that has endured job losses, pay cuts, deterioration in benefits, and the anxiety of an uncertain future. But above all, he inherits a workplace that has suffered one lackluster project after the other, and a project culture that has failed to stress markets not methodology.

Here is the problem; his leadership style, characterised by the quick and disruptive changes he made five years ago, may not be very different from the leadership style practiced by his two predecessors at Chrysler.

But he must be different if he is to succeed in making sustainable changes.

Is he flexible enough to become the transformational leader that Chrysler so desperately needs or will he ignore Chrysler’s rough ride over the last ten years, grab the reins, ignore the cultural differences, and simply repeat history? Can he be tough on the problems but at the same time restore morale and create a project-based environment that motivates not alienates its project teams?

Or, will he be the third in a string of tough CEOs and continue with the beatings until the morale at Chrysler improves?

Question:

1. Analyse the case and discuss the case facts.

Source: <http://www.projectsmart.co.uk/project-failures-from-the-top-down-can-marchionne-save-chrysler.html>

Unit 10: Measuring Project Profitability

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Objectives

After studying this unit, you will be able to:

- Define PayBack Period
- Discuss about Accounting Rate of Return
- Describe about NPV
- Explain about Internal Rate of Return
- Discuss the assessment of various methods

Introduction

As a cost means a different thing to different people (in a given context), therefore, it is obvious that profitability would also be sensitive to these variations. For example, we have "Gross Margin", "Operating Margin", and "Contribution Margin" to assess the profitability from

different perspective; one cannot be a substitute for another, as the constitution of each is different, and each has been devised to assess a performance from a specific perspective.

Notes

Is that all about a project when it comes to profitability assessment; may be not.

One may usually start from ROI (IRR, NPV, and Payback Period (including McFarlan's analysis,)) to assess from returns perspective; however, it may not be true for s/w projects that we carry out for customers because this step would have already been done by customer. Nonetheless, it is the starting point for a project, though this accountability may not lie at our end, or we may not carry out the analysis exactly under those heads.

Having said that, a project (unless it runs to some millions of dollars, or is of strategic importance) may not require these overall measures, instead we would be interested in data in terms of "Earn vs. Burn" (Earned Value). This is profitability from "delivery" aspect. It has been in practice for more than a decade, and has matured over a period of time. Though, there are many variations and measures for this, a quick look upon CPI, SPI, and TCPI should provide enough pointers; getting into details, where these measures point trouble (may be potential one) is the subsequent step.

10.1 Pay Back Period

Payback period in capital budgeting refers to the period of time required for the return on an investment to "repay" the sum of the original investment. For example, a \$1000 investment which returned \$500 per year would have a two year payback period. The time value of money is not taken into account. Payback period intuitively measures how long something takes to "pay for itself." All else being equal, shorter payback periods are preferable to longer payback periods. Payback period is widely used because of its ease of use despite the recognized limitations described below.

The term is also widely used in other types of investment areas, often with respect to energy efficiency technologies, maintenance, upgrades, or other changes. For example, a compact fluorescent light bulb may be described as having a payback period of a certain number of years or operating hours, assuming certain costs. Here, the return to the investment consists of reduced operating costs. Although primarily a financial term, the concept of a payback period is occasionally extended to other uses, such as energy payback period (the period of time over which the energy savings of a project equal the amount of energy expended since project inception); these other terms may not be standardized or widely used.

Payback period as a tool of analysis is often used because it is easy to apply and easy to understand for most individuals, regardless of academic training or field of endeavour. When used carefully or to compare similar investments, it can be quite useful. As a stand-alone tool to compare an investment to "doing nothing," payback period has no explicit criteria for decision-making (except, perhaps, that the payback period should be less than infinity).

The payback period is considered a method of analysis with serious limitations and qualifications for its use, because it does not account for the time value of money, risk, financing or other important considerations, such as the opportunity cost. Whilst the time value of money can be rectified by applying a weighted average cost of capital discount, it is generally agreed that this tool for investment decisions should not be used in isolation. Alternative measures of "return" preferred by economists are net present value and internal rate of return. An implicit assumption in the use of payback period is that returns to the investment continue after the payback period. Payback period does not specify any required comparison to other investments or even to not making an investment.

Payback period is usually expressed in years. Start by calculating Net Cash Flow for each year: Net Cash Flow Year 1 = Cash Inflow Year 1 - Cash Outflow Year 1. Then Cumulative Cash Flow

Notes	= (Net Cash Flow Year 1 + Net Cash Flow Year 2 + Net Cash Flow Year 3 ... etc.) Accumulate by year until Cumulative Cash Flow is a positive number: that year is the payback year.
	To calculate a more exact payback period: Payback Period = Amount to be Invested/Estimated Annual Net Cash Flow 1.
	Additional complexity arises when the cash flow changes sign several times, i.e., it contains outflows in the midst or at the end of the project lifetime. The modified payback period algorithm may be applied then. First, the sum of all of the cash outflows is calculated. Then the cumulative positive cash flows are determined for each period. The modified payback period is calculated as the moment in which the cumulative positive cash flow exceeds the total cash outflow.



Notes Payback period as a tool of analysis is often used because it is easy to apply and easy to understand for most individuals, regardless of academic training or field of endeavour.

Self Assessment

Fill in the blanks:

1. in capital budgeting refers to the period of time required for the return on an investment to "repay" the sum of the original investment.
2. Payback period as a of analysis is often used because it is easy to apply and easy to understand for most individual.
3. The payback period is considered a method of analysis with serious limitations and for its use.
4. Payback period intuitively how long something takes to "pay for itself."

10.2 Accounting Rate of Return

Accounting rate of return or simple rate of return is the ratio of the estimated accounting profit of a project to its average investment. It is an investment appraisal technique. ARR ignores the time value of money.

Formula:

Accounting Rate of Return is calculated as follows:

$$ARR = \frac{\text{Average Accounting Profit}}{\text{Initial Investment}}$$

Average accounting profit is the arithmetic mean of accounting income expected to be earned during each year of the project's life time. Initial investment is sometimes replaced by average investment due to the reason that the book value of the project usually declines over its life time. Average investment is calculated as the sum of the beginning and ending book value of the project divided by 2.



Notes An implicit assumption in the use of payback period is that returns to the investment continue after the payback period. Payback period does not specify any required comparison to other investments or even to not making an investment.

10.2.1 Decision Rule

Notes

Accept the project only if its ARR is not less than the required accounting rate of return. In case of mutually exclusive projects, accept the one with highest ARR.



Example 1: An initial investment of \$130,000 is expected to generate annual cash inflow of \$32,000 for 6 years. Depreciation is to be allowed on the straight line basis. It is estimated that the project will generate a scrap amount of \$10,500 at end of the 6th year. Calculate its accounting rate of return assuming that there are no other expenses on the project.

Solution:

$$\text{Annual Depreciation} = (\text{Initial Investment} - \text{Scrap Value}) / \text{Useful Life in Years}$$

$$\text{Annual Depreciation} = (\$130,000 - \$10,500) / 6 \text{ H"} \$19,917$$

$$\text{Average Accounting Income} = \$32,000 - \$19,917 = \$12,083$$

$$\text{Accounting Rate of Return} = \$12,083 / \$130,000 \text{ H"} 9.3\%$$



Example 2: Compare the following two exclusive projects on the basis of ARR. Cash flows and salvage values are in thousands of dollars. Use the straight line depreciation method.

Project A:

Year	0	1	2	3
Cash Outflow	-220			
Cash Inflow		91	130	105
Salvage Value				10

Project B:

Year	0	1	2	3
Cash Outflow	-220			
Cash Inflow		91	130	105
Salvage Value				10

Solution:

Project A:

$$\text{Step 1: Annual Depreciation} = (220 - 10) / 3 = 70$$

Step 2:

Year	1	2	3
Cash Inflow	91	130	105
Salvage Value	10		
Depreciation*	-70	-70	-70
Accounting Income	16	60	45

Notes $\text{Step 3: Average Accounting Income} = (16 + 60 + 45) / 3$
 $= 40.333$

$\text{Step 4: Accounting Rate of Return} = 40.333 / 220 = 18.3\%$

Project B:

$\text{Step 1: Annual Depreciation} = (198 - 18) / 3 = 60$

Step 2:

Year	1	2	3
Cash Inflow	87	110	84
Salvage Value	18		
Depreciation*	-60	-60	-60
Accounting Income	27	50	42

$\text{Step 3: Average Accounting Income} = (27 + 50 + 42) / 3$
 $= 39.666$

$\text{Step 4: Accounting Rate of Return} = 39.666 / 198 H - 20.0\%$

Since the ARR of the project B is higher, it is more favorable than the project A.

Advantages and Disadvantages

Advantages:

1. Like payback period, this method of investment appraisal is easy to calculate.
2. It recognizes the profitability factor of investment.

Disadvantages:

1. It ignores time value of money. Suppose, if we use ARR to compare two projects having equal initial investments. The project which has higher annual income in the latter years of its useful life may rank higher than the one having higher annual income in the beginning years, even if the present value of the income generated by the latter project is higher.
2. It can be calculated in different ways. Thus there is problem of consistency.
3. It uses accounting income rather than cash flow information. Thus it is not suitable for projects which have high maintenance costs because their viability also depends upon timely cash inflows.



Task Discuss about NPV.

10.3 Net Present Value

In finance, the Net Present Value (NPV) or Net Present Worth (NPW) of a time series of cash flows, both incoming and outgoing, is defined as the sum of the Present Values (PVs) of the individual cash flows of the same entity.

In the case when all future cash flows are incoming (such as coupons and principal of a bond) and the only outflow of cash is the purchase price, the NPV is simply the PV of future cash flows minus the purchase price (which is its own PV). NPV is a central tool in discounted cash flow (DCF) analysis and is a standard method for using the time value of money to appraise long-term projects. Used for capital budgeting and widely used throughout economics, finance, and accounting, it measures the excess or shortfall of cash flows, in present value terms, once financing charges are met.

Notes

NPV can be described as the “difference amount” between the sums of discounted: cash inflows and cash outflows. It compares the present value of money today to the present value of money in future, taking inflation and returns into account.

The NPV of a sequence of cash flows takes as input the cash flows and a discount rate or discount curve and outputs a price; the converse process in DCF analysis – taking a sequence of cash flows and a price as input and inferring as output a discount rate (the discount rate which would yield the given price as NPV) – is called the yield and is more widely used in bond trading.

Formula: Each cash inflow/outflow is discounted back to its Present Value (PV). Then they are summed. Therefore NPV is the sum of all terms,

$$\frac{R_t}{(1+i)^t}$$

where

t - the time of the cash flow

i - the discount rate (the rate of return that could be earned on an investment in the financial markets with similar risk); the opportunity cost of capital.

- the net cash flow (the amount of cash, inflow minus outflow) at time t . For educational purposes, is commonly placed to the left of the sum to emphasize its role as (minus) the investment.

The result of this formula is multiplied with the Annual Net cash inflows and reduced by Initial Cash outlay the present value but in cases where the cash flows are not equal in amount, then the previous formula will be used to determine the present value of each cash flow separately. Any cash flow within 12 months will not be discounted for NPV purpose.



Caution The NPV of a sequence of cash flows takes as input the cash flows and a discount rate or discount curve and outputs a price.

10.3.1 The Discount Rate

The rate used to discount future cash flows to the present value is a key variable of this process.

A firm's weighted average cost of capital (after tax) is often used, but many people believe that it is appropriate to use higher discount rates to adjust for risk or other factors. A variable discount rate with higher rates applied to cash flows occurring further along the time span might be used to reflect the yield curve premium for long-term debt.

Another approach to choosing the discount rate factor is to decide the rate which the capital needed for the project could return if invested in an alternative venture. If, for example, the capital required for Project A can earn 5% elsewhere, use this discount rate in the NPV calculation to allow a direct comparison to be made between Project A and the alternative. Related to this concept is to use the firm's reinvestment rate. Reinvestment rate can be defined as the rate of

Notes return for the firm's investments on average. When analyzing projects in a capital constrained environment, it may be appropriate to use the reinvestment rate rather than the firm's weighted average cost of capital as the discount factor. It reflects opportunity cost of investment, rather than the possibly lower cost of capital.

An NPV calculated using variable discount rates (if they are known for the duration of the investment) better reflects the situation than one calculated from a constant discount rate for the entire investment duration. Refer to the tutorial article written by Samuel Baker for more detailed relationship between the NPV value and the discount rate.

For some professional investors, their investment funds are committed to target a specified rate of return. In such cases, that rate of return should be selected as the discount rate for the NPV calculation. In this way, a direct comparison can be made between the profitability of the project and the desired rate of return.

To some extent, the selection of the discount rate is dependent on the use to which it will be put. If the intent is simply to determine whether a project will add value to the company, using the firm's weighted average cost of capital may be appropriate. If trying to decide between alternative investments in order to maximize the value of the firm, the corporate reinvestment rate would probably be a better choice.

Using variable rates over time, or discounting "guaranteed" cash flows differently from "at risk" cash flows, may be a superior methodology but is seldom used in practice. Using the discount rate to adjust for risk is often difficult to do in practice (especially internationally) and is difficult to do well. An alternative to using discount factor to adjust for risk is to explicitly correct the cash flows for the risk elements using rNPV or a similar method, then discount at the firm's rate.



Did u know? An NPV calculated using variable discount rates better reflects the situation than one calculated from a constant discount rate for the entire investment duration.

Self Assessment

State True or False:

5. NPV can be described as the "difference amount" between the sums of discounted: cash inflows and cash outflows.
6. The CPV of a sequence of cash flows takes as input the cash flows and a discount rate or discount curve and outputs a price.
7. A firm's weighted average cost of capital (after tax) is often used, but many people believe that it is appropriate to use higher discount rates to adjust for risk or other factors.
8. Accounting rate of return or simple rate of return is the ratio of the estimated accounting profit of a project to its average investment.
9. Average accounting profit is the arithmetic mean of accounting income expected to be earned during each year of the project's life time.
10. For some professional investors, their investment funds are committed to target a unspecified rate of return.

10.4 Internal Rate of Return

Notes

The Internal Rate of Return (IRR) or Economic Rate of Return (ERR) is a rate of return used in capital budgeting to measure and compare the profitability of investments. It is also called the Discounted Cash Flow Rate of Return (DCFROR) or the Rate of Return (ROR). In the context of savings and loans the IRR is also called the effective interest rate. The term *internal* refers to the fact that its calculation does not incorporate environmental factors (e.g., the interest rate or inflation).

The internal rate of return on an investment or project is the “annualized effective compounded return rate” or “rate of return” that makes the net present value (NPV as $NET^*1/(1+IRR)^{year}$) of all cash flows (both positive and negative) from a particular investment equal to zero.

In more specific terms, the IRR of an investment is the discount rate at which the net present value of costs (negative cash flows) of the investment equals the net present value of the benefits (positive cash flows) of the investment.

IRR calculations are commonly used to evaluate the desirability of investments or projects. The higher a project’s IRR, the more desirable it is to undertake the project. Assuming all projects require the same amount of up-front investment, the project with the highest IRR would be considered the best and undertaken first.

A firm (or individual) should, in theory, undertake all projects or investments available with IRRs that exceed the cost of capital. Investment may be limited by availability of funds to the firm and/or by the firm’s capacity or ability to manage numerous projects.

10.4.1 Uses

Because the internal rate of return is a rate quantity, it is an indicator of the efficiency, quality, or yield of an investment. This is in contrast with the net present value, which is an indicator of the value or magnitude of an investment.

An investment is considered acceptable if its internal rate of return is greater than an established minimum acceptable rate of return or cost of capital. In a scenario where an investment is considered by a firm that has equity holders, this minimum rate is the cost of capital of the investment (which may be determined by the risk-adjusted cost of capital of alternative investments). This ensures that the investment is supported by equity holders since, in general, an investment whose IRR exceeds its cost of capital adds value for the company (i.e., it is economically profitable).



Caution For some professional investors, their investment funds are committed to target a specified rate of return. In such cases, that rate of return should be selected as the discount rate for the NPV calculation.

10.5 BCR Method

The total discounted benefits are divided by the total discounted costs. Projects with a benefit-cost ratio greater than 1 have greater benefits than costs; hence they have positive *net* benefits. The higher the ratio, the greater the benefits relative to the costs. Note that simple benefit-cost ratio is insensitive to the magnitude of net benefits and therefore may favor projects with small costs and benefits over those with higher net benefits. (This problem can be eliminated by the use of the incremental benefit-cost ratio or the net present value.)

Notes	Calculating the Simple Benefit-Cost Ratio $n+1$ = the number of years over which benefits and costs are analyzed B_i = the benefits of the project in year i , $i=0$ to n C_i = the costs of the project in year i d = the discount rate
	First, discount the costs and benefits in future years. The discounted benefits of the project in year i are equal to $B_i/(1+d)^i$. The discounted costs of the project in year i are equal to $C_i/(1+d)^i$ Then, sum both the discounted benefits and the discounted costs over all years (0 though n) and divide the sum of the discounted benefits by the sum of the discounted costs: $\Sigma(B_i/(1+d)^i)/\Sigma(C_i/(1+d)^i)$, summed over $i = 0$ to n .

10.5.1 Calculating the Incremental Benefit-Cost Ratio

This method is applicable if there are two or more alternative projects to compare to the base case. It is also known as the "Challenger-Defender Method."

B_k = the total discounted benefits of an alternative k , calculated as above

C_k = the total discounted costs of an alternative k , calculated as above

First, discount all future costs and benefits to obtain C_k and B_k for each alternative and for the base case. Then start by identifying the base case as the defender, represented by the subscript "f." Pick the alternative with the least value of total discounted costs as the challenger "c." Calculate the incremental benefit-cost ratio to compare the challenger and defender: $(B_f - B_d)/(C_f - C_d)$. If the incremental B/C ratio is greater than 1, the challenger becomes the defender. Otherwise, the defender remains. In either case, the next alternative in order of increasing value of C_k is picked as the new challenger. Continue to compare challenger to defender following the above logic until all alternatives have been considered. The surviving defender is the economically preferred alternative.

This procedure is mathematically equivalent to Net Present Value, and it always gives the same result, but use of this procedure may provide greater insights into the relationships between costs and benefits of the different projects.

10.6 Other Assessment Methods

The other assessment methods for assessing profitability are discussed below:

10.6.1 Net Present Value

In capital budgeting, net present value, or NPV, is a technique used to evaluate the potential profitability of a new investment or project. This includes a valuation of the cash outflows to sustain an investment against its future cash inflows. For example, say that an investment's future cash returns have a present value of \$100,000, after discounting cash outflows on the investment project. An assessment of whether the investment is profitable will generally depend on whether its current market value, if sold today, would return more than \$100,000.

10.6.2 Discounted Payback Period

The discounted payback period is a capital budgeting technique used to calculate the number of years it will take an investment or project to break even. A discounted payback period will not

exist for an investment that has a negative NPV because the initial cash outflow will never be recovered. When making a business case for sustainable investments, project managers seek projects with the shortest possible discounted payback period.

Notes

10.6.3 Profitability Index

The ratio between a cash outflow on an investment and its prospective payoff is its profitability index, also referred to as profit investment ratio, benefit-cost ratio and value investment ratio. This is a capital budgeting technique that is used to grade an investment by assessing its benefit-cost ratio. Twelve percent of companies used the profitability index capital budgeting technique, among the least frequently used of capital budgeting methods, according to a 2002 survey conducted by John Graham and Campbell Harvey of Duke University.

10.6.4 Internal Rate of Return

The internal rate of return, or IRR, is a capital budgeting method used to evaluate the potential growth of a project. Like the NPV capital budgeting technique, the IRR methodology is a time-adjusted measurement of the profitability of an investment. IRR is a good tool for comparing the profitability and sustainability of different investment opportunities.

Self Assessment

State True or False:

11. The discounted payback period is a capital budgeting technique used to calculate the number of years it will take an investment or project to break even.
12. The ratio between a cash outflow on an investment and its prospective payoff is its profitability index, also referred to as profit investment ratio.
13. The accounting rate of return, or ARR, is a capital budgeting method used to evaluate the potential growth of a project.
14. The ratio between a cash outflow on an investment and its prospective payoff is its profitability index, also referred to as profit investment ratio.
15. When making a business case for sustainable investments, project managers seek projects with the shortest possible discounted payback period.

10.7 Summary

- As a cost means a different thing to different people therefore, it is obvious that profitability would also be sensitive to these variations.
- Payback period in capital budgeting refers to the period of time required for the return on an investment to “repay” the sum of the original investment.
- Accounting rate of return or simple rate of return is the ratio of the estimated accounting profit of a project to its average investment.
- NPV can be described as the “difference amount” between the sums of discounted: cash inflows and cash outflows.
- The Internal Rate of Return (IRR) or Economic Rate of Return (ERR) is a rate of return used in capital budgeting to measure and compare the profitability of investments.

- Notes**
- An investment is considered acceptable if its internal rate of return is greater than an established minimum acceptable rate of return or cost of capital.

10.8 Keywords

Accounting Rate of Return or Simple Rate of Return: It is the ratio of the estimated accounting profit of a project to its average investment.

Average Accounting Profit: It is the arithmetic mean of accounting income expected to be earned during each year of the project's life time.

Discounted Payback Period: It is a capital budgeting technique used to calculate the number of years it will take an investment or project to break even.

NPV: In finance, the Net Present Value (NPV) or Net Present Worth (NPW) of a time series of cash flows, both incoming and outgoing, is defined as the sum of the Present Values (PVs) of the individual cash flows of the same entity.

Payback Period: In capital budgeting refers to the period of time required for the return on an investment to "repay" the sum of the original investment.

Profitability Index: It is the ratio between a cash outflow on an investment and its prospective payoff.

10.9 Review Questions

1. Explain about Measuring Project Profitability.
2. What do you Know about Payback Period?
3. Discuss about Accounting Rate of Return.
4. Define the term " NPV".
5. Discuss about Internal Rate of Return.
6. Describe about BCR method.
7. Discuss the assessment of various methods.
8. Discuss about the Discount Rate.
9. Describe about the "Decision Rule".
10. Explain about Accounting Rate of Return.

Answers: Self Assessment

- | | |
|-------------------|-------------|
| 1. PayBack Period | 2. Tool |
| 3. Qualifications | 4. Measures |
| 5. True | 6. False |
| 7. True | 8. True |
| 9. True | 10. False |
| 11. True | 12. False |
| 13. False | 14. True |
| 15. True | |

10.10 Further Readings

Notes



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf

www.pma-india.org/ - Trinidad and Tobago

www.nickjenkins.net/prose/projectPrimer.p

www.mpug.com/Pages/WhatisProjectManagement.aspx

www.mindtools.com/pages/main/newMN_PPM.htm

www.freelancer.com/jobs/Project-Management/

Notes



Case Study

Axis Bank Centralizes Information, Achieves Significant Project Visibility

After significant growth and a corresponding increase in the number of projects needing to be managed, Axis Bank wanted to improve its project and resource management methodologies. It also wanted a centralized repository for internal project information to help executives better manage resources and make more informed decisions. The bank implemented the Microsoft Enterprise Project Management (EPM) solution, which includes Microsoft Project Server 2010, Microsoft Project Professional 2010, and Microsoft SharePoint Server 2010. The EPM solution has streamlined total work management, provided better accountability, increased employee efficiency and involvement, and simplified reporting. It has also significantly improved project visibility and better resource management. In addition, standardized project management processes have enhanced collaboration across the IT delivery teams.

Situation

Axis Bank was the first of the new private banks to have begun operations in 1994, after the Government of India allowed new private banks to be established. The bank was promoted jointly by the Administrator of the specified undertaking of the Unit Trust of India (UTI - I), Life Insurance Corporation of India (LIC), General Insurance Corporation of India (GIC), and the other four PSU insurance companies, i.e., National Insurance Company Ltd., The New India Assurance Company Ltd., The Oriental Insurance Company Ltd., and United India Insurance Company Ltd.

Headquartered in Mumbai, India, the bank has a wide network of over 1,200 branches and 7,500 ATMs. It has strengths in both retail and corporate banking and is committed to adopting the best industry practices internationally in order to achieve excellence.

Axis Bank IT Projects Management Office (PMO) had a primary objective of recording, monitoring, and reporting on IT Projects delivery. The IT PMO was looking for adequate visibility into all aspects of IT projects such as schedules, resource allocations, and projects delivery status.

RVS Sridhar, President IT and Retail Banking Operations, Axis Bank, says, "We wanted an enterprise wide view of schedules, resources, and progress on IT projects throughout the organization, with emphasis on a robust and transparent project governance model."

Solution

To overcome these challenges, Axis Bank wanted a unified project management system that offered greater business analysis and planning capabilities. The bank determined that an EPM solution would enable it not only to standardize and improve resource allocation and planning, but also to centralize all information relating to project management. It ultimately chose the Microsoft EPM solution because it best met the requirements.

The Microsoft EPM solution includes Microsoft Project Server 2010, Microsoft Project Professional 2010, and Microsoft SharePoint Server 2010. The solution intelligently manages the entire project lifecycle. Capabilities include work management, resource and investment management, portfolio optimization, quality management, and business/intelligence reporting. "The EPM solution gives us what we need," says Subhakanta

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Satpathy, Senior Vice President IT and CIO Axis Bank. "It also integrates with the user desktop logins."

Notes

Project Server 2010 provides innovative capabilities across the entire lifecycle to help effectively initiate, select, plan, schedule, and monitor the projects for timelines and budget. It unifies project and portfolio management to help prioritize investments, align resources, and execute projects efficiently and effectively. What's more, it brings together the business collaboration platform services of Microsoft SharePoint Server 2010 with structured execution capabilities to provide flexible work management solutions.

Axis Bank started the EPM deployment in October 2010. The implementation was completed smoothly in approximately one year. Currently, the solution is available to about 250 employees of the IT department.

Axis Bank uses Project Server 2010 to incorporate the database of potential projects and to prioritize them. The solution is used to manage the stages and functions of all its projects and other activities related to those projects. As Project Server 2010 is built on SharePoint Server 2010, the bank has the collaborative part of its solution.

A centralized and consolidated view of project schedules, scope, and resource information helps executives to better evaluate and prioritize activities.

Project Managers are using Project Professional 2010 to create projects and delegate work items to the execution team members. Employees access it on the web to modify and update the status of different activities resulting in an efficient and seamless collaborative environment.

