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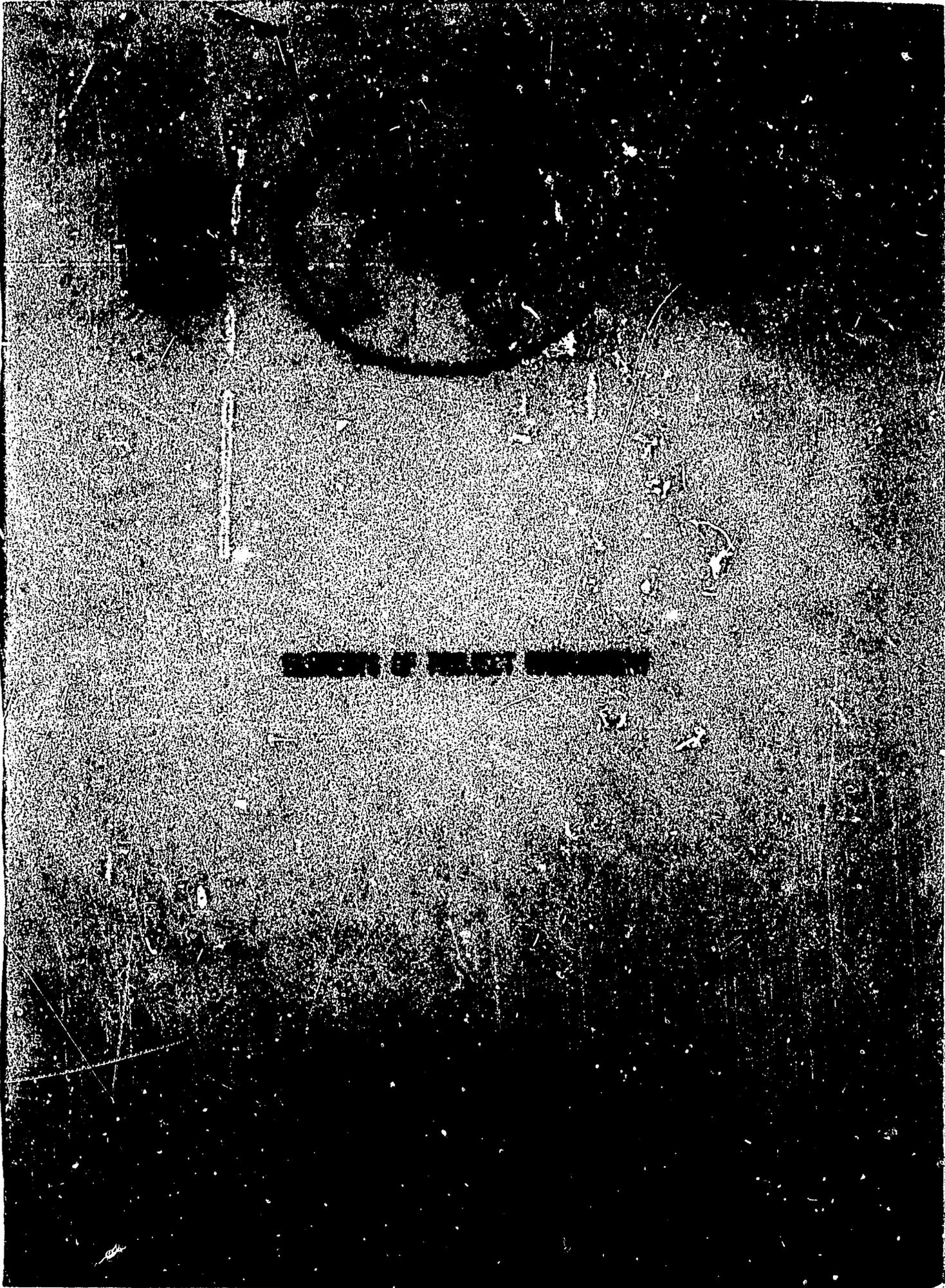
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9. ABSTRACT

This paper is for use in training project participants who need to share a common conceptual framework. Efforts to improve conditions or outputs in developing countries normally are organized as projects and programs that need to be planned, managed, and evaluated. The efforts of separate contributors to a project can be best integrated if those persons understand the nature of a project and methods of project management. The first section of this paper defines a project, a program, the project cycle and its management, pre-authorization planning, post-authorization planning, and the differences between project management and ongoing management. Section two covers project planning--the iterative nature of planning, studying the environment, establishing planning premises, and setting objectives. Section three presents the cycle of planning-action-control, including targeting as a technique for planning and implementation. Section four discusses economic analysis, including decision-making, physical planning, cash flows, national concepts of return, non-market-oriented projects, and risk and uncertainty. A section on creativity discusses brainstorming and force field analysis. A section on design approaches treats of the diagnostic method and the creative design or ideals concept. A final section on implementing the investment phases of the project includes discussions of the analysis of implementing capacity, social analysis, dealing with resistance, force field analysis, and involving the target population.

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## Foreword

This paper attempts to synthesize a wide range of ideas expressed about project management in a form useful to those responsible for planning and implementing development projects or helping others to do so. It was drafted by Morris J. Solomon with specific inputs from A.I.D. consultant E. Edward Rizzo. The contribution from written sources, trainers and researchers in both developing and developed nations are too numerous for specific acknowledgement. However, the work is deeply indebted to these many contributors.

Particular acknowledgement is due to the staff at the University of Ife and from the Universities of Connecticut and Massachusetts training team working there under USAID auspices, with specific mention of Mr. Lawrence J. Sespaniak and the late John Bragg. The inputs of Drs. H. Raymond Radosevich, Dennis Rondinelli and others under an A.I.D. research and development contract with the Vanderbilt University Graduate School of Management were also invaluable.

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This paper is a technical and professional statement that does not necessarily represent the views of the contributors or of the U.S. government.

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## Introduction

The project is the prototype activity of economic and social development. Any creation of new development capacity will usually take the form of a project or a cluster of projects. A project of any complexity involves different disciplines and collaboration among institutions. Specialist knowledge and specialized functions have to be combined in ways that are appropriate for the project, so that it is not enough to have competent engineers, economists, agronomists, administrators as seen from the point of view of each discipline separately.

A project is often initially planned by one set of individuals and carried out by another group. But planning and implementation are intermingled in varying degrees during the life of the project, so that an overview of the whole project is required by all contributors to the project. In the face of a crucial need for integration of the various aspects of a project, there is a strong tendency for planning and implementation to be fragmented in a number of ways - by discipline, organization, level of organization and by stage. Such fragmentation can easily prevent the integration that is necessary for a successful project. There is an urgent need for processes which integrate the efforts of separate contributors to a project. Training may be one of the most critical processes for integrating and synthesizing these diverse contributions.

Another important tool for achieving this necessary integration is a common and meaningful framework which is shared by all who participate

in project activities. This paper attempts to provide such a framework. Hopefully this will facilitate fruitful collaboration among different disciplines, organizations, levels of organization and those in charge of different stages of the project.

In addition, this document can serve important training needs by providing a vehicle for seeking consensus among trainers as well as between trainers and trainees. We can expect that it will be revised as trainers use it and discuss it among themselves. Perhaps each trainer or trainer group will eventually have their own version which summarizes their framework.

The material in this paper can serve as a basis for orientation of top decision makers. Finally, whatever the focus of training, a short segment based on this material can provide very useful orientation of those in training.

## ELEMENTS OF PROJECT MANAGEMENT

### Nature of a Project

#### Definition

A project is a unit of purposeful activity with a beginning and ending point in time that is chosen to be separately planned, analyzed and administratively implemented. The unit of activity can be the construction of a new steel plant or the expansion of an existing facility. It can be the establishment of a family planning activity which is designed to yield services or it can be an agricultural project that is expected to yield food or fiber. It can be an activity where the output is sold (bicycles) or it can provide output that is not sold, but is given free, such as primary school education. It may be relatively independent or it may be closely intertwined with a number of other projects.

#### Projects, Programs and Ongoing Activities

Projects are often part of a program or have a close relationship to a program. A program is generally a combination of related projects and/ or ongoing activities. The related projects can be planned for a geographical area (such as an irrigation project), or can be a combination of similar projects in a number of localities (such as a forestry program).

The distinction between projects and programs is not a sharp one because activities that can form separate projects can also be treated as part of an enlarged project. Oftentimes programs have to be appraised and administered as a whole as well as separately. Projects may have need for services that are part of continuing programs such as customs control and road maintenance.

Variations in treatment can be illustrated with a rice growing activity. The project boundaries can include all the activities necessary (extension, seed multiplication, supply procurement and distribution, credit, rice milling) or they can be defined more narrowly, with supporting services treated as separate projects of a rice growing program. Some of the required services may be routine activities that are carried out by governmental organizations. No matter how the boundaries for the project or program are drawn, however, all interdependent aspects have to be adequately provided for in planning, appraisal and implementation.

The Project Cycle and Its Management

The usual project contains three basic phases. These are



The first two phases take place during the investment period. In

the investment period of a project there is a flow of inputs (architect hours, bricks, mortar, bricklayer hours, bulldozer hours, purchase and installation of machinery etc.). These inputs generally can be used for more than one year and are called investment inputs. Figure 1 illustrates the flows during the investment period.

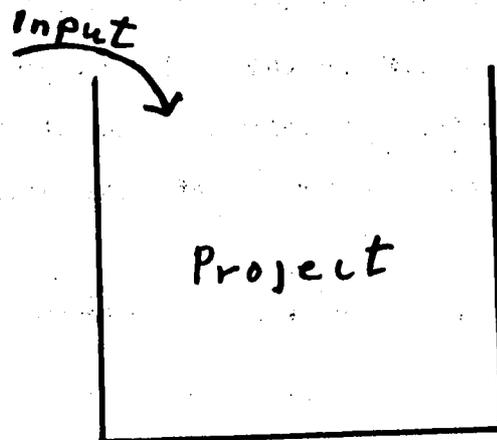


Figure 1 - The Investment Period

Figure 2 illustrates the process that takes place during the output generation period.

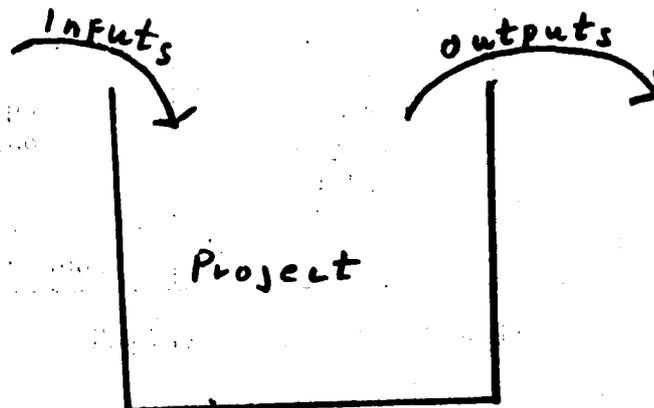


Figure 2 - The Output Generation Period

During the output generation period there is a flow of both inputs and outputs. The inputs (in this phase) are used up on a current basis. An example of such inputs would be raw materials that become part of the current output. Such inputs are called current inputs. The outputs generated by the project are goods and/or services. The chief justification for the project are such goods and services. A fundamental problem facing those who consider undertaking a project is whether the project will achieve a favorable relation of outputs to inputs over the life of the project--hence the term "benefit-cost analysis."

The "typical" cycle of a project is represented in Figure 3.

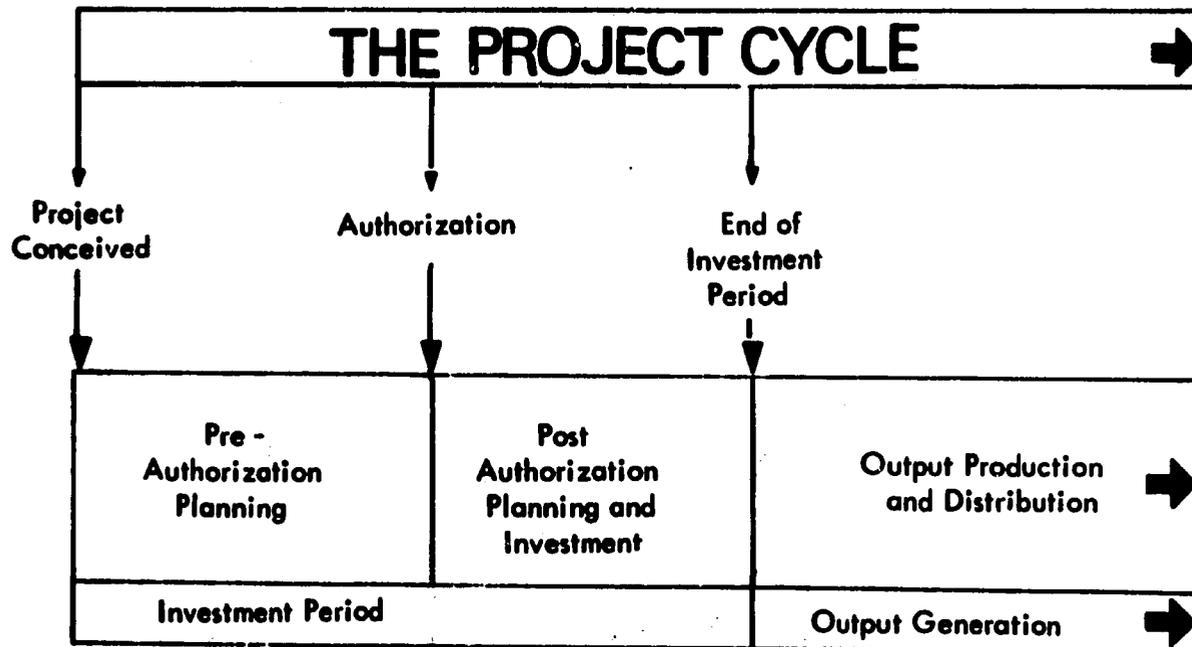


Figure 3 - Typical Project Cycle

**Pre-Authorization Planning.** Pre-Authorization planning takes place on a minimum budget to avoid spending money on projects that will not be undertaken. The planning is no more detailed than is necessary, to determine if the project should be authorized. The inputs are generally the services of technical personnel, taking the form of marketing studies, aerial or terrestrial surveys, borings, sample surveys of people, statistical analysis and a variety of other forms. The planning covers the full life of the project, that is the investment period and the output generation period. The period of time for which planning takes place is sometimes called the "planning time horizon." The outer limit of this period is the point in time at which the facility is expected to stop operating, or as far as the planner cares to look ahead, whichever is shorter.

A steel plant might have a six year investment period and a twenty-five year output generation period, or a total of a thirty-one year planning time horizon. A bicycle plant might have a two year investment period and twelve year output generation period, or a total fourteen year planning time horizon.

Pre-Authorization planning must reflect and cope with the conditions that can be expected to prevail both during the investment period and the output generation period. Thus if delays in importing equipment and raw materials can be expected because of customs procedures, provision for coping with such delays must be made in drawing up plans for the project. Similarly, if there is need for training of personnel for use during the output generation period, provision for such training would have to be made both during the investment period as well as the output generation period.

Planning before authorization encompasses the socio-political, managerial, technical, organizational, financial and economic aspects of the project. The design must be tailored to the ground rules and standards of the financing institution as well as the sponsoring entity. It must also take into account the environment that the project will be implemented and operating in, including linkages with other organizations. An important part of initial planning is to establish contact with those elements in society that would have an interest in the project, so as to work toward having the project reflect their wishes and needs and obtaining their cooperation and support. This process of identifying important environmental linkages and building relationships is an often neglected part of Pre-Authorization planning.