The EPM solution provides a powerful reporting infrastructure coupled with flexible business intelligence tools to help ensure visibility across project portfolios. Project Server 2010 uses the Microsoft business intelligence platform, including Excel Services, PerformancePoint Services, SQL Reporting Services, and more, all of which provide a comprehensive solution that can grow with Axis Bank's reporting needs.

The solution provides non-technical resources with familiar tools to easily create reports and configure powerful audience-based dashboards. Technical resources or power users can create complex views using the solution's more sophisticated capabilities.

"Project Server 2010 enhances reporting and project execution," says Ajay Lande, Deputy Vice President - IT Project Management Organization (PMO), Axis Bank. "We now have a central repository of project data that helps us to monitor and review the progress of our projects as part of the PMO function."

The Excel reporting services enables easy and flexible data extraction from the tool says Sameer Khan, Assistant Vice President - IT PMO. "It makes tracking and reporting of the project portfolio easy and flexible."

Project Server 2010 workflow capabilities help Axis Bank define the right governance processes to effectively control the Project lifecycle. The solution also empowers the mobile workforce by bringing the power of Microsoft Project Professional 2010 to the browser with web based project scheduling.

Benefits

Since it began using the solution, Axis Bank has better visibility and control over all projects and resources. Project Server is helping the bank to centralize project information, and enhance capacity and resource management. Vidya Jayaram, Vice President IT and head PMO, Axis Bank explains, "The EPM solution provides us with powerful reporting

Contd...

Notes

and analysis features that can be accessed across the organization. As a result, we will be able to optimize the project management process by facilitating communication, effectively managing projects and resources, and generating complete and up-to-date reports."

Better Organizational Visibility

Axis Bank is using Project Server as a centralized repository for internal project data. The bank now has much clearer visibility into its tasks, resources, issues, and deliverables. Currently, the CIO, project managers, and team leaders are using the solution to track projects and find out where things are and who's working on what. "Our goal was to have all metadata associated with a project in one place. We have achieved our goal of complete visibility of the projects in a single solution. Going forward, we intend to use the platform to manage and measure the progress on all projects." Subhakanta Satpathy, Senior Vice President IT and CIO of Axis Bank says, "I would say we have achieved significant insight into our IT projects."

Improved Resource Management

At Axis Bank, the IT department was frequently approached with new project requests and swiftly acting upon them was always a priority. With Project Server 2010, the bank will have the ability to manage its resources optimally.

With the EPM solution, managers will be able to check for resources in a single place. Employees can quickly see who is busy and who is available for work. "The solution will facilitate our decision making on resource requirements and capacity planning for IT projects. This will help us better manage our projects portfolio," says R Mani, Vice President IT, Axis Bank.

Enhanced Collaboration

With the integration of the Microsoft EPM with SharePoint Server, Axis Bank gains a powerful and centralized tool to help its team members collaborate. SharePoint Server allows employees easy access to important project plans, documents, and reports. It provides an enhanced platform for team collaboration. "With SharePoint Server, we can easily access and manage project information in one place," adds Subhakanta Satpathy. "By streamlining the collaboration process, team members work together more closely and execute faster on project timelines."

The senior management has a consolidated, as well as drilled down views of all the IT projects running at the bank. They can now also view the specific category of a project, like delayed projects, high-risk projects, etc.

Question:

1. Analyse the case and discuss the case facts.

Source: <http://www.microsoft.com/india/casestudies>

Unit 11: Project Cash Flow

Notes

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- Objectives
- Introduction
- 11.1 Determining Project Cash Flow
- 11.2 Elements of a Cash Flow Stream
- 11.3 Cash Flow for a Replacement Project
- 11.4 Cost of Capital
 - 11.4.1 How it Works
 - 11.4.2 Why it Matters
- 11.5 WACC
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 - 11.6.2 Combining the MCC and IOS Schedules
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- 11.9 Keywords
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Objectives

After studying this unit, you will be able to:

- Define Project Cash Flow
- Discuss about elements of cash flow stream
- Describe cash flow of a replacement Project
- Explain Cost of Capital
- Discuss Optimal Capital Budget

Introduction

Cash flow is the movement of money into or out of a business, project, or financial product. It is usually measured during a specified, finite period of time. Measurement of cash flow can be used for calculating other parameters that give information on a company's value and situation.

Notes

11.1 Determining Project Cash Flow

When beginning capital-budgeting analysis, it is important to determine a project's cash flows. These cash flows can be segmented as follows:

1. ***Initial Investment Outlay:*** These are the costs that are needed to start the project, such as new equipment, installation, etc.
2. ***Operating Cash Flow over a Project's Life:*** This is the additional cash flow a new project generates.
3. ***Terminal-Year Cash Flow:*** This is the final cash flow, both the inflows and outflows, at the end of the project's life; for example, potential salvage value at the end of a machine's life.



Example: Newco wants to add to its production capacity and is looking closely at investing in Machine B. Machine B has a cost of \$2,000, with shipping and installation expenses of \$500 and a \$300 cost in net working capital. Newco expects the machine to last for five years, at which point Machine B will have a book value (BV) of \$1,000 (\$2,000 minus five years of \$200 annual depreciation) and a potential market value of \$800.

With respect to cash flows, Newco expects the new machine to generate an additional \$1,500 in revenues and costs of \$200. We will assume Newco has a tax rate of 40%. The maximum payback period that the company has established is five years.

Let's calculate the project's initial investment outlay, operating cash flow over the project's life and the terminal-year cash flow for the expansion project.

Answer:

Initial Investment Outlay: Machine cost + shipping and installation expenses + change in net working capital = $\$2,000 + \$500 + \$300 = \$2,800$

Operating Cash Flow

$$CF_t = (\text{revenues} - \text{costs}) * (1 - \text{tax rate})$$

$$CF_1 = (\$1,500 - \$200) * (1 - 40\%) = \$780$$

$$CF_2 = (\$1,500 - \$200) * (1 - 40\%) = \$780$$

$$CF_3 = (\$1,500 - \$200) * (1 - 40\%) = \$780$$

$$CF_4 = (\$1,500 - \$200) * (1 - 40\%) = \$780$$

$$CF_5 = (\$1,500 - \$200) * (1 - 40\%) = \$780$$

Terminal Cash Flow

Tips and Tricks: The key metrics for determining the terminal cash flow are salvage value of the asset, net working capital and tax benefit/loss from the asset.

The terminal cash flow can be calculated as illustrated:

Return of net working capital $+\$300$

Salvage value of the machine $+\$800$

Tax reduction from loss (salvage $<$ BV) $+\$80$

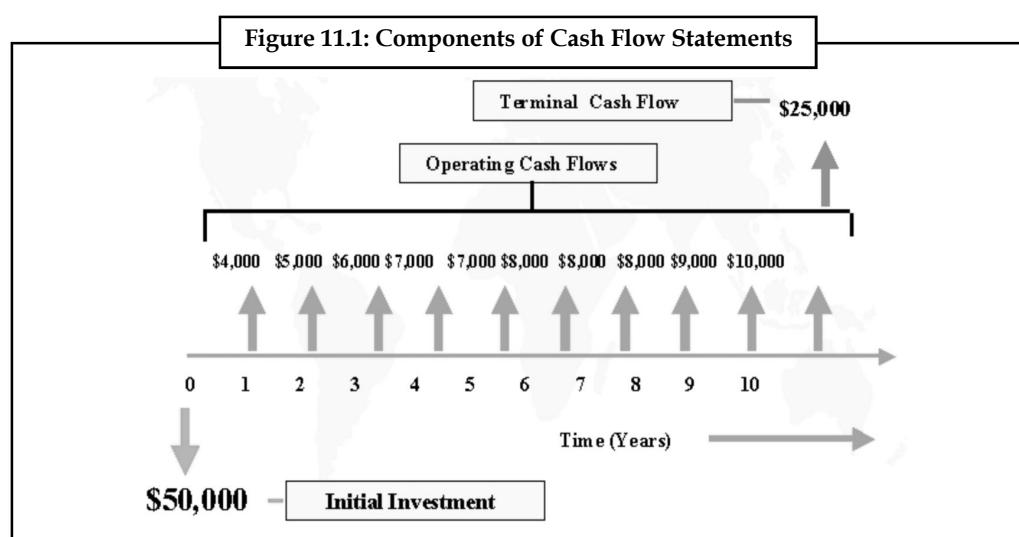
Net terminal cash flow \$1,180	Notes
Operating CF ₅ +\$780	
Total year-five cash flow \$1,960	

For determining the tax benefit or loss, a benefit is received if the book value of the asset is more than the salvage value, and a tax loss is recorded if the book value of the asset is less than the salvage value.

11.2 Elements of a Cash Flow Stream

To evaluate a project, you must determine the relevant Cash Flows, which are the incremental after-tax cash flows associated with the project. The Cash Flow Stream of a conventional Project-a project which involves cash outflows followed by cash inflows comprises three basic components (i) initial investment (ii) operating cash inflows, and (iii) terminal cash inflow.

The initial investment is the after tax cash outlay on capital expenditure and net working capital when the project is set up. The operating cash inflows are the after tax cash inflows resulting from the operations of the project during its economic life. The terminal cash inflow is the after tax cash inflow resulting from the operations of the project during its economic life. The terminal cash inflow is the after tax cash flow resulting from the liquidation of the project at the end of its economic life. Figure 11.1 depicts on a time line the cash flows for an illustrative project, with each of the cash flow components labelled.



Time Horizon for Analysis: How is the time horizon for cash flow analysis usually established? The time horizon for cash flow analysis is usually the minimum of the following:

Physical Life of the Plant: This refers to the period during which the plant remains in a physically usable condition, i.e. the number of years the plant would perform the function for which it had been acquired. This depends on the wear and tear which the plant is subject to. Suppliers of the plant may provide information on the physical life under normal operating conditions. While the concept of physical life may be useful for determining the depreciation charge, it is not very useful for investment decision purposes.

Technological Life of the Plant: The technological life of a plant refers to the period of time for which the present plant would not be rendered obsolete by a new plant. It is very difficult to estimate the technological life because the pace of new developments is not governed by any

Notes

law. While it is almost certain that a new development would occur when it would occur is anybody's guess. Yet an estimate of the technological life has to be made.

Product Market Life of the Plant: A Plant may be physically usable, its technology may not be obsolete, but the market for its products may disappear or shrink and hence its continuance may not be justified. The product Market Life of a plant refers to the period for which the product of the plant enjoys a reasonably satisfactory market.

Investment Planning Horizon of the Firm: The time period for which a firm wishes to look ahead for purposes of investment analysis may be referred to as its investment planning horizon. It naturally tends to vary with the complexity and size of investment. For small investment it may be 5 years, for medium investment it may be 10 years and for large size investments it may be 15 years.



Notes To evaluate a project, you must determine the relevant Cash Flows, which are the incremental after-tax cash flows associated with the project.

Self Assessment

Fill in the blanks:

1. is the movement of money into or out of a business, project, or financial product.
2. New Technological Developments tend to render existing plants
3. A may be physically usable, its technology may not be obsolete.
4. The for which a firm wishes to look ahead for purposes of investment analysis may be referred to as its investment planning horizon.

11.3 Cash Flow for a Replacement Project

These are projects where the firm must either: replace worn out equipment or invest in new equipment that is expected to lower current production costs and/or increase current sales.

1. **Example Q:** The old machine has the following history of high maintenance cost and significant downtime. Downtime on the machine is a major inconvenience, but it doesn't usually stop production unless it lasts for an extended period. This is because the company maintains an emergency inventory of stamped pieces and has been able to temporarily reroute production without much notice. Manufacturing managers estimate that every hour of downtime costs the company \$500, but have no hard data backing up that figure. Example \$45 \$42 \$35 \$10 In warranty Maintenance expense (\$000) 128 130 100 60 40 Hours down 5 4 3 2' 1 Year.
2. **Example Q:** The makers of the replacement machines have said that Harrington will spend about \$15,000 a year maintaining their product and that an average of only 30 hours of downtime a year should be expected. However, they are not willing to guarantee those estimates after the one-year warranty runs out. The new machine is expected to produce higher quality output than the old one. The result is expected to be better customer satisfaction and possibly more sales in the future. Management would like to include some benefit for this effect in the analysis, but is unsure of how to quantify it. Estimate the incremental cash flows over the next five years associated with buying the new machine. Assume Harrington's marginal tax rate is 34%, and that the company is currently profitable

so that changes in taxable income result in tax changes at 34% whether positive or negative. Assume any gain on the sale of the old machine is also taxed at 34% since corporations don't receive favorable tax treatment on capital gains.

Notes

3. **Example A:** There are two kinds of cash flows in this problem – those that can be estimated fairly objectively and those that require some degree of subjective guesswork. Objective Cash Flows: The initial outlay is relatively straightforward: Example \$110.1 Initial outlay 39.9 Less proceeds from sale of old machine \$150.0 Cost of new machine The old machine has a current market value of \$45,000 and a book value of \$30,000 (initial cost of \$80,000 less depreciation of \$50,000). Thus, a gain on the sale of the old machine of \$15,000 results in additional taxes of \$5.1. The net cash proceeds on the sale of the old machine are \$39.9 (or \$45.0 - \$5.1).
4. **Example A:** Depreciation and labor savings are straightforward as well: Example \$25.0 \$25.0 \$25.0 \$25.0 Labor savings \$10.2 \$10.2 \$6.8 \$6.8 \$6.8 Cash tax savings @ 34% \$30.0 \$30.0 \$20.0 \$20.0 \$20.0 Net increase in depreciation 10.0 10.0 10.0 Old depreciation \$30.0 \$30.0 \$30.0 \$30.0 New depreciation 5 4 3 2 1 Year Represent the cost savings from needing only two employees rather than three.
5. **Example A:** The subjective benefits (which are based on opinions) are hard to quantify and lead to biases when estimated by people who want project approval. The financial analyst should ensure that only reasonable estimates of unprovable benefits are used. Example \$30.0 \$30.0 \$30.0 \$30.0 \$45.0 Savings 15.0 15.0 15.0 15.0 In warranty New machine maintenance \$45.0 \$45.0 \$45.0 \$45.0 \$45.0 Old machine maintenance 5 4 3 2 1 Year The question is: Should we assume maintenance on the old machine would have remained at \$45.0 or increase as the machine gets older? Also, will maintenance on the new machine rise as the new machine ages?
6. **Example A:** Another subjective estimate is that of downtime. The old machine has been having about 130 hours of downtime while the new one promises 30 hours – a savings of 100 hours. But, argument could be made for using different assumptions for downtime hours. Another question is: How much is each hour of downtime savings worth? Arguments range from no savings (as we are unable to say exactly how much it's worth) to \$500 an hour. Most people favor a middle-of-the-road approach – we'll use \$200 an hour, which yields an estimated cash flow savings of \$20,000 per year. Example \$49.5 \$49.5 \$49.5 \$49.5 \$59.4 Net after tax \$75.0 \$75.0 \$75.0 \$75.0 \$90.0 Total \$20.0 \$20.0 \$20.0 \$20.0 \$20.0 Downtime savings \$30.0 \$30.0 \$30.0 \$30.0 \$45.0 Maintenance savings \$25.0 \$25.0 \$25.0 \$25.0 \$25.0 Labor savings \$59.7 \$59.7 \$56.3 \$56.3 \$66.2 Cash flow 10.2 10.2 6.8 6.8 L Tax savings on depreciation 25.5 25.5 25.5 25.5 30.6 Tax 5 4 3 2 1 Year.



Task Discuss about Cost of Capital.

11.4 Cost of Capital

Capital is a term used in the field of financial investment to refer to the cost of a company's funds (both debt and equity), or, from an investor's point of view "the shareholder's required return on a portfolio company's existing securities". It is used to evaluate new projects of a company as it is the minimum return that investors expect for providing capital to the company, thus setting a benchmark that a new project has to meet.

For an investment to be worthwhile, the expected return on capital must be greater than the cost of capital. The cost of capital is the rate of return that capital could be expected to earn in an

Notes alternative investment of equivalent risk. If a project is of similar risk to a company's average business activities it is reasonable to use the company's average cost of capital as a basis for the evaluation. A company's securities typically include both debt and equity, one must therefore calculate both the cost of debt and the cost of equity to determine a company's cost of capital. However, a rate of return larger than the cost of capital is usually required.

The cost of debt is relatively simple to calculate, as it is composed of the rate of interest paid. In practice, the interest-rate paid by the company can be modelled as the risk-free rate plus a risk component (risk premium), which itself incorporates a probable rate of default (and amount of recovery given default). For companies with similar risk or credit ratings, the interest rate is largely exogenous (not linked to the company's activities).

The cost of equity is more challenging to calculate as equity does not pay a set return to its investors. Similar to the cost of debt, the cost of equity is broadly defined as the risk-weighted projected return required by investors, where the return is largely unknown. The cost of equity is therefore *inferred* by comparing the investment to other investments (comparable) with similar risk profiles to determine the "market" cost of equity.

Once cost of debt and cost of equity have been determined, their blend, the Weighted Average Cost of Capital (WACC), can be calculated. This WACC can then be used as a discount rate for a project's projected cash flows.

Cost of capital refers to the opportunity cost of making a specific investment. It is the rate of return that could have been earned by putting the same money into a different investment with equal risk. Thus, the cost of capital is the rate of return required to persuade the investor to make a given investment.

11.4.1 How it Works

Cost of capital is determined by the market and represents the degree of perceived risk by investors. When given the choice between two investments of equal risk, investors will generally choose the one providing the higher return.

Let's assume Company XYZ is considering whether to renovate its warehouse systems. The renovation will cost \$50 million and is expected to save \$10 million per year over the next 5 years. There is some risk that the renovation will not save Company XYZ a full \$10 million per year. Alternatively, Company XYZ could use the \$50 million to buy equally risky 5-year bonds in ABC Co., which return 12% per year.

Because the renovation is expected to return 20% per year ($\$10,000,000 / \$50,000,000$), the renovation is a good use of capital, because the 20% return exceeds the 12% required return XYZ could have gotten by taking the same risk elsewhere.

The return an investor receives on a company security is the cost of that security to the company that issued it. A company's overall cost of capital is a mixture of returns needed to compensate all creditors and stockholders. This is often called the weighted average cost of capital, and refers to the weighted average costs of the company's debt and equity.

11.4.2 Why it Matters

Cost of capital is an important component of business valuation work. Because an investor expects his or her investment to grow by at least the cost of capital, cost of capital can be used as a discount rate to calculate the fair value of an investment's cash flows.

Investors frequently borrow money to make investments, and analysts commonly make the mistake of equating cost of capital with the interest rate on that money.



Notes It is important to remember that cost of capital is not dependent upon how and where the capital was raised. Put another way, cost of capital is dependent on the *use* of funds, not the source of funds.

Notes

Caution Cost of capital refers to the opportunity cost of making a specific investment. It is the rate of return that could have been earned by putting the same money into a different investment with equal risk.

11.5 WACC

A calculation of a firm's cost of capital in which each category of capital is proportionately weighted. All capital sources - common stock, preferred stock, bonds and any other long-term debt - are included in a WACC calculation. All else equal, the WACC of a firm increases as the beta and rate of return on equity increases, as an increase in WACC notes a decrease in valuation and a higher risk.

The WACC equation is the cost of each capital component multiplied by its proportional weight and then summing:

$$\text{WACC} = \frac{E}{V} * \text{Re} + \frac{D}{V} * \text{Rd} * (1 - \text{Tc})$$

Where:

Re = cost of equity

Rd = cost of debt

E = market value of the firm's equity

D = market value of the firm's debt

V = E + D

E/V = percentage of financing that is equity

D/V = percentage of financing that is debt

Tc = corporate tax rate

Businesses often discount cash flows at WACC to determine the Net Present Value (NPV) of a project, using the formula:

NPV = Present Value (PV) of the Cash Flows discounted at WACC.



Did u know? Cost of capital is an important component of business valuation work.

11.6 Optimal Capital Budget

Up this point, we have discussed some of the issues regarding a firm's cost of capital and capital budgeting decisions. In the process, we have looked at some of the techniques a financial manager can use in identifying the cost of various forms of capital and choosing projects that are "profitable" to the firm. Based on our earlier discussions, we know there is a significant

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relationship between a firm's cost of capital and capital budgeting decisions. In order to decide whether a project is desirable, a financial manager uses the cost of capital the firm faces to determine the project's net present value; or compare the project's IRR with the cost of capital. In addition, we also know that the cost of capital a firm faces might not be constant (i.e. the firm's MCC schedule might experience several break points). In that case, how does a firm decide what is the appropriate cost of capital? And how does it decide the optimal budget it needs for project investments? In order to answer those questions, we need to first look at a firm's investment opportunity schedule (IOS).

11.6.1 The Investment Opportunity Schedule (IOS)

The concept behind the IOS is very similar to that of the MCC schedule. The MCC schedule represents the cost of capital faced by the firm (ranking from the cheapest to the most expensive) while the IOS represents the projects that are available to the firm (ranking from the most desirable to the least desirable).

In order to construct the IOS, the firm needs to first estimate the IRR of each of the project it is considering. Once that is accomplished, the financial manager can plot the IOS, which is a chart of the IRRs of the firm's projects arranged from the highest IRR to the lowest IRR.



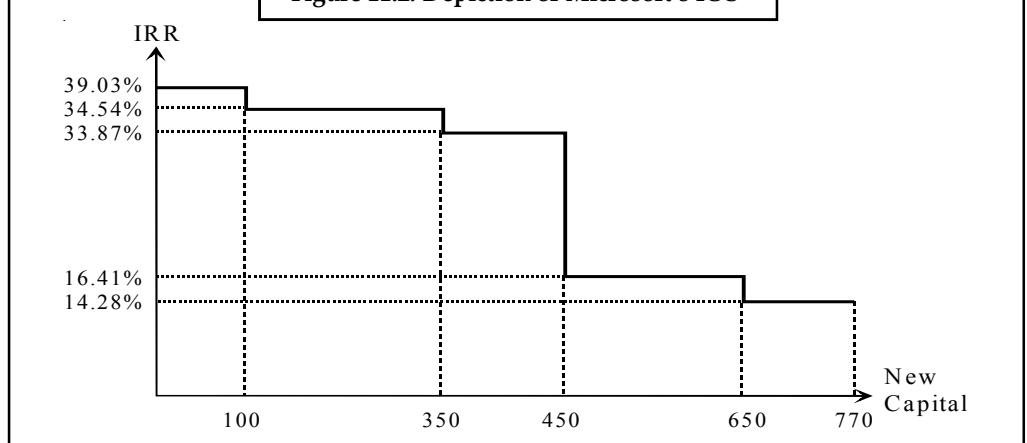
Example: Microsoft is interested in five independent projects, and the financial information regarding those projects is presented in the following table:

Table 11.1: Information of Financial and Independent Projects

Year	Project 1	Project 2	Project 3	Project 4	Project 5
Initial Cost	\$250,000	\$100,000	\$100,000	\$120,000	\$200,000
IRR	34.54%	39.03%	33.87%	14.28%	16.41%
Payback	2.21	1.50	1.83	3.50	4.33

Using the IRR information above, we can arrange the projects from the highest IRR to the lowest IRR as follows: Projects 2, 1, 3, 5 and 4. This information is used to plot the Microsoft's IOS and it is depicted below:

Figure 11.2: Depiction of Microsoft's IOS



From the IOS above, we know that if Microsoft decides to undertake all five projects, it will need an investment budget of \$770,000. However, Microsoft does not know if this is advisable because

it does not know if all the projects will be able to generate a high enough return (i.e. IRR) to cover the cost of raising the new capital. In order to make the correct decisions, Microsoft needs to combine its IOS with its MCC schedule to determine which project it should undertake and which project it should reject.

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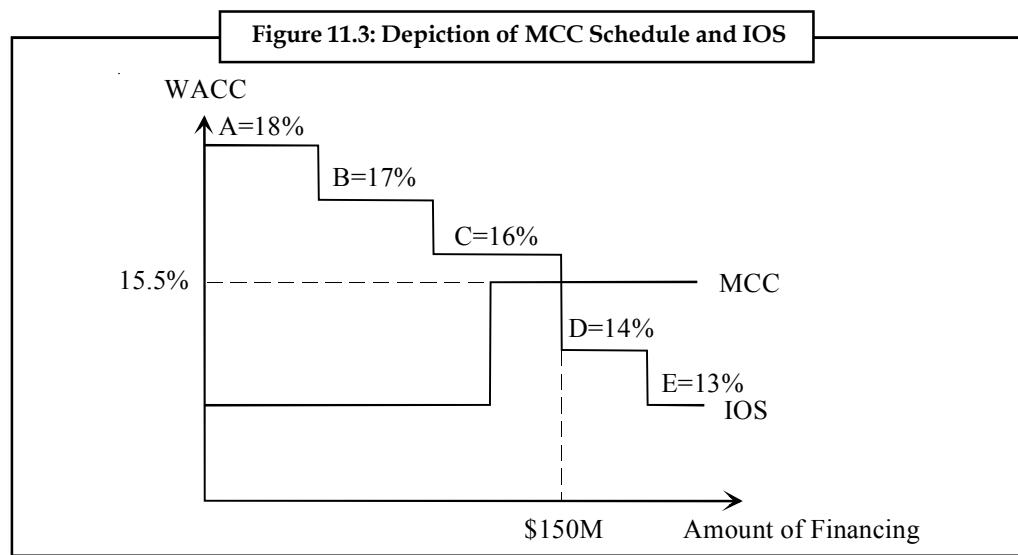
11.6.2 Combining the MCC and IOS Schedules

A financial manager will continue to accept project as long as the marginal return generated by the project is higher than the marginal cost the firm needs to pay to finance it. The financial manager will stop accepting projects once the marginal return generated by the project is exactly offset by the marginal cost faced by the firm. This is the point where the IOS and MCC schedule of the firm intersects.

The intersection point indicates the marginal cost of capital faced by the firm. In other words, the cost the firm will have to pay if it decides to raise one additional dollar. This is usually the rate the firm uses to evaluate its average risk projects (i.e. finding the NPVs).

The marginal cost of capital a firm faced depends on the availability of projects. If the firm has fewer available projects, the IOS will shift to the left and the firm will face a lower marginal cost. Whereas an increase in available projects will shift the IOS to the right, and this will raise the marginal cost.

The following figure shows the MCC schedule and IOS of a particular firm. The IOS indicates that the firm faces five potential projects, and its MCC schedule indicates the firm will experience a break point (most probably when it exhausts its retained earnings). From the graph below, we know from the intersection of the firm's IOS and MCC schedule that the marginal cost of capital for the firm is 15.5%. The firm will use this marginal cost of capital to pick its projects. From our earlier discussion, we know a firm will pick a project only if its IRR is greater than its cost of capital. In this particular case, the firm will pick projects A, B and C (and rejects projects D and E). In addition, we know the optimal capital budget for the firm is \$150 million.



Example: The financial manager of Surf the Net, Inc. (STN) is planning next year's capital budget. STN expects its net income to be \$2,700,000 next year, and its payout ratio is 30%. The company's earnings and dividends are growing at a constant rate of 8%; the last dividend, D_0 , was \$1.00; and the current equilibrium stock price is \$16. STN can raise up to \$1,800,000 of debt

Notes at 11% before-tax cost, the next \$1,800,000 will cost 12%, and all debt after \$3,600,000 will cost 13%. If STN issues new common stock, a 12% underwriting cost will be incurred. STN can sell the first \$200,000 of new common stock at the current market price, but to sell any additional new stock, STN must lower the price to \$14. STN is at its optimal capital structure, which is 60% debt and 40% equity, and the firm's marginal federal-plus-state tax rate is 40%. STN has the following independent, indivisible, and equally risky investment opportunities:

Table 11.2: Investment Opportunities Available to STN

Project	Cost	IRR (%)
A	\$3,200,000	13.0
B	1,300,000	10.7
C	1,750,000	12.0
D	450,000	11.2

What is STN's optimal capital budget?

The first thing we need to determine is STN's MCC schedule. In order to do that, we will follow the three-step procedure. First, we will identify the different break points in the MCC schedule. In this scenario, there will be 4 break points in the MCC schedule.

Break Point 1: *When the firm exhausts its retained earnings and issues new common stocks.*

We will let T_1 represents the total amount of capital STN can raise without exhausting its retained earnings. We know that STN is expecting a net income of \$2,700,000 and it is planning on retaining 70% of it (since the payout ratio is 30%). As a result, we know the following:

$$\text{Retained earnings} = 0.7 \times 2,700,000 = \$1,890,000$$

Since we know 40% of T_1 comes from the retained earnings, it is true that:

$$0.4 \times T_1 = 1,890,000 \Rightarrow T_1 = \frac{1,890,000}{0.4} = \$4,725,000$$

From the above calculation, we know STN can raise up to \$4,725,000 in capital without exhausting its retained earnings.

Break Point 2: *When STN has to go from issuing 11% debt to issuing 12% debt.*

We know STN can raise a total of \$1,800,000 with 11% debt. We will let T_2 be the total amount of capital STN can raise with the help of issuing 11% debt. Since STN raises its capital with 60% debt, we know the following:

$$0.6 \times T_2 = 1,800,000 \Rightarrow T_2 = \frac{1,800,000}{0.6} = \$3,000,000$$

STN can raise up to \$3,000,000 in capital with the help of issuing only 11% debt.

Break Point 3: *When STN has to go from issuing 12% debt to issuing 13% debt.*

We know STN can raise the first \$1,800,000 with 11% debt and the next \$1,800,000 with 12% debt. In other words, STN can raise a total of \$3,600,000 using only 11% and 12% debt. We will let T_3 represents the maximum amount of capital

it can raise with the help of only 11% and 12% debt. We know the following is true:

$$0.6T_3 = 3,600,000 \Rightarrow T_3 = \frac{3,600,000}{0.6} = \$6,000,000$$

From the above, we know that STN can raise up to \$6,000,000 in capital with the help of issuing only 11% and 12% debt.

Break Point 4: When STN has to lower the price of its new stock from \$16 to \$14 per share.

It is important to remember that when a firm lowers its stock price, it represents a rise in its cost of new common stock because it is not getting as much money from each share of new common stock as it can before.

We will let T_4 be the maximum amount of capital STN can raise without lowering its new stock price to \$14 per share. STN can raise a total of \$200,000 and keep its new stock price at \$16. However, it is important to remember that the \$16 stock is not the only equity used to help raise T_4 . STN has already exhausted \$1,890,000 of retained earnings before issuing new common stocks. Hence the amount of equity in T_4 is \$2,090,000 ($=\$1,890,000 + \$200,000$). As a result, we know the following is true:

$$0.4 \times T_4 = \$2,090,000 \Rightarrow T_4 = \frac{20,900,000}{0.4} = \$5,225,000$$

From the above calculation, we know that STN can raise up to \$5,225,000 in capital with the help of using only retained earnings and \$16 stocks.

The break points we have discovered are not in the correct order. The following table summarizes the break points:

Table 11.3: Break Points

Events Leading to the Break Points	Break Points
1. Exhausting all the retained earnings	\$4,725,000
2. Going from 12% debt to 14% debt	3,000,000
3. Going from 12% debt to 14% debt	6,000,000
4. Lowering price of new common stocks from \$8.59 to \$7.63	5,225,000

Using the table above as the guideline, we can break the MCC schedule into 5 intervals. It is important that we identify the types of capital use in each interval.

Table 11.4: Intervals in MCC Schedule

Interval	Instruments Used	Break Point
1	Retained earnings and 11% debt	
2	Retained earnings and 12% debt	\$3,000,000
3	\$16 common stocks and 12% debt	4,725,000
4	\$14 common stocks and 12% debt	5,225,000
5	\$14 common stocks and 13% debt	6,000,000

Notes

Before we proceed with plotting the MCC schedule, we need to first determine the cost of each type of capital used. We are given the different costs of debt, so we need to solve only for the cost of retained earnings and the cost of new common stock.

1. Cost of retained earnings

$$r_{re} = \frac{D_1}{P_0} + g = \frac{1 \times (1 + 0.08)}{16} + 0.08 = 0.1475 = 14.75\%$$

2. Cost of new common stock when the price is \$16

$$r_s = \frac{D_1}{P_0(1 - F)} + g = \frac{1 \times (1 + 0.08)}{16(1 - 0.12)} + 0.08 = 0.1567 = 15.67\%$$

3. Cost of new common stock when the price is \$14

$$r_s = \frac{D_1}{P_0(1 - F)} + g = \frac{1 \times (1 + 0.08)}{14(1 - 0.12)} + 0.08 = 0.1677 = 16.77\%$$

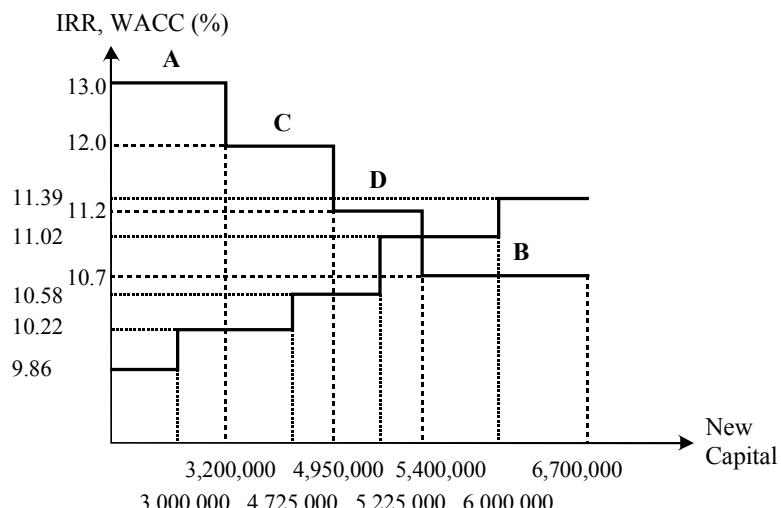
Now we can determine the WACC for each of the interval, and the table below shows the results:

Table 11.5: Result showing for WACC

Interval	WACC	Break Point
1	9.86%	
2	10.22%	\$3,000,000
3	10.58%	4,725,000
4	11.02%	5,225,000
5	11.39%	6,000,000

We can easily plot STN's MCC schedule with the information we got. Now we need to plot the IOS. It is important to remember to rank the projects according to their IRR. In this situation, the ranking is projects A, C, D and B.

Figure 11.4: Graphic Presentation of STN's, MCC Schedule



The graph above indicates that STN should invest only in projects A, C and D. In this case, we know STN's optimal budget is \$5,400,000.

Notes

There are two additional issues we need to discuss regarding a firm's choice of investment projects: (1) choosing between mutually exclusive projects, (2) evaluating marginal projects, and (3) risk adjustment.

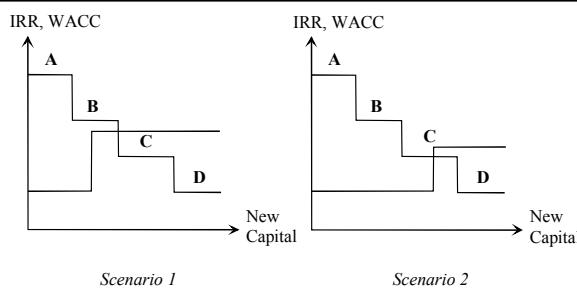
- Choosing between mutually exclusive projects:** When a firm is faced with two mutually exclusive projects, it will have two IOS schedules. Similarly, three mutually exclusive projects will lead to three IOS schedules. When we plot the IOS schedules using the IRRs of the projects, we cannot simply pick the mutually exclusive project with the highest IRR. A firm is interested more in maximizing its value, and this can only be done by choosing the project with the highest NPV rather than the highest IRR. If you remember from our earlier discussion on capital budgeting decisions, a higher IRR does not always translate into higher NPV for a project.

In order to pick the right project, the firm needs to find the NPVs of the mutually exclusive projects. However, this cannot be done without knowing the marginal cost of capital. The firm needs the MCC schedule to determine the marginal cost of capital (for each IOS schedule). Once the marginal cost is determined, the firm can find the NPV for each mutually exclusive project. The one with the highest NPV will be chosen.

- Evaluating marginal project:** So far, we have encountered projects with IRR either above the MCC or below the MCC. In situations like this, it is very easy for the financial manager to make the decisions: accept projects that have IRRs above the marginal cost of capital and reject projects that have IRRs below the marginal cost of capital. This situation is depicted in Scenario 1 in the following graph. In this particular situation, the firm will accept Projects A and B, and reject Projects C and D.

However, what should the financial manager do if "part" of the project has an IRR above the marginal cost of capital but the rest of it below the marginal cost? This situation is depicted in Scenario 2 in the following graph. In this particular situation, part of Project C has an IRR higher than the marginal cost of capital and part of it has an IRR below the marginal cost of capital. If Project C is divisible (i.e. the firm can invest in all or parts of the project), then the firm will invest only in the portion of Project C that has an IRR above the marginal cost of capital.

Figure 11.5: Evaluation of Marginal Project in Scenario 1 and 2



What if the project is not divisible? In that case, should it be rejected? The answer depends on the project's average cost. We will illustrate that with an example.



Example: Suppose the marginal project considered by Microsoft has an IRR of 12%. We know that the project has an initial cost of \$100,000. The first \$60,000 of the project can be financed at a cost of 10%, and the last \$40,000 at a cost of 14%. Should the project be accepted?

Notes

We need to determine the average cost for financing the marginal project.

$$\text{Average cost} = \left[0.1 \times \frac{60000}{100000} \right] + \left[0.14 \times \frac{40000}{100000} \right] = 0.116 = 11.6\%$$

Since the average cost of the project is below that of the IRR, the project should be chosen.

3. **Risk adjustment:** So far, we have assumed that all the projects have the same level of risk. However, this is not true in the real world. In a later unit, we will discuss the technique for adjusting for different risk level among the projects by adjusting the cost of capital. We can also adjust for the risk level by adjusting the IOS schedule (i.e. the IRR of the projects). Projects with above average risk will have a certain percentage points deducted from their IRRs while projects with below average risk will have a certain percentage point added to their IRRs.



Caution In order to pick the right project, the firm needs to find the NPVs of the mutually exclusive projects.

Self Assessment

Fill in the blanks:

5. A will continue to accept project as long as the marginal return generated by the project is higher than the marginal cost the firm needs to pay to finance it.
6. The intersection point indicates the cost of capital faced by the firm.
7. The marginal cost of a firm faced depends on the availability of projects.
8. The concept behind the is very similar to that of the MCC schedule.
9. The schedule represents the cost of capital faced by the firm.
10. A firm is interested more in maximizing its value, and this can only be done by choosing the project with the highest rather than the highest IRR.

11.7 Capital Rationing

Our discussion so far has assumed that the firm invests in projects with IRR greater than its cost of capital. This implicitly assumes that the firm does not have an investment budget. In other words, it has an infinite amount of money to invest. However, in many situations, a firm will set a certain amount for its investment budget that is insufficient to undertake all the available profitable projects. This is known as capital rationing.

There are many reasons why there is capital rationing:

1. A firm is unwilling to use external funding (i.e. debt and common stock) and rely solely on retained earnings. This is because the managers feel that using debt makes the firm riskier and using common stocks dilute their controlling power.
2. A firm might have a shortage of resources such that additional projects would not be properly managed.
3. A firm limits the investment budget to control the expansion rate so that it will not be over-extended.

There are two general types of capital rationing faced by a financial manager: soft capital rationing and hard capital rationing. Soft capital rationing is the type of capital rationing we have discussed earlier, i.e. the limit on the capital budget is adopted (or imposed) by the management for reasons cited above. On the other hand, hard capital rationing is a situation where the financial manager is unable to raise any capital for a project under any circumstances. This is a very unique situation, and financial manager usually faces hard capital rationing when the firm faces severe financial difficulties (possibly bankruptcy) or he/she is prohibited to do so due to some pre-existing contractual agreements (such as those contained in a bond covenant).

How does a financial manager makes capital budgeting decisions facing a (soft) capital rationing? In our earlier discussions, we know that when a financial manager faces no capital rationing, his/her goal is to maximize the value of the firm. However, with capital rationing, the goal of the manager is to maximize the value of the firm within the investment budget constraint. In other words, he/she will try to invest in projects that will bring the highest overall NPV (as a group) the budget can support.



Example: Microsoft has set an investment budget of \$400,000 for the next quarter for its Internet division. It is able to raise capital at a cost of 10% and it is considering in investing in the following projects:

Project	Cost	NPV	IRR
1	\$100,000	\$36,000	12%
2	250,000	110,000	14%
3	50,000	25,000	10%
4	150,000	120,000	13%
5	200,000	130,000	11%

Since the cost of capital is 10%, all the 5 projects are acceptable. However, Microsoft cannot invest in all of them due to its investment budget. The 5 projects cost a total of \$750,000, which exceeds the investment budget of \$400,000.

Microsoft can pick different combination of projects that are affordable (with the capital rationing). The combination of projects 1, 2 and 3 is one possibility, and the combination of projects 1, 3 and 5 is another possibility. In this case, Microsoft needs to figure out the different combinations of projects that it can afford, and pick the one with the highest NPV. In this particular example, the financial manager has an easy job of determining the appropriate combination of projects that is affordable and brings in the highest value. However, in most situations a firm faces more than 5 projects. As the number of available project increases, the number of combinations also increases. As a result, a firm needs to use a computer to figure out what is the best combination using linear programming.

From the above discussion, we know that a large number of available projects make capital budgeting decision very difficult when the firm is facing capital rationing. There are other factors that make capital budgeting decisions under capital rationing even more difficult: (1) projects with different risk level, and (2) multiple time constraints.

1. **Projects with different risk level:** At this point in time, computer software has not been developed to handle projects with different risk levels. It is possible for the managers to factor the risk level in their computation with a small number of projects. However, when the number increases, they need to use a computer to find the best combination, but the computer software cannot handle different risk level.

Notes

- Notes**
2. **Multiple time constraints:** When the managers face an investment budget that is set for several periods, the actions taken in the first period will affect the actions taken in the subsequent periods. Similarly, actions taken in the second period will affect the actions taken in other periods. This is because the projects undertaken will generate cash flows that the managers can use to finance other projects.



Notes A firm limits the investment budget to control the expansion rate so that it will not be over-extended.

Self Assessment

Fill in the blanks:

11. At this point in time, has not been developed to handle projects with different risk levels.
12. When the face an investment budget that is set for several periods, the actions taken in the first period will affect the actions taken in the subsequent periods.
13. The life of a project is not always a clear-cut indication of whether a financial manager should use short-term or long-term financing.
14. The manager has an easy job of determining the appropriate combination of projects that is affordable and brings in the highest value.

11.8 Summary

- Cash flow is the movement of money into or out of a business, project, or financial product.
- The initial investment is the after tax cash outlay on capital expenditure and net working capital when the project is set up.
- New Technological Developments tend to render existing plants obsolete.
- A Plant may be physically usable, its technology may not be obsolete, but the market for its products may disappear or shrink and hence its continuance may not be justified.
- The time period for which a firm wishes to look ahead for purposes of investment analysis may be referred to as its investment planning horizon.
- The cost of debt is relatively simple to calculate, as it is composed of the rate of interest paid.
- The cost of equity is more challenging to calculate as equity does not pay a set return to its investors.
- Cost of capital is determined by the market and represents the degree of perceived risk by investors.
- Cost of capital is an important component of business valuation work.
- The financial manager will stop accepting projects once the marginal return generated by the project is exactly offset by the marginal cost faced by the firm.

11.9 Keywords

Notes

Cash Flow: It is the movement of money into or out of a business, project, or financial product.

Cost of Capital: Cost of capital is determined by the market and represents the degree of perceived risk by investors.

Cost of Equity: The cost of equity is more challenging to calculate as equity does not pay a set return to its investors.

Initial Investment Outlay: These are the costs that are needed to start the project, such as new equipment, installation, etc.

Operating Cash Flow: This is the additional cash flow a new project generates.

Terminal-Year Cash Flow: This is the final cash flow, both the inflows and outflows, at the end of the project's life; for example, potential salvage value at the end of a machine's life.

11.10 Review Questions

1. Discuss about Project Cash Flow.
2. What are the elements of a cash Flow Stream?
3. What is the Physical Life of the Plant?
4. Describe about the Product Market Life of the Plant.
5. Explain about the cash flow for a replacement Project.
6. Explain about Cost of Capital.
7. Discuss about WACC.
8. What do you know about optimal capital Budget?
9. Discuss about Capital Rationing.
10. What are the other factors affecting the optimal capital Budget?
11. Describe about Project Maturity.

Answers: Self Assessment

- | | |
|-----------------------|----------------|
| 1. Cash Flow | 2. Obsolete |
| 3. Plant | 4. Time Period |
| 5. Financial Manager | 6. Marginal |
| 7. Capital | 8. IOS |
| 9. MCC | 10. NPV |
| 11. Computer Software | 12. Managers |
| 13. Economic | 14. Financial |

Notes

11.11 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

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www.mpug.com/Pages/WhatisProjectManagement.aspx

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www.freelancer.com/jobs/Project-Management/

*Case Study***Notes**

The Royal Canadian Mint: Improving Energy Performance



The Royal Canadian Mint is the Crown Corporation responsible for minting and distributing Canada's circulation coins. It also designs and manufactures collector, commemorative and gold bullion coins, as well as customized medals and tokens for customers across Canada and around the world.

With headquarters in Ottawa, Ontario, where it designs the coins, and a production facility in Winnipeg, Manitoba, the Mint employs over 450 people in all aspects of coin design, production and marketing.

In the fall of 2003, the Mint recognized an opportunity to improve the energy performance of its historic building on Sussex Drive in Ottawa, which it has occupied since, its founding in 1908. It concluded that by using energy and water more efficiently, it could substantially reduce operating costs and lower greenhouse gas (GHG) emissions that contribute to climate change.

In addition, by introducing energy-efficient design elements, including new systems and equipment, the retrofit would improve the building's air quality, creating a healthier and more comfortable work environment for employees.

In January 2004, the Mint issued a Request for Proposal for energy efficiency improvements to its facility. By March of that year, representatives of the Mint began to evaluate proposals from four energy service companies (ESCs), which were pre-qualified under the Federal Buildings Initiative (FBI).

Contd...

Notes

The First Steps

The project was underway in the fall of 2003 when the Mint began working with the FBI to develop an energy efficiency opportunity assessment.

An opportunity assessment considers the age and maintenance characteristics of buildings, provides an overview of their energy systems and reviews energy and water consumption. Like an energy audit, the assessment offers clients technical data and analyses, possible energy-savings opportunities and preliminary savings estimates.

A critical first step, the opportunity assessment helped the Mint to determine whether an energy performance contract (EPC) would be beneficial. It also ensured that the project would be of market value to the pre-qualified ESC.

Once the Mint was identified as a candidate for an EPC, the project team, which would work closely with the ESC, began outlining some of the energy efficiency goals and objectives of the retrofit.

This early planning allowed the project team to identify the issues facing the Mint, including inefficiencies in water and energy use and high operating costs. It also laid some of the groundwork that would later help in selecting the ESC for the project.

The project team identified the following goals for the project:

- improve energy efficiency in the facility
- reduce the facility's operating and maintenance costs
- reduce GHG emissions
- create a healthier, more comfortable work environment for employees



The Mint and Siemens: Partners for Success

Careful planning and preparation before selecting an ESC can make the difference between choosing a "good" ESC and the "right" ESC for the job.

As a long-term partner, the ESC must work closely with the organization to plan the project, implement the recommended measures and monitor the resulting changes in energy and water use. After carefully reviewing proposals from the four ESCs, the Mint selected Siemens Building Technologies Ltd. to implement the project.

Contd...

Siemens was chosen because its scope of work was innovative and dealt extensively with converting costly maintenance improvements into significant savings.

As Dr. Albert Maringer, President and CEO of Siemens Canada Ltd., explained, "It was our goal to provide the most innovative solutions to reduce future energy costs and provide a new infrastructure program that will reduce overall maintenance requirements at the Mint."

Once the ESC was selected, the process of preparing a detailed feasibility study and negotiating the final contract was underway. On March 24, 2005, the Mint and Siemens Building Technologies Ltd. finalized and signed the EPC.

Project Scope

The proposed total costs of the energy efficiency improvements at the Mint are estimated at \$8 million. Potential cost savings are estimated to reach as high as \$1 million annually.

The project's design integrates a variety of systems, technologies, practices and programs, including the following energy efficiency measures:

- Installation of new chillers and boilers in response to the rising cost of purchasing steam from an outside supplier. The feasibility study conducted by Siemens concluded that the installation of new chillers and boilers in the facility would be the most economical solution for the Mint.
- Replacement of aging air compressors with new energy-efficient ones to increase the reliability of operations and lower maintenance costs.
- Installation of two new supply air units with variable air volume (VAV) terminal boxes to replace old fan coils. The VAV system varies the amount of air delivered to ensure workspace conditions are maintained. The system also substantially lowers energy and maintenance costs.
- Modernization of the filtration unit in the Mint's process operation to increase water filtration capacity and reduce energy use.

Notes



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Notes	<p>Project Implementation</p> <p>Work to implement the energy efficiency improvements began in January 2005. During the construction period, the Mint and Siemens worked together to ensure that all project components were implemented seamlessly and that the Mint would benefit from the energy management solutions being integrated.</p> <p>Because of the Mint's manufacturing environment, care was taken to avoid shutting down the process.</p> <p>Questions:</p> <ol style="list-style-type: none">1. Study and analyze the case.2. Write down the case facts.3. What do you infer from it?
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Source: <http://oee.nrcan.gc.ca/publications/federal-buildings-initiative/12608>

Unit 12: Work Break Down Structure

Notes

CONTENTS

- Objectives
- Introduction
- 12.1 Need and Importance of Work Break Down Structure
 - 12.1.1 Purpose
 - 12.1.2 Process
 - 12.1.3 Pitfalls
- 12.2 Other Factors Affecting the Optimal Capital Budget
- 12.3 Summary
- 12.4 Keywords
- 12.5 Review Questions
- 12.6 Further Readings

Objectives

After studying this unit, you will be able to:

- Define work break down structure
- Discuss about project execution plan

Introduction

A Work Breakdown Structure (WBS), in project management and systems engineering, is a deliverable oriented decomposition of a project into smaller components. It defines and groups a project's discrete work elements in a way that helps organize and define the total work scope of the project.

A work breakdown structure element may be a product, data, a service, or any combination. A WBS also provides the necessary framework for detailed cost estimating and control along with providing guidance for schedule development and control.

12.1 Need and Importance of Work Break Down Structure

In this we are going to look at what many project managers and project management professionals refer to as the "foundation" of the project, or at least the foundation of project planning. The Work Breakdown Structure (WBS) is defined by *A Guide to the Project Management Body of Knowledge* 3rd Edition (PMBOK Guide) as:

"A deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables."

It is not nearly as daunting as it sounds. Creating a quality WBS will require a substantial amount of energy, time, and people, but in the end is not rocket science. However, before we get too deep into how to actually create a WBS let's first look at its purpose.

Notes

12.1.1 Purpose

Why do we need to create a WBS for our projects? What purpose does it serve? Why should I waste my time writing on post-it notes and drawing charts when I could be getting my team started on the actual work of the project? Now, I know everyone reading this is a great project manager or team member, so I am sure none of you have ever said comments such as these, but I am sure you have heard them from those “other” project managers who will remain nameless.

So to answer these questions, let’s take a look at what purpose the WBS serves to our project and our project team. There are three reasons to use a WBS in your projects. The first is that it helps more accurately and specifically define and organise the scope of the total project. The most common way this is done is by using a hierarchical tree structure. Each level of this structure breaks the project deliverables or objectives down to more specific and measurable chunks. The second reason for using a WBS in your projects is to help with assigning responsibilities, resource allocation, monitoring the project, and controlling the project. The WBS makes the deliverables more precise and concrete so that the project team knows exactly what has to be accomplished within each deliverable. This also allows for better estimating of cost, risk, and time because you can work from the smaller tasks back up to the level of the entire project. Finally, it allows you to double check all the deliverables’ specifics with the stakeholders and make sure there is nothing missing or overlapping.