Post-Authorization Planning. After the project is authorized, planning of the project becomes more detailed. It is quite common for the project to be handed over to a person other than the one who was responsible for preparing the earlier plan. The new planning group may make considerable changes in the original plan. In any case, details which were left open in the previous planning are made quite specific. Personnel and organizational arrangements are planned both for the investment period and the output generation period. A project organization is set up for the period, including plans for the termination of some activities and the transfer of others. Specific plans are made for personnel who will operate the facility as the investments are completed. Equipment is

more closely identified, detailed designs are created, specific vendors identified, a detailed schedule is set up, specific provision for training and procurement is made and provisions for controlling the project are spelled out.

In Post-Authorization planning particular attention is paid to implementation processes. The project is broken down into work components which become the responsibility of designated individuals. The major work components are broken down into discrete work units and activities that form a detailed schedule. These activities are further specified in terms of cost, content, quality specifications and when they are to start and be completed. The project is modified if detailed planning indicates the need or desirability of such modification.

At the earliest possible date, it is generally desirable for those who design the project to involve those who will affect or be affected by the project. This is important for three reasons. First, the design can better reflect the desires, needs and constraints that will affect the project. Second, the resolution of difficulties can start at an early date. Third, early participation by all concerned can create a climate of openness and willingness to compromise. This process of involving those who can affect the project conflicts with the need to avoid commitment in the Pre-Authorization planning. Once authorization takes place, the process of interacting with affected interests can proceed much further.

### Project Management and Ongoing Management

The generic term "management" means the direction of the activity in question. A useful dichotomy is that between management of the project during the investment period and the direction of the activity during the output generation period. The first can be called "Project Management," the second "Ongoing Management." While such a distinction is useful, it must be reconciled with the following considerations:

- . Project Management has to anticipate and provide for the needs of Ongoing Management
- . Provision must be made for a smooth transition from Project Management to Ongoing Management
- . It is not uncommon to have both investment and regular production of output going on simultaneously for some time

The relationship of Project Management to Ongoing Management is sketched in Figure 4. The hatched area is an assumed overlap period.

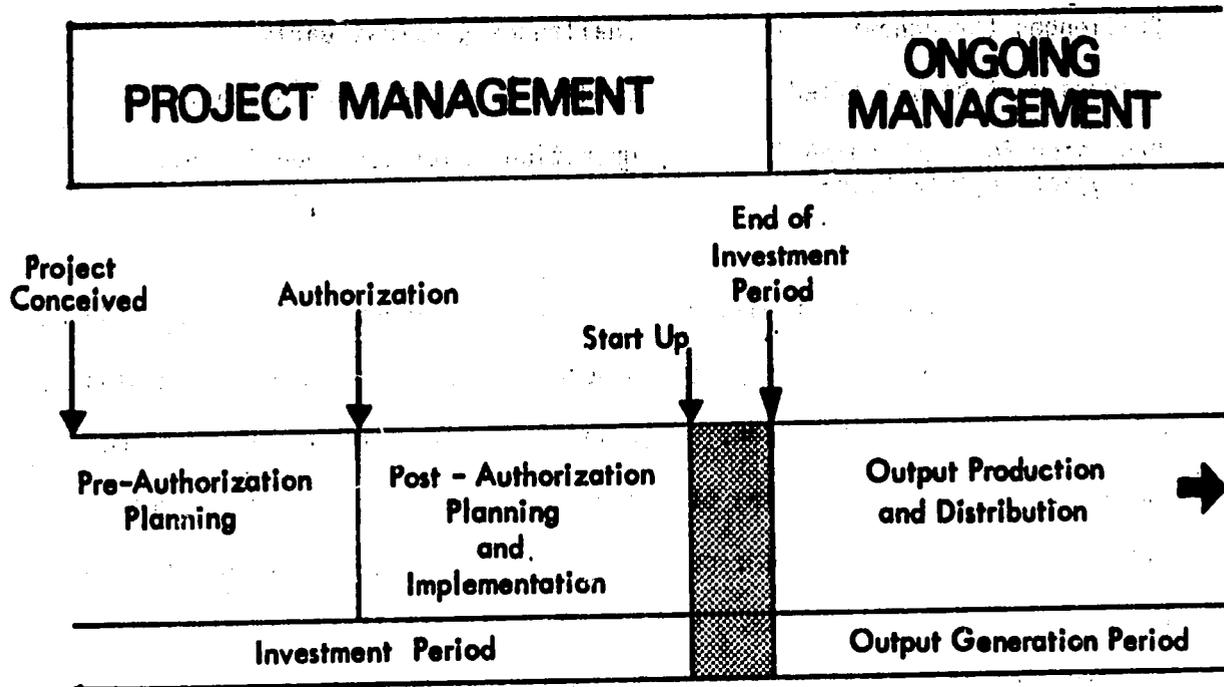


Figure 4 - Various Phases of Project

Project Management has the responsibility for designing two systems:

- a project system that carries out the investment phase
- an output system that will be operated by ongoing management

Comparative characteristics of Project Management and Ongoing Management are as follows:

Project Management	Ongoing Management
Activities are one-time	Activities are repetitive
Commitments long term	Commitments short term
Commitments irreversible	Commitments more reversible
Mistakes difficult to correct	Mistakes easier to correct

**Challenges throughout**

**Lenders must be satisfied**

**Provision for disbanding  
project organization**

**Challenges greatest early**

**Lenders relatively unimportant**

**Operation continues indefinitely**

Where investment activities are complex and innovative, responsibility for important aspects of Project Management is often assumed by specialized organizations. To assure continuity and to handle the special problems associated with the beginning of Ongoing Management, such specialized organizations may also assume responsibility for some aspects of Ongoing Management for a short while. For example, the detailed planning and construction of a steel mill might be undertaken by a steel company of a developed country on a contract basis. To assure a smooth transition to Ongoing Management and to assist in solving initial operating problems, the contracting company may operate the plant for the first year or two. A simpler activity such as a flour milling operation would be taken over by Ongoing Management following the installation and testing of the equipment.

In some cases the investment period and the output generation period may completely overlap. For example, experimental and pilot projects in agriculture involving new crops and new arrangements must move through the entire investment/output generation cycle before their main output becomes available. The main output of such projects is information on the feasibility of large-scale operations.

## Project Management

The project is a purposeful action that has to be managed. Figure 5 illustrates a very simple model of the management of a project.

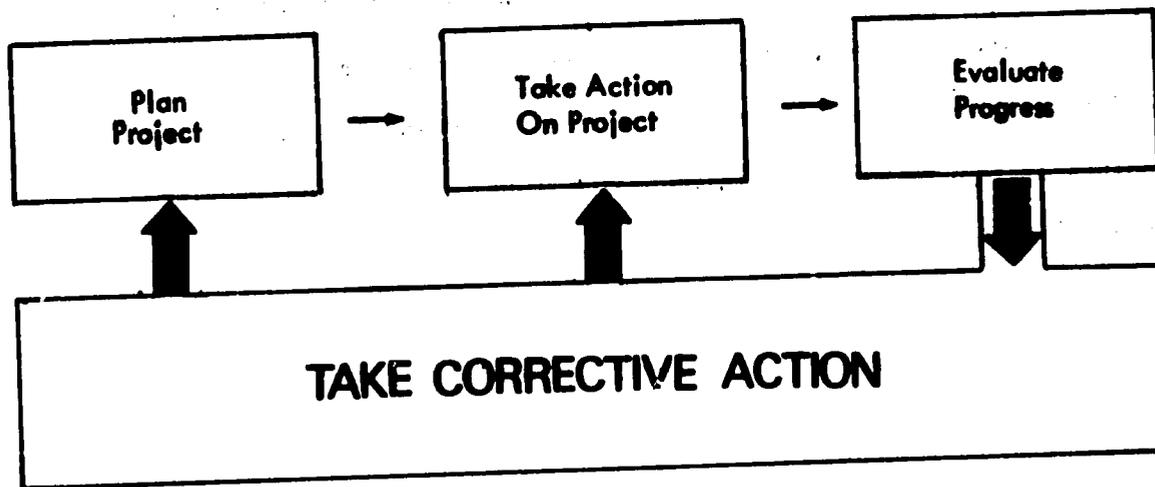


Figure 5 - Simple Model of Management

The basic elements of project management are

- . Plans for the project
- . Action
- . Evaluation of progress to date, generally a comparison of planned versus actual achievement
- . Corrective action based on the evaluation, with potential change to any of the previous elements.

Figure 5 is a simplification of the modern concept of Management. The same phenomenon will be discussed in greater detail at a later point.

### Planning the Project

The process of planning determines the desired end points and the path to reach these points. The path and milestones to reach these points must be described sufficiently to serve as a detailed guide to those who will be responsible for reaching the desired end points as they proceed to implement the plan. A plan must provide the following:

- The objectives of the project, including the various relevant dimensions (political, economic, social etc.)
- The scope of the project (size, coverage, functions, etc.)
- The detailed activities necessary to be achieved with specifications as to time phasing, technology and performance criteria to be met.
- The list of persons or organizations who will be responsible for the various activities.
- The relation of the various participants in the project to each other as well as to the various activities of the project.
- The relation of those in the project with individuals and organizations outside that can affect the project.

- ° The reasoning and assumptions behind the various arrangements.
- ° An appraisal of the project which forms the basis of a decision to authorize the project.

Planning takes place during the whole life of the project.

### Iterative Nature of Planning

A cycle of planning consists of the following steps:

- Study the environment
- Establish planning premises
- Set objectives of project
- Formulate alternatives
- Choose alternative
- Lay out detailed steps for implementation
- Replan during implementation

The above steps are not necessarily in the order in which planning takes place. Whatever step one starts out with, it will be necessary to recycle (go back) a number of times to steps previously taken. For example, if one starts out with "set objectives of project" and then goes on to "study the environment" and "establish the planning premises" one would have to go back to "set the objectives" to reflect what has been learned about the environment and the planning premises. This recycling or iteration is represented in Figure 6.

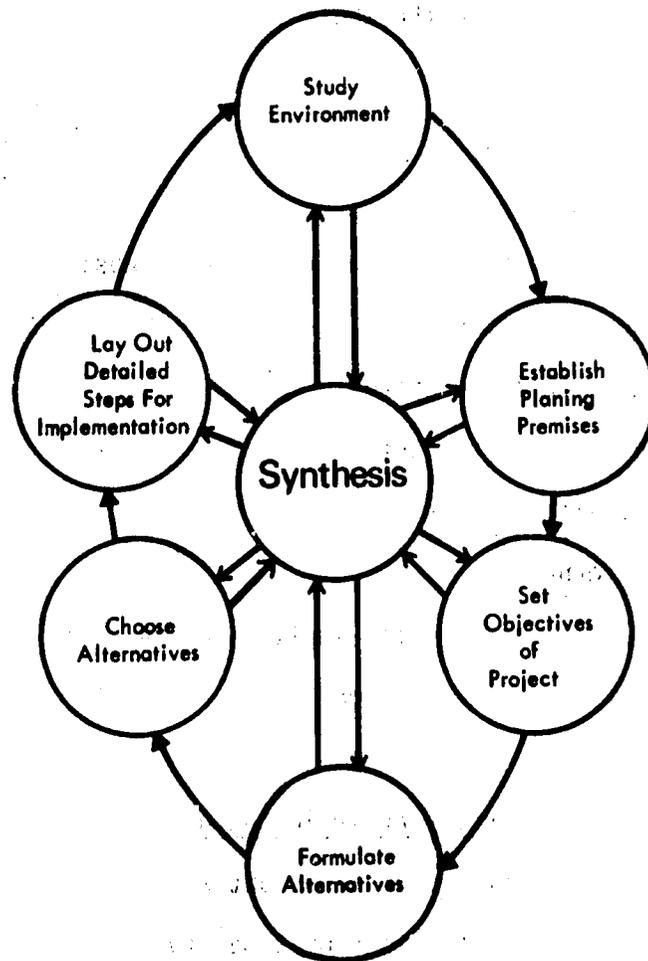


Figure 6 The Planning Process

Each step in the planning process is interrelated with the others so that as one develops something in one step, there are implications that have to be synthesized for a step that was previously "completed." Thus within the planning cycle there has to be considerable synthesis and iteration to accommodate the high interaction among the steps.

Normally, there are a number of planning cycles completed on a project even before authorization of the project. One can start with a rough idea for a project and make some "back of the envelope" calculations taking perhaps only a day or two. A result of such calculations may be either to reject the idea, defer action, or go into a more detailed and costly preliminary study. This in turn can lead to rejection or deferral, or to a feasibility study which in turn can lead to rejection or authorization. It is only after authorization that a detailed study is made. Each succeeding planning cycle involves a greater commitment. By limiting the expenditures in the early planning cycles, one can avoid spending large sums on projects that will not be undertaken. The pattern of expenditure might be as follows:

<b>Rough Planning Study</b>	<b>\$ 400</b>
<b>Preliminary Planning Study</b>	<b>\$ 2,000</b>
<b>Feasibility Study</b>	<b>\$ 10,000</b>
<b>Detailed Study</b>	<b>\$ 100,000</b>



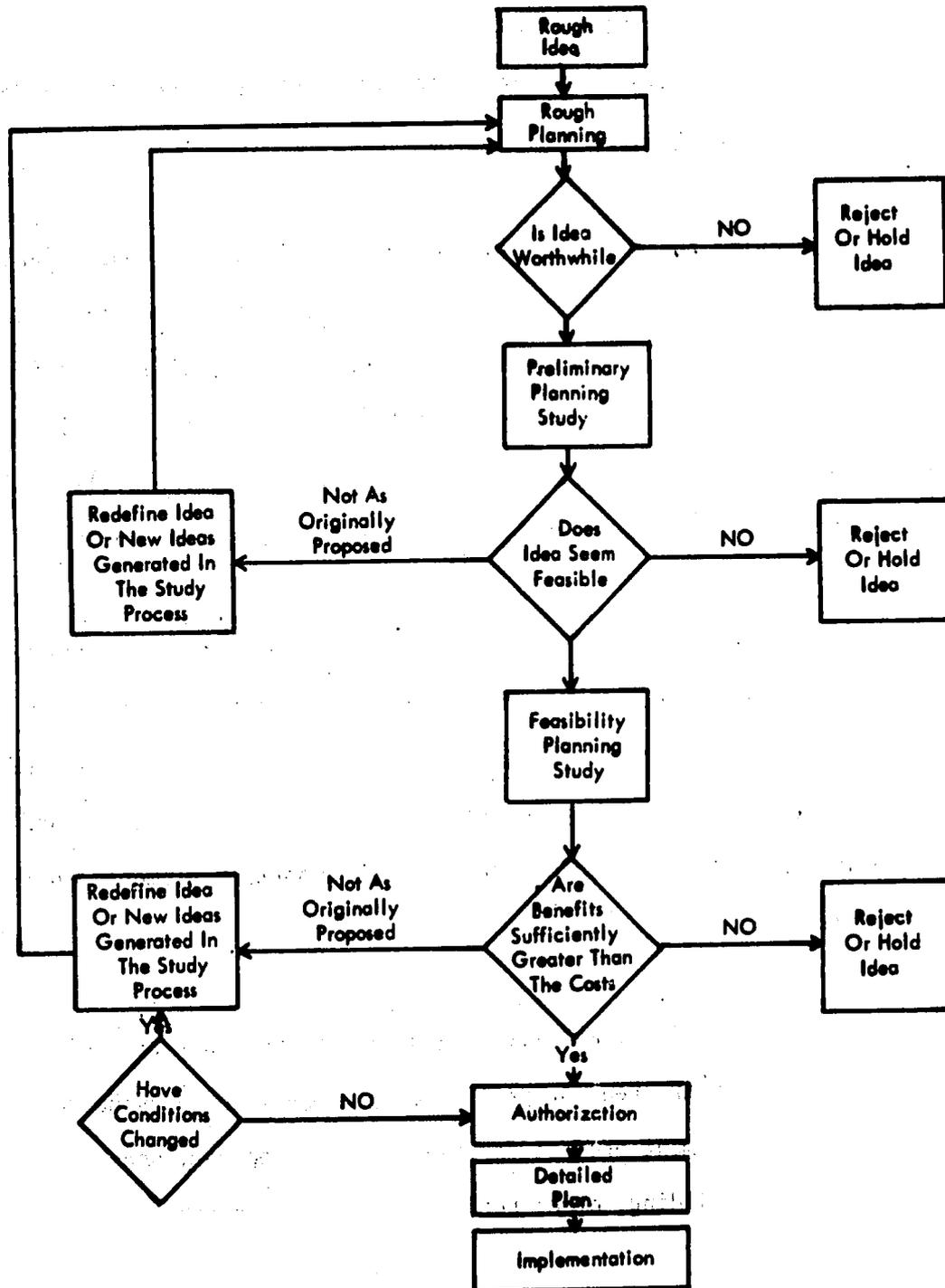


Figure 7 - Iteration of Project Planning

relevant social conditions, political forces, constraints, organizations etc. An especially important part of the environment to be studied are the variables which indicate the nature (extent, shape or location) of human needs that have been unmet in the past. These in turn are usefully classified as to needs which are customarily met by market processes or administrative processes.