12.1.2 Process

Now that we have agreed that creating a WBS will be helpful to our project’s efficiency and effectiveness, how do we go about it? First, let’s look at what all we need to get started. There are several inputs you will need to get you off on the right foot:

1. The Project Scope Statement
2. The Project Scope Management Plan
3. Organisational Process Assets
4. Approved Change Requests - (PMBOK Guide)

These inputs should give you all the information you and your team needs to create your WBS. Along with these inputs, you will use certain tools as well:

1. Work Breakdown Structure Templates
2. Decomposition - (PMBOK Guide)

Finally, using these inputs and tools you will create the following outputs:

1. Work Breakdown Structure
2. WBS Dictionary
3. Scope Baseline
4. Project Scope Statement (updates)
5. Project Scope Management Plan (updates)
6. Requested Changes - (PMBOK Guide)

The first step to creating your WBS is to get all your team, and possibly key stakeholders, together in one room. Although your team is not listed as an input or tool in the above sections, they are probably your most vital asset to this process. Your team possesses all the expertise,

experience, and creative thinking that will be needed to get down to the specifics of each deliverable. Next, we have to get the first two levels setup. The first level is the project title, and the second level is made up of all the deliverables for the project. At this stage it is important to function under the 100% Rule. This rule basically states that the WBS (specifically the first two levels) includes 100% of all the work defined in the project scope statement and management plan. Also, it must capture 100% of all the deliverables for the project including internal, external, and interim. In reality the WBS usually only captures between 90-95%, and 100% is our goal.

Notes

Once we have gotten the first two levels set, it is time to launch into our decomposition. Decomposition is the act of breaking down deliverables into successively smaller chunks of work to be completed in order to achieve a level of work that can be both realistically managed by the project manager and completed within a given time frame by one or more team members. This level of breakdown and detail is called the work package. Work packages are the lowest level of the WBS and are pieces of work that are specifically assigned to one person or one team of people to be completed. This is also the level at which the project manager has to monitor all project work. Now the million dollar question is how specific and small does a chunk of work need to be to still be considered a work package? Well PMBOK does not seem to give a definitive answer on that. Most project managers concur that this varies by project, but can usually be measured using the 8/80 Rule. The 8/80 Rule says that no work package should be less than 8 hours or greater than 80 hours. Notice we said that the work package is the lowest level of the WBS. Activities and tasks are not included in the WBS. They will be planned from the work packages once they are assigned.

Now you are ready to start your team on the work of decomposition, but do not get too far ahead of yourself quite yet. As grandpa always said "There is no reason to reinvent the wheel." Occasionally, you will run into a project that is a "first of its kind," but that is not usually the case. Most of the time, you, your team, or your organisation has done a project like this one in the past. That means that there should be a WBS from the previous project that you can use as a template. This will save you a lot time and effort. Even if you have not done a project like this one before, most Project Management Offices (PMOs) have basic WBS templates that can get you started. Another great technique to make your life easier is the Post-It Note Technique. I know it sounds a little cheesy, but it actually works very well. In this technique you simply write each deliverable on a post-it note and stick them at the top of a wall. Then you and your team start to break down each deliverable into components and write each component on its own post-it note. This way, as you place them on the wall and start to create your tree structure, everyone can easily see what has been accomplished and where you are headed. Also this technique allows for easy movement of components around within the WBS.

Now the conference room wall is covered in post-it notes and Sally is frantically wanting to write everything down before they start to fall, but wait one more step before you put it into an official (or semi-official) document. You can use your newly created WBS to look for missing or overlapping pieces of each deliverable. This will help eliminate change requests and double work down the road. Once that is completed, put your WBS on paper and log it into your project.

Many projects will also find it necessary to create a WBS Dictionary to accompany their WBS. The WBS Dictionary is simply a document that describes each component in the WBS. This helps clarify any specifics later on when team members completing the work or stakeholders viewing the deliverables have questions. Also, when creating the WBS for very large, lengthy, or complex projects, all the deliverables' specifics might not be known up front and, therefore, it is difficult to create a full WBS. In cases such as these many people use what is called Rolling Wave Planning. This is when you plan down to the level of detail currently known and go back to plan deeper once more information is acquired. Usually rolling wave planning needs to stay as least 2-3 months ahead of the actual work being done, but of course this varies slightly by industry.

Notes



Notes Many projects will also find it necessary to create a WBS Dictionary to accompany their WBS. The WBS Dictionary is simply a document that describes each component in the WBS.

12.1.3 Pitfalls

Lastly let's look at five common pitfalls to creating a WBS. If you can keep these few possible issues in mind when you are creating your WBS, you and your team will be much more successful at creating a useful and accurate Work Breakdown Structure.

1. ***Level of Work Package Detail:*** When deciding how specific and detailed to make your work packages, you must be careful to not get too detailed. This will lead to the project manager to have to micromanage the project and eventually slow down project progress. On the other hand, work packages whose details are too broad or large become impossible for the project manager to manage as a whole.
2. ***Deliverables Not Activities or Tasks:*** The WBS should contain a list of broken down deliverables. In other words, what the customer/stakeholder will get when the project is complete. It is NOT a list of specific activities and tasks used to accomplish the deliverables. How the work is completed (tasks and activities) can vary and change throughout the project, but deliverables cannot without a change request, so you do not want to list activities and tasks in the WBS.
3. ***WBS is not a Plan or Schedule:*** The WBS cannot be used as a replacement for the project plan or schedule. A WBS is not required to be created in any type of order or sequence. It is simply a visual breakdown of deliverables.
4. ***WBS Updates Require Change Control:*** The WBS is a formal project document, and any changes to it require the use of the project change control process. Any changes to the WBS change the deliverables and, therefore, the scope of the project. This is an important point to help control scope creep.
5. ***WBS is not an Organisational Hierarchy:*** The WBS and Organisational Hierarchy chart are never the same thing. Although often similar in appearance, these two documents are very different. The Organisational Hierarchy shows things like chain of command and lines of communication, but the WBS is restricted simply to a project and shows only the deliverables and scope of that project.

We hope that this article has helped you better understand the Work Breakdown Structure's purpose, process, and common pitfalls. The WBS is an extremely valuable tool to the project management methodology. It can make or break a project. It sets the foundation for the rest of the project planning. A solid WBS helps ensure proper project baselines, estimating, resource use, scheduling, risk analysis, and procurement.



Caution The WBS should contain a list of broken down deliverables. In other words, what the customer/stakeholder will get when the project is complete.

12.2 Other Factors Affecting the Optimal Capital Budget

Notes

So far, we have discussed how a firm determines its optimal capital budget by looking at its IOS and MCC schedules. In addition, we have also discussed briefly how a firm's optimal capital budget will be influenced when it faces capital rationing. There are other factors that will also affect a firm's optimal budget: (1) earnings growth, (2) project maturity, and (3) strategic considerations.

1. **Earnings growth:** If you recalled from our earlier discussions on the valuation of common stocks and determination of the cost of common equity (using the dividend growth model), we have mentioned that shareholders "expect" a certain growth rate in dividends (which is tied to the growth rate of a firm's earnings). As a result, a financial manager sometimes needs to pick less "superior" projects that will meet this short-term "goal". We will illustrate this with the following example.



Example: The CFO of Morning Glory, Inc. is presented with two potential projects, A and B, with the following financial information:

	0	1	2	3	4	5
Project A	-\$100,000	\$30,000	\$30,000	\$25,000	\$25,000	\$20,000
Project B	-\$100,000	-\$40,000	\$60,000	\$60,000	\$60,000	\$60,000

Suppose the firm is facing a cost of capital of 10%. In that case, we know the NPVs of Projects A and B will be \$342.75 and \$36,538.12, respectively. If the two projects are independent, then both projects will be accepted (assuming that the firm faces no capital rationing). On the other hand, if they are mutually exclusive, then Project B will be chosen because it has a much higher NPV. However, if we look at the very immediate future after undertaking the project(s) (i.e. time 1), we know that Project A will lead to an increase in cash flow (and possibly an increase in earnings) while Project B will lead to a decrease in cash flow (and possibly a decrease in earnings). As a result, Project B will lead to a drop in earnings growth initially (because of the negative cash flow at time 1), and this is not going to make the shareholders happy (even though the situation improves later on in the life of the project). In this case, the shareholders will require a higher return on the firm's stocks, which translates into a higher cost of common equity for the firm. Facing the pressure of a rising cost of common equity, the financial manager will opt for Project A rather than Project B.

We know that ultimately Project B will bring in a much higher value to the firm than Project A, why would the shareholders not want the financial manager to pick Project B? That is because there is asymmetric information between the shareholders and the management. Technically, the shareholders are the owners of the firm, but most of them do not pay attention to the operations of the firm. In other words, the shareholders do not really have much information about the firm. In addition, there are certain types of inside information (such as the projected cash flows of all the projects under review) that are available only to the management and not the shareholders. As a result, shareholders usually make decisions without having the same set of information the management has.



Did u know? When the managers face an investment budget that is set for several periods, the actions taken in the first period will affect the actions taken in the subsequent periods. Similarly, actions taken in the second period will affect the actions taken in other periods.

- Notes**
2. **Project maturity:** We know interest rate has a term structure, i.e. interest rates (or yields) are affected by the term (or life) of the assets or loans. In addition, we know the most common relationship between interest rate and term to maturity is a positive one (i.e. an upward sloping yield curve). In other words, it is cheaper to borrow short term than it is to borrow long term. This will have an impact on the financial manager's financing decision depending on the life of the project.
- The economic life of a project is not always a clear-cut indication of whether a financial manager should use short-term or long-term financing. This depends on whether the management has made a long-term commitment to the project, i.e. renewing a project with short economic life when it comes due. Examples of long-term commitment on projects with short economic life include cash registers (at a retail store like K-Mart), utensils (at a restaurant), etc. When a financial manager makes a long-term commitment, he/she will "borrow" at the long-term interest rate even though the project has a short economic life.
3. **Strategic considerations:** Even though certain projects might not generate a positive NPV for the firm, the management still approves those projects because they might help the firm gain certain technological expertise (and they are mostly R&D projects). For example, GE might be working on a project to create a robot that will sweep the floor based on voice commands. The firm can probably find a cleaning crew that will do a better job (and at a much lower cost) than the robot, but this project will help GE gain technical knowledge on robotics and voice command systems, which might prove invaluable in future GE projects (and products).



Task Find out the role of "WBS" in Project Planning.

Self Assessment

State True or False:

1. A financial manager sometimes needs to pick less superior projects that will meet this short-term goal.
2. Interest rates (or yields) are not affected by the term (or life) of the assets or loans.
3. A Work Breakdown Structure (WBS), in project management and systems engineering, is a deliverable oriented decomposition of a project into smaller components.
4. Decomposition is the act of combining deliverables into successively larger chunks of work to be completed.

12.3 Summary

- The first step to creating your WBS is to get all your team, and possibly key stakeholders, together in one room.
- The WBS should contain a list of broken down deliverables.
- The WBS cannot be used as a replacement for the project plan or schedule.
- A WBS is not required to be created in any type of order or sequence. It is simply a visual breakdown of deliverables.

- | | |
|--|--------------|
| <ul style="list-style-type: none">• The WBS is a formal project document, and any changes to it require the use of the project change control process.• PERT is used in Research type of projects whereas CPM is used in all of non research type projects.• The network techniques of PERT and CPM were concurrently developed in 1957.• In the beginning, CPM was used for planning and scheduling of constructional projects.• The PERT model was developed for projects characterized by uncertainty and the CPM model was developed for projects which are relatively risk-free.• The costs associated with a project can be divided into two components: direct costs and indirect costs. | Notes |
|--|--------------|

12.4 Keywords

Lead Time: Lead time is the time by which a predecessor event must be completed in order to allow sufficient time for the activities that must elapse before a specific PERT event is reached to be completed.

Most Likely Time: Most likely time (M) is the best estimate of the time required to accomplish a task, assuming everything proceeds as normal.

Pessimistic Time: Pessimistic time (P) is the maximum possible time required to accomplish a task, assuming everything goes wrong (but excluding major catastrophes).

WBS: A Work Breakdown Structure (WBS), in project management and systems engineering, is a deliverable oriented decomposition of a project into smaller components.

12.5 Review Questions

1. Discuss the need and importance of work break down structure.
2. Explain about project execution plan.
3. What are the factors affecting the optimal Capital Budget?
4. Describe the pitfalls of work break down structure.

Answers: Self Assessment

- | | |
|---------|----------|
| 1. True | 2. False |
| 3. True | 4. False |

12.6 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

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Online links

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www.nickjenkins.net/prose/projectPrimer.p

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www.freelancer.com/jobs/Project-Management/



Case Study

Notes

National Aerospace Laboratories

For more than a decade, K.Yegna Narayana, director of the light transport aircraft (LTA) project at the National Aerospace Laboratories (NAL) in Bangalore had little else than thinking, talking about and working on his project. At NAL hangar near his office, the aircraft is getting finishing touches. The 14-seater LTA, now named Saras and looking impressively big near tiny two-seaters designed and made by NAL, is set to roll out on 4th February. It will fly by the end of June. Saras is the first civilian aircraft to be designed and manufactured completely in India. India is entering the civil aircraft industry this year. India contributes 0.1% to the world aircraft manufacturing market of \$350 billion. Saras is the first serious attempt to address this anomaly.

The project was conceived by Roddam Narsimha, who was the director of NAL in 80s and early 90s. Narsimha had decided that NAL needed to design aircraft and not just do research. The first attempt was an assembly: the experimental light canard aircraft. NAL then designed the two-seater Hansa, the only all-composite two-seater in the world. Hansa got certified in 2000. Even while the Hansa work was in progress, NAL decided to make Saras. The first feasibility study was done in 1989. Russia's Myasishev Design Bureau was a partner. But Saras got stuck due to lack of funding. The Russians pulled out due to economic difficulties. By the end of 90s, it seemed that Saras would never be developed. In 1999, the Department of Science and Technology's technology development board (TDB) agreed to help. TDB sanctioned a grant of ₹ 65 crore for the development of Saras. The estimated development cost was ₹ 132 crore. The Council of Scientific and Industrial Research, of which NAL is a part, put in ₹ 52 crore. Hindustan Aeronautics (HAL) and the ministry of Civil Aviation put in ₹ 9 crore and ₹ 5 crore respectively. The project got underway by end-1999, 10 years after the feasibility study.

A number of companies worked on the project. HAL designed and developed the landing gear, electrical systems and few other parts. Taneja aerospace made most of the sheet metal parts. NAL did the design and development, structural and qualification testing and the project management. The Central Mechanical Engineering and Research Institute, Durgapur, developed the throttle control box. About 20 firms in Bangalore did the machine tooling. To reduce development costs, developers used off-the-shelf components as much as possible. T.S. Prahlad, who was NAL's director till recently, says, "Saras is specially designed for Indian conditions." It can take off from short run ways, in hot conditions and on high altitudes. It can fly in any kind of weather. India's feeder airline services are poorly developed; even existing services like Vayudoot have stopped operations. Other than poor management, two major problems have been lack of cheap Indian aircraft and poor economies of scale for maintenance. Saras could solve both.

NAL now estimates an Indian market of 200 planes in the next 10 years. The aircraft industry has a considerable influence on the economy of a country. The economic impact of aviation on the world's GDP is about 10%. After Saras, the next civil aircraft project is the 100-seater from HAL. Can these two projects Kickstart an aircraft industry in the country?

Questions:

1. Study and analyze the case.
2. Write down the case facts.
3. What do you infer from it?

Source: <http://www.scribd.com/doc/6929735/Project-Management0406>

Notes

Unit 13: PERT, CPM and Time Estimation

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Objectives

After studying this unit, you will be able to:

- Know about CPM
- Understand the language of PERT
- Know about Time Estimation

Introduction

Notes

In the late 1950s, the Program Evaluation and Review Technique (PERT) and the Critical Path Method (CPM) were independently developed. PERT was developed by the U.S. Navy, Booz-Allen Hamilton (a business consulting firm), and Lockheed Aircraft (now Lockheed Martin Corp.); and CPM was developed by Dupont De Nemours Inc. When they were developed, there were significant differences in the methods.



Example: PERT used probabilistic (or uncertain) estimates of activity durations and CPM used deterministic (or certain) estimates but included both time and cost estimates to allow time/cost trade-offs to be used. Both methods employed networks to schedule and display task sequences. (Throughout this unit, we will use the words "activity" and "task" as synonyms to avoid constant repetition of one or the other.)

Both methods identified a critical path of tasks that could not be delayed without delaying the project. Both methods identified activities with slack (or float) that could be somewhat delayed without extending the time required to complete the project. While PERT and CPM used slightly different ways of drawing the network of activities, anything one could do with PERT, one could also do with CPM and vice versa. When writing about the history of project management, differentiating PERT and CPM is important and interesting. When managing projects, the distinction is merely fussy. Traditional PERT is used less often than CPM; but CPM can be used with three-time estimates, and we can do things with PERT that were restricted to CPM in "olden times." We use both names because users in the real world are apt to use either.

13.1 Brief History of PERT/CPM

PERT/CPM or Network Analysis as the technique is sometimes called, developed along two parallel streams, one industrial and the other military.

CPM was the discovery of M.R. Walker of E.I. DuPont de Nemours & Co. and J.E.Kelly of Remington Rand, circa 1957. The computation was designed for the UNIVAC-I computer. The first test was made in 1958, when CPM was applied to the construction of a new chemical plant. In March 1959, the method was applied to maintenance shut-down at the Du Pont works in Louisville, Kentucky. Unproductive time was reduced from 125 to 93 hours.

PERT was devised in 1958 for the POLARIS missile program by the Program Evaluation Branch of the Special Projects office of the U.S. Navy, helped by the Lockheed Missile Systems division and the Consultant firm of Booz-Allen & Hamilton. The calculations were so arranged so that they could be carried out on the IBM Naval Ordnance Research Computer (NORC) at Dahlgren, Virginia.

13.2 Language of PERT/CPM

Several terms used in discussing PERT/CPM analysis have been adopted from everyday language but have quite different meanings than in common usage. These terms are defined here as used in PERT/CPM.

13.3 Network Techniques of Project Management

To achieve the objectives of project management network techniques is widely used. It is commonly known as PERT (Programmed Evaluation and Review Technique), CPM (Critical Path Method).

Notes	PERT is used in Research type of projects whereas CPM is used in all of non-research type projects.
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Task Discuss the Network Techniques of Project Management.

13.3.1 Evolution of Network Techniques

By the end of 18th century, the decision-making process was mainly depended on the managerial capabilities, experiences and academic background of managers. In the early stage of 19th century, the pioneers of scientific management started developing the scientific management techniques. During World War I, Henry L. Gantt developed Gantt chart for production scheduling which was later on modified to bar chart for the purpose of project and production scheduling.

The network techniques of PERT and CPM were concurrently developed in 1957. In the beginning, CPM was used for planning and scheduling of constructional projects. It was also used for scheduling the maintenance shutdown. The construction industry in general and the petrochemical industry in particular were the major areas of CPM applications. PERT was developed by US Navy for scheduling the research and development work for the Polaris Fleet Ballistic Missiles Programmed whose activities were subject to a considerable degree of uncertainty. Initially, this technique was named as "Programmed Evaluation and Review Technique" after 1958, this technique was used by Russian Scientists for the utilization and management of their huge ammunition. But after 1960, this technique came up as a revolutionary technique for the purpose of decision-making. With the passage of time, PERT and CPM applications started overlapping and now they are used almost as single technique and the difference between the two is only of the historical and academic interest.



Notes The network techniques of PERT and CPM were concurrently developed in 1957. In the beginning, CPM was used for planning and scheduling of constructional projects.

Self Assessment

Fill in the blanks:

1. The was designed for the UNIVAC-I computer.
2. was devised in 1958 for the POLARIS missile program by the Program Evaluation Branch of the Special Projects office of the U.S. Navy.
3. Traditional PERT is used less often than

State True or False:

4. Critical Path is the shortest pathway taken from the initial event to the terminal event.
5. Lag time is the earliest time by which a successor event can follow a specific PERT event.
6. In project management, a critical path is the sequence of project network activities with the longest overall duration, determining the shortest time possible to complete the project.

13.4 Types of Network

Notes

1. **AOA Network:** Activity on Arrow Network.
2. **PDM/AON Network:** Precedence Diagram Method/ Activity on Node Network.

13.4.1 CPM

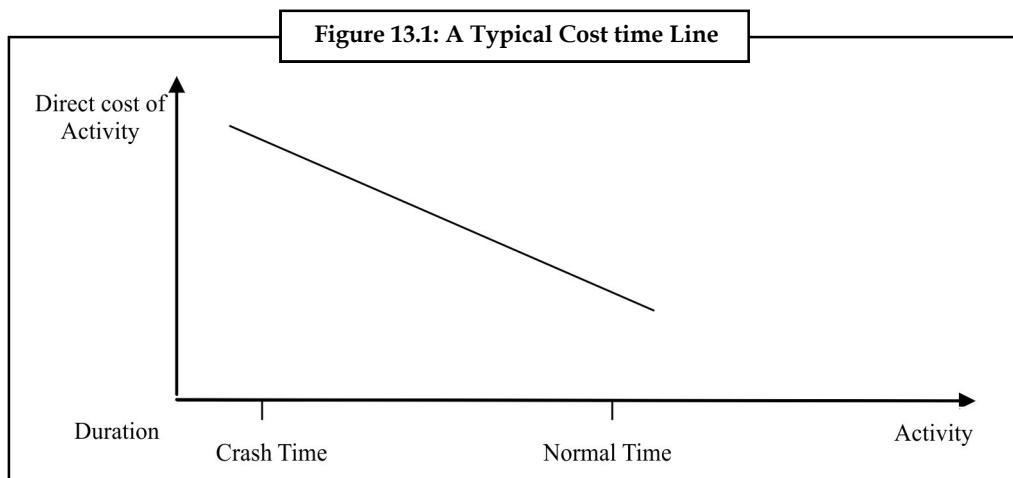
The PERT model was developed for projects characterized by uncertainty and the CPM model was developed for projects which are relatively risk-free. While both the approaches 'begin with the development of the network and a focus on the critical path, the PERT approach is 'probabilistic' and the CPM approach is 'deterministic'. This does not, however, mean that in CPM analysis we work with single time estimates. In fact, the principal focus of CPM analysis is on variations in activity times as a result of changes in resource assignments. These variations are planned and related to resource assignments and are not caused by random factors beyond the control of management as in the case of PERT analysis. The main thrust of CPM analysis is on time cost relationships and it seeks to determine the project schedule which minimizes total cost.

Assumptions

The usual assumptions underlying CPM analysis are:

1. The costs associated with a project can be divided into two components: direct costs and indirect costs. Direct costs are incurred on direct material and direct labour. Indirect costs consist of overhead items like indirect supplies, rent, insurance, managerial services, etc.
2. Activities of the project can be expedited by crashing which involves employing more resources.
3. Crashing reduces time but enhances direct costs because of factors like overtime payments, extra payments, and wastage. The relationship between time and direct activity cost can be reasonably approximated by a downward sloping straight line.

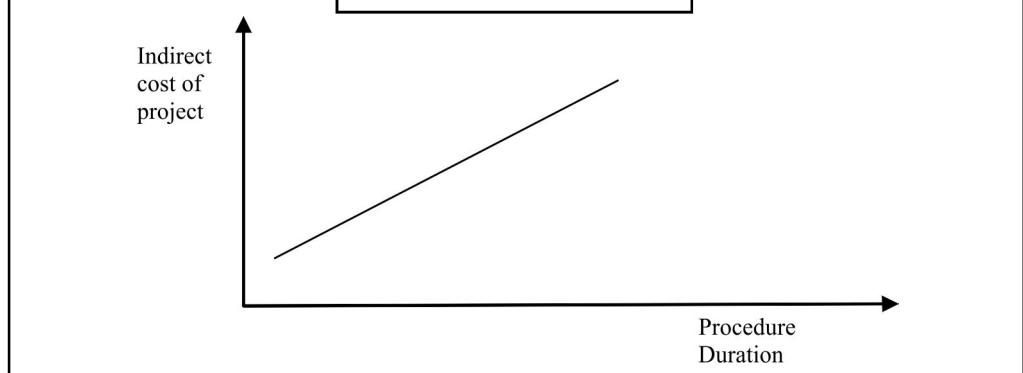
A typical cost time line is shown in Figure 13.1.



4. Indirect costs associated with the project increase linearly with project duration. A typical line for indirect costs is shown in Figure 13.2.

Notes

Figure 13.2: Indirect Costs



Procedure

Given the above assumptions, CPM analysis seeks to examine the consequences of crashing on total cost (direct cost plus indirect cost). Since the behaviour of indirect project cost is well defined, the bulk of CPM analysis is concerned with the relationship between total direct cost and project duration. The procedure used in this respect is generally as follows:

1. Obtain the critical path in the normal network. Determine the project duration and direct cost.
2. Examine the cost time slope of activities on the critical path obtained and crash the activity which has the least slope.
3. Construct the new critical path after crashing as per step 2. Determine project duration and cost.
4. Repeat steps 2 and 3 till activities on the critical path (which may change every time) are crashed.



Example: The above procedure may be illustrated with an example. The activities, durations, and direct activity costs of a project are shown in Table 13.1. The indirect cost is ₹ 2,000 per week.