In studying the environment, the project planner must be oriented toward linking the past and present conditions with a potential future that is more desirable. Thus the export of new hides will suggest the possibility of processing such hides. The existence of a sizable import will suggest its possible production in the country. The availability of certain skills may suggest specific export oriented projects.

In the case of agricultural projects the land tenure conditions, density of population, natural resources and physical environment, location in relation to markets, roads and railways, availability of improved and tested technology, transport availability, storage and marketing conditions and price controls are important elements in the environment.

Political promises, as well as a national, regional or sectoral plan may point up the need or promise of a project and provide relevant information. A cement project for example would be very sensitive to plans for road building, other public works and home construction.

An important part of the environment are the policies, laws and procedures followed by the Government. For example, the foreign

exchange, tariff and tax structure of the Government may aid or impede the indigenous production of particular products. Sometimes procedures followed by government agencies may be important hindrances to carrying out projects. Parts of the environment often neglected are the individuals and organizations which can aid or hinder a project.

The most readily available sources of information about the environment are sectoral, regional and project studies, other public documents and knowledgeable individuals. To the extent that these are insufficient, the project analyst may have to carry out his or her own investigations.

#### Establish the Planning Premises

Based in large part on the study of the environment, one would establish the planning premises for future years, projecting the following:

- availability of resources - physical, financial and human
- demand or need for output
- governmental priorities
- projects and programs related to proposed project
- relevant social trends

- constraints (physical, financial, social, economic and political)
- criteria and standards to be applied

The criteria and standards are set tentatively, according to the nature of the project and the other planning premises.

An important planning premise of a project is whether the recipient of the output is expected to pay the full cost of the output. If the recipient is expected to pay the full cost, including the return on investment, the scale of the project can be based on demand and the project can be treated as market oriented. If the recipient is not expected to pay for the full cost of the output, then the scale of the project has to be based on the "need" which the project is "premised" to meet. In that case the project is non-market oriented.

Payment for output by the consumer is determined by the nature of the activity and policies of the country. Where it is impossible, awkward or disadvantageous to charge the user for a good or service, there is a tendency to have a non-market orientation. Activities that are almost always non-market oriented are primary school education and inoculations against disease. Production of goods (such as steel, cement, bicycles) are generally market oriented. In some projects, the beneficiary is supposed to pay only a fraction of the full cost. For example, it may be public policy to have farmers pay for only a portion of veterinarian services. The scale of such services would be based on the estimated needs and budget considerations.

It is extremely important to state the planning premises explicitly so that one can readily consider the effects of changing them and modify the project accordingly.

Using the planning premises, one frames a strategy--an overall approach to achieving the objectives of the project. The strategy of an agricultural project might encompass the promotion of a specific package of practices (seeds, fertilizer, tillage practices, crop rotation, etc.), the use of cooperatives as a channel for disbursing credit, radio for communication and clusters of farmers for face to face communication. The strategy of an industrial project might call for joint ownership with a foreign company that has a good international marketing position. At an early stage several alternative strategies may be retained for consideration.

### Set Objectives

An objective is where one wants to be at some time in the future. Having studied the environment and determined where one is starting from and having estimated (tentatively) probable future conditions and the possible strategies, one can consider and set objectives.

An objective can take general or concrete forms. A general objective would be "Achieve a healthier population." A more concrete objective would be "Reduce infant mortality of District A by 50 percent within ten years." The latter objective can be said to be in operational

form. It can be the basis for specific action and is concrete enough so that at the end of ten years one can measure the extent of success or failure.

Similarly, the general objective of achieving greater human equality becomes more operational when one states in specific terms (quantity, quality and calendar time) the relevant dimensions such as access to education and jobs, availability of water, level of nutrition, health care and income levels. These in turn require further specification to become more operational. Otherwise objectives become meaningless in the world of practical affairs. A good rule to follow is that no statement of objectives is operational unless, after the fact, it is possible to determine if the objective has been reached.

In going from general objectives to more specific objectives, one generally goes from ends to means. This sequence or hierarchy of ends-means can be illustrated with the objective "Improve human nutrition." One might go through the sequence illustrated in Figure 8.

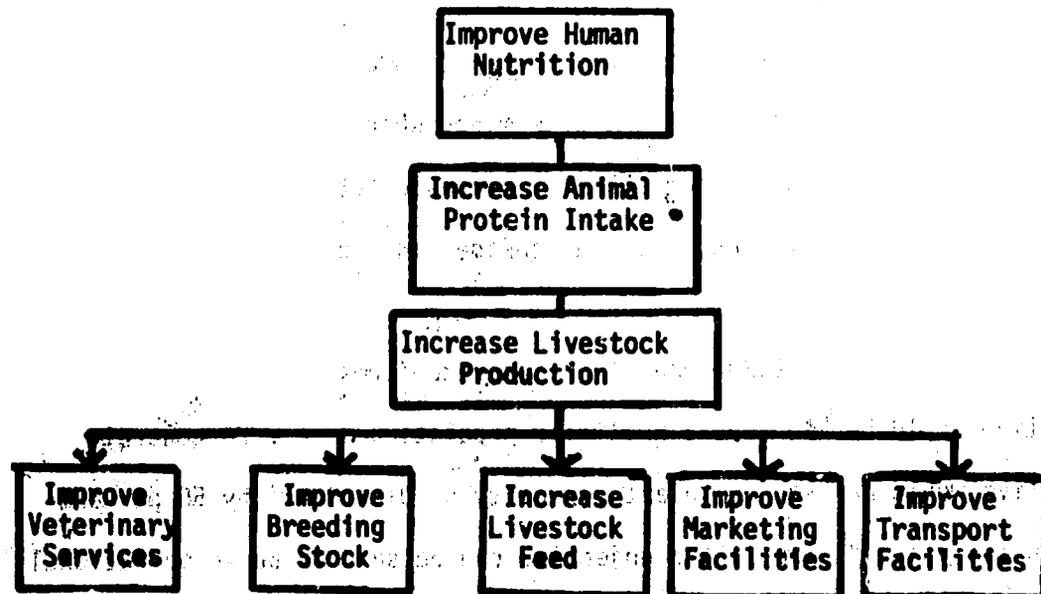


Figure 8: Hierarchy of Objectives

This hierarchy of objectives is very much like a chain of ends-means which is no stronger than its weakest link. For example, in the face of a marketing failure, a program for raising more cattle may fail even if everything else goes well. The objectives below the very top are "intermediate" with respect to those at the top, that is, they are the means of achieving the higher objective. One can have valid information about the accomplishment of intermediate objectives and still fail to achieve the end objectives that are desired because the ends-means relationships did not turn out to be as anticipated. At any point in time knowledge of ends-means relationships is uncertain, so that as implementation proceeds, it is important to generate data that tests the assumed relationships in the light of the findings. For example, a program to improve the nutrition of farm families through increased livestock may not reach its objective because farmers are selling their livestock rather than using it for meat. This may have been unanticipated by those who drew up the original project plan.

An objective can be the concern of more than one organization. Human nutrition would be of interest to both the Ministry of Health as well as the Ministry of Agriculture.

In going from the objective of improving human nutrition to more specific objectives, one must try to choose the best alternatives. For example, it may be that the most promising way of increasing the protein content of the human diet in a region is by promoting crops such as legumes, triticale or high lysine corn. Depending on circum-

stances, the promotion of livestock may be relatively disadvantageous. Or even if the livestock alternative were promising, a subordinate organization unit might displace crops that make important contributions to the diet of the population. In general, as objectives become more specific, they tend to become the primary objective of a lower level of organization.

In following the ends-means chain from ends to means, it is easy to make poor choices not only with respect to the immediately preceding end, but other "higher order objectives." A project is likely to have a specific objective such as increasing livestock feed. A likely means of improving livestock in a country is to use supplemental feed derived from by-products of grain processing plants and promoting the use of processed grains for human consumption. Yet such a development in a staple like wheat can shift valuable nutrients of the whole grain from the human population to the animal population with harmful effects on the higher order objective of improving human nutrition which prompted the livestock program in the first place.

A particular project can also run counter to higher order objectives of other programs and organizations. Housing developments with low population density may make it more difficult to provide economic public transportation within a city.

The objectives of a program or project are necessarily particular to a country at that point in time. However, there is one objective which

can be said to be applicable to all projects in all developing countries. In fact it is an imperative. The objective must be to have an output that is favorable in relation to the input. To achieve this, one uses some form of benefit-cost analysis. A country's economic growth is very sensitive to the extent to which its projects have a favorable relation between the outputs and inputs of its projects. Without substantial economic growth, a country cannot realize ambitious objectives, whatever these objectives are. At a later point a framework for benefit-cost analysis of projects will be described in greater detail.

The establishment of objectives is a complex process. The reasons for this are:

- Objectives for the same project differ according to the group or organization (entity) considered
- Ordinarily there is more than one objective that an entity would like to achieve
- Many of the objectives are in different dimensions (time, resources, money units, rates per thousand)
- Many objectives are related to each other in complicated ways
- Objectives are often in conflict with each other

**Objectives Differ by Entity.** As previously discussed, objectives take different forms as one goes down the organizational ladder. The same project will have a different set of objectives depending on the organizational entity. An agricultural project might involve the following entities:

External financial institutions

Land reform agency

Marketing board

Ministry of Agriculture

Private businesses

Cooperatives

Individual farmers

Banks

Whole economy

In some cases there may be a public agency that combines a number of functions such as marketing, credit and extension. Such an agency will be referred to as a Development Agency.

While there is often considerable correlation between the objectives of the different organizations, each entity has its own objectives. A Development Agency would like to increase the income of farmers and income to the whole economy, obtain political support for itself as an agency and also have its investments and funds return to it as early as possible so that it can reuse these funds for further development. The private business will be concerned mainly with making a sufficiently large profit over the time period considered.

Many Objectives. Ordinarily even the same entity has more than one objective. Thus a farmer may have the objective of assuring food for his family, increasing his income and keeping his risk of losses to some acceptable level. The case of the development agency cited above is another illustration of multiple objectives.

Different Dimensions. Detailed objectives often involve different dimensions. In addition to the most common dimensions of money units, there are physical units, calendar time, rates and qualitative indexes. Thus foreign exchange earnings and expenditures of a project can both be expressed in money terms, but mortality rates of mothers would be expressed per 100,000 births, literacy rate in percentage of adults; nutrition in percentage of population malnourished and pollution in terms of parts per million cubic feet.

Complicated Relationships. Objectives relate to each other in complex ways. Increased income of a farmer, for example, can be related to other objectives in a multitude of ways. Figure 9 sketches some of the more obvious relationships. Increased farm income leads to improvements in many spheres, these improvements in turn generating further improvement in income.

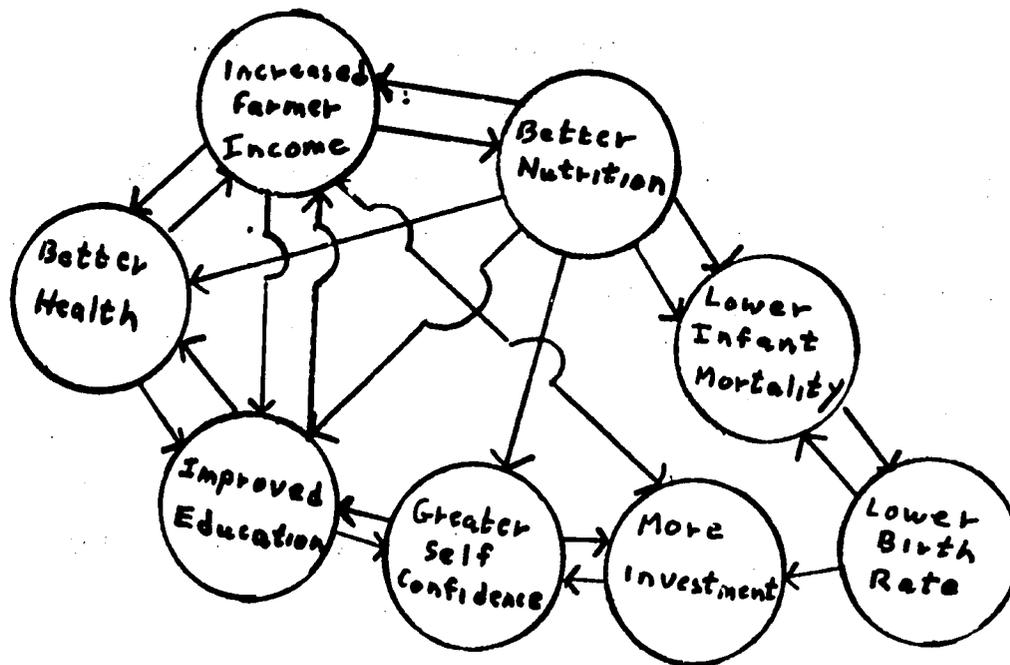


Figure 9: Relationships Among Possible Objectives of an Agricultural Project

Some objectives are difficult to measure or consist of sub-objectives which can be measured but whose relative importance is difficult to ascertain in decision making. In air pollution, for example, there may be five different pollutants, some of which are easier to eliminate than others. Some objectives may require subjective estimates or one may have to arrive at satisfactory "trade-offs" of different sub-objectives, through executive judgment.

Objectives Are Value Laden. Objectives generally involve deeply held values. For example, equality of economic opportunity as an objective will be very much influenced by values concerning women. In a society where deeply held values involve women in a role that is subordinate or at least distinctly feminine, equality is generally thought of as primarily affecting males. In addition the means employed are often

restrained by values. Proposed changes in agricultural practices as a means of increasing farm income will be affected by the customary role of women and men. Thus objectives at the general level and both the means and the specific and detailed objectives has to be reconciled to values.

Objectives In Conflict. Objectives may be in conflict with each other. For example, a development authority may find that the objective of recycling investment funds may be in conflict with the objective of retaining political support or there may be a conflict between achieving an early increase in food production and achieving greater equality in rural areas. Several things can be said about conflicts in objectives.