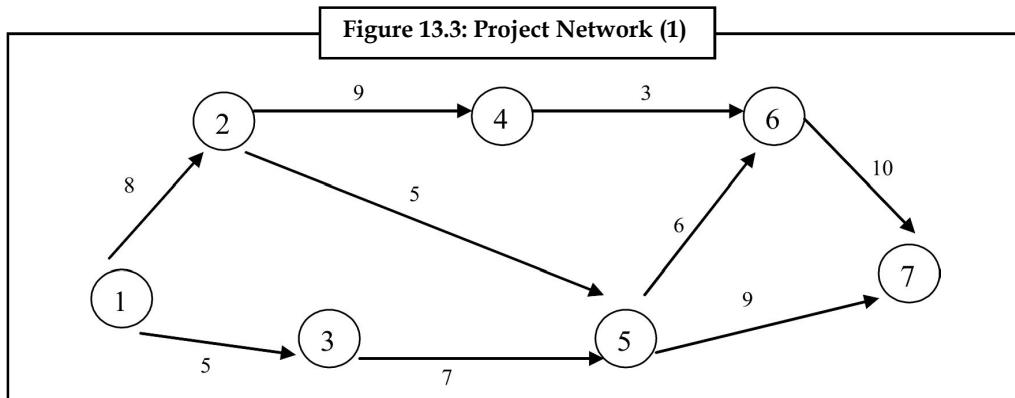
Table 13.1: Normal and Crash Time and Cost

Activity	Time in Weeks		Cost		Cost to Expedite per Weeks
	Normal	Crash	Normal	Crash	
1-2	8	4	₹ 3,000	₹ 6,000	₹ 450
1-3	5	3	₹ 4,000	₹ 8,000	₹ 2,000
2-4	9	6	₹ 4,000	₹ 5,500	₹ 500
3-5	7	5	₹ 2,000	₹ 3,200	₹ 600
2-5	5	1	₹ 8,000	₹ 12,000	₹ 1,000
4-6	3	2 ^{1/2}	₹ 10,000	₹ 11,200	₹ 2,400
5-6	6	2	₹ 4,000	₹ 6,800	₹ 700
6-7	10	7	₹ 6,000	₹ 8,700	₹ 900
5-7	9	5	₹ 4,200	₹ 9,000	₹ 1,200
			₹ 45,200	₹ 70,400	

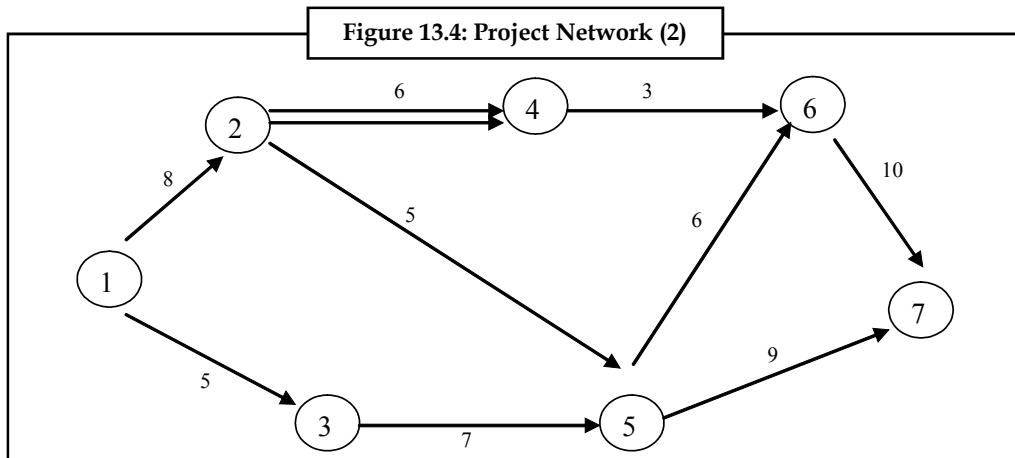
Notes

The project network with normal duration is shown in Figure 13.3.

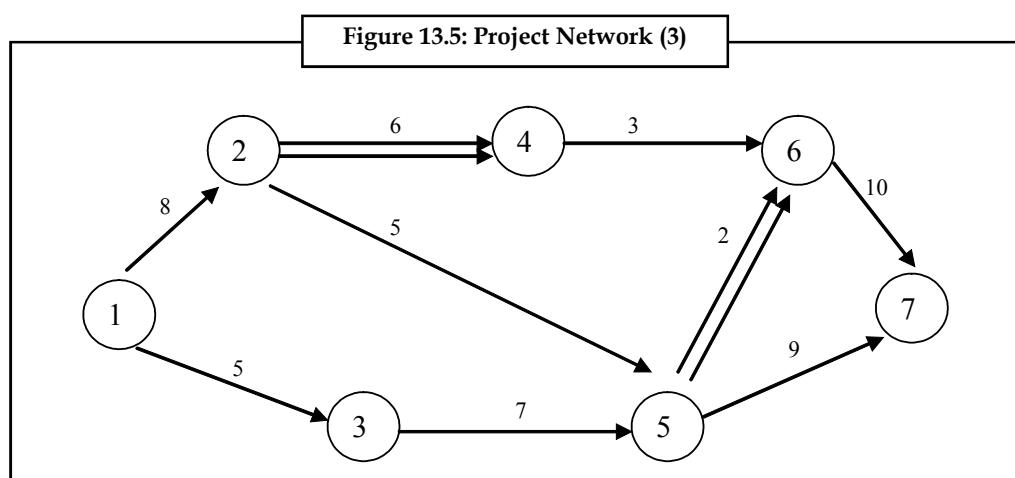
The critical path in the all normal network is (1-2-4-6-7). The project duration is 30 weeks and the total direct cost is ₹ 45,200.



Examining the time cost slope of activities on the critical path we find that activity (2-4) has the lowest slope; in other words, the cost to expedite per week is the lowest for activity (2-4). Hence activity (2-4) is crashed. The project network after such a crashing is shown in Figure 13.4.

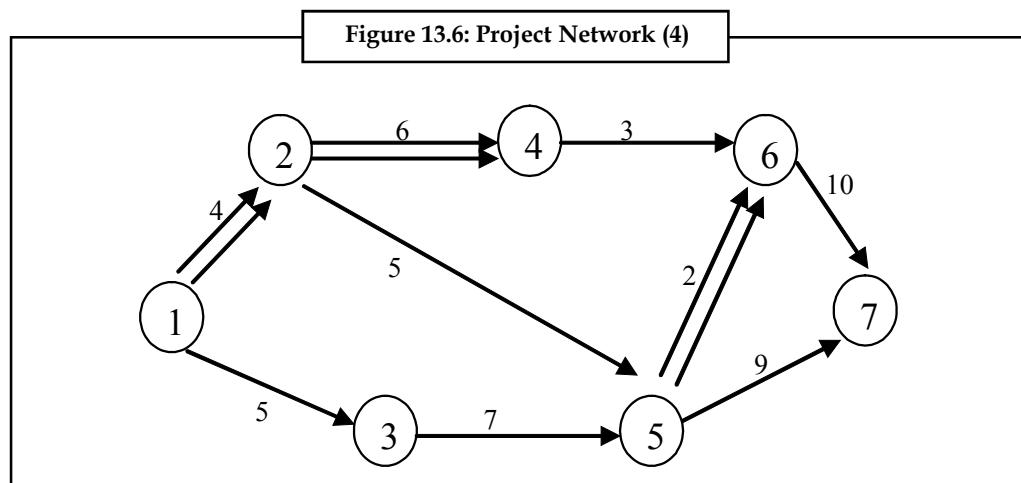


As per Figure 13.4 the critical path is (1-2-5-6-7), with a length of 29 weeks, and the total direct cost is ₹ 46,700.



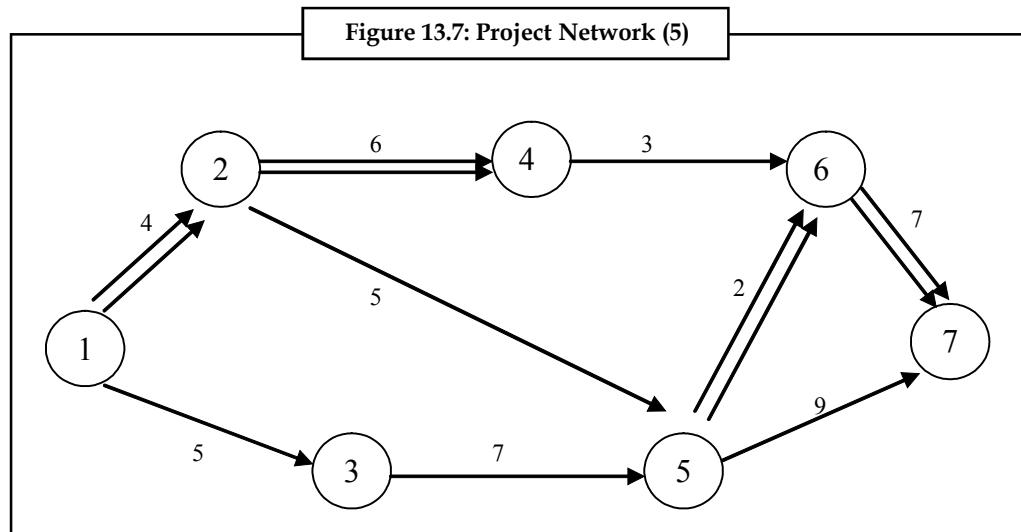
Notes

Looking at the time cost slope of the activities on the new critical path (1-2-5-6-7), we find that the activity (5-6) has the lowest slope. Hence this activity is crashed. The project network after such crashing is shown in Figure 13.5, the critical path is (1-2-4-6-7) with a length of 27 weeks and the total direct cost is ₹ 49,500.



Comparing the time cost slope of the non-crashed activities on the new critical path (1-2-4-6-7), we find that the activity which costs the least to crash is (1-2). Hence this is crashed. The project network after such a crashing is shown in Figure 13.6. As per this Figure 13.6 the critical path is (1-3-5-6-7) with a length of 24 weeks and the total direct cost is ₹ 52,500.

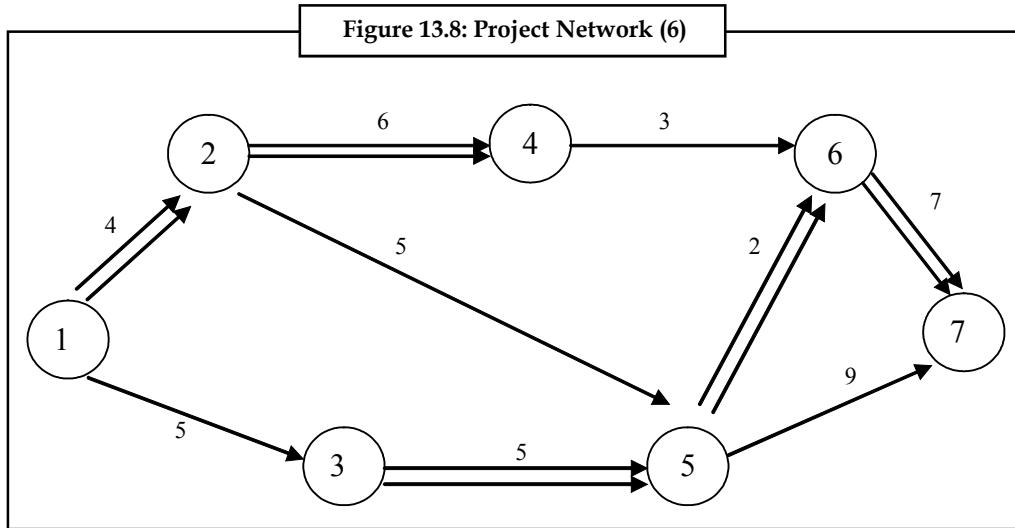
Looking at the time cost slope of the non crashed activities on the new critical path, (1-3-6-7), we find that activity (6-7) has the lowest slope. Hence it is crashed. The project network after such a crashing is shown in Figure 13.7. As per this Figure 13.7 there are two critical paths (1-3-5-6-7) and (1-3-5-7), both with a length of 21 weeks, and the total direct cost is ₹ 55,200.



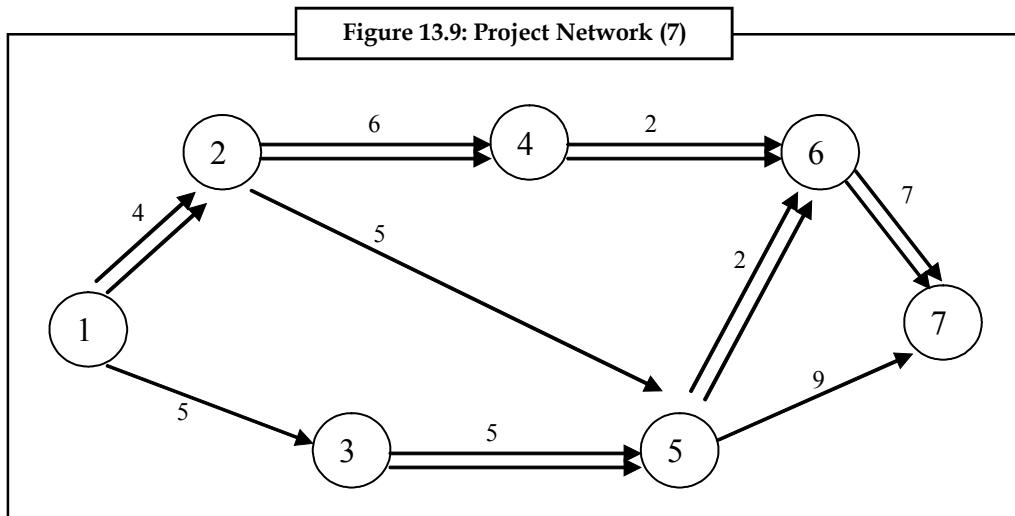
Considering the time cost slope of non crashed activities on critical paths (1-3-5-6-7) and (1-3-5-7), we find that activity (3-5) which is common to both the critical paths is the least costly to

Notes

crash. Hence, it is crashed. The project network after this crashing is shown in Figure 13.8. As per this Figure 13.8, the critical path is (1-2-4-6-7) with a duration of 2014 weeks and the total direct cost is ₹ 56,400.



Looking at the new critical path (1-2-4-6-7) we find that the only non crashed activity is (4-6). Crashing this gives us the project network shown in Figure 13.9. As per this Figure 13.9, the critical path again is (1-2-4-6-7) with a duration of 191/2 weeks and the total direct cost is ₹ 57,600.



Since all the activities on the critical path (1-2-4-6-7) are crashed, there is no possibility of further time reduction.

From Table 13.2, we find that the total cost is minimized for the project schedule represented by the activities crashed are (1-2), (2-4), (3-5), (5-6), (6-7). The information provided in Table 13.2 is useful for decision-making.

Notes**Table 13.2: Project Duration and Total Cost**

Figure No.	Activities Crashed	Project Duration in Weeks	Total Direct Cost	Total Indirect Cost	Total Cost
13.3	None	30	45,200	60,000	105,200
13.4	(2-4)	29	46,700	58,000	104,700
13.5	(2-4 and 5-6)	27	49,500	54,000	103,500
13.6	(1-2), (2-4) and (5-6)	24	52,500	48,000	100,500
13.7	(1-2), (2-4), (5-6), and (6-7)	21	55,500	42,000	97,200
13.8	(1-2), (2-4), (3-5), (5-6), and (6-7)	20	56,400	40,000	96,400
13.9	(1-2), (2-4), (3-5), (5-6), (4-6), and (6-7)	19 ^{1/2}	57,600	39,000	96,600



Caution Crashing reduces time but enhances direct costs because of factors like overtime payments, extra payments, and wastage.

Self Assessment

Fill in the blanks:

7. The associated with a project can be divided into two components: direct costs and indirect costs.
8. are incurred on direct material and direct labour.
9. Crashing reduces time but enhances direct costs because of factors like, extra payments, and wastage.
10. The relationship between time and cost can be reasonably approximated by a downward sloping straight line.

13.5 PERT Network Analysis – Steps

The steps are as follows:

1. Clearly defining the goal of the project,
2. Obtaining a work-break structure to a set of individual jobs, and arranging them in a logical fashion,
3. Estimating the job duration, making provisions for optimistic and pessimistic schedules,
4. Identifying the resource requirement constraints,
5. Locating the schedule of dates for each activity by planning a detailed control structure,

- | | |
|---|--------------|
| <ol style="list-style-type: none"> 6. Preparing project control systems and identifying the requirements of progress reports for different levels of management, 7. Developing the critical path and slack times, 8. Crashing the time-optimum cost levels on the basis of costs, 9. Updating the network continuously by systematized methods, 10. Monitoring, evaluating and reviewing the network constantly. | Notes |
|---|--------------|

13.5.1 Benefits of PERT

PERT is particularly suited to the uncertain Indian conditions for R&D because of the following reasons:

1. PERT gives management the ability to plan the best possible use of resources to achieve a given goal within the overall time and cost limitations. It enables the project executives to manage a variety of programmes as opposed to repetitive production situations; it helps the project manager to handle the uncertainties involved in programming where no standard time data are available; it utilises the time network analysis as a base method of approach to determine manpower, material machinery and capital requirements. The use of PERT needs a clear definition of goals for proper communication at all levels: the feedback and review of the different stages of the project helps the management to take corrective measures and formulate strategies for allocating the limited resources in case of emergencies.
2. PERT is an effective mechanism for planning, scheduling and coordinating the different activities in project buying. The tenders for many public sector projects insist on PERT network charts to be submitted along with the quotations.
3. PERT is useful for balance-sheet preparation, annual shutdown and overhauls to identify the critical activities; it is particularly useful in construction and R&D projects because it makes room for uncertainties associated with futuristic decisions on project planning. It not only helps the management in deciding when to initiate the follow-up and provide the materials, but also gives an estimate of the consequences of not meeting such demands. Thus, it helps avoid last minute delays, and panic buying resulting in cost overruns. Because of the logical interrelationships between the planned elements, the project can think of alternative vendors.
4. PERT enables the optimum utilization of the resources by their transfer from the slack to busy segments in the network in order to accomplish the stipulated goal. It is useful for pre-crisis planning and buying when the force major clauses are operative because the responsibilities to project executives are allocated well in advance to tackle such emergencies. The summation of manpower data in PERT.



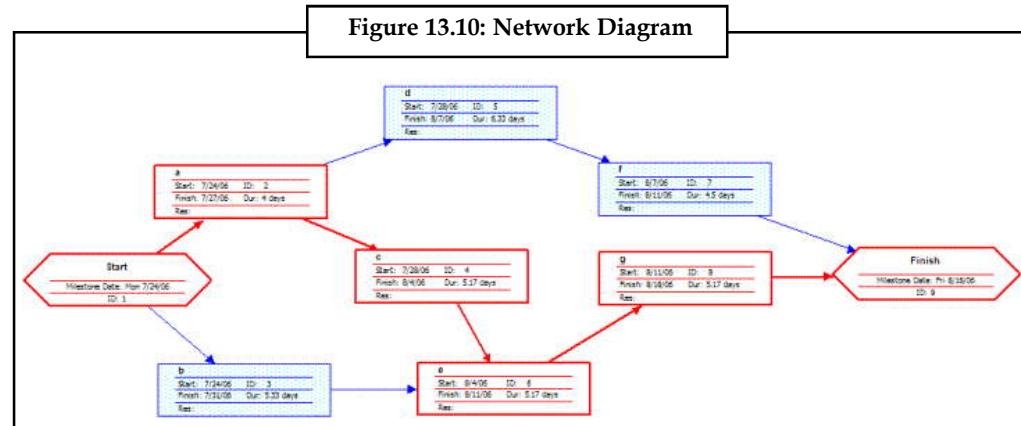
Task Describe the benefits of PERT.

13.6 Analyzing Network

A network diagram can be created by hand or by using software such as Microsoft Project. There are two types of network diagrams, activity on arrow (AOA) and activity on node (AON). Activity on node diagrams are generally easier to create and interpret. To create an AON diagram, it is recommended (but not necessary) to start with a node named *start*. This "activity" has a

Notes

duration of zero (0). Then you draw each activity that does not have a predecessor activity (*a* and *b* in this example) and connect them with an arrow. Next, since both *c* and *d* list *a* as a predecessor activity, their nodes are drawn with arrows coming from *a*. Activity *e* is listed with *b* and *c* as predecessor activities, so node *e* is drawn with arrows coming from both *b* and *c*, signifying that *e* cannot begin until both *b* and *c* have been completed. Activity *f* has *d* as a predecessor activity, so an arrow is drawn connecting the activities. Likewise, an arrow is drawn from *e* to *g*. Since there are no activities that come after *f* or *g*, it is recommended (but again not necessary) to connect them to a node labelled finish.



A network diagram created using Microsoft Project (MSP).

Early Start	Duration	Early Finish
Task Name		
Late Start	Slack	Late Finish

A node like this one (from Microsoft Vision) can be used to display the activity name, duration, ES, EF, LS, LF, and slack.

By itself, the network diagram pictured above does not give much more information than a Gantt chart; however, it can be expanded to display more information. The most common information shown is:

1. The activity name
2. The normal duration time
3. The early start time (ES)
4. The early finish time (EF)
5. The late start time (LS)
6. The late finish time (LF)
7. The slack

In order to determine this information it is assumed that the activities and normal duration times are given. The first step is to determine the ES and EF. The ES is defined as the maximum EF of all predecessor activities, unless the activity in question is the first activity, which the ES is zero (0). The EF is the ES plus the task duration (EF = ES + duration).

- | | Notes |
|---|-------|
| 1. The ES for start is zero since it is the first activity. Since the duration is zero, the EF is also zero. This EF is used as the ES for <i>a</i> and <i>b</i> . | Notes |
| 2. The ES for <i>a</i> is zero. The duration (4 work days) is added to the ES to get an EF of four. This EF is used as the ES for <i>c</i> and <i>d</i> . | |
| 3. The ES for <i>b</i> is zero. The duration (5.33 work days) is added to the ES to get an EF of 5.33. | |
| 4. The ES for <i>c</i> is four. The duration (5.17 work days) is added to the ES to get an EF of 9.17. | |
| 5. The ES for <i>d</i> is four. The duration (6.33 work days) is added to the ES to get an EF of 10.33. This EF is used as the ES for <i>f</i> . | |
| 6. The ES for <i>e</i> is the greatest EF of its predecessor activities (<i>b</i> and <i>c</i>). Since <i>b</i> has an EF of 5.33 and <i>c</i> has an EF of 9.17, the ES of <i>e</i> is 9.17. The duration (5.17 work days) is added to the ES to get an EF of 14.34. This EF is used as the ES for <i>g</i> . | |
| 7. The ES for <i>f</i> is 10.33. The duration (4.5 work days) is added to the ES to get an EF of 14.83. | |
| 8. The ES for <i>g</i> is 14.34. The duration (5.17 work days) is added to the ES to get an EF of 19.51. | |
| 9. The ES for <i>finish</i> is the greatest EF of its predecessor activities (<i>f</i> and <i>g</i>). Since <i>f</i> has an EF of 14.83 and <i>g</i> has an EF of 19.51, the ES of <i>finish</i> is 19.51. <i>Finish</i> is a milestone (and therefore has a duration of zero), so the EF is also 19.51. | |
| 10. Barring any unforeseen events, the project should take 19.51 work days to complete. The next step is to determine the late start (LS) and late finish (LF) of each activity. This will eventually show if there are activities that have slack. The LF is defined as the minimum LS of all successor activities, unless the activity is the last activity, for which the LF equals the EF. The LS is the LF minus the task duration (LS = LF - duration). | |
| 11. The LF for <i>finish</i> is equal to the EF (19.51 work days) since it is the last activity in the project. Since the duration is zero, the LS is also 19.51 work days. This will be used as the LF for <i>f</i> and <i>g</i> . | |
| 12. The LF for <i>g</i> is 19.51 work days. The duration (5.17 work days) is subtracted from the LF to get a LS of 14.34 work days. This will be used as the LF for <i>e</i> . | |
| 13. The LF for <i>f</i> is 19.51 work days. The duration (4.5 work days) is subtracted from the LF to get a LS of 15.01 work days. This will be used as the LF for <i>d</i> . | |
| 14. The LF for <i>e</i> is 14.34 work days. The duration (5.17 work days) is subtracted from the LF to get a LS of 9.17 work days. This will be used as the LF for <i>b</i> and <i>c</i> . | |
| 15. The LF for <i>d</i> is 15.01 work days. The duration (6.33 work days) is subtracted from the LF to get a LS of 8.68 work days. | |
| 16. The LF for <i>c</i> is 9.17 work days. The duration (5.17 work days) is subtracted from the LF to get a LS of 4 work days. | |
| 17. The LF for <i>b</i> is 9.17 work days. The duration (5.33 work days) is subtracted from the LF to get a LS of 3.84 work days. | |
| 18. The LF for <i>a</i> is the minimum LS of its successor activities. Since <i>c</i> has a LS of 4 work days and <i>d</i> has a LS of 8.68 work days, the LF for <i>a</i> is 4 work days. The duration (4 work days) is subtracted from the LF to get a LS of 0 work days. | |
| 19. The LF for <i>start</i> is the minimum LS of its successor activities. Since <i>a</i> has a LS of 0 work days and <i>b</i> has a LS of 3.84 work days, the LS is 0 work days. | |

The next step is to determine the critical path and if any activities have slack. The critical path is the path that takes the longest to complete. To determine the path times, add the task durations

Notes

for all available paths. Activities that have slack can be delayed without changing the overall time of the project. Slack is computed in one of two ways, $\text{slack} = \text{LF} - \text{EF}$ or $\text{slack} = \text{LS} - \text{ES}$. Activities that are on the critical path have a slack of zero (0).

1. The duration of path adf is 14.83 work days.
2. The duration of path $aceg$ is 19.51 work days.
3. The duration of path beg is 15.67 work days.
4. The critical path is $aceg$ and the critical time is 19.51 work days. It is important to note that there can be more than one critical path (in a project more complex than this example) or the critical path can change. For example, let's say that activities d and f take their pessimistic (b) times to complete instead of their normal (T_E) times. The critical path is now adf and the critical time is 22 work days. On the other hand, if activity c can be crashed to one work day, the path time for $aceg$ is reduced to 15.34 work days, which is slightly less than the time of the new critical path, beg (15.67 work days).

Assuming these scenarios do not happen, the slack for each activity can now be determined.

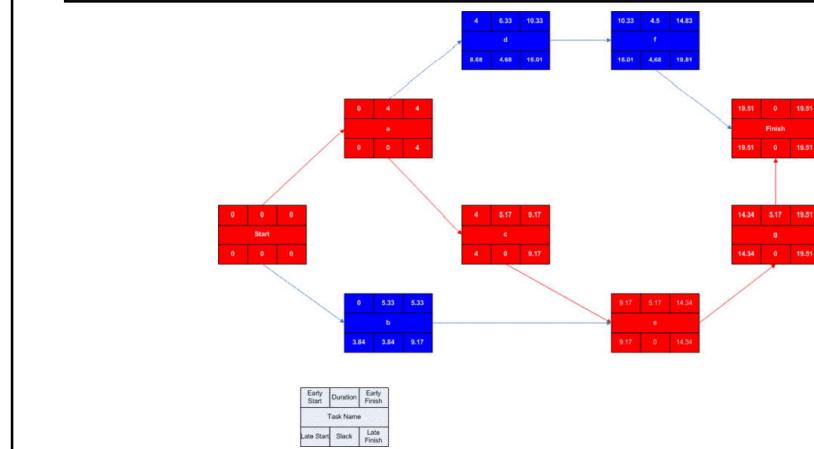
Start and *finish* are milestones and by definition have no duration, therefore they can have no slack (0 work days).

The activities on the critical path by definition have a slack of zero; however, it is always a good idea to check the math anyway when drawing by hand.