Economic and financial objectives are often important elements in such conflicts.

Projects that have an overall favorable benefit-cost relationship offer greater scope for resolving conflicts among objectives because more resources are available to satisfy various objectives and entities.

Objectives apparently in conflict can often be reconciled by ingenuity and creative innovation.

Because conflicts in objectives often become evident only after analysis and the elapse of time, one must regard objectives as tentative and subject to modification as one learns more about

the possibilities of conflicts and the means of resolving them.

Politics of Objectives. On a formal basis ultimate decisions on objectives are the prerogative of political authorities. Actual decisions can be made at one extreme by the political authorities with very little input by technical personnel, at the other extreme by the technical personnel, with little input or influence by the political authorities. Either extreme is unsuitable for projects of any complexity. Political authorities who make decisions with little regard to or interaction with technical personnel run a substantial risk that the objectives are impractical or are in serious conflict with other desired objectives. Where objectives of a project are chosen by technical personnel with little interaction with political authorities, there is a serious risk that the objectives will not be acceptable to the political authorities or that sufficient support for the project will not be forthcoming. The optimum situation is where there is interaction between the political authorities and the technical personnel, with the political authorities making the final decisions. Such interaction makes it more likely that objectives will change as more information is obtained on costs, problems and social and political effects, but most important, that the project will be implemented successfully.

Formulation of Alternatives Ways of Achieving Objectives

For any given objective there are generally a large number of ways of going about to achieve the objective. For example, if the objective

is to increase meat production and income of a region, there are many different ways of proceeding. One can choose to do this by raising cattle, swine, sheep, goats, poultry or rabbits. Any of these alternatives can be carried on at different scales, using different technologies and different ways of organizing.

The formulation of an alternative consists of identifying it and spelling out its characteristics. Experiments in problem solving suggests that the following pattern of action leads to better alternatives.

**Stage 1 - List as many promising alternatives as one can think of without regard to difficulties or judgment as to their practicality or merit. Encourage unusual ideas and modifications, but do not think of or discuss the merits of such ideas or modifications. The whole thrust of the initial effort is to generate as many alternatives as possible.**

**Stage 2 - Compare the alternatives with a view to combining and modifying some and eliminating other. Such comparisons will suggest modifications that will strengthen some alternatives. A feature or characteristic of even a rejected alternative may "fit" an attractive alternative and make it more desirable.**

**Stage 3 - Choose relatively few alternatives that are more promising for final consideration.**

The deferral of judgments on alternatives and a spirit of openness to variation are key elements in good formulation of alternatives. In addition one has to bring to bear a knowledge of the relevant technologies and of the environment. For example, based on a knowledge of the soil, topography, rainfall and weather patterns, one might think that new varieties of maize show great promise for an area. One would also consider what conditions have to exist to induce farmers to grow the maize. This might involve matters such as land tenure, government policies and procedures, marketing, fertilizers and insecticide, transportation, storage, availability and effectiveness of extension agents and prices of inputs and outputs. Since a knowledge of the relevant variables generally spans various disciplines, the formulation of alternatives benefits from the direct participation, consultation and interaction of various specialists.

The formulation of an alternative will take the form of a description of the physical inputs and outputs that can be expected. The physical inputs and outputs are converted into a common dimension of monetary units. In addition the processes are described both as to content and time frame along with the envisaged organizational and managerial arrangements.

### Choose Alternative

In making the final choice one would consider

**Constraints**

Effect on different entities (beneficiaries,  
collaborators and bystanders)

Effects on total society

Risks of various kinds

Where an alternative is sensitive to a policy constraint, it may be considered advantageous to relax the constraint. For example, the initial constraint may be that the location of the facility will be in a certain place. If subsequent investigation indicates that a different location will be substantially better, a reconsideration of the constraint on location is in order.

In tracing the effects on different entities, the use of cash flows is a significant tool. Cash flows are important indicators in their own right. They also signal important qualitative gains and losses to such entities and will affect the support for the project.

Where several alternatives appear equally advantageous in the preliminary analysis, it may be necessary to defer the final choice to a later point where more will become known about the several alternatives.

All alternatives will have risks. Explicit consideration of these risks has three advantages. First, by considering the important risks, one is in a better position to modify the alternatives to reduce some of the risk. Second, one can give suitable weight to the factor of risk in choosing the alternative. Third, having chosen an alternative with a fuller realization of the risks, one can implement the project in a way which will reduce the relevant risks.

### Lay Out Detailed Steps

In formulating a project one generally estimates the time that the major phases of the project will take. In an industrial project it may be estimated that two years after authorization, regular production would start and the productive life of the project would be about 20 years. Such an estimate may be sufficient to choose the alternative. But one would want greater calendar detail on the various activities of the project even before authorization. After authorization even greater detail would be required. Such greater detail can provide a guide for those who will carry out the project.

A fundamental tool for detailing the sequence of activities of a project is the modern technique of networking. Modern networking can help experienced project managers to plan and carry out complex projects. The relative gain to inexperienced managers is even greater.

Networking is based on two simple concepts:

An activity denoted by an arrow 

An event denoted by a numbered node 

Using these two concepts and symbols, one can detail the sequence required to reach the end point of the project's investment period. An activity may represent:

- a process

- a task
- a procurement action
- waiting time
- a precedence relationship

The completion of an activity culminates in an event. An event is a specific definable accomplishment in a project plan, recognizable at a particular instant in time. Delivery of a machine would be an event. So would completion of a task like "excavation of site." Events do not consume time or resources.

An activity cannot be started until the event preceding it has occurred. Thus the activity "install machinery" cannot begin until its preceding event "machinery received at site" takes place. In fact, an activity is identified by the prior event and the culminating event. Figure 10 illustrates a very simple network for building a garage. Note the numbers on the arrows. These are the estimated duration in number of weeks.

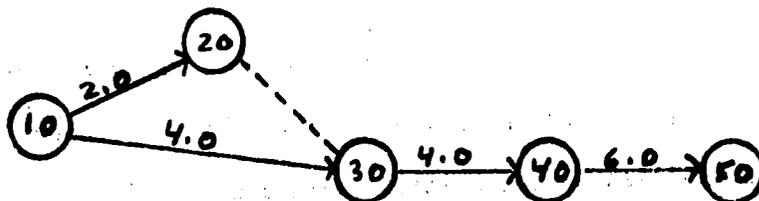


Figure 10: Simple Network for Building a Garage

A description of the activities and events of Figure 10 is as follows:

Activity Designation	Description of Activity	Description of Beginning Event	Description of Ending Event
10-20	Obtain permit	Approval of Architect's Plan	Permit obtained
10-30	Obtain bank loan	Approval of Architect's Plan	Loan obtained
30-40	Order materials	Loan obtained	Material received
40-50	Build garage	Material received	Garage completed

In actual practice one need only describe the activities and events can be understood. To determine how long it will take to complete the garage, it is necessary to estimate the length of the longest path, since all paths must be completed. In Figure 10 the paths are as follows:

Path 1: 10-20, 20-30, 30-40, 40-50 for a total of 12 weeks

Path 2: 10-30, 30-40, 40-50 for a total of 14 weeks

Since all paths have to be traversed, the longest path limits the completion of the garage so that the total amount of time required is 14 weeks. The longest path is called the critical path. It is the path that has to be shortened if the total time is to be reduced. One way of reducing the total time is to reduce the time of one or more activities on the critical path. Another way is to arrange it so that concurrent activities on the critical path are done in parallel. For example, one could order the materials after obtaining a preliminary approval of the loan from the bank. The new network is illustrated in Figure 11 where

- 10-20 is obtain permit
- 10-25 is obtain preliminary bank approval
- 25-30 is obtain final bank approval
- 25-27 is order materials
- 30-50 is build garage

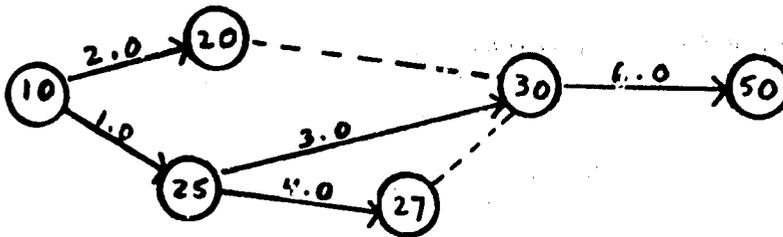


Figure 11: Shortened Schedule for Building Garage

For Figure 11 the paths would be:

- Path 1: 10-20, 20-30, 30-50 for a total of 8.0 weeks
- Path 2: 10-25, 25-30, 30-50 for a total of 10.0 weeks
- Path 3: 10-25, 25-27, 27-30, 30-50 for a total of 11.0 weeks

The plan embodied in Figure 11 is based on different arrangements and makes it possible to complete the building of the garage in 11.0 weeks.

The example given is a simple one. Networking is most useful where there are a substantial number of activities. Networks can be more or less detailed, depending on the stage of planning. Notice that numbering of events is not strictly consecutive. This is done to leave lots of room for insertion of additional and more detailed activities. The first network is sure to be changed as one learns more about the process.

#### Replan During Implementation

As one starts to carry out plans, there are new developments which may require substantial replanning. These new developments take the form

of new knowledge gained in implementation or relevant developments arising outside the project. Such new knowledge may point to unanticipated difficulties or opportunities to be taken advantage of. This process of taking corrective action during implementation was illustrated in Figure 5 in a simple way. A more detailed picture of planning and implementation is presented in the Planning-Action-Control Cycle.

### The Planning-Action-Control Cycle

The planning-action-control cycle is depicted in Figure 12. The various steps in planning have been discussed. In addition to planning, there is action which includes inputs, sequences of action and output and the two kinds of control. First, there is routine control where pre-determined standards are applied to inputs, sequences of action and output. Corrective action is taken on a routine basis on one or all of these, depending on the comparison of the actual vs. pre-determined standards. Rules for corrective action are prescribed beforehand by plan. Routine control is exercised by operating personnel on the spot where the action takes place. For example, during the construction of the building of a cannery, a defect in the brick-laying would be the immediate concern of the foreman. Similarly the foreman would be concerned with the amount of work done each day. In both cases it would be up to the foreman to take corrective action as needed.

The second kind of control is executive control where the criteria projected in the plan are applied to the action components (input,

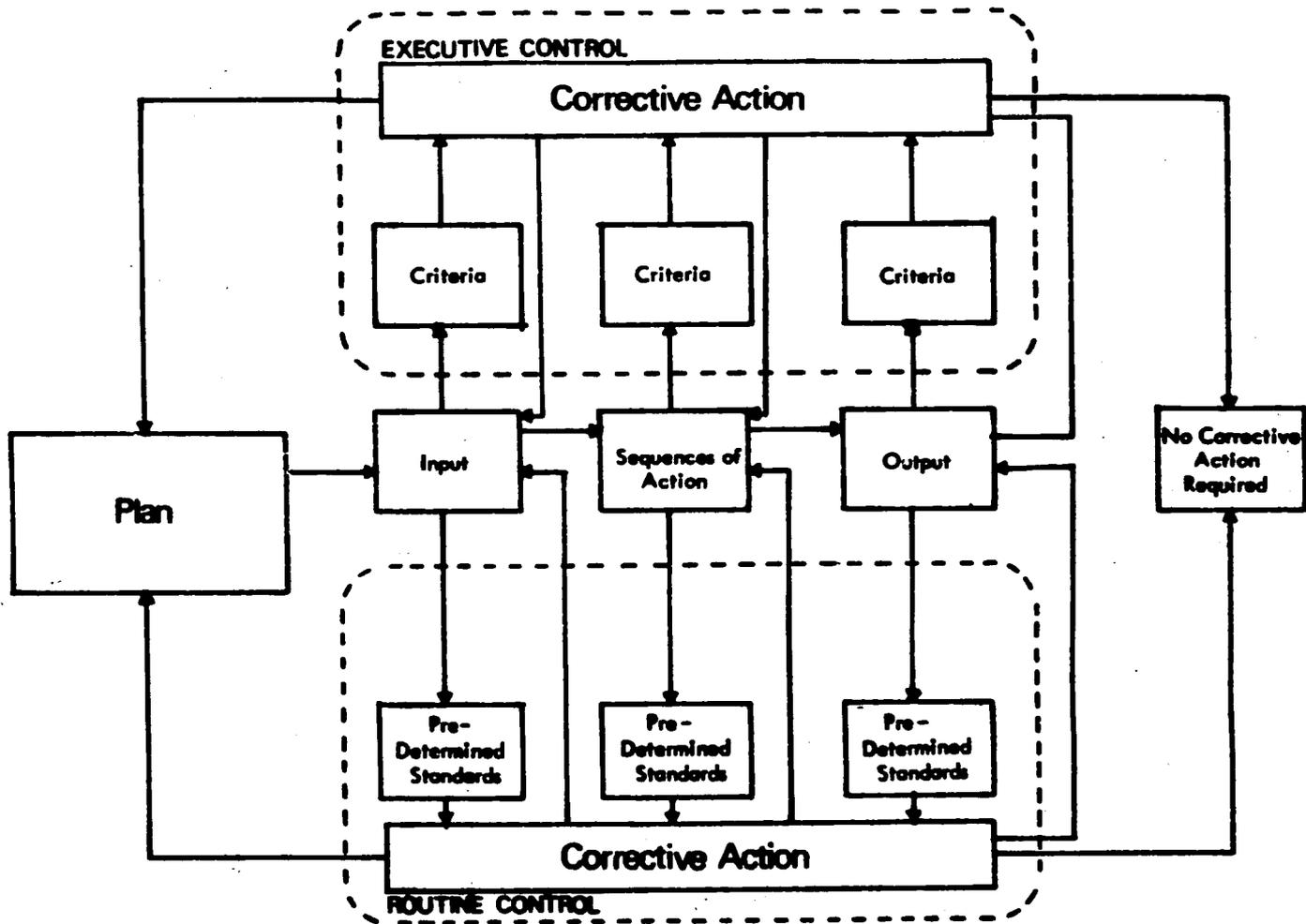


Figure 12 - Planning - Action - Control Cycle

sequences of action, and output). The criteria generally apply to longer term actions, and the determination of appropriate corrective action is based on analysis and executive judgment. For example, in the case of the canning project, if construction is falling behind the schedule outlined in the network so that the scheduled opening for the harvest would be missed, serious consideration might be given to authorizing overtime work so as to be open in time.

The basis for control is set up in planning where provision is made for standards and criteria, personnel, equipment, facilities and procedures. If day-to-day discrepancies are not handled by routine control (pre-determined standards, rules for taking corrective action), deficiencies either are not remedied or they have to be taken care of by executives. In the latter case, delay is likely, costs are substantial and executives are overloaded so they are forced to forego doing the things that only executives can do.

If matters requiring executive action are allowed to be handled by routine control, remedial action is likely to be inappropriate or ineffective. There is also a danger that no provision is made for controlling some aspect of action either through executive control or routine control. This is a deficiency in planning that is likely to be costly.

In addition to setting up controls for the investment period a project manager would plan for the controls for the output generation period as well. This may require provision for the advanced training of personnel, procurement and layout of equipment and the creation of suitable operating procedures for the output generation period.

Figure 12 is incomplete in an important respect. It depicts a closed system in which the project cycle operates without affecting or being affected by conditions outside the project. A more complete and realistic picture is presented in Figure 12 A where the unhatched area is the same as in Figure 12, but the hatched area is the environment of the project. The environment includes persons and entities not under the control of the project that can affect the project or who will be affected by the project and conditions bearing on the project. It includes government programs, policies and procedures, shifts in consumer or client demand and tastes, pressures from emerging groups, international developments, price changes in inputs and outputs, moves of competitors and technological developments. Figure 12 is a diagram of a "closed system." Figure 12 A depicts an open system.

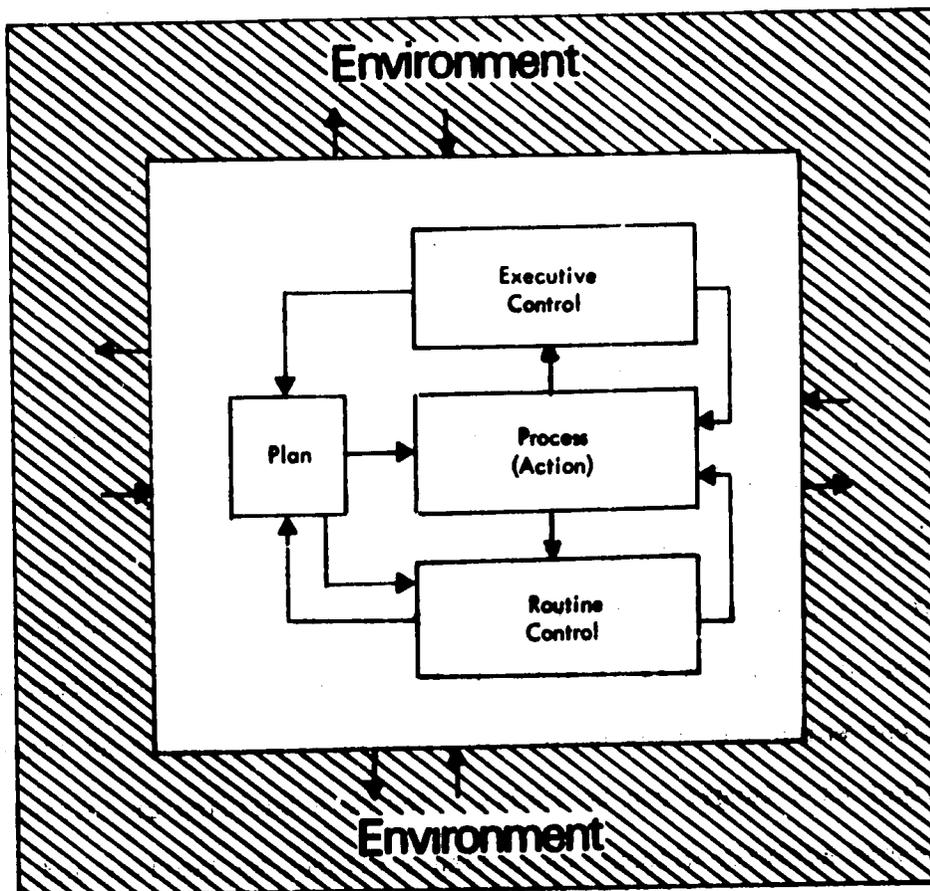


Figure 12 A - The Project As An Open System

Throughout the life of the project, scanning of the environment for new or anticipated developments that will affect the project is an extremely important function. On the basis of such scanning and analysis, management must frame and implement adequate responses to relevant changes. Adequate responses may take the form of price changes, changes in product, service, raw materials, or technology, new investments, procedures, organizational structure and time schedules.

#### Problems of Control Systems

To achieve the objectives of a project, it is usually necessary to take many steps that are expected to lead to the end objective. These steps take the form of inputs and intermediate outputs or necessary accomplishments. Both the inputs and the intermediate outputs would be part of a network. A rural development project might have as its input certain supplies that would be supplied to farmer organizations. An intermediate output might be the building of some specified number of sanitary latrines. Both inputs and intermediate outputs lend themselves to ready quantification so that they are useful indicators of progress and very attractive to administrators. These are often referred to as "targets". Selecting inputs or accomplishment targets is justified because they are presumed to be leading to the end objectives. But this presumption of causation may be faulty, either because the knowledge of causation is in error or there are important qualitative considerations which are being neglected. Similarly the use of an intermediate output as a target can be faulty. The mere building of latrines is a burdensome activity without supporting attitudes by families and

their actual use. These qualitative considerations are often quite critical and if neglected or absent invalidate the whole ends-means chain. Reconciling the ends-means originally envisaged with actual experience is an extremely important part of the control function.

At the beginning of an activity there is considerable scope for malfunctioning. Malfunctioning can arise from difficulties which the plan did not anticipate or may be the resultant of inexperience, incompetence, carelessness of operating personnel or changes in the environment. By keeping close touch with results at the very beginning and taking prompt corrective action, serious difficulties can be avoided. Supervisors need to be oriented to giving close attention to an operation when it starts. An executive can maintain close touch with an operation by a combination of personal observation, informal reports by supervisory personnel and formal reports. An advantage of informal reporting is that once the activity stabilizes at a satisfactory level, less frequent reporting is adequate and routine formal reports can be relied on. A common mistake in control systems is to rely unduly on formal written reports that are too infrequent at the beginning of the activity and too frequent once the operation stabilizes.

Where people are being judged on the basis of their performance, there is a danger that they will falsify reports on progress. Conditions especially favorable to such falsification are:

- a. Results are intangible or subjective
- b. Checks are not considered feasible or probable
- c. Results are threatening to the interest of the person reporting
- d. Report will be used for disciplinary purposes

The most important aspect of a control system is the climate under which it operates. Where personnel carrying out the project have played an active role in setting up the activities of the project, including the schedule, they tend to be more committed to it. It is important that the group focus on what is to be done in the future rather than who is to blame for past difficulties. Consideration has to be given to whether the original plans are still appropriate and the extent to which they have to be modified. There should be room for failure, especially when due to outside factors. Where personnel feel that there is no room for failure they are under strong pressure to distort reporting.

Wherever possible and meaningful, items should be reported in a form that is verifiable. While the identification of events in a network provides such identification with respect to calendar time, it is necessary that both cost, quality goals and facilitating conditions be specified carefully and then reported on. In addition to creating an

environment in which reporting personnel feel free to report deficiencies, independent checks on results reported have to be established as a routine. Early reporting of deficiencies can raise an alarm that permits prompt and effective corrective action at the appropriate level.

### Planning and Implementation

Because of the way institutions are organized, the scarcity of personnel and the need for specialization, the various segments of the planning-action-control cycle are often carried out by different organizations and different personnel. The resulting fragmentation can be very harmful unless there are careful safeguards. These safeguards are:

- ° Make personnel familiar with the processes of the full cycle
- ° Provide procedures for detailed documentation of plans
- ° Have planners and implementers interact before implementation proceeds, providing an overlap to assure continuity. If at all possible have at least one person in the planning group continue as part of the implementing team.
- ° Encourage or at least permit implementers to replan as the need arises

**Familiarity With Full Cycle.** There is a tendency to regard planning and implementation as two separate processes. Those who plan should have familiarity with the problems of action and control. Otherwise their planning will not be realistic. Those who are concerned with action must be familiar with planning as a process and must understand the particular plan they are carrying out so they can replan as necessary. Therefore training in project management has to encompass both planning and implementation.

**Planning Documentation.** Planning documents must describe the implementation process in sufficient detail covering what is to be done, how it is to be done, by whom and why. In its final detail the plan document serves as a guide for those who will carry out the project. It is also a point of departure for modifications that are deemed necessary.

**Interaction of Planners and Implementers.** A well documented plan for a project is very valuable for personnel taking over a project for implementation. But in addition, there is a need for interaction between those who plan and those who carry out the project. For large and complex projects there may be a need for a transition period in which some of the original planners work with the implementers.

**Replanning By Implementers.** Those who implement a project plan should have a thorough understanding of the original plan, but must also regard such plans as tentative and subject to change. As one proceeds with

more detailed planning and implementation, new aspects and considerations often come into view which make changes advisable. Or changes in the environment may have important impacts on the project. While important changes in the project will require the agreement of sponsors and other participants, the initiative for necessary changes is the responsibility of the implementers. This initiative will be exercised adequately only where implementers have a good understanding of the original plan, have a planning capability of their own and have the self confidence to exercise such capability.

#### Targeting As Technique For Planning and Implementation

A target is an intermediate goal used in both planning and implementation. It can be the completion of an activity, the achievement of a quantitative goal or a series of such activities and quantitative goals.

In rural development targets can take the form of on the farm demonstrations, latrines dug or loans paid out to farmers. In construction any of the activities can be a target for some organizational entity. The reasons targets are attractive to administrators are that they are simple and unequivocal. After the fact one can tell if the target has been achieved.

Setting targets (and building networks) assumes that one has defined the end to be achieved and that enough is known about the means end chain. To the extent that these are known, one can proceed to set

targets with the important qualification that targets generally have important cost and quality dimensions. These have to be specified in advance and monitored during implementation. For example, it is not sufficient to set a target of holding a specified number of on the farm demonstrations without regard to receptivity of farmers, the number of farmers attending and the spirit and content of such demonstrations. In the absence of crucial qualitative elements, targets become ritualistic and meaningless for the accomplishment of the desired ends. Similarly the completion of a portion of a building by a certain date cannot be considered apart from its monetary cost.

In actual practice, knowledge of the means-end chain is tentative, so that one must constantly reexamine the assumptions that were initially made as depicted in Figure 8, page 24. Indeed as one gains experience, it may become necessary to modify the ends as well.

As was pointed out when networking was discussed, targets set in consultation with those who will be responsible for carrying them out, with provision for joint review are more likely to be achieved. Targets have to be justified on the basis of evidence and negotiated on the basis of data available. Where data does not exist or the means-ends relationships are not sufficiently well known, the setting of targets should be deferred until more information is generated. The setting of targets that are trivial, irrelevant or misleading can do considerable harm to an effort.

### Economic Analysis

A project can be regarded as an activity which gives rise to a flow of resources into the project which we call inputs and then to a flow of outputs from the project. A country that wants to grow rapidly has to be concerned that the outputs are large in relation to the inputs. This is sometimes referred to as benefit-cost analysis. This section will explore the logic of such analysis.

Just as each entity has a different set of objectives, each entity will have its own flow. Thus in an agricultural project, one can derive the flow of resources (inputs and outputs) of entities involved in the project such as:

External financial institutions

Land reform agency

Marketing board

Ministry of Agriculture

Private businesses

Cooperatives

Farmers

Banks

Whole economy

The analysis of the flows of all but the last entity is commonly called financial analysis. Analysis from the point of view of the whole economy is always called economic analysis.

### Decision Making and Alternatives

Decision making is always taking place with reference to alternatives. (If there is only one alternative in total, there is nothing to decide.) It is very important to be quite explicit as to which alternatives(s) the proposed project is being compared to. An alternative can be a variation of the project (size, location, technology etc.) or it can be to do nothing. The latter case, the status quo, does not mean that things will stand still so that even in that case, the future of the project and that of the status quo must be compared. For example, if the proposed project is to manufacture an item which is presently being imported, the status quo may be to continue to import the item in increasing quantities in future years. The latter eventuality is different than what is presently taking place.

### Physical Planning

Physical planning consists of deriving a schedule of activities leading up to the final outputs (goods and services) in order to achieve the objectives of the project. These activities require physical inputs and outputs. The physical planning of an orange grove will be used to illustrate how one uses the activities to derive the physical inputs and outputs.

The objective of the assumed project is to grow oranges and to earn income for the owner of the grove. For simplicity sake, only the point of view of the owner will be considered. The activities and the physical inputs and outputs are given in Table-1.

If there were a promising alternative of creating an orange grove involving a different size seedling, more or less labor and or other changes, one would have a table similar to Table 1, but with different quantities of inputs and outputs, possibly with different timing.

TABLE 1

**Physical Inputs and Outputs for Orange Grove**

<u>WEEK</u>	<u>ACTIVITY</u>	<u>INPUTS</u>	<u>OUTPUTS</u>
1-4	Acquire land	100 hectares land	
6-20	Plant seedlings	50,000 Seedlings 30,000 unskilled manhours 2,000 supervisory manhours 25 tons fertilizer	
21-52	Maintain grove	7,000 unskilled manhours 600 supervisory manhours	
53-104	Maintain grove	6,000 unskilled manhours 2,000 supervisory manhours 10 tons fertilizer	
105-156	Maintain grove	Same as weeks 53-104	

157-208	Maintain grove	Same as weeks 53-104	
209-260	Maintain grove	Same as weeks 53-104	
261-312	Maintain grove	Same as weeks 53-104	
313-364	First year harvest and maintenance	10,000 unskilled manhours 2,000 supervisory manhours 25 tons fertilizer	1,000 tons of oranges
365-416	Second year harvest	11,000 unskilled manhours 2,000 supervisory manhours 25 tons fertilizer	1,250 tons of oranges
417-468	Third year harvest and maintenance	12,000 unskilled manhours 2,000 supervisory manhours 25 tons fertilizer	1,500 tons of oranges

Each year after year 9 to the year 26 there will be the same inputs and outputs as the ninth year (weeks 417-468).

How can one compare two alternatives with a different set of physical inputs and outputs with a view to choosing the best? Or even if there were only one way of creating the grove, how can the owner judge whether to do something else with the available funds? Except for unusual circumstances, the physical inputs and outputs are not in a form that permits such comparisons.

In the simple example of the orange grove, one might want to consider whether to purchase a larger seedling; use more or less labor; plant one variety of orange or another, full size or dwarf varieties; whether to plant an annual crop between rows the first few years, and a host of other possibilities. Generally technical data will be required to answer these questions, but in many cases decisions cannot be made merely on a technological basis.

In designing projects, one has to consider alternatives which differ with respect to one or more of the following aspects:

1. Raw materials
2. Technology
3. Scale of operations
4. Location
5. Phasing over time
6. Making or buying
7. Provision for expansion
8. Personnel hours
9. Financing
10. Quality of output
11. Variety of output

Each alternative (involving combinations of the above) has its own set of physical inputs and outputs. There is a certain appeal to making decisions on the basis of real physical factors; however any serious attempt to compare alternatives through their physical inputs and outputs alone immediately runs into the difficulty of basic incomparability.

### Need for Cash Flows

In our orange grove example, suppose that a larger seedling could bring in fruit in the same quantity, but one year sooner. Would it be worth going to a larger seedling? Generally, differences among alternatives are far more complex. Ordinarily one can come to grips with the problem of choosing an alternative by converting the physical flow of inputs and outputs into the equivalent time phased cash flow.

Suppose that inputs and outputs of the orange grove had the following prices:

Land	\$250 per hectare
80 cm seedlings	\$ .20 each
100 cm seedling	\$ .24 each
Unskilled	\$ .30 per hour
Supervisory labor	\$ .70 per hour
Fertilizer	\$200 per ton
Oranges	\$35 per ton

If it takes 10,000 more unskilled personnel hours to plant the larger seedlings and the above prices are applied to the respective physical flows, then the cash flows for the two alternatives are as presented in Table 2.

TABLE 2

**Owners Cash Flow of Two Alternative  
Patterns for Orange Grove**

<u>YEAR</u>	<u>80 CM SEEDLINGS</u>	<u>100 cm SEEDLINGS</u>
1	-52,920	-57,920
2	- 5,200	- 5,200
3	- 5,200	- 5,200
4	- 5,200	- 5,200
5	- 5,200	- 5,200
6	- 5,200	+25,600
7	+25,600	+34,050
8	+34,050	+42,500
9	+42,500	+42,500
10	+42,500	+42,500
11	+42,500	+42,500
12	+42,500	+42,500
13	+42,500	+42,500
14	+42,500	+42,500
15	+42,500	+42,500
16	+42,500	+42,500
17	+42,500	+42,500
18	+42,500	+42,500

19	+42,500	+42,500
20	+42,500	+42,500
21	+42,500	+42,500
22	+42,500	+42,500
23	+42,500	+42,500
24	+42,500	+42,500
25	+42,500	+42,500
26	+42,500	0

Notice that the costs are given a negative sign and the income is given a positive sign. The positive quantities are net of cost.