- (a) $\text{LF}_a - \text{EF}_a = 4 - 4 = 0$
- (b) $\text{LF}_c - \text{EF}_c = 9.17 - 9.17 = 0$
- (c) $\text{LF}_e - \text{EF}_e = 14.34 - 14.34 = 0$
- (d) $\text{LF}_g - \text{EF}_g = 19.51 - 19.51 = 0$
5. Activity b has a LF of 9.17 and a EF of 5.33, so the slack is 3.84 work days.
6. Activity d has a LF of 15.01 and a EF of 10.33, so the slack is 4.68 work days.
7. Activity f has a LF of 19.51 and a EF of 14.83, so the slack is 3.84 work days.

Therefore, activity b can be delayed almost 4 work days without delaying the project. Likewise, activity d or activity f can be delayed 4.68 work days without delaying the project (alternatively, d and f can be delayed 2.34 work days each).

Figure 13.11: A Completed Network Diagram Created using Microsoft Visio



Self Assessment Notes

Fill in the blanks:

11. enables the optimum utilization of the resources by their transfer from the slack to busy segments in the network in order to accomplish the stipulated goal.
12. A diagram can be created by hand or by using software such as Microsoft Project.
13. PERT is useful for preparation, annual shutdown and overhauls to identify the critical activities.

13.7 Project Uncertainty and Risk Management

13.7.1 Calculating Probabilistic Activity Times

First, it is necessary to define what is meant by the terms "pessimistic," "optimistic," and "most likely" (or "normal"). Assume that all possible durations (or all possible costs) for some task can be represented by a statistical distribution. The individual or group making the estimates is asked for a task duration, a , such that the actual duration of the task will be lower or less than 1 percent of the time. Thus it is an optimistic estimate. The pessimistic estimate, b , is an estimated duration for the same task such that the actual finish time will be b or greater less than 1 percent of the time. (These estimates are often referred to as "at the .99 or the 99 percent level" or at the "almost never level.")

13.7.2 Extensions to PERT/CPM

There have been several extensions to both network and chart forms of project scheduling. At times these extensions are quite sophisticated.



Example: The application of fuzzy set theory to aid in estimating activity durations in cases where activity durations are difficult to estimate because project activities cannot be well defined (McMahon, 1993). In this section we briefly discuss one significant extension of traditional scheduling methods, precedence diagramming. Elihu Goldratt's Critical Chain (1997) is also a significant addition to traditional scheduling methods. It uses networks that combine project scheduling with resource allocation.

We then comment on some of the managerial implications of the two fundamental approaches to risk management taken in this unit, statistical analysis and simulation.

13.7.3 Precedence Diagramming

One shortcoming of the PERT/CPM network method is that it does not allow for leads and lags between two activities without greatly increasing the number of sub-activities to account for this. That is, our regular network methods described earlier assume that an activity can start as soon as its predecessor activities are completed. Sometimes, however, the restrictions are more complex.



Example: When a follow-on activity cannot begin until a certain amount of time.

Notes



Notes There have been several extensions to both network and chart forms of project scheduling. At times these extensions are quite sophisticated; for example, the application of fuzzy set theory to aid in estimating activity durations in cases where activity durations are difficult to estimate because project activities cannot be well defined.

13.8 Planning, Scheduling and Control

Planning, Scheduling (or organising) and Control are considered to be basic Managerial functions, and PERT/CPM has been rightfully accorded due importance in the literature on Operations Research and Quantitative Analysis.

Far more than the technical benefits, it was found that PERT/CPM provided a focus around which managers could brainstorm and put their ideas together. It proved to be a great communication medium by which thinkers and planners at one level could communicate their ideas, their doubts and fears to another level. Most important, it became a useful tool for evaluating the performance of individuals and teams.

There are many variations of PERT/CPM which have been useful in planning costs, scheduling manpower and machine time. PERT/CPM can answer the following important questions:

How long will the entire project take to be completed? What are the risks involved?

Which are the critical activities or tasks in the project which could delay the entire project if they were not completed on time?

Is the project on schedule, behind schedule or ahead of schedule?

If the project has to be finished earlier than planned, what is the best way to do this at the least cost?

The Framework for PERT and CPM

Essentially, there are six steps which are common to both the techniques. The procedure is listed below:

1. Define the Project and all of its significant activities or tasks. The Project (made up of several tasks) should have only a single start activity and a single finish activity.
2. Develop the relationships among the activities. Decide which activities must precede and which must follow others.
3. Draw the "Network" connecting all the activities. Each Activity should have unique event numbers. Dummy arrows are used where required to avoid giving the same numbering to two activities.
4. Assign time and/or cost estimates to each activity.
5. Compute the longest time path through the network. This is called the critical path.
6. Use the Network to help plan, schedule, monitor and control the project.

The Key Concept used by PERT/CPM is that a small set of activities, which make up the longest path through the activity network control the entire project. If these "critical" activities could be identified and assigned to responsible persons, management resources could be optimally used by concentrating on the few activities which determine the fate of the entire project.

Non-critical activities can be replanned, rescheduled and resources for them can be reallocated flexibly, without affecting the whole project.

Notes

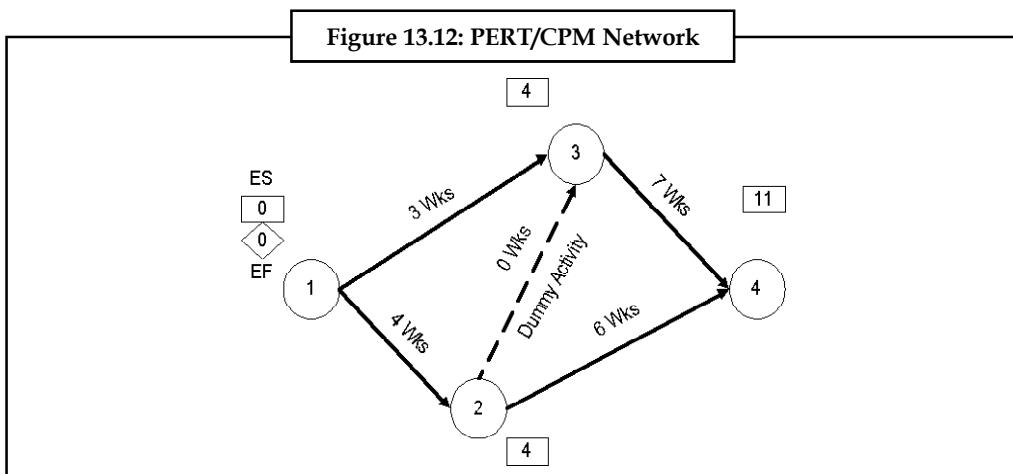
Five useful questions to ask when preparing an activity network are:

1. Is this a Start Activity?
2. Is this a Finish Activity?
3. What Activity Precedes this?
4. What Activity Follows this?
5. What Activity is Concurrent with this?

Some activities are serially linked. The second activity can begin only after the first activity is completed. In certain cases, the activities are concurrent, because they are independent of each other and can start simultaneously. This is especially the case in organisations which have supervisory resources so that work can be delegated to various departments which will be responsible for the activities and their completion as planned. When work is delegated like this, the need for constant feedback and coordination becomes an important senior management preoccupation.

Drawing the PERT/CPM Network

Each activity (or sub-project) in a PERT/CPM Network is represented by an arrow symbol. Each activity is preceded and succeeded by an event, represented as a circle and numbered.



At Event 3, we have to evaluate two predecessor activities - Activity 1-3 and Activity 2-3, both of which are predecessor activities. Activity 1-3 gives us an Earliest Start of 3 weeks at Event 3. However, Activity 2-3 also has to be completed before Event 3 can begin. Along this route, the Earliest Start would be $4+0=4$. The rule is to take the longer (bigger) of the two Earliest Starts. So the Earliest Start at event 3 is 4.

Similarly, at Event 4, we find we have to evaluate two predecessor activities - Activity 2-4 and Activity 3-4. Along Activity 2-4, the Earliest Start at Event 4 would be 10 wks, but along Activity 3-4, the Earliest Start at Event 4 would be 11 wks. Since 11 wks is larger than 10 wks, we select it as the Earliest Start at Event 4. We have now found the longest path through the network. It will take 11 weeks along activities 1-2, 2-3 and 3-4. This is the Critical Path.

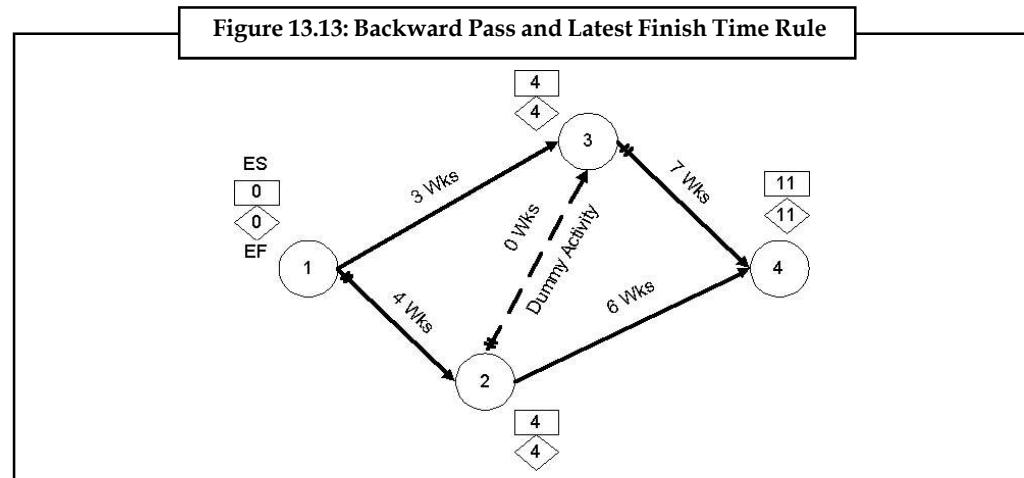
Notes



Task Describe the steps for Drawing the PERT/CPM Network.

The Backward Pass - Latest Finish Time Rule

To make the Backward Pass, we begin at the sink or the final event and work backwards to the first event.



At Event 3 there is only one activity, Activity 3-4 in the backward pass, and we find that the value is $11-7 = 4$ weeks. However at Event 2 we have to evaluate 2 activities, 2-3 and 2-4. We find that the backward pass through 2-4 gives us a value of $11-6 = 5$ while 2-3 gives us $4-0 = 4$. We take the smaller value of 4 on the backward pass.

Self Assessment

State True or False:

14. Planning, Scheduling and Control are considered to be advanced Managerial functions.
15. There are many variations of PERT/CPM which have been useful in planning costs, scheduling manpower and machine time.
16. Non-critical activities can be replanned, rescheduled and resources for them can be reallocated flexibly.
17. Each activity in a PERT/CPM Network is represented by a circle symbol.

13.9 Tabulation and Analysis of Activities

We are now ready to tabulate the various events and calculate the Earliest and Latest Start and Finish times. We are also now ready to compute the SLACK or TOTAL FLOAT, which is defined as the difference between the Latest Start and Earliest Start.

Notes

Table 13.3

Event	Duration (Weeks)	Earliest Start	Earliest Finish	Latest Start	Latest Finish	Total Float
1-2	4	0	4	0	4	0
2-3	0	4	4	4	4	0
3-4	7	4	11	4	11	0
1-3	3	0	3	1	4	1
2-4	6	4	10	5	11	1

The Earliest Start is the value in the rectangle near the tail of each activity.

1. The Earliest Finish is = Earliest Start + Duration
2. The Latest Finish is the value in the diamond at the head of each activity
3. The Latest Start is = Latest Finish - Duration

There are two important types of Float or Slack. These are Total Float and Free Float.

TOTAL FLOAT is the spare time available when all preceding activities occur at the earliest possible times and all succeeding activities occur at the latest possible times.

Total Float = Latest Start - Earliest Start

Activities with zero Total float are on the Critical Path

FREE FLOAT is the spare time available when all preceding activities occur at the earliest possible times and all succeeding activities occur at the earliest possible times.

When an activity has zero Total float, Free float will also be zero.

There are various other types of float (Independent, Early Free, Early Interfering, Late Free, Late Interfering), and float can also be negative. We shall not go into these situations at present for the sake of simplicity and be concerned only with Total Float for the time being.

Having computed the various parameters of each activity, we are now ready to go into the scheduling phase, using a type of bar chart known as the Gantt Chart.

There are various other types of float (Independent, Early Free, Early Interfering, Late Free, Late Interfering), and float can also be negative. We shall not go into these situations at present for the sake of simplicity and be concerned only with Total Float for the time being. Having computed the various parameters of each activity, we are now ready to go into the scheduling phase, using a type of bar chart known as the Gantt Chart.



Did u know? TOTAL FLOAT is the spare time available when all preceding activities occur at the earliest possible times and all succeeding activities occur at the latest possible times.

13.10 The PERT (Probabilistic) Approach

So far we have talked about projects, where there is high certainty about the outcomes of activities. In other words, the cause-effect logic is well known. This is particularly the case in Engineering projects.

Notes

However, in Research and Development projects, or in Social Projects which are defined as "Process Projects", where learning is an important outcome, the cause-effect relationship is not so well established.

In such situations, the PERT approach is useful, because it can accommodate the variation in event completion times, based on an expert's or an expert committee's estimates.

For each activity, three time estimates are taken-

- The Most Optimistic
- The Most Likely
- The Most Pessimistic

The Duration of an activity is calculated using the following formula:

$$t_e = \frac{t_o + 4t_m + t_p}{6}$$

Where t_e is the Expected time, t_o is the Optimistic time, t_m is the most probable activity time and t_p is the Pessimistic time.

It is not necessary to go into the theory behind the formula. It is enough to know that the weights are based on an approximation of the Beta distribution.

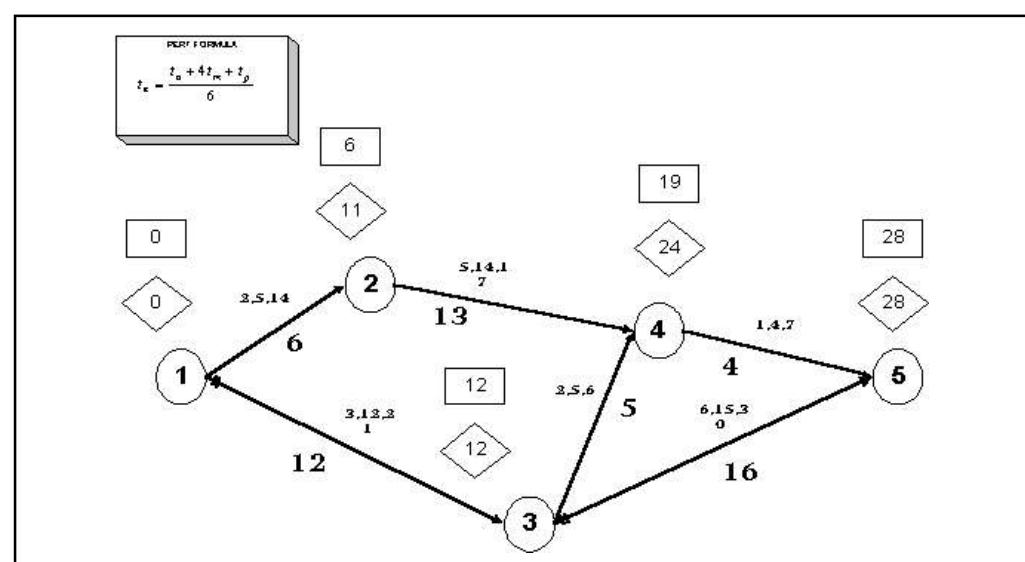
The Standard Deviation, which is a good measure of the variability of each activity is calculated by the rather simplified formula:

$$s_1 = \frac{t_p - t_o}{6}$$

The Variance is the Square of the Standard Deviation.

13.10.1 PERT Calculations for the Social Project

In our Social Project, the Project Manager is now not so certain that each activity will be completed on the basis of the single estimate he gave. There are many assumptions involved in each estimate, and these assumptions are illustrated in the three-time estimate he would prefer to give to each activity.



In Activity 1-3, the time estimates are 3,12 and 21. Using our PERT formula, we get:

Notes

$$t_e = \frac{3 + (4 \times 12) + 21}{6} = \frac{72}{6} = 12$$

$$s_1 = \frac{(21 - 3)}{6} = \frac{18}{6} = 3$$

The Standard Deviation (s.d.) for this activity is also calculated using the PERT formula.

We calculate the PERT event times and other details as below for each activity:

Event	t_o	t_m	t_p	t_e	ES	EF	LS	LF	TF	s.d.	Var.
1-3	3	12	21	12	0	12	0	12	0	3	9
3-5	6	15	30	16	12	28	12	28	0	4	16
1-2	2	5	14	6	0	6	5	11	5	2	4
2-4	5	14	17	13	6	19	11	24	5	2	4
3-4	2	5	8	5	12	17	19	24	7	1	1
4-5	1	4	7	4	19	23	24	28	5	1	1

Estimating Risk

Having calculated the S.D. and the Variance, we are ready to do some risk analysis. Before that we should be aware of two of the most important assumptions made by PERT.

1. The Beta distribution is appropriate for calculation of activity durations.
2. Activities are independent, and the time required to complete one activity has no bearing on the completion times of its successor activities in the network. The validity of this assumption is questionable when we consider that in practice, many activities have dependencies.



Caution PERT assumes that the expected length of a project (or a sequence of independent activities) is simply the sum of their separate expected lengths.

Expected Length of a Project

PERT assumes that the expected length of a project (or a sequence of independent activities) is simply the sum of their separate expected lengths.

Thus the summation of all the t_e 's along the critical path gives us the length of the project.

Similarly the variance of a sum of independent activity times is equal to the sum of their individual variances.

In our example, the sum of the variance of the activity times along the critical path, VT is found to be equal to $(9+16) = 25$.

The square root VT gives us the standard deviation of the project length. Thus, $ST = \sqrt{25} = 5$. The higher the standard deviation, the greater the uncertainty that the project will be completed on the due date.

Notes

Although the t_e 's are randomly distributed, the average or expected project length T_e approximately follows a Normal Distribution.

Since we have a lot of information about a Normal Distribution, we can make several statistically significant conclusions from these calculations.

A random variable drawn from a Normal Distribution has 0.68 probability of falling within one standard deviation of the distribution average. Therefore, there is a 68% chance that the actual project duration will be within one standard deviation, S_t of the estimated average length of the project, t_e .

In our case, the $t_e = (12+16) = 28$ weeks and the $S_t = 5$ weeks. Assuming t_e to be normally distributed, we can state that there is a probability of 0.68 that the project will be completed within 28 ± 5 weeks, which is to say, between 23 and 33 weeks.

Since it is known that just over 95% (.954) of the area under a Normal Distribution falls within two standard deviations, we can state that the probability that the project will be completed within 28 ± 10 is very high at 0.95.

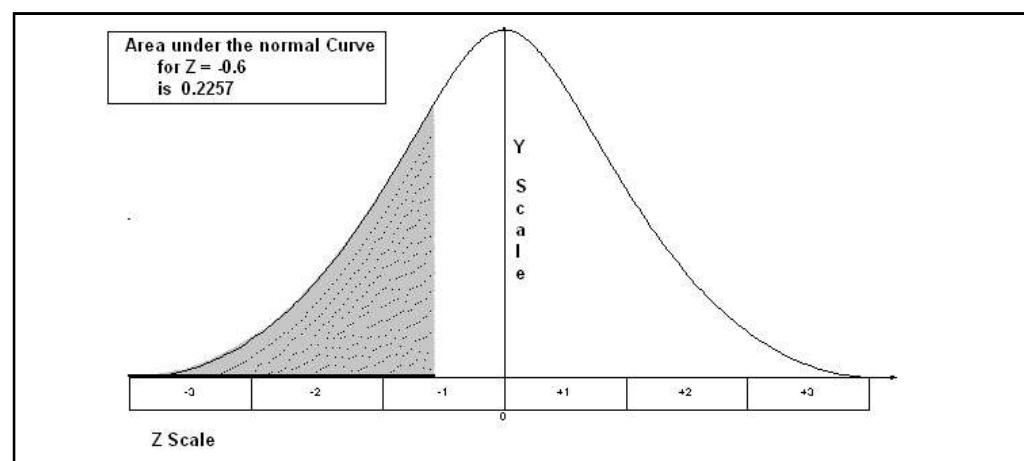
Probability of Project Completion by Due Date

Now, although the project is estimated to be completed within 28 weeks ($t_e=28$) our Project Director would like to know what is the probability that the project might be completed within 25 weeks (i.e. Due Date or $D=25$).

For this calculation, we use the formula for calculating Z , the number of standard deviations that D is away from t_e .

By looking at the following extract from a standard normal table, we see that the probability associated with a Z of -0.6 is 0.274. This means that the chance of the project being completed within 25 weeks, instead of the expected 28 weeks is about 2 out of 7. Not very encouraging.

$$Z = \frac{D - t_e}{S_t} = \frac{25 - 28}{5} = \frac{-3}{5} = -0.6$$

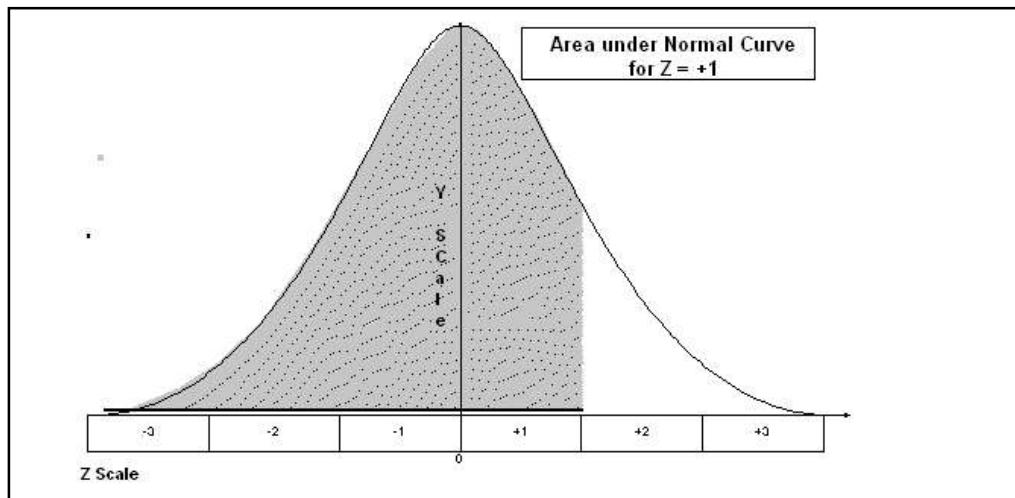


On the other hand, the probability that the project will be completed within 33 weeks is calculated as follows:

$$Z = \frac{D - t_e}{S_t} = \frac{33 - 28}{5} = \frac{5}{5} = 1$$

The probability associated with $Z = +1$ is 0.84134. This is a strong probability, and indicates that the odds are 16 to 3 that the project will be completed by the due date.

Notes



If the probability of an event is p , the odds for its occurrence are a to b , where:

$$\frac{a}{b} = \frac{p}{1-p} = \frac{0.84134}{0.15866} \approx \frac{16}{3}$$

13.11 Time Estimation

Accurate time estimation is a skill essential for good project management. It is important to get time estimates right for two main reasons:

1. Time estimates drive the setting of deadlines for delivery and planning of projects, and hence will impact on other peoples assessment of your reliability and competence as a project manager.
2. Time estimates often determine the pricing of contracts and hence the profitability of the contract/project in commercial terms.

Often people underestimate the amount of time needed to implement projects. This is true particularly when the project manager is not familiar with the task to be carried out. Unexpected events or unscheduled high priority work may not be taken into account. Project managers also often simply fail to allow for the full complexity or potential errors and stuff ups, involved with a project. The 2004-2006 Wembley Stadium project in London is often used as an example, although there are countless others of less profile.

Time estimates are important as inputs into other techniques used to organise and structure all projects. Using good time estimation techniques may reduce large projects to a series of smaller projects.

Step 1 - Understand the Project Outcome

First you need to fully understand what it is you need to achieve. (Refer to my article; Project Management - Begin with the end in mind). Review the project/task in detail so that there are no "unknowns." Some difficult-to-understand, tricky problems that take the greatest amount of time to solve. The best way to review the job is to just list all component tasks in full detail.

Notes

Step 2 - Estimate Time

When you have a detailed list of all the tasks that you must achieve to complete the project then you can begin to estimate how long each will take.

Make sure that you also allow time for project management administration, detailed project liaison with outside bodies resources and authorities, meetings, quality assurance developing supporting documentation or procedures necessary, and training.

Also make sure that you have allowed time for:

1. Other high urgency tasks to be carried out which will have priority over this one. Accidents and emergencies. Internal/external meetings.
2. Holidays and sickness in key staff/stakeholders.
3. Contact with other customers, suppliers and contractors.
4. Breakdowns in equipment.
5. Missed deliveries by suppliers.
6. Interruptions by customers, suppliers, contractors, family, pets, co-workers etc. Others priorities and schedules e.g. local government planning processes. Quality control rejections etc.
7. Unanticipated events (e.g. renovating the bathroom finding white-ants/termites in the walls).

These factors may significantly lengthen the time and cost needed to complete a project.

If the accuracy of time estimates is critical, you will find it effective to develop a systematic approach to including these factors. If possible, base this on past experience. In the absence of your own past experience, ask someone who has already done the task or project to advise what can go wrong; what you need to plan for; and how long each task took previously.

You can lose a great deal of credibility, and money, by underestimating the length of time needed to implement a project. If you underestimate time, not only do you miss deadlines, you can also put other people under unnecessary stress.

Step 3 - Plan for it Going Wrong

Finally, allow time for all the expected and unexpected disruptions and delays to work that will inevitably happen. Sickness, strikes, materials not available, poor quality work, bureaucratic bungling etc.

Self Assessment

Fill in the blanks:

18. Activities with zero Total float are on the Path.
19. The distribution is appropriate for calculation of activity durations.
20. assumes that the expected length of a project is simply the sum of their separate expected lengths.
21. The sum of the of the activity times along the critical path.
22. The square root gives us the standard deviation of the project length.
23. The of the variance of the activity times along the critical path.