It should be emphasized that in principle, any real resources used or generated by a project should be converted into a cash flow since the whole purpose of computing cash flows is to evaluate the real flow of resources. Thus any in-kind inputs into a project or in-kind outputs should be valued and be incorporated into the cash flow.

### Evaluating Cash Flows

Whereas Table 1 had a flow of personnel hours, fertilizer, seedlings and oranges over a 26 year period, Table 2 has flows expressed in monetary units--surely an improvement. But Table 2 still presents a problem to someone who wants to decide which of the two alternatives to choose. There are a number of common but faulty approaches to making this choice that one sometimes encounters. For example, one might choose the alternative where the sum of plus values exceed the sum of the negative values

by a larger amount or the alternative which has the higher ratio of value of pluses to negatives. Or one might choose the alternative where the owner gets back initially invested money the earliest (payback). All these approaches are very deficient in that they fail to consider that project returns could be reinvested to produce still more income during the remainder of the project period.

In simpler terms, which would the owner rather have: \$1,000 income this year or \$1,000 five years from now? Undoubtedly this year, so as to enable reinvestment sooner. And for the same return over a 26 year period which would the owner prefer: a project that requires investing \$5,000 more now? How about investing \$5,000 more in larger seedlings but getting income one year earlier? To make sensible choices among alternatives one needs a procedure that will take into account the "time value of money"; that is resources made available sooner have a value that should be taken into account. There is such a procedure. It is called discounting.

Discounting the cash flows for different alternatives makes it possible to determine which alternative is preferable if resources can earn  $X\%$  in other uses. For example, if resources can earn 12% elsewhere in the economy is it worth making \$5000 greater investment in labor and larger seedlings in the orange grove to obtain fruit one year sooner? If the owner can achieve 12% annual rate of return, elsewhere, discounting the two flows can provide a good basis for making a decision on which alternative is more attractive financially. By applying the appropriate "discount factor" to each

item of a flow it is possible to obtain the discounted "present value" of the entire flow. The reason it is called present value is that in discounting a flow, each item of the cash flow is converted to its value at present, assuming that money can earn the stated percent per year (in our case 12%). The cash flow of the alternative with the highest present value is the preferred alternative from the financial point of view.

Closely connected with the problem of choosing the most attractive alternative from the financial point of view is determining whether the best alternative is sufficiently attractive as compared to other opportunities open to the owner. The calculation of the present value of a flow and the determination of the rate of return is based on the compound interest equation.

$$S_n = P(1+r)^n$$

where  $S_n$  is the value of the principal  $P$  at the end of the  $n$ th period where the rate of growth is  $r$ . Thus if a bank pays 6% per annum, the principal of \$100 would at the end of 2 years be worth

$$S_2 = 100(1+.06)^2 = \$112.36$$

Since in projects the flow at the end of each period of the project is known (estimated), the problem for projects is to determine  $P$  for the entire life of the project. From the compound interest equation

$$S_n = P(1+r)^n$$

$$P = \frac{S_n}{(1+r)^n} = S_n \frac{1}{(1+r)^n}$$

The quantity  $\frac{1}{(1+r)^n}$  is known as the discount factor or present worth factor. These factors are readily available in published tables for various values of  $r$  and  $n$ . Appendix A provides a set of such tables. In using discounting the owner has a way of making decisions on the basis of the rate of growth of the investment funds.

Table 3 illustrates the calculation of the present value of the two orange grove alternatives, assuming that the owner has opportunities to receive 12% per annum elsewhere. The higher present value of the alternative of using a 100 cm seedling at 12% indicates that from the financial point of view it is to be preferred. The margin is substantial enough to be significant. The actual decision will require taking into account other considerations such as uncertainty, and risk, administrative and management convenience, government policy etc. so that financial measurements are not the sole basis for decisions.

If the owner has opportunities to receive 18% for his money, then the two alternatives would have to be tested in terms of 18% discount factors rather than 12%. If either alternative gave a negative present value, then from the owner's point of view neither would be worth undertaking. It is important to note that one can only determine the value of an alternative from somebody's point of view. In Table 2, the point of view adopted is that of the potential owner. Other points of view may be that of a potential lender, a development agency or the economy as a whole. A potential lender would give serious consideration to the risk elements in a proposed project.

A Development Agency will often extend free services, provide supervised credit for inputs at a designated interest rate and market outputs to yield a margin of profit. This is done of course for a large number of cultivators. In that case, it is very useful to have a measure of what can be expected to happen to the coffers of the Development Agency. This can be done by obtaining the cash flow of the Development Agency. If the return is negative then one has a basis for deciding what to do about it. Depending on policies and circumstances, one might modify the plans on the basis of the initially determined cash flows.

Table 3. Computation of Present Value of Cash Flow  
For Two Alternatives of Orange Grove

YEAR	<u>80 cm Seedlings</u>			<u>100 cm Seedlings</u>	
	Cash Flow	DISCOUNT FACTOR F 12%	DISCOUNTED VALUE	Cash Flow	DISCOUNTED VALUE
1	-52,920	.8929	-47,252	-57,920	-51,717
2	- 5,200	.7972	- 4,145	- 5,200	- 4,145
3	- 5,200	.7118	- 3,701	- 5,200	- 3,701
4	- 5,200	.6355	- 3,305	- 5,200	- 3,305
5	- 5,200	.5674	- 2,950	- 5,200	- 2,950
6	- 5,200	.5066	- 2,634	+25,600	+12,969
7	+25,600	.4523	+11,579	+34,060	+15,401

8	+34,050	.4039	+13,753	+42,500	+17,166
9	+42,500	.3606	+15,326	+42,500	+15,326
10	+42,500	.3220	+13,685	+42,500	+13,685
11	+42,500	.2875	+12,219	+42,500	+12,219
12	+42,500	.2567	+10,910	+42,500	+10,910
13	+42,500	.2292	+ 9,741	+42,500	+ 9,741
14	+42,500	.2046	+ 8,696	+42,500	+ 8,696
15	+42,500	.1827	+ 7,765	+42,500	+ 7,765
16	+42,500	.1631	+ 6,932	+42,500	+ 6,932
17	+42,500	.1456	+ 6,188	+42,500	+ 6,188
18	+42,500	.1300	+ 5,525	+42,500	+ 5,525
19	+42,500	.1161	+ 4,934	+42,500	+ 4,934
20	+42,500	.1037	+ 4,407	+42,500	+ 4,407
21	+42,500	.0926	+ 3,936	+42,500	+ 3,936
22	+42,500	.0826	+ 3,510	+42,500	+ 3,510
23	+42,500	.0738	+ 3,136	+42,500	+ 3,136
24	+42,500	.0659	+ 2,801	+42,500	+ 2,801
25	+42,500	.0588	+ 2,499	+42,500	+ 2,499
26	+42,500	.0525	<u>+ 2,231</u>	----	<u>-----</u>
			-63,987		-65,818
			<u>+149,773</u>		<u>+167,746</u>
	Present Value.....		+ 85,786.....		+101,928

### National Economy Point of View

The calculation in Table 3 was oriented to the owners interest in the orange project. As was pointed out one could look at the project from the lender's or development agency's point of view. It is also possible to derive a cash flow from the point of view of the national economy. The most widely used concept for this purpose is the net return concept. This concept is based on the notion that the economy constitutes a large pocket which includes the interests of all entities of the economy, exclusive of foreigners. The project has a relationship to the economy first in the investment period and then during the output generating period. This is illustrated in Figures 13 and 14.

Inputs into the project from the economy are treated as negative items, while outputs from the project into the economy are treated as positive items. During the investment period the flow is only one way, resources going from the economy to the project, denoted by a negative sign. During the output generating period the flow is two-way so the net benefit of the project is the value of outputs from the project less the value of inputs to the project. Once the net return cash flow is derived, discounting is applied to it in the same way as with the owner's cash flow, that is, it can be measured against a desired rate of return. A rate of return is usually expressed in terms of percent per year. For a poor country that wants to grow rapidly the desired rate of return would be 15% or even higher.

The net return concept incorporates a view of costs and return that is different than a private point of view. A private enterprise would

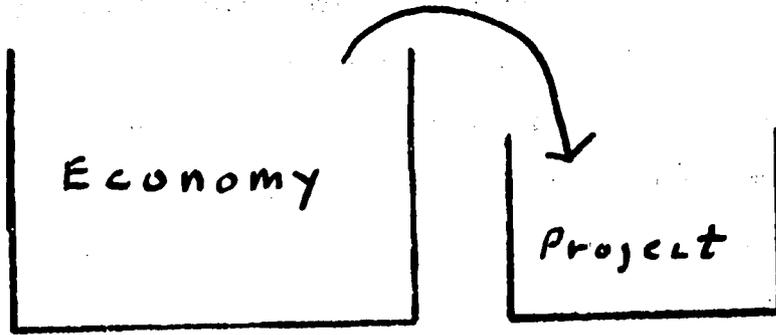


Figure 13: Flows During Investment Period

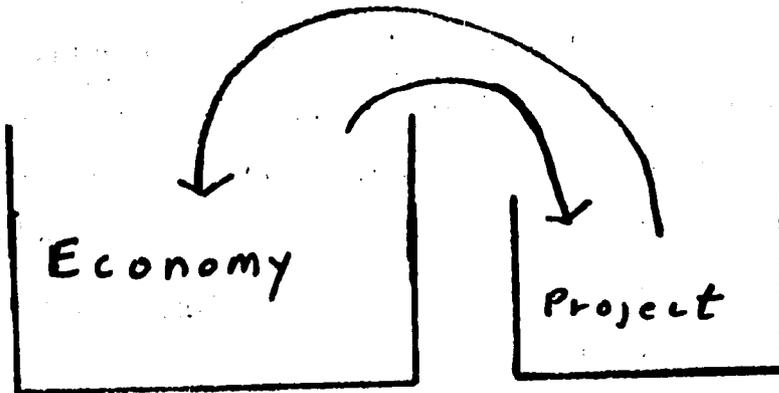


Figure 14: Flows During Output Generation Period

regard taxes and customs duty as costs, whereas from the national point of view they are income, or at least transfer of funds within the country. Similarly subsidies would be revenue from a private point of view, but a cost from the national point of view or at least a transfer of funds within the country. Interest paid to a domestic bank would be a cost to a private enterprise, but from the national point of view it would be "earned" by the project for the economy. The cost of foreign exchange to a private enterprise is determined by the official rate of exchange, but the value of the foreign exchange may be greater from a national point of view. These differences between the private and the national point of view may create divergences between private rates of return and national rates of return. A project can have a high private rate of return and a low national rate of return or vice versa.

Sometimes the net return concept is given another form - that of the benefit cost ratio. Here the discounted value of net benefit divided by the discounted value of investment is taken as the index of desirability. If the value of the benefit-cost ratio is greater than 1.0, then the project is regarded as economically attractive. In any computation of the benefit-cost ratio or present value, a critical assumption is the rate of return used in the computation.

#### Other National Concepts of Return

The net return is an attempt to summarize the national economic return of a project. However there are other ways of looking at a project from the national point of view. These are:

- . For every unit of national investment, at what rate is income being generated.
- . For every unit of national investment at what rate are reinvestable funds being generated.
- . For every unit of national investment at what rate are jobs being generated.

The generation of income will be important for every developing country. While in general there will be a close association of income generated with job generation, this may not be always true. Job generation by itself is a very poor criterion, apart from income generation. Putting people to work to dig useless holes would create jobs, but would be poor policy for a country. The stress on generation of reinvestable funds will vary considerably depending on the circumstances of the country. An oil rich country would place less stress on the rate of generation of reinvestable funds than one without easy access to such funds. In computing national rates of return, the valuation of foreign exchange will depend on the country's foreign exchange position.

#### Non-Market Oriented Projects

In market oriented projects current outputs would be priced at their market value, that is, they would be valued at what the users are willing and able to pay. But for non-market oriented projects there is no basis for valuing the output in money terms. The evaluation of a non-market

oriented project therefore is not identical with that of a market oriented project.

Procedures for testing alternatives of non-market oriented projects are identical with those used for market oriented projects. For example, there may be two proposed designs for a primary school, one involving a greater initial expenditure and less maintenance cost, the other requiring less initial cost but greater maintenance. By using discounting one can determine the least cost alternative.

Table 4 illustrates the calculation of the present value for a hypothetical primary school building, assuming that money can earn 15% per annum elsewhere in the economy. The more durable and costly building has a higher negative present value indicating that on an economic basis the less durable building is more advantageous. Needless to say the decision maker may choose the more durable building in spite of the additional cost. Presumably there are other reasons (pride, beauty, administrative convenience, etc.) which might justify such action in a specific context.

Once the least cost alternative is identified, then the non-market oriented project must be considered in the light of the total budget available for that category of expenditure. This is not unlike a family with limited funds deciding on the purchase of a major item like a piece of furniture. First it would ascertain the kind of furniture it wants and then look for the least cost item that meets this want. Having located the least cost item, it still has to decide whether it is advisable to spend that part of its budget on this item. The process of deciding involves weighing the least cost

against the benefits. Since in the case of non-market oriented projects there is no market valuation of the benefits, the decision maker must use subjective estimates for making his decision. The subjective estimates will include considerations such as political support from beneficiaries, income equality, development of a backward region, and complementarity to market oriented activities.

Table 4. Computation of Present Value of Two  
Alternative Primary School Buildings

Year	Durable Building	15%	Present	Less	Present
		Discount Factors	Value	Durable Building	Value
1	-5500	.8696	-4782.8	-3700	-3217.5
2	- 500	.7561	- 378.1	- 700	- 529.3
3	- 500	.6575	- 328.8	- 700	- 460.2
4	- 500	.5718	- 285.9	- 700	- 400.3
5	- 500	.4972	- 248.6	-1000	- 497.2
6	- 500	.4323	- 216.2	- 700	- 302.6
7	- 500	.3759	- 188.0	- 700	- 263.1
8	- 500	.3269	- 163.4	- 700	- 228.8
9	- 500	.2843	- 142.2	-1000	- 284.3
10	- 500	.2472	- 123.6	- 700	- 173.0

11	- 500	.2149	- 107.5	- 700	- 150.4
12	- 500	.1869	- 93.5	- 700	- 130.8
13	- 500	.1625	- 81.3	-1000	- 162.5
14	- 500	.1413	- 70.7	- 700	- 98.9
15	- 500	.1229	- 61.5	- 700	- 86.0
16	- 500	.1069	- 53.5	- 700	- 74.8
17	- 500	.0929	- 46.5	- 700	- 65.0
Total Present Value			-7372.1		-7124.7

### Risk and Uncertainty

A project is based on estimates of what is expected to take place in the future. Such estimates are subject to uncertainty arising from a variety of sources. Investment cost can be higher, sales can be lower or the selling price can be lower. Taking into account the effects of such uncertainties can improve the design, appraisal and implementation of projects.

Sensitivity analysis is a means of exploring the effects of important variables within a likely range of values of such variables so that a greater awareness can be achieved about the risks of the project. Essentially it involves changing the assumed value of a variable and determining how different the payoff effect would be as compared to the planned values. For example, if the assumed price of the product is  $X$ , one might determine the cash flow and rate of return if the price was  $.8X$ ,  $.9X$ ,  $1.10X$  and  $1.20X$ . If a price of  $.8X$  was considered likely and the rate of return would be very low (return is sensitive to price), then this would indicate that the variable of price is very important to the success of the project.

Sensitivity analysis has a number of different kinds of benefits. It can alert those who are planning the project to dangers by source and lead to modifications that reduce the risk from that source either in the basic design or in plan for implementation. If the project is sensitive to price, it may be advantageous to reduce the scale of the project which in turn diminishes the risk of market saturation (with resulting pressure on price). Sometimes the project can be implemented differently to "buy insurance". To give greater assurance of projected sales and price level there might be provisions for market research, promotion or a foreign sales contract. To guard against a protracted construction period, contractors may work under an incentive contract. Advance warning of a danger can often make it possible to overcome or minimize the danger. Forewarned is forearmed.

Another possible outcome of sensitivity analysis is the postponement or rejection of the project. Where there are serious environmental questions, the project may be postponed so that the environmental threats can be studied more carefully. Such study might require experimental efforts that are time consuming.

Risks impact people differently. Therefore meaningful measurement of risk depends on the point of view of the entity considered and their perception of these risks. For example in agricultural projects the perception of risk by the farmer is extremely important. If as is very common, the farmer gives priority to his subsistence crops, he will tend to resist any crop program which proposes to subject his food supply to serious risk. Similarly, because of his meager resources he will resist risking serious

losses. In industrial projects risk impacts will be different for workers, lender and entrepreneurs.

In considering risks it is important that one place oneself in the place of the entity considered with their values and circumstances.

Since the payoff of many projects are in dimensions other than money (disease rates, employment, etc.), one should consider risk effects on the relevant dimensions other than money.

After having attempted to estimate the risks connected with a proposed project there will still remain important risks that are hard to quantify. It is important that these be described as best one can so that they enter into decisions.

Since sources of risk, their seriousness and imminence change as the project proceeds, those who carry out the project should be familiar with the risk analysis that the planners made and be alert to changes in the project and the environment that will affect risks. Changes in government procedures or perceptions of the affected population for example can change risks substantially. Such changes will often require modifications in the project.

### Creativity

Projects generally are new activities or old activities that are carried out under a new and changing environment. Because of its innova-

tive nature, project management can benefit enormously from creative solutions. Creative thinking is directed toward achieving new solutions that are superior to existing solutions. As was previously mentioned, creative thinking is best carried out in stages such as the following

**Stage 1 - List As many promising alternatives as one can think of without regard to difficulties or judgment as to their practicality or merit. Encourage unusual ideas and modifications to expressed ideas, but do not think of or discuss the merits of such ideas or their modifications. The whole thrust of the initial effort is to generate as many alternatives as possible.**

**Stage 2 - Compare the alternatives with a view to combining and modifying some and eliminating others. Such comparisons will suggest modifications that will strengthen some alternatives. A feature or characteristic of even a rejected alternative may "fit" an attractive alternative and make it more desirable.**

**Stage 3 - Choose relatively few alternatives that are most promising for final consideration.**

Oftentimes a later stage may suggest new aspects which could be improved by going through stage 1 again.

Numerous experiments indicate that an exclusive concern with getting

more ideas without regard to their worth, produce a larger number of better ideas than if the search for ideas is combined with judgment and analysis. By temporarily separating the search for ideas from their analysis, it is possible for a person to be much more creative. While individuals differ in their creativity, most individuals can improve their creativity by consciously adopting the three stage pattern.

### Brainstorming

In addition to the possibility of the individuals being more creative, groups of individuals can be more creative. A formal structure to embody stage 1 of creative thinking is the so-called "brainstorming session" where the group tries to generate as many ideas ("alternatives") as possible. During this idea generation phase the following ground rules are followed:

- there will be no criticism or evaluative statements during the idea generation phase
- unusual ideas are encouraged
- members can try to build upon ideas of others
- quantity is desired

In a later session the group evaluates the ideas and tries to select a more limited number that they consider worth further evaluation. It is not unusual for new variants to emerge from such evaluation.

A project manager can tap the experience, training and imagination of his group to obtain innovative and promising solutions to important problems by conducting brainstorming sessions. Apart from the getting better ideas, participants in such sessions are more likely to drop their pet ideas and be more receptive to new solutions arrived at in this way. In addition, brainstorming sessions create a climate where people look for new solutions in their regular work.

### Force Field Analysts

Another form of creative problem solving is "force field analysis." Every problem situation can be viewed as a set of opposing forces. Some of these forces help to solve the problem. These are called the "driving forces." Others inhibit the problem solution. The latter are called "restraining forces." Suppose a group has a problem of maintaining its schedule of construction. It might find that helpful (driving) forces are the following:

- . cooperation of suppliers
- . cooperation of contractors
- . use of overtime
- . use of special transport
- . flexibility of staff

Unhelpful (restraining) forces might be

- . changes in specifications
- . machine breakdowns

- . unavailabilities of raw materials
- . infrequent transport
- . strikes

A common procedure is for the group to first have a brainstorming session to list as many of the driving forces as possible. Another brainstorming session is held to determine all possible restraining forces. At later brainstorming sessions the group will consider different ways in which the driving forces can be made stronger, trying to be as specific as possible. Similarly the group will consider how the restraining forces can be weakened.

In addition to generating better ideas for remedial action, group participation in force field analysis generates better follow up. In many problem situations individuals start out with fixed ideas on what is wrong based on their limited experience and bias stemming from self interest. Participation in force field analysis in a group has the effect of making people more open to new ideas, producing greater commitment to the solutions generated.

### Design Approaches

In designing a project, there are two approaches that can be very effective.



Remedial Measures	Results
Setting Objectives Clearly and Operationally	Improve
Setting Standards of Performance to Further Objectives	Performance
Rewarding Superior Performance on Basis of Performance To Standards	Retain Good Personnel

The diagnostic method is most effective in the early stages of planning, particularly in setting the planning premises since it can affect the project design radically. In some cases, the improvement of the existing facilities would have priority over, or even take the place of a new project. This is particularly true when a proposed project is viewed from the point of view of the national economy.

Some critics of the diagnostic method claim that the examination of an existing system at an early stage in the design stifles creativity, that is the examination induces "psychological set" that adapts existing solutions.

#### Creative Design or Ideals Concept

This method starts out with needs of a population, demand for an end product or a general objective. These may be one or more of the following:

- a. local perception of a need
- b. a crisis or emergency
- c. an external threat

- d. a shortage or bottleneck
- e. a linkage with an existing project
- f. a project failure
- g. experiments
- h. political pressure
- i. sector or other studies

Or projects can start with opportunities such as:

- a. sector studies recommending the project
- b. funding priorities of assistance agencies
- c. follow-on funding from leading agencies
- d. replication of a successful project
- e. discovery of excess or idle resources
- f. advantages from existing project
- g. promising innovation
- h. price changes
- i. government incentives
- j. increased imports of a product
- k. foreign demand

Selecting the relevant needs and opportunities, using brainstorming and force field analysis, an individual or group tries to generate a large number of alternative approaches and means.

Once the alternatives have been generated, the alternatives are then analyzed in physical, economic, social and political terms, with special attention to constraints that would get in the way of promising configurations. A possible sequence to create a project in this way is

the following:

1. Define the needs to be filled by the project and operating environment over the anticipated operating time horizon based on objectives.
2. Using creativity techniques, generate alternative project configurations with no regard to current constraints.
3. For each promising alternate configuration, define the constraints (reasons why the system is currently not feasible). Involve the people who are responsible for implementing and operating the project.
4. Select the most promising configuration. Modify it so that the constraints are no longer binding and the design becomes feasible. (This action usually reduces the performance potential.)

#### Organizing to Implement the Investment Phases of the Project

During the investment phases of the project, output generation capability is created. The creation of such a capability calls for physical construction of buildings, selection, procurement and installation of capital equipment and break-in and start-up of a new facility requiring specialized skills and knowledge that are different than those called for by output generation itself. Generally the services of a large number of people may be required for relatively short periods of time. Knowledge as to what will work best (technology, location, personnel, marketing, contractors) is much more uncertain than in a going operation. Along with more uncertain knowledge and the need for innovation is greater complexity involving many disciplines. Errors tend to be more serious because rather large sums of money are involved and commitments are difficult, or at least costly, to reverse.

Who is to carry out the investment phase of the project? If the project is an entirely new undertaking, there may be only one possibility--create a new organization. But most projects are related or can be related to existing organizations. Either they are extensions of existing activities or they bear some important relation to such organizations. Either they will have to be integrated during the output generation phase or they can draw on a pool of talent or resources to carry out the investment phase. Because the pool of talent and resources in developing countries is limited, there is a strong tendency to give an existing organization the responsibility for carrying out the investment phase of the project.

The existing organization can choose to designate one of the departments of the organization (such as the Engineering Department) to take responsibility for carrying out the investment phase of the project. In that case the head of the department or the designated project manager would have to obtain the cooperation of the various departments to handle their related functions of the project, such as personnel, accounting, finance, purchasing, security, transport and marketing. The potential advantages of such an arrangement are the following:

- ° Permits use of specialized personnel
- ° Project can share scarce personnel and equipment that is available in parent organization
- ° If project workload is small in relation to normal workload it may be squeezed in or accomplished by "stretching" personnel

- Participation in new project can increase skills of management and technical personnel
- Integration of project with existing organization after investment phase is made easier
- Even if some additional personnel is needed, staffing and training is facilitated

The potential disadvantages of a department-led project are the following:

- Barriers develop among departments, impeding communication and integration
- Staff not oriented to cope with innovation and frequent change demanded by project
- Project workload may be large in relation to regular workload
- Regular work is given precedence
- Defects of parent organization (personnel, work habits, etc.) are serious impediments to accomplishing project objectives

To avoid the potential disadvantages and retain some of the advantages, the matrix form of organization is sometimes adopted. Here the parent organization designates a project manager who is empowered to draw resources from the organization and outside the organization to achieve the goals of the project. The project manager proceeds to bargain for resources from the departments. Personnel from the various departments are arranged for on a full or part-time basis. Arrangements are worked out for receiving services as required by the project plan from outside the organization as considered necessary. A noteworthy feature of this arrange-

ment is the ambiguous status of the project team members in relation to the regular departments. They may be under the formal jurisdiction of the department heads as far as promotion is concerned, but they have a responsibility to the project manager for work on the project. This dual allegiance can lead to difficulties. Matrix organization of a project works satisfactorily where a) the regular operation of the organization runs reasonably well, b) plans are laid out in advance by those who will have to carry out these plans, c) a climate of mission accomplishment is established, and d) there is support from top management for the project plan.

The matrix organization tends to have all the advantages of the department coordinated form of organization with some additional advantages. It permits greater selectivity of personnel and greater flexibility as to sources of help. For example, a project manager is freer to contract for help outside the parent organization if he or she feels that performance will be better or cheaper. Better insulation from the regular workload can be obtained since a sharper allocation of personnel can be attained. By working directly with the team members rather than department heads, the project manager can help the team focus on the project goals in a more concentrated way. The project manager has the advantage of direct access to the head of the organization if a serious obstacle arises.

The potential disadvantages of the matrix form of organization are the following:

- ° Conflicting loyalties of team members who come from the parent organization. This is especially true of those members who work on the project part-time.
- ° Possible conflicts between the project manager and department managers.

- Dual management structure complicates management procedures.
- Personnel available from departments may not be suitable for project work.

A third organization alternative is to set up a separate organization to plan and carry out the project for the investment phases. Here the project manager is free to choose members of the team purely for their qualifications and suitability, without being bound by the procedures of the parent organization. If the project manager chooses people from the parent organization they generally sever their connection for a set period. The potential disadvantages of a separate organization are:

- Recruitment may be difficult because of the limited period of employment.
- Personnel may be diverted from their work by concern for future employment.
- The benefits of experience do not remain with the parent organization.
- It is more difficult to tap the experience and knowledge of the parent organization.
- Procedures have to be set up anew.
- Controls of parent organization are not available to check malfeasance.
- Integration of project into parent organization is more difficult.

The choice of how to organize the project is often made by the parent organization even before the project manager is appointed; having to make the best of whatever decision has been made, the project manager can try to capitalize on the potential advantages and take steps to avoid the potential disadvantages. This is often a matter of both style and substance. For example, if the decision has been made to set up a separate organization, the project manager could try to maintain a close liaison with key persons of the parent organization. Even though independent, he can maintain a relationship which will facilitate a smooth merging with the parent organization at the end of the investment phases. Such a relationship requires genuine consultation, an attitude of respect and frequent communication.

#### Analysis of Implementing Capacity

A project may be carried out by one or more organizations. Typically several are involved. The organizations may already exist, or may be created as a part of the project. In either case it is vital to estimate (1) the role of each organization, (2) the importance and interrelationships of these roles, (3) the capacity of each organization to carry out its assigned role, (4) the adequacy of proposed mechanisms and procedures for achieving the required coordination of functions.

If a project is to be carried out by an existing organization, the latter's "track record" is a relevant consideration. By examining an organization's record of leadership, programs, staff and outputs, one can often determine strengths, weaknesses and dangers to be avoided.

One important determinant of an organization's effectiveness is the ideas its leaders have about its "mission" and its programs, and the degree to which such ideas differ among its personnel. The leaders

of a community development organization, for example, may see their primary role as bringing social amenities to its clients or they may see their role as integrating the efforts of other agencies to achieve economic as well as social development. Top management may have one view of the organization's role and those at lower rungs may have different, or even incompatible views.

Where ideas differ about what the organization's mission is, and how it should participate in the project, one can expect difficulties in implementation. Such differences within organizations and among organizations essential to the project must be carefully gauged from the beginning so that the project planning and implementation process can be designed to narrow the differences.

The motivation of the staff of an organization will affect its outputs. Commitment to the purposes of the organization may range from strong to weak. Conditions of employment and direction of the organization may vary in the degree to which it rewards or encourages efficiency or effective behavior.

One should ask the following questions about the organizations that will be implementing the project:

a. Is there top-level support? Support means assistance with budget, staff, facilities, information, protection from political interference, etc. "Top-level" is a relative term, but the source of support must be as high as necessary (whether in or out of government) to effectively deliver the legitimation and the support specified above. Is this top-level fairly stable? How often does it change? Is there likely to be a change before the project is terminated? Will the new leadership be supportive? What

measures if any are being taken to build support?

b. Are there qualified individuals who can act as Project Leader and key people on the team? The qualifications include technical, managerial leadership, communication and negotiating skills as well as motivation. If qualified people are not available, is provision being made for their timely recruitment and training?

c. Is there an organizational unit assigned the functions, authority and commensurate responsibility to execute the project? If not, is there an organizational unit with clear responsibility and authority to coordinate the inputs of other entities to policies and goals? Is the project team assured of top level support to resolve difficulties?

d. Is there an adequate mechanism for coordination with other organizations in other sectors, universities, regions or state and local government?

e. Is the implementing agency capable of developing a detailed operating plan, i.e., to specify the major tasks to be undertaken, schedule and sequence these tasks in a realistic time frame, assign responsibility for execution of the tasks, estimate the resource requirements by category (personnel, material, money, equipment, supplies, etc.) and by appropriate time period, and to plan for the disassembly of the project when it transfers the project output to the receiving organization. If not, is there provision for training of the project team for doing this?

f. Does the implementing institution provide adequate salary, allowances, promotions, recognition as well as provision for subsequent assignment of project personnel? Are project staff motivated and rewarded for such service? If not, what provision is being made or can be made to overcome this difficulty?

g. Will sufficient work space, equipment, communication facilities, transport and supplies be available? Will there be adequate support personnel for such services? Is there assurance that quality, quantity and timeliness of these resources will be adequate? If not, what remedial actions need to be taken?

h. Is the financial management adequate to provide: realistic estimates of financial need? Realistic allocation of spending authority? Timely disbursement of funds? Reasonable but not excessive controls? Post-audit on use of funds? Accounting to meet program needs as well as fiscal needs? Flexible budget authority to project permitting transfers among expenditure categories (e.g., money for travel and per diem as well as salaries)?

i. Are there responsive procurement procedures to cut red tape and meet the deadlines required by the project? Are there prolonged, formalistic bid procedures or uncontrolled "kick-back" procedures that will interfere with project execution? If so, what provision is there being made for overcoming this disability?

j. For projects involving expensive equipment, can the institution purchase, transport, store, guard, maintain and control such items? If not, how can provision be made for this capability?

k. Can the implementing institution report on project progress and resource utilization? Are reports tied to plans? Can it take remedial actions in order to bring project operations into conformance with targets and standards? Will a system for project control and periodic evaluation be workable between the executing agency and the donors? Has it been done before? If not, what provision has been made to train personnel and install such a system?