13.12 Summary

Notes

- CPM was the discovery of M.R. Walker of E.I. DuPont de Nemours & Co. and J.E. Kelly of Remington Rand, circa 1957.
- PERT was devised in 1958 for the POLARIS missile program by the Program Evaluation Branch of the Special Projects office of the U.S. Navy.
- There have been several extensions to both network and chart forms of project scheduling.
- Planning, Scheduling (or organising) and Control are considered to be basic Managerial functions.
- In our Social Project, the Project Manager is now not so certain that each activity will be completed on the basis of the single estimate.
- The Beta distribution is appropriate for calculation of activity durations.
- One shortcoming of the PERT/CPM network method is that it does not allow for leads and lags between two activities without greatly increasing the number of sub-activities to account for this.
- Far more than the technical benefits, it was found that PERT/CPM provided a focus around which managers could brainstorm and put their ideas together.
- There are many variations of PERT/CPM which have been useful in planning costs, scheduling manpower and machine time.

13.13 Keywords

Critical Path: Critical Path is the longest pathway taken from the initial event to the terminal event.

Expected Length of a Project: It is simply the sum of their separate expected lengths.

Free Float: It is the spare time available when all preceding activities occur at the **earliest** possible times and all succeeding activities occur at the **earliest** possible times.

Pessimistic Time: Pessimistic time (P) is the maximum possible time required to accomplish a task, assuming everything goes wrong (but excluding major catastrophes).

PERT: PERT assumes that the expected length of a project (or a sequence of independent activities) is simply the sum of their separate expected lengths.

Slack: The slack of an event is a measure of the excess time and resources available in achieving this event. Positive slack would indicate ahead of schedule; negative slack would indicate behind schedule; and zero slack would indicate on schedule.

Time Estimation: Accurate time estimation is a skill essential for good project management.

Total Float: It is the spare time available when all preceding activities occur at the earliest possible times and all succeeding activities occur at the latest possible times.

13.14 Review Questions

1. Describe about the brief history and language of CRM.
2. Discuss about the framework of PERT and CPM.
3. Discuss about Network Techniques of Project Management.

- Notes**
4. Describe about type of Networks.
 5. Discuss about Evolution of Network Techniques.
 6. What are the assumptions underlying CPM analysis?
 7. Describe about Total Float and Free Float.
 8. Explain about the expected length of a project.
 9. Discuss about the rule "The Backward pass".
 10. What do you know about Time Estimation?

Answers: Self Assessment

- | | |
|----------------------|---------------------|
| 1. Computation | 2. PERT |
| 3. CPM | 4. False |
| 5. True | 6. True |
| 7. Costs | 8. Direct Costs |
| 9. Overtime Payments | 10. Direct Activity |
| 11. PERT | 12. Network |
| 13. Balance sheet | 14. False |
| 15. True | 16. True |
| 17. False | 18. Critical |
| 19. Beta | 20. PERT |
| 21. Variance | 22. VT |
| 23. Sum | |

13.15 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

Notes

- www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf
- www.pma-india.org/ - Trinidad and Tobago
- www.nickjenkins.net/prose/projectPrimer.p
- www.mpug.com/Pages/WhatisProjectManagement.aspx
- www.mindtools.com/pages/main/newMN_PPM.htm
- www.freelancer.com/jobs/Project-Management/

Notes

Case Study

A Tale of Two Projects**A business tale of what it takes to turn around troubled projects.**

The year is 2005 and times are good. The business environment is vibrant and the economy is strong. Large businesses are committing large amounts of capital and resources to implement new strategies, establish new capabilities, and open new markets. It was no different at PintCo, where Jack works as a Director of Customer Relationship Management.

Jack walked into work on Monday morning like any other. He dropped his briefcase in his office, grabbed a cup of coffee and headed down the hall to meet with his boss, Brandon, about one of the company's troubled projects. Although Jack had substantial experience, he had only recently joined PintCo after being hired away from a chief competitor. He was still learning about some of the nuances of his current employer.

After the typical morning banter, Brandon and Jack got to the topic at hand. "Jack, I'll get straight to the point. I need to you to take over the Customer Master File project from Paul." Brandon said. He continued, "We hired you because of your significant project management expertise. I know that you've turned around a lot more difficult situations than this." Over an hour later, Jack emerged from Brandon's office and set out to learn more about the challenge that Brandon had posed to him.

Jack was an experienced business leader and project manager. He had seen more than his fair share of ugly projects; some he turned around while others had spun hopelessly out of control. He would be able to tell very quickly how this one would go based on the makeup and culture of the project team.

1. Trouble Waters

Over the course of the next few weeks, Jack took over the Customer Master File project, met with key project team members, and conducted dozens of interviews with key stakeholders. It was only a few weeks since Brandon had handed the keys to him for this troubled project, and now Jack was back in Brandon's office to give a rather stark update on the situation.

"Brandon, I've talked to the project team and to key stakeholders, and I know why this project is in trouble," Jack started. "If you truly want me to turn this project around, I'll need your support to make some critical changes."

Brandon, a 20-year veteran at PintCo, knew what was coming. He had seen too many projects start, flounder, and then fail at the company. He didn't want to hear that another project was on the brink of failure, but he asked anyway, "What did you find out, Jack, and what can I do to help?"

Jack drew a deep breath and began to explain his findings. "Brandon, as you know this project has been in flight for nearly 6 months now and it is already behind schedule and over budget." Jack went on, "In talking to the project team and other stakeholders, I don't see the situation getting better without making some pretty significant changes."

Jack's experience helped him to quickly identify a number of critical issues with the project, which he carefully outlined for Brandon:

- ❖ "The scope of the project is not well defined,"
- ❖ "The IT architects are sitting in their ivory towers and disagree with the project's direction,"

Contd...

- ❖ “The project team is not functioning as a team,”
- ❖ “There is a lack of clear executive sponsorship, and”
- ❖ “Steve from Marketing is trying to manipulate this project for his own political gain.”

Notes

“I’m not going to sugar coat this for you Brandon,” Jack explained. “I’ve seen this situation far too often in my career, and if we don’t change the situation this project will fail in glorious fashion.”

2. Foundations for Success

Brandon knew that what Jack said was true, and he also knew that changing the situation would be difficult, painful, and potentially costly. He reluctantly agreed with Jack, and together they laid out several key changes.

“Thanks for working with me on this Brandon,” Jack said. “Just to confirm, let me summarise the changes that we agreed to implement:

- ❖ “First, we’re going to stop the current project and recreate a clear and well-defined scope and get consensus buy-in on the new scope.”
- ❖ “Second, we’re going end the architectural holy wars by assigning key IT architects to the project on a full time basis.”
- ❖ “Third, we’re going to collocate the team and assign members to a full-time basis on the project. No more part-time participation.”
- ❖ “Fourth, Brandon, you agree to be much more visible and an active participant to drive key decisions for the project.”
- ❖ “Finally, Brandon - you are going to have a heart-to-heart with Steve and if necessary his boss - to eliminate any political agendas that could derail the project.”

Brandon and Jack both agreed with the plan. Jack knew that some of these changes would be unpopular, but without them the project would be doomed. He left Brandon’s office with a sense of relief and apprehension. There was still a lot of hard work and heavy lifting yet to be done.

3. Celebrations

Six months later, Jack ran into Brandon in the break room as they both were angling for their morning coffee refill. “Jack!”, Brandon shouted while patting Jack on the back. “Congratulations on getting the Customer Master File project into pilot. By all accounts, it has been a resounding success!” Brandon crowed.

“Thank you,” Jack smiled and answered, “but you know it was pretty touch and go after we met in your office to plan the project turnaround. There were a lot of unhappy campers and several of them didn’t like the idea of being assigned 100% to the project if you recall.”

“But we quickly converted them - and now I see a project team that is hitting on all cylinders,” Jack added. “In fact, Sharon told me she was ready to quit six months ago - and now she’s happier than ever and up for promotion.” Jack explained.

“I love it when a plan comes together,” Jack said proudly as he turned to walk away and take on his next big project.

Question:

1. Analyse the case and discuss the case facts.

Source: <http://www.projectsmart.co.uk/a-tale-of-two-projects.html>

Unit 14: Conflict and Negotiation

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Objectives

After studying this unit, you will be able to:

- Define conflict and negotiation
- Describe about nature and type of negotiation
- Discuss about project review and administrative aspects
- Describe about post completion audits and abandonment analysis

Introduction

Notes

Conflict is inevitable and universal phenomenon of our individual, team and organizational life. Life is a never ending saga of conflict. Remember the time when you were a small child and had to choose between a tricycle and a cricket set or say, a set of dolls and a new frock for a birthday present. That was probably your first exposure to a conflict situation. Of course, this is a simplistic example of a conflict, but has life been the same since? Probably not. Think back and recall how each succeeding conflict in your life over the years has been increasingly complex.

Conflict has occupied the thinking of man more than any other theme. It has always been widespread in society but in recent year it has generated a lot of interest and has become the focus of research and study. We are living in the age of conflict. Everyday the choices available to us regarding any decision are increasing in number. You may have wanted to become a manager, an entrepreneur or a computer scientist. On the other hand, your father might have wanted you to become a doctor, a lawyer or a chartered accountant. Thus you faced a conflict not only at an intrapersonal level, in terms of the various choices confronting you, but also at an interpersonal level – your choice vs. your father's choice of a career for you.

Management today is faced with the awesome responsibility of ensuring optimum level of growth and productivity in an environment that is full of conflicting situations. A survey suggests that the modern man spends over 20 per cent of his time handling one form of conflict or the other. Top and middle level managers in the same survey have pointed out the importance of conflict management skills. We hope that the knowledge you will gain from this unit will equip you better to manage conflict situations more deeply at your workplace.

14.1 Conflict is Everywhere

Conflict is not confined at the individual level alone but is manifesting itself more and more in organizations. Employees have become more vociferous in their demands for a better deal. Various departments in an organization face a situation full of conflicts due to a number of reasons like goal diversity, scarcity or resources or task over-dependence etc.

From organizations that are divided by their strategies and roles to local communities that are divided by race, economics, religion, or politics; from homes torn apart by chronic feuds between parents and children, siblings, or in-laws to countries that are torn apart by civil strife. At a superficial level, conflicts can be categorized into 'hot' (strong emotions, loud voices, visible tension) and cold (suppressed emotions, tense silence, invisible stress). Although hot and cold conflicts are as different as summer and winter, they both have destructive consequences if handled poorly. They produce chronic inefficiency in our organizations, strife in our communities, and turmoil in our lives. Even if we went to live alone, like a hermit on a mountain top in total self-sufficiency, we would still carry in our memory all the previous experiences of conflict.

These conflicts are real. They are unavoidable. And they are not going away. So the question each of us faces is, "How to deal with it?" In our day-to-day life conflicts are only increasing and becoming more complex and intractable.

Just as differences are deepening in the communities where we live, so they are in the organizations where we work. Today more than sixty-three thousand trans-national companies operate globally with over eight hundred thousand subsidiaries spanning the planet. They employ more than 90 million people and produce 25 per cent of the world's Gross National Product (GNP). Unlike forty years ago, when 60 per cent of the world's top global companies were American, now only a third is. In less than a generation, the number of business people working across geographic borders has skyrocketed.

Notes “The borders are coming down,” In Unipolar globe “It’s an irreversible trend, whether they are tariff borders, monetary borders, political borders, ethnic borders – they are coming down.” And as the world is changing, leadership must change too.

But these differences between nations and cultures are only one part of the picture. For many leaders today, the more immediate challenge is the differences within their own organizations. Gone are the days when senior executives in the private sector were responsible to a wide range of stakeholders who are often scattered all over the world. They are juggling cross-border consistencies including employees, multiple suppliers, customers, governments (with different regulatory system), relevant NGOs (environmental, worker’s rights, human rights, etc.), and more. Effective leaders today must develop the skills for turning these differences into opportunities – or they simply won’t succeed.

Leaders who can traverse divisive boundaries have always been vital to civilization, but today the need for this leadership capacity is even more urgent and widespread. Leading as if the world stops at the edge of one’s tribe, religion, nation, or corporation has become impractical, and often impossible. We simply cannot manage a whole company, a whole community and certainly not a whole planet – with leaders who identify only with one part. Instead, more often than ever before, we need boundary – crossing leaders who can help the parts work together to strengthen the whole.

“Leading through conflict” involves facing differences honestly and creatively, understanding their full complexity and scope, and enabling those involved to move towards original solutions. Such leadership requires going beyond the powerful, primordial responses to difference that result in an “us vs them” mentality. It requires capacities that such bear both personal and professional skills that turn serious conflicts into rewarding opportunities for collaboration and innovation.

Following are the vital tools of the mediator:

1. ***Integral vision:*** committing ourselves to hold all sides of the conflict, in all their complexity, in our minds – and in our hearts.
2. ***System thinking:*** identifying all (or as many as possible) of the significant elements related to the conflict situation and understanding the relationships between these elements.
3. ***Presence:*** applying all our mental, emotional, and spiritual resources to witnessing the conflict of which we are now a part.
4. ***Inquiry:*** asking questions that elicit essential information about the conflict that is necessary for its transformation.
5. ***Conscious conversation:*** becoming aware of our full range of choices about how we speak and listen.
6. ***Dialogue:*** communicating in order to catalyze the human capacity for bridging and innovation.
7. ***Bridging:*** building partnerships and alliances that cross the borders that divide an organization or a community.
8. ***Innovation:*** fostering social or entrepreneurial breakthroughs that create new options for moving through conflicts.

Through interviews with scores of leaders around the world, it is established how they have transformed – not just managed, settled, contained, or resolved – some of the most challenging, intractable conflicts of our time. Transformation means that the conflict is neither superficially ‘settled’ with a quick compromise nor temporarily “fixed.” It means that the stakeholders go through a process of change that raises the dynamics of the conflict to another level.

Notes

Transformation requires us to “wake up” out of vengeance and numbness. It challenges us to stand up and defend these life-affirming values – not to hurt but to heal; not for victory but for justice; not for our rights but for the rights of all; not just for our “side” but for the whole of which we are only a small and fragile part.

As our world grows smaller, opportunities for conflict multiply. Ethnic, religious, political and personal differences drive people apart in organizations and institutions of all kinds – with potentially disastrous consequences. It’s the task of effective leaders with mediator skills to bring people together again.



Did u know? The word “negotiation” originated from the Latin expression, “negotiatus”, past participle of negotiare which means “to carry on business”. “Negotium” means literally “not leisure”.

Self Assessment

Fill in the blanks:

1. is inevitable and universal phenomenon of our individual, team and organisational life.
2. Conflict is not confined at the individual level alone but is manifesting itself more and more in
3. requires us to “wake up” out of vengeance and numbness.
4. Conflict can be defined in many ways and can be considered as an expression of
5. Conflict is not at the individual level alone but is manifesting itself more and more in organisations.

14.2 Negotiation

Negotiation is process of adjusting both parties’ views of their ideal outcomes to an attainable outcome.

In journey of our lives, we negotiate at every step to achieve success both in our personal and professional lives. People negotiate in their personal life (e.g. with their spouses, children, school teachers, neighbours) as well as in their business life. Thus, the scope of negotiation ranges from one-on-one to highly complex multi-party and multi-nation interactions. In the business world, people negotiate at multiple levels and contexts – within departmental or business units, between departments, companies, and even across industries. For this reason, managers must understand enough about negotiations to be effective negotiating within, between, and up and across all of these business environments.

14.2.1 Definition and Scope

In this unit, we use the following working definition of negotiation: Negotiation is an interpersonal decision-making process necessary whenever we cannot achieve our objectives single-handedly. Negotiations not only include the one-on-one business meeting, but also multi-party, multi-company, and multimillion-dollar deals. Whether simple or complex, negotiations boil down to people, communication, and influence. Even the most complex of business deals can be broken down to a system of one-on-one relationships.

Notes Somehow the term ‘Collective Bargaining’ and ‘Negotiation’ have been often used synonymously. It would be more logical and meaningful to consider negotiations as part of collective bargaining. ‘Collective Bargaining’ refers in the structural and/or institutional arrangement relations and also covers the parties, goals, environments, and contents as well as the process often used for resolving the conflict of interest between the management and unions. Whereas the negotiation processes has been described by Walton and McKersieas “the deliberate interaction of two or more complex social units which are attempting to define or redefine the terms of their interdependence”. Gottschalk defines negotiation process as “an occasion where one or more representatives of two or more parties interact in an explicit attempt to reach a jointly acceptable position on one or more divisive issues.” The term negotiation as described by Micael Salamon as “the interpersonal process used by representatives of management and employees/unions, within the various institutional arrangements of collective bargaining, in order to resolve their differences and reach agreement. Negotiation is a process for resolving conflict between tow or more parties whereby both or all modify their demands to achieve a mutually acceptable compromise.

Negotiation can be characterised as:

1. an explicit and deliberate event;
2. it takes place between the representatives of parties concerned;
3. the process which intends to settle the disputes/differences between the parties involved;
4. the outcome of the negotiation is dependent (party) on the relative power relationship between the parties involved.

14.2.2 The Prevalence of Negotiation

This is an age of negotiation. Almost each and every aspect of our lives is subject to one or the other form of negotiation. Sometimes we negotiate several times a day also, though we don't realise doing so.

Negotiations, governments, employers, employees, unions, management, husbands, wives, parents and children all negotiate whether it is a national or international problem, negotiation is the solution, e.g. summit of super negotiation between Israel and Arabs or Palestinians.

Labor disputes are far more visible and get extensive news coverage than commercial disputes which are as frequently but public and visible. Go slows, strikes, bans and lock-outs have become quite familiar dramas. Industrial relations disputes do get more publicity and coverage, as in this case both the parties try to win public support and sympathy to strengthen their sides. Whereas commercial emotions are generally held in private kind of environment, party to have edge over the competitors and to protect the companies images.

There has been substantial in the use of the term “Negotiation” in the commercial context. Negotiating in this context is not merely selling but its extension where the interested parties having agreed to do business need to agree on the terms and conditions. Myriads of interest groups negotiate with their local authorities/government for various social welfare, rights and amenities. Negotiated settlement for marriage between the parents of prospective couple for the size of dowry, has been a common practice and far more decisive factor than the compatibility of the prospective partners. Now negotiation has become quite common and effective in divorce settlements. Lawyers specialise in representing their clients in such negotiation. Husbands, wives, and lovers negotiation in go under. One thing which's common in all such cases and makes negotiation necessary is that the parties involved may have varying degrees of powers but not absolute power over each other. We are forced to negotiate because we are not fully in control of events.



Notes

Did u know? The foundations of negotiation theory are decision analysis, behavioural decision-making, game theory and negotiation analysis. Another classification of theories distinguishes between Structural Analysis, Strategic Analysis, Process Analysis, Integrative Analysis and behavioral analysis of negotiations.

Individuals should make separate, interactive decisions; and negotiation analysis considers how groups of reasonably bright individuals should and could make joint, collaborative decisions. These theories are interleaved and should be approached from the synthetic perspective.

14.3 Alternatives to Negotiation

The right to differ is regarded in democracies as a fundamental right. Given that everybody demands the right to have a viewpoint, naturally follows to find out a way of handling the mutual right to differ and that is negotiation. Negotiating may not work in certain circumstances, necessitating finding other way outs. There are alternatives to negotiation which are appropriate and sometimes even preferred to suit the circumstances.

Dictatorship is one of the alternatives to negotiations, which is even preferable in certain circumstances. If the decision is made unilaterally and the other party accepts it because either one has surrendered one's own right or is fearful of the consequences, accepting the right and might of the dictator. Decisions will be dictated whenever such situations exist such decisions are far more common than realised and widespread throughout society.

In military orders are not subject to negotiation; in sports the referee's decision is final, through a player does not lose the right to challenge it risking punishment.

A solution can be hit through arbitration, if negotiation fails to produce one. Arbitration may be another alternative to negotiation wherein a third party is designated to make decisions for the two parties, who could not agree as one. This may not work always.

Because of its nature arbitration is also unpopular among the negotiators, as it requires the parties concerned to hand over their powers in the hand of a neutral party and hence lose the opportunity to influence the decision in their favor, and moreover the decision of the arbitrator has to be mutually binding. Thus it has some proximity to the decision by dictatorship.

Pendulum arbitration is more common. In this the arbitrator selects one or the other party's final positions and is precluded from forming a compromise between them. Such a mechanism encourages the interested parties to move closer and closer to what they think the arbitrator may consider as a reasonable solution, thus even increasing the probability of striking a solution without the necessity of arbitration.

The most common alternative negotiation is persuasion. If the other party can be persuaded to accept one's point of view. It is often the first thing we try and keep on trying throughout the negotiation. Unfortunately, the experiences show a very pessimistic picture of the success rate of persuasion, provoking the feeling of frustration as people in conflict can seldom be persuaded easily.

Self Assessment

Multiple Choice Questions:

6. Negotiation is a process in which:
 - (a) two or more parties try to resolve differences.

- Notes**
- (b) two or more parties try to avoid differences.
 - (c) two or more parties try to create differences.
7. In the lose-win strategy:
 - (a) one party is satisfied and the other dissatisfied with a negotiated settlement.
 - (b) one party is prepared to give concessions, and the result may go one way or the other.
 - (c) both parties are dissatisfied with the negotiated result.
 8. Coercive power in negotiation is based on:
 - (a) the control over resources desired by others.
 - (b) punishment, authority and use of force, whereby others are compelled to behave a particular way.
 - (c) a capacity to seek information and consider the ideas of others.
 9. The four elements of the principled negotiation method are:
 - (a) purpose, intervention, opinions and criteria.
 - (b) people, interactions, options and criteria.
 - (c) people, interests, options and criteria.

14.4 Negotiating Conflicts

The right to differ and have one's own viewpoint is an integral part of a democracy. We become convinced that our point of view is the right one and that the other party could not agree to it because of the lack of understanding or inability to using the same facts and arguments to arrive at the conclusion. As a result both the parties waste hours and days together fruitlessly arguing repeating the same ground instead of negotiating to achieve a workable compromise.

One of the major causes of conflict is differing perceptions. Beside there are other causes too: e.g. one of the parties might want to improve on other's offer (even after a deal has been agreed) thus introducing conflict deliberately. Sometimes there is a genuine gap between the parties beyond their control e.g. suppose a flight is delayed due to fog, hence a major contract is lost, consequently substantial reduction of work available in the company, redundancies are inevitable.

People negotiate because of self interest, be it corporate or personal. It is not always possible to resolve conflict by negotiation. Two parties in conflict can, of course, decide to ignore the issue and agree to disagree. Difference of opinion on politics, religion and sport may probably fall in this category. Agreeing to disagree will not make the problem go away where these differences affect or are part of a work or commercial relationship.

In the negotiating context, the conflict can be of two kinds:

1. Conflict of interest, and
2. Conflict of rights.

The conflict of interest occurs where either the terms of business have not been settled or being renegotiated, having settled earlier. Labour negotiations on wages, hours, numbers and working conditions, commercial negotiations on price, quantity, quality and delivery are the examples of the conflicts of interest.

Notes

The conflict of rights occurs where a difference of interpretation arises about the existing agreement between the two parties. In labour negotiations a dispute can arise over the application of an existing agreement. In commercial negotiation the conflict could centre on whether the terms of the existing contract have been met? Did one party fulfill its obligations under the contract, if not, was it entirely its own fault or did the other party contributed too, if yes, how much? Again, this is a conflict about rights not interests.

The word 'Conflict' is used descriptively because that is what it is. Characterising or categorising the conflicts of rights or interests, is a prelude to resolving it.

Negotiations as a process for conflict resolution necessarily centers on the issue on which the two parties are in conflict and not their relationship in total. It is because parties despite all difference have a common overall interest and common interest in finding a negotiated settlement. It does not imply that any terms are acceptable.



Task Conduct a debate on following statements and interpret them:

1. "This is an age of negotiation".
2. "Negotiation is process of adjusting both parties' views of their ideal outcomes to an attainable outcome".

14.5 Need and Importance of Negotiation

Following are the five key reasons that illustrate the importance of negotiation skills (1) the dynamic nature of business, (2) interdependence, (3) competition (4) the information age, and (5) globalisation.

14.5.1 Dynamic Nature of Business

Mobility and flexibility are the dictates of the new world of work. The dynamic, changing nature of business means that people must negotiate and renegotiate their existence in organisations throughout the duration of their careers. The advent of decentralised business structures and the absence of hierarchical decision-making provide opportunities for managers, but they also pose some daunting challenges. People must continually create possibilities, integrate their interests with others, and recognise the inevitability of competition both within and between companies. Managers must be in a near-constant mode of negotiating opportunities. According to Linda Greene, Associate Vice Chancellor for academic affairs at the University of Wisconsin-Madison, "Many important events essential to professional success and professional satisfaction happen everyday in the workplace and they are not always announced in advance."

In reality, negotiation comes into play when people participate in important meetings, get new assignments, head a team, participate in a reorganisation process, and set priorities for their work unit. Negotiation should be like second nature to the business manager, but often it is not.

14.5.2 Interdependence

The increasing interdependence of people within organisations, both laterally and hierarchically, implies that people need to know how to integrate their interests and work together across business units and functional areas.

Notes

14.5.3 Competition

Business is increasingly competitive. This means that companies must be experts in competitive environments. Managers not only need to function as advocates for their products and services, but they must also recognise the competition that is inevitable between companies and, in some cases, between units within a company. Understanding how to navigate this competitive environment is essential for successful negotiation.

14.5.4 Information Age

The information age also provides special opportunities and challenges for the manager as negotiator.

14.5.5 Globalization

Most managers must effectively cross cultural boundaries in order to do their jobs. Setting aside obvious language and currency issues, globalisation presents challenges in terms of different norms of communication. Managers need to develop negotiation skills that can be successfully employed with people of different nationalities, backgrounds, and styles of communication. Consequently, negotiators who have developed a bargaining style that works only within a narrow subset of the business world will suffer unless they can broaden their negotiation skills to effectively work with different people across functional units, industries, and cultures.

It is a challenge to develop a negotiation skill, set general enough to be used across different contexts, groups, and continents, but specialised enough to provide meaningful behavioural strategies in any given situation. This book helps to develop such skills.



Caution The dynamic, changing nature of business means that people must negotiate and renegotiate their existence in organisations throughout the duration of their careers.