1. Is there an adequate flow of data (statistics, information, intelligence) to the project team concerning: (1) the external system it is trying to influence (e.g., health status of target population, small farmer production, etc.); (2) the outputs the project is producing; (3) the inputs it is utilizing--personnel available, money, supplies, etc.; (4) the change in the indicators for the key assumptions made by the project plan. If not, how can they be provided?

m. Does the implementing agency foster teamwork? Can the prospective project team members work as a unit among themselves and with other organizations? Are there any factors that impede necessary coordination--e.g., personality, culture, social, religious, tribal, ideological, social class, regional, etc.? Can these barriers be surmounted?

The project by its nature is a form of change in its environment. As such it will affect and tend to be seen as a benefit by some and a threat by others--whether real or fancied. Moreover, this perception may change over time as indeed may the reality of the project's benefits and dysfunctions. At the planning stage it is useful to make an assessment of the project's potential supporters and detractors, with meaningful (wherever possible, quantitative) estimates of benefits and disbenefits accruing to each affected party. Insofar as these can be measured by money flows this can be done in the financial and economic analysis. Such an initial assessment is likely to lead to a modification of the project plan. In addition to these monetary measurements, estimates can be made of non-monetary benefits and costs. People who know the local scene should be consulted on the potential supporters and detractors, with the maintenance of an "early warning" system throughout the project period to note changes in this assessment so as to be able to take prompt and appropriate action.

There are two kinds of analysis that can be useful to assure support for the project and reduce resistance. These are social analysis and institutional analysis.

### Social Analysis

In discussing benefit-cost analysis it was suggested that there was not one unique set of benefits and costs that were relevant. Rather, that benefits and costs had to be defined according to the point of view of different entities. It is important that things assumed to be a benefit are perceived as such by the recipient. What is crucial is the subjective image that the supposed beneficiaries have of their own circumstances and the devising of measurements that reflect these images.

Where a project's success depends on widespread public acceptance the leadership patterns in the affected area are important. In each area it should be possible to ascertain who are the most respected leaders. Special attempts should be made to ensure the support of such people. Such individuals may well perform in their communities the same role that extension personnel perform in the area of immediate project impact and on that basis it may be reasonable for the government to recognize the quasi-official nature of their work by giving them such reasonable assistance as they may request.

It is important to delineate the characteristics and functions of leadership in the various groups. For example, where individual choice is not circumscribed by social obligations or institutional regulations, it will be useful to know who the opinion leaders are and where they are located. The support of such people will ultimately be vital to the success of policies

aimed at increasing benefit incidence. These opinion leaders may not by themselves be involved in project type activities; instead, they may be political or religious leaders, high officials, or even the most senior citizens. The precise role and function of leadership can sometimes be obtained through questionnaire survey methods. The issue that has to be resolved is who are the leaders whose support or cooperation or lack of opposition will be essential to the success of particular kinds of project and program?

What would be the motivation for participation in development activities of the type covered by a project? This involves placing oneself in the position of significant groups, adopting their point of view, and trying to work out the likely reaction. Is the need for the project actually perceived by potential participants? Often the rationale for a project is really only understandable in the light of information possessed by top management in Governments and development agencies.

A definite motivation must be assigned to each significant group that is expected to participate; it should be the actual motivation of that group and not what someone imagined would be the motivation if he or she were a member of that group. For example, in one group motivation may be a desire for increased power and prestige; another group may desire to follow the example of opinion leaders; another group may desire financial reward; another group may be moved by patriotism because of a key role the project may play in the nation's economy. A desire for their children to have better educational opportunities, for increased leisure time, for increased efficiency, or even competitiveness may be important.

It should be possible to construct a profile of the average potential

participant. This profile must specify the minimum requirements, i.e., level of education, resources, skills, attitudes, etc., which would make individual participation possible as well as the maximum attribute possession which might tend to discourage participation on the part of various individuals. A minimum participant profile will emphasize who could reasonably be expected to participate. Mobility and motivational data will give numbers and locations. Where, at minimum, is the project or program to affect? What is the basis for this estimate? How, at minimum, are participants expected to adopt new patterns of behavior implied by adoption of innovation? What is the minimum, in terms of extension contact, media contact, or contact with opinion leaders, necessary to secure lasting benefits from the program? What is the longest period of time envisaged for the adoption of innovation?

When data on the nature and location of groups and the participant profiles is compared, it should be possible to identify and locate those who probably will participate. This would mean that against the background of proposals one could roughly estimate where the potential participants were located and how many could potentially be expected to become involved. These potentials could be quantitatively mapped out on charts. The charts would reflect where and with what kinds of groups particular types of project could actually be executed, where they should be executed to achieve maximum effect.

Who will not be affected by the project? What is their number? Where are they located? How will successful execution of this project benefit these people? There should be some plausible linkage, some definitely discernable

relationship between the circumstances of those who are small in number and who will be assisted by the project and those who are many and who are ultimately expected to become beneficiaries.

Armed with data on location and number of potential participants as well as an assessment of what would have to happen if this potential is to be realized, the next step would be to identify social or political, or religious obstacles to progress. (At this stage a force field analysis could be very valuable). These obstacles, if removed, should result in the generation of project or program effects.

Those groups who stood to lose or gain nothing as a result of satisfactory project implementation should be identified. Any change in patterns of resource allocation, deferred consumption, or elimination of inefficient or wasteful practices will worsen the position of some groups.

For example, cooperatives may be opposed by private businessmen; birth control measures may be opposed by religious groups; mechanization may be opposed by unions; ethnic groups may oppose aid to other groups; creation of government monopolies may be resisted by private interests; private consumer groups may oppose paying for services which stem from attempts to improve institutional performance.

Table 5 is an illustration of how various entities and interests relate to a health clinic project.

Table 5 - Entities and Interests Related to a Health Clinic

<u>Organization</u>	<u>Role re Project</u>	<u>Attitude</u>		<u>Comment</u>
		<u>Present</u>	<u>Potential</u>	
Office of the Presidency	Need President's Approval, President Appoints Minister of Health	Favorable	Favorable, but term expires in two years	Sees project as political plus with small farmers
Office of Planning	Approves Project, Sets Program Priorities, Evaluates Project, Recommends Funding Level	Favorable, Interested in efficiency, but opposed to budget increase	Unknown, chief may leave in two months	Crucial relation to monitor
Ministry of Finance	Sets Budget and Expenditure Level, Must approve major purchases, Fiscal Inspection, Performs Accounting	Cool. Not Opposed to Goals, but will not relax detailed controls and pre-audit which would stall project	May slow down project	Powerful Ministry Rigid at lower level. Vice Minister favorably disposed to goals
Office of Social Security	Finance & Operate Hospitals in Target Area. Gather Revenue & Contract Medical Services. Compete for Resources and Functions with Project	Suspicious of Threat	Political fight over jurisdiction and resources	Need careful negotiation and coordination of mutual interests

<u>Organization</u>	<u>Roles re Project</u>	<u>Attitude</u>		<u>Comments</u>
		<u>Present</u>	<u>Potential</u>	
<b>Community Development Organization</b>	Drill Local Water Wells Organize Local Health Committees	Cooperative	Can become favorable or negative according to approach	Develop close and positive working relation
<b>Office of Nutrition in Ministry of Health</b>	Formulate Nutrition Policy and National Program Recommend Budget and Evaluate Field Projects	Chief cannot get along with project personnel, Nutrition Program still favors proj.	Interests are compatible but have personality conflict	Coordination is important. Appeal to Director General for resolution Monitor closely
<b>Medical Association</b>	Influences Attitude of Private Physicians, Congress and general Public, Powerful pressure group	Hostile. See proj. as lowering medical standards. Also diverts funds from large hosp.	Compromise possible	Some of the opposition based on inaccurate information but there is clash of interest Negotiation called for
<b>Campesino Association</b>	Clientele of Project Votes influence President and Congress	Favorable. Want more Health Services in Rural Area	Favorable	Natural harmony of interests. Maintain liaison

<u>Organization</u>	<u>Roles re Project</u>	<u>Attitude</u>		<u>Comments</u>
		<u>Present</u>	<u>Potential</u>	
ulti-Lateral Donor	Financing Related Project Provide Tech. Assistance for Sector Planning	Cool. Fear dilution of their influ- ence on sector plans.	Favorable. No real conflict of interests. Have personal- ity problem and info gap	Present Problem to host gov't. and ask them to handle person- ality issue.
egional Medical Office	Direct Field Operations Controls Hospitals and Staff Needed for Project	Threatened. Dir. sees proj. as potential danger to way he does busi- ness. Has powerful political influence	Conflict is real. Politi- cal pressure may create serious prob- lem	Consider changing site of pilot project

The identification of the key institutions that can help or cripple the project is subject to variation, of course, but knowledgeable operators on the local scene are usually aware of the individuals, groups, and institutions that are friendly and which are opposed. It is possible that there is mis-information, lack of information and poor calculation. It is better, therefore, to make the assessment with more than one local source and where feasible to make some first-hand contacts with people and organizations crucial to the success of the project to determine their attitude.

The assessment should include whether there is a personal or institutional interest involved and to what extent there is a misconception or lack of communication involved where attitudes are negative.

Further Examples of interests involved in different kinds of projects are the following:

A Farm to Market Road

Landowners  
 Tenant farmers  
 Finance Ministry  
 Local officials  
 Investors  
 Bus companies  
 Contractors  
 Highway Department  
 Trucking companies  
 Farm Supply Companies  
 Agriculture Ministry  
 Extension Service  
 Area Planning Office

Commodity Storage

Farmers  
 Landowners  
 Truckers  
 Dealers in the commodity  
 Importers of supplies  
 Banks  
 Local money lenders  
 Finance Ministry  
 Agriculture Ministry  
 Extension Service  
 Cooperatives  
 Office of Nutrition, Ministry  
 of Health

**Electricity**

New and existing  
 Consumers  
 New and existing  
 Industrial Users  
 Domestic  
 Contractors  
 Foreign contractors  
 Landowners  
 Domestic suppliers  
 Foreign suppliers  
 Electric Company  
 Finance Ministry  
 Multi-lateral Financing  
 Institutions  
 Regional Engineers  
 Ministry for Energy  
 National Planning Office

**Steel Plant**

Consumers  
 Domestic users  
 Present steel  
 Importers  
 Distributors  
 Customs Department  
 Finance Ministry  
 Foreign suppliers  
 Planning Ministry  
 Highway Department  
 Bureau of Mines  
 Trucking industry  
 Other planned projects  
 using steel  
 Lenders

**Dealing with Resistance**

What to do about negative attitudes toward the project depends upon a careful appraisal of the possible causes for the resistance. In general, it is useful to:

- a. Wherever possible obtain reactions to a provisional design of the project from various affected parties so that the final design can reflect knowledge of the various interests. Aside from the desirable effects on the final design, the very act of consultation serves to create a more collaborative attitude. It is best for those who will approve or carry out the project to undertake this kind of consultation and coordination.
- b. Make sure that wrong information, wrong assumptions and baseless fears are resolved through clear communication.
- c. Reason and persuasion are effective instruments where there are in fact some values that can be mutually advanced by the project.

- d. Conflicts of interest can be resolved sometimes where there is a common superior to appeal to.
- e. Where there is no arbiter or higher authority to resolve the issue, compromise is a time-honored technique.
- f. Where the opposition is unchanging and absolutely crucial to the success of the project, consider redesigning the project to avoid the issue or flagging this issue as a risk factor.

### Force-Field Analysis

As discussed previously, force field analysis involves listing all those forces (people, organizations, economic, social, physical, political aspects--anything) that will impede the realization of the objective and those forces that will help realize the objectives. Once made explicit, the question is asked: how can we eliminate or diminish the restraining forces and increase or maintain the positive driving forces?

Although this kind of open-end thought process may repeat some of the analysis made under Institutional Interest Analysis, it serves to confirm or double-check the validity of the previous appraisal. The benefit of the Force-Field Analysis is that it can encompass factors such as economic forces, technology trends, market forces, social forces that go far beyond institutional interests. By making such assumptions explicit, it facilitates dealing with them in the action strategy or monitoring these forces when nothing else could be done about them.

### Reaching and Involving the Target Population

For those projects attempting to deliver a service or good to--or catalyze action by a given population, an important part of the Project Plan is analysis of the actual circumstances of the target clientele and design of the mechanisms to reach them. There is sufficient experience to indicate that neither delivery to or involvement of the target group occurs automatically; it requires explicit attention and actions during the design and implementation phases of the project. A common failing of projects is that they are planned from the top down or from the center out and the action required at the periphery or delivery end is assumed to follow logically. Often, it does not!

Delivery Systems. There are two basic kinds of delivery systems--a "push" and a "pull" system. The "push" system is one where the deliverer of the product or service triggers the delivery. Examples are: agricultural extension workers who seek out the farmer and provide some information, or malaria workers who spray houses and take blood samples, or literacy teachers who find and train illiterates. The "pull" system is one where the recipient of the good or service seeks out and triggers the delivery. Examples: the sick patient who seeks out the Health Center for a medical service, the clients who apply for a potable water service, etc. There are combinations of both types of delivery but one will tend to predominate in most programs. For example, a Health Clinic will offer low-cost medical services (pull system) but have outreach workers to give family planning information (push system).

The distinction between the "push and pull" systems is significant because it affects the design of the delivery mechanisms. Clearly, a push system requires less effort on the part of the clientele and more effort on the part of the system, since the people must be sought out and given the service or product. A "pull" system implies that the clientele must seek out the service or product and travel, wait, pay, fill out forms or whatever is necessary to receive the product and hence has a manifest interest in it. The choice of the system depends on the Project's objectives. Whatever the system, there are key questions to be asked during the design stage:

- a. For "pull systems," is the delivery really desired by the target population? What obstacles must they overcome (distance, cost, time, embarrassment, poor quality service, cultural antipathy, lack of information, etc.) to receive the product or service?
- b. For "push" systems, is the service or product acceptable or wanted? If not, what can be done to increase acceptance? Can the delivery be combined with something the target population desires? (e.g., family planning information given when medical services requested).
- c. Is the product or service physically accessible--are there roads and means of travel?
- d. Is it convenient to reach within a reasonable time period--working or by transportation?
- e. Is the cost within reach for the clientele?

- f. Are the hours of delivery