14.6 Preconditions for Negotiations

1. There must be two or more parties which have either conflict or disagreement.
2. There must be a perceived conflict of needs, positions and interests.
3. There must be interdependence so that the outcome must be satisfying to all parties.
4. Agreement must be required to be reached within reasonable time, so that it becomes beneficial to parties.
5. The success of negotiation depends on the facts that:
 - (a) The issue is negotiable.
 - (b) The negotiators are not only taking but giving also.
 - (c) The negotiator's parties must trust each other to some extent.
 - (d) There is a fear that failure may lead to crisis.

14.7 Elements of Negotiation

Notes

Most of the descriptions given above basically identify the following elements in the process of negotiation:

1. People generally do not negotiate with themselves. All negotiations involve transactions between a minimum of two individuals/groups. However, in some situations, it could be more than two individuals/groups. For example, in India, differences between labour and management are often resolved with the involvement of the Government.
2. For negotiation to take place, there must exist a conflict of interest between two individuals/parties. When they come to negotiate, they would like to find a solution that would satisfy the individual interests of both the parties.
3. The reason why two individuals/groups opt for negotiation is because their relationship is interdependent. One depends on the other for the satisfaction of his interests, which cannot be taken care of by another individual or group. For instance, the union depends on the management and the management is dependent on the workers who are represented by the unions.
4. The process of negotiation begins by presentation of an initial demand/proposal which is followed by a counter proposal by the other party. If this is followed by several proposals and counter proposal, negotiation does not take place. Saying yes or no as opening move, or tossing a coin and sticking to it does not constitute negotiation.
5. In all negotiations the concern is either for division and/or exchange of specific resources. The first is a fixed pie situation where negotiation takes place for a share of the pie. The second is simply a barter situation, where negotiation takes place as a process of give and take.
6. Very often people negotiate on behalf of another person, organisation, or even a country, called constituents. Often the constituents provide these negotiators the ranges within which they are to settle the deal. However, in some cases no such ranges are provided and the final deal is left to the judgement of the negotiators. In cases where the people actually negotiate on behalf of someone, they have to be accountable to their constituents.
7. All negotiations do not always end up in a mutually satisfying memorandum of agreement. Sometimes the negotiators get so involved with the issues that they are not able to go beyond them. At this point of time, they may decide to involve mediation by a third party, acceptable to both the parties in negotiation.

Hence, we see negotiation as a way of getting what one wants by presenting proposals and counter proposals for division and/or exchange of resources in a mutually dependent relationship. In case of parties failing, it provides the possibility of a third-party intervention.



Notes People generally do not negotiate with themselves. All negotiations involve transactions between a minimum of two individuals/groups. However, in some situations, it could be more than two individuals/groups.

14.8 Nature and Type of Negotiation

Like it or not, everybody is a negotiator. We use negotiation techniques almost every day. We negotiated when we were kids trading sports cards or toys. We still do it today when we negotiate with the boss for a salary raise, or to buy bigger toys like autos and the latest gimmicks.

Notes	<p>It doesn't stop there either because we also use negotiation in our personal lives. We all have some combination of family, friends, significant other, or kids. At some level, we negotiate with them all the time without even knowing it.</p> <p>Many people don't like to negotiate because they view it as a hassle. Even though we might consciously think we're avoiding the blatant negotiation process, we end up doing it without realising that's exactly what's happening. So we may as well learn how to do it well, and decide which of the two negotiation types to use.</p> <p>Removing the veil, we find there are two relatively distinct types of negotiation. The two types are known as distributive negotiations, and integrative negotiations. The Negotiation Experts' training courses teach both methods, as both are essential to negotiate successfully in business.</p>
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14.8.1 Distributive Negotiations – The Fixed Pie

The term distributive means; there is a giving out; or the scattering of things. By its mere nature, there is a limit or finite amount in the thing being distributed or divided amongst the people involved. Hence, this type of negotiation is often referred to as '*The Fixed Pie*'. There is only so much to go around, but the proportion to be distributed is limited but also variable. How many times has somebody shouted out, '*Who wants the last piece of pizza?*' Everyone looks at each other, then the pizza slice, and two or more hands rush to grab it.

In the real world of negotiations, two parties face off with the goal of getting as much as possible. The seller wants to go after the best price they can obtain, while the buyer wants to pay the lowest price to achieve the best bargain. It's really just good old plain haggling, which is not all that much different from playing a tug of war.

A distributive negotiation usually involves people who have never had a previous interactive relationship, nor are they likely to do so again in the near future. Simple everyday examples, would be when we're buying a car or a house. Purchasing products or services are simple business examples where distributive bargaining is often employed. Remember, even friends or business acquaintances can drive a hard bargain just as well as any stranger.

Secondly, when we are dealing with someone unknown to us, and it's a one time only occurrence, we really have no particular interest in forming a relationship with them, except for the purpose of the deal itself. We are generally less concerned with how they perceive us, or how they might regard our reputation. Ours and their interests are usually self serving.

14.8.2 Distributive Bargaining Basics

1. *Play your cards close to your chest:* Give little or no information to the other side. The less they know about our interests as to why we want to make the purchase, our preferences, or the point at which we'd decline to deal, the better our position. Expressing eagerness or need, reveals a weakness which could be exploited to our disadvantage.
2. *The opposite is equally true:* Try to pry as much information from the other side. Any additional information that we uncover can be used as leverage to negotiate a better deal.
3. *The only thing you should ever tell:* The only information we should ever reveal are those alternative options, such as other sellers, which shows we are prepared to walk from the negotiation whenever it suits us.
4. *Let them make the first offer:* Whatever is used as the first offer will generally act as an anchor upon which the rest of the negotiation will revolve. Try to get the other side to set the stage from which to start.

5. ***Be realistic:*** Being too greedy or too stingy will likely result in no agreement, so keep it real.

Notes

14.8.3 Integrative Negotiations – Everybody Wins Something (usually)

The word integrative means to join several parts into a whole. Conceptually, this implies some cooperation, or a joining of forces to achieve something together. Usually involves a higher degree of trust and a forming of a relationship. Both parties want to walk away feeling they've achieved something which has value by getting what each wants. Ideally, it is a twofold process.

In the real world of business, the results often tilt in favour of one party over the other because, it's unlikely that both parties will come to the table at even strength, when they begin the talks.

Nonetheless, there are many advantages to be gained by both parties, when they take a cooperative approach to mutual problem solving. The process generally involves some form or combination of making value for value concessions, in conjunction with creative problem solving. Generally, this form of negotiation is looking down the road, to them forming a long-term relationship to create mutual gain. It is often described as the win-win scenario.

Integrative Negotiation Basics

1. ***Multiple Issues:*** Integrative negotiations usually entails a multitude of issues to be negotiated, unlike distributive negotiations which generally revolve around the price, or a single issue. In integrative negotiations, each side wants to get something of value while trading something which has a lesser value.
2. ***Sharing:*** To fully understand each other's situation, both parties must realistically share as much information as they can to understand the other's interests. You can't solve a problem without knowing the parameters. Cooperation is essential.
3. ***Problem Solving:*** Find solutions to each other's problems. If you can offer something of lesser value which gives your counterpart something which they need, and this results in you realising your objective, then you have integrated your problems into a positive solution.
4. ***Bridge Building:*** More and more businesses are engaging in long term relationships. Relationships offer greater security.



Caution The word integrative means to join several parts into a whole. Conceptually, this implies some cooperation, or a joining of forces to achieve something together.

14.9 Project Review and Administrative Aspects

A Project is monitored during the implementation phase so that time and cost overrun are minimised. After a project is commissioned its performance is periodically reviewed to see whether its performance has been in line with expectations. If things turn sour the abandonment may also have to be examined.

14.9.1 Post Completion Audits

Post Completion Audits (PCA) are used as a guide for future decision-making in the realm of capital budgeting. In Pinches schema, PCA is conducted as a way to identify mistakes in past investment decisions and uses the information to create a comprehensive resources allocation

Notes framework. Specifically, PCA aims to identify operating difficulties in order to impose intervention, assess manager's expertise to establish reward systems and lower managerial autonomy to the local level (1992). PCA is the process of monitoring and evaluating a capital investment project through a comparison of the actual cash flows and other benefits with those that are forecasted or planned at the time of authorisation for start-up (2007).

PCA is also referred as post completion review. In this framework, PCA is a process of assessing *ex post* efficiency and effectiveness of capital budgeting as well as its implementation. It compares planned and actual actions, cost and resource allocation and results against benefits analysis. In addition, it reviews the assumptions made earlier about markets, technology, human resources, financing schemes and other external variables. As a result, PCA intends organizations to learn and improve through adoption of processes that is rationalized by continuous analysis of their implications (2007).

There are three specific purpose of PCA; namely, to support continuous improvement in the capital investment and implementation process in forward-looking stance, allowing the organization to determine and execute corrective actions as intervention strategies that suggest opportunity to evaluate financial factors at the date of review but also future cash flows and allow the review of current processes and create more efficient ones to improve future decision alternatives leading to better conformance of results (2007).

PCA helps the firm to be a learning organization. It also polishes the rough edges that the organization uses when it is forecasting or creating forecasting parameters. A learning organization is one that is skilled in creating, acquiring and transferring knowledge in which it uses these to change its behavior towards better results. This definition makes PCA an important component of learning approach because it sets conditions for the organization to develop an effective learning capability especially on projects (1998).

Circumstances for Post Completion Audit

PCA is carried under circumstances of a project's life; namely, the regular monitoring of a project during its planning stage, the regular monitoring of a project during its early phases of operation, the examination of the performance of managerial employees who are responsible and accountable with the operations and the extensive examination of the initial evaluation of the project against its actual results (1992).

In the case forwarded by Baker Corporation, PCA should be implemented in cases where the project has new and ambiguous technology in it. The organization was left unaware about the effectiveness of the IT department's program that is why the PCA is conducted to detect the actual competencies of the new technology. In the implementation, PCA was called post-implementation audit or PIA where it is defined as a top-to-bottom evaluation of hard and soft benefits derived from a strategic information system, the security of the system and the project management process for deploying the technology. At the end of PIA, it is found that the firm is able to save at least \$150,000 yearly and identified that the returns on the new technology is pulled down by unexpected need for additional operators which served as additional cost pressure (2007).

The experience of Baker showed that PCA is a tool that not only determine the strengths of an uncertain technological strategy but also it transforms the organization of proactive thinking because employees are able to create solutions to problems as they emerge. In effect, employees are more confident with the new technology because they know its potential if only they cooperate as well as actual benefits. In addition, PCA is also applied during continuous improvement strategies because an organization will not know how much they improve if they do not have a benchmark (2007). In a study, PCA is applied only if the project exceeded a specified monetary amount of the budget. However, the author argued that this approach or

also referred as negative budget analysis dilemma made the respondent's capital budgeting system inefficient because expensive investment's problems are let undetected (2000).

Notes

Since PCA has the capacity to monitor operations, projects that have costs that are highly sensitive to certain business forces should be applied with it. In this way, the cause of deviations to intended results will be determined and will serve as a platform for appropriate action plan. However, PCA does not have the ability to discipline accountable persons who failed to produce planned operation/strategy outcome. Due to this, PCA is the suitable tool in monitoring big projects that employees may hesitate to handle due to certain bonds or disciplinary clauses if they fail to succeed (2007).

PCA should be implemented based on three criteria; namely, significant projects, nature of objectives of the project and nature of the project. The first obliges the firm to apply PCA in cases where the project affects its strategic direction, financial scope is comparable to its size, strategic duration, limited risk or extraordinary returns and the requirements to use new forecasting or planning techniques does not adversely affect some societal ethical issues. The second refers to the projects simplicity or complexity because PCA is more useful when projects are categorized as the latter. The third component suggests that non-recurring projects should not be applied by PCA because learning would be useless (2007).

Nature and Size of a Post Completion Audit Team

Most PCA are applied within a formal and complex system especially for large organizations. Due to this, the cost of applying PCA can compensate the risk attached to adopting new process or technologies. However, small organizations, small projects and relatively less risky strategies would not be able to compensate the costs and human resources burden associated with PCA (2007).

According to VP of Greif Manufacturing, when the project tends to benefit the entire firm, departmental projects should hold the entire firm also accountable if it fails. This stance will put every employee and department accountable to the project's success even though they are indirectly participating in the project. It usually take ten (10) days when an organization undergoes PCA but other firms like Sun Financial aspires to complete PCA within two weeks. In determining the people who will be involved in PCA, the quality of their feedback is the core criteria for most companies. For example, Honeywell Aviation Services and its projects use its employees who have training in Six Sigma to evaluate IT department projects and assure that the system has streamlined workflows (2007).

Usually, the most common groups or workers involved in PCA are members of project implementation team from IT, members of project implementation team from both IT and the business and/or representatives from a company's internal audit department. In this view, Sun Life Financial approach to PCA implementation is one of the industries best according to PricewaterhouseCoopers. In the latter opinion, PCA should consist of a businessperson, IT personnel and someone who is not part of the project team like the internal auditor. In this way, a group of people with different functions participates in the audit, which creates holistic approach to benefits, deliverables and requirements for the project (2007).

Managers and top-level executives carry PCA team. Furthermore, committee should be formed consisting of persons who are experienced in the firm's financial control system and familiar with technical, financial and marketing aspects of the project in question as well as its outcome. Since PCA is more than financial evaluation, the team should be headed by a managerial accountant to prevent overly focus on accounting processes rather business thinking. Lastly, the size of the committee to be formed is dependent on the size of the organization or it can also be suited to the size of the project in terms of the assets used, personnel involved, time frame for completion and business partners engaged (2007).

Notes



Task Discuss about Abandonment Analysis.

14.9.2 Abandonment Analysis

Project Abandonment Analysis is a process that organizations should execute before making decisions upon stopping or continuation of their projects. This analysis embraces economic and administrative considerations that an organization should give to their projects prior to making a well-grounded project continuation vs. abandon decision when it is necessary for an organization to cease some of their projects for the sake of a better viability of their other projects.

Project abandonment analysis comprises the following considerations:

1. Justifying reasons for organization to shut certain project down – why it doesn't make sense anymore to continue this project and why it is better to terminate it, instead of just freezing it.
2. Comparing losses that a company will incur from abandonment of certain project against the profits it can prospectively earn by reallocation of resources to other projects.
3. Appraising values of unattained benefits (belonging to a project to be abandoned) against all other benefits that can be achieved at their costs (from other projects).
4. Evaluation of effects that project abandonment may cause to an organization owning it.

Self Assessment

Fill in the blanks:

10. People because of self interest, be it corporate or personal.
11. and flexibility are the dictates of the new world of work.
12. Most must effectively cross cultural boundaries in order to do their jobs.
13. A is monitored during the implementation phase so that time and cost over run are minimized.
14. Post completion are used as a guide for future decision-making in the realm of capital budgeting.
15. Most are applied within a formal and complex system especially for large organizations.

14.10 Summary

- Conflict is not confined at the individual level alone but is manifesting itself more and more in organizations.
- Leaders who can traverse divisive boundaries have always been vital to civilization, but today the need for this leadership capacity is even more urgent and widespread.
- Transformation requires us to “wake up” out of vengeance and numbness.
- Negotiation is process of adjusting both parties’ views of their ideal outcomes to an attainable outcome.

- | | |
|--|--------------|
| <ul style="list-style-type: none">• Labour disputes are far more visible and get extensive news coverage than commercial disputes which are as frequent but public and visible.• Dictatorship is one of the alternatives to negotiations.• The most common alternative negotiation is persuasion.• The right to differ and have one's own viewpoint is an integral part of a democracy.• The conflict of rights occurs where a difference of interpretation arises about the existing agreement between the two parties. | Notes |
|--|--------------|

14.11 Keywords

Bluffing: It refers to the making of a false statement of position, a promise, or threat which the individual/party has no intention to carry out. The negotiators use “linguistic behaviour” such as disclaimer, hedging, omissions, and vague language to project an image of strength.

Even Split: Even splits, like compromises, refer to how the bargaining zone is divided among the negotiators. For example, two sisters who quarrel over an orange and ultimately decide to cut it in half have reached an even split.

Frequency: It refers to the number of times proposals are made and size refers to the quantity/value of the proposals.

Implementation Plan: Agreeing on an issue in negotiation leads to putting the agreement into an action plan. The exact nature of the plan must be sorted out during the negotiation to reduce any future misunderstanding.

Negotiation Dance: This is based on two elements – frequency of proposals and size of proposals.

Nibble: This basically refers to wearing down the adversary to reach an agreement on an issue after hard and prolonged bargaining.

Opening Move: If the parties in negotiation are meeting for the first time, the opening move becomes very important.

Snow Job: It refers to putting pressure on the other individual/party by presenting a long list of issues to be discussed, most of which may not have any significance for the individual/party presenting them.

14.12 Review Questions

1. Define the term Negotiation.
2. Explain about the prevalence of Negotiation.
3. What are the alternatives to Negotiation?
4. Discuss about Negotiating Conflicts.
5. What is the need and importance of Negotiation?
6. Discuss about Preconditions for Negotiation.
7. What are the elements of Negotiation?
8. Define about the term “Distributive Negotiation”.
9. Explain about Post Completion Audits.

- Notes**
10. What is the nature and Size of Post Completion Audit Team?
 11. Discuss about Abandonment Analysis.

Answers: Self Assessment

- | | |
|-------------------|------------------|
| 1. Conflict | 2. Organisations |
| 3. Transformation | 4. Hostility |
| 5. Confined | 6. a |
| 7. b | 8. b |
| 9. c | 10. Negotiate |
| 11. Mobility | 12. Managers |
| 13. Project | 14. Audits |
| 15. PCA | |

14.13 Further Readings



Books

Clements/Gido, *Effective Project Management*, Thomson

Clifford F. Gray and Erik W. Larson, *Project Management*, Tata McGraw Hill

Dennis Lock, *Project Management*, Ninth Edition, Gower

K. Nagarajan, *Project Management*, Third Edition, New Age International

P.C.K. Rao, *Project Management and Control*, Sultan Chand & Sons

Prasanna Chandra, *Projects – Planning, Selection, Financing, Implementation, and Review*, Sixth Edition, Tata McGraw Hill

Vasant Desai, *Project Management*, Second Revised Edition, Himalaya Publishing House



Online links

www.col.org/SiteCollectionDocuments/SuccessProjMgt.pdf

www.pma-india.org/ - Trinidad and Tobago

www.nickjenkins.net/prose/projectPrimer.p

www.mpu.com/Pages/WhatisProjectManagement.aspx

www.mindtools.com/pages/main/newMN_PPM.htm

www.freelancer.com/jobs/Project-Management/



Case Study

Notes

Probability in PERT

PERT is probabilistic in nature. It is used in those projects which are being developed for the first time. Hence, the developer has no previous experience and seeks guidance from the knowledgeable persons. On the other hand, CPM is deterministic in nature as all estimates are based on own experience or track-records.

But it must be remembered that many internal and external events may frustrate the predictions. This happens frequently and is taken as norm rather than exception especially in unstable economic and political environments.

In order to make realistic estimates, PERT obtains three estimates of different scenarios as shown below:

- Optimistic Time Estimates if everything turns favorable.
- Pessimistic Time Estimates if all goes bad.
- Mostly likely time which would be experienced in normal conditions.

Time Estimation Formula

Since Optimistic and Pessimistic conditions would be far less than normal conditions, a weight of one each is assigned to Optimistic and Pessimistic Times. In case of mostly likely time, a weight of 4 is assigned. This is a standard practice. The result is divided by total weight of 6, to find out weighted average which would serve as Time Estimate or T_e as in the formula shown on the right-hand side:

Basic Question

YATCH CONSTRUCTION			
	a	m	b
1 Construction of hull	4	6	8
2 Construction of deck	2	5	8
3 Engine installation	3	5	13
4 Super structure	5	8	11
5 Plumbing and wiring	2	3	4
6 Radar installation	1	2	3
7 Interior finishing	6	9	12
8 Painting	4	6	8

Contd...

Notes	Time Expected (Te)
YATCH CONSTRUCTION	
	<i>a m b Te</i>
1 Construction of hull	4 6 8 6
2 Construction of deck	2 5 8 5
3 Engine installation	3 5 13 6
4 Super structure	5 8 11 8
5 Plumbing and wiring	2 3 4 3
6 Radar installation	1 2 3 2
7 Interior finishing	6 9 12 9
8 Painting	4 6 8 6

A Construction Project

Let us start with construction program of a yacht. Being our first venture, we would prepare a PERT and obtain necessary estimates from designers, yacht builders and other knowledgeable persons like carpenters, welders and electricians in their respective fields.

The three estimates, optimistic, most likely and pessimistic, are given in table titled Basic Question. In the next table Time Expected (Te) has been calculated based on the formula given previously.

As stated before, PERT uses a "Weighted Average" of three time-estimates to calculate Time Expected (Te) for a particular task. These estimates are not wild guesses but have come from reliable sources. When it comes to masonry work, who can better estimate time required for making a brick wall than an experienced mason.

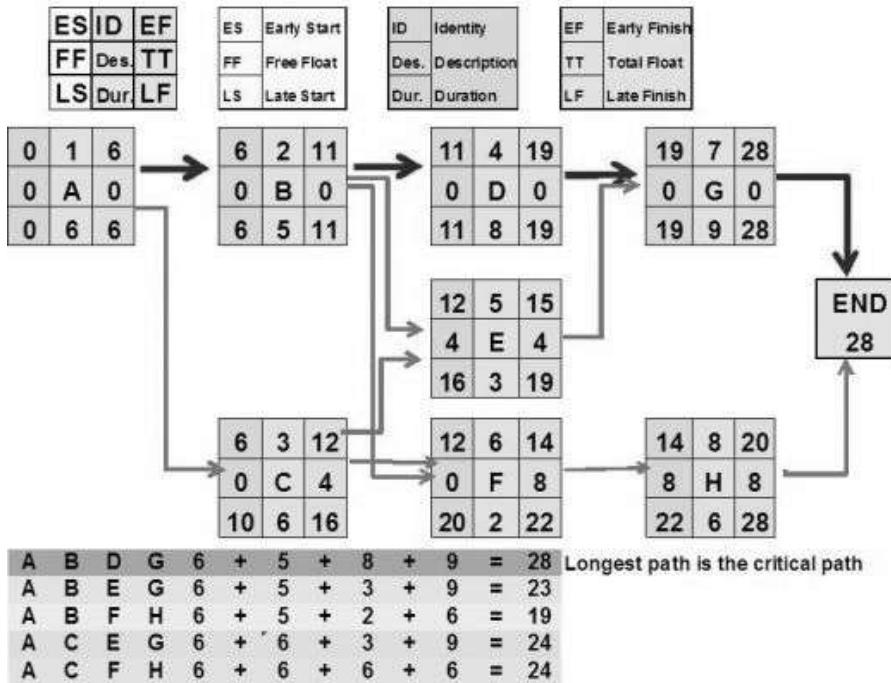
Various researchers have criticized use of "weighted averages" in time estimates. They argue that in this way, time would often be underestimated. But whenever one tries to predict future, one is confronted with many problems. To be realistic, one should make meticulous efforts and double check every figure.

Once we know the Te for each task, the rest is like CPM i.e. (i) the boxes representing various activities would be placed keeping in view the predecessor and successor activities, (ii) clear cut linkages shown between the activities, (iii) forward passes made to workout project duration, (iv) all possible paths identified and (iv) the longest path, being the Critical Path highlighted with red-line. This has been shown in the net work given below:

Contd...

PERT Network – Activity on Node (AON)

Notes



Variance Calculation

YATCH CONSTRUCTION				
	a	m	b	
1 Construction of hull	4	6	8	0.444
2 Construction of deck	2	5	8	1.000
3 Super structure	5	8	11	1.000
4 Interior finishing	6	9	12	1.000
SUM TOTAL OF Variances				3.444
Square Root				1.856

PERT Formulae: Variance & Standard Deviation

$$\sigma^2 = \left(\frac{b-a}{6} \right)^2$$

$$\sqrt{\text{sum total of } \sigma^2 \text{ of activities on CP}}$$

What-if Analysis

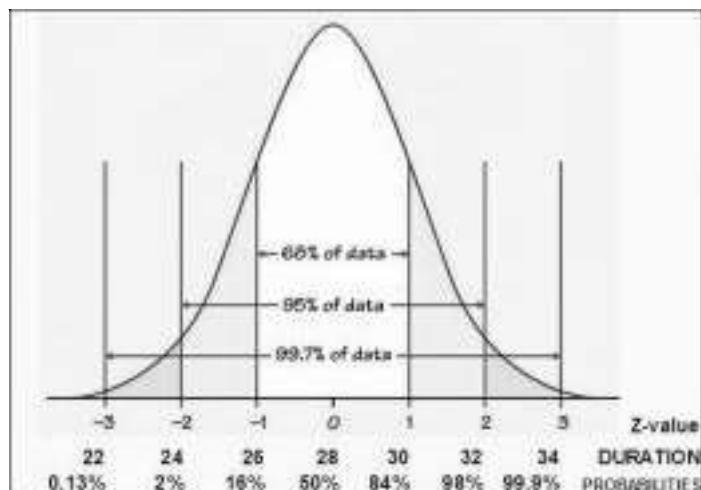
Since PERT recognizes uncertainty in estimates of durations, it gives rough estimates about final completion. Now what-if analysis can be conducted like what is the probability

Contd...

Notes

of completion if project is delayed by certain period of time. Please note that probability of being completed by critical time is 50%. If more days are added the probability would increase and can be quantified by using normal curve method. For this we need a z-table and a standard deviation. PERT has special formula for calculating Standard Deviation. First, it would identify the activities on the critical path. Second, it would calculate variance for each activity on the path. Finally, square-root would be worked of sum total of variances of activities on the critical path. Necessary working is shown in the right hand side table.

Normal Curve with properties



Probability of completion

Probability of completing in days 30	
Desired Time	30 days
Critical Time	28 days
Standard Deviation	1.86
Z-Score	1.078
Area under normal Curve	0.869 or 86%

Normal Distribution

Normal distribution is natural distribution. I teach Project Management to a class of 40 students. Since all the students are reading from the same books, are being taught by the same teacher in the same environments, their marks in any test would be normally distributed. About 68% of the students would gain around the average, a few would well above it and a few well below. In a recently conducted test, the average score was 80 with a standard deviation of 6. It means that 68% of them got marks between 74 & 86. There were few exceptions. A few students were well above 86 while a few were much below 74.

Question:

1. Critically analyse and find out the probability of a student getting marks above 80%.

Source: <http://hafeezrm.hubpages.com/hub/CASE-STUDY---Probability-in-PERT>

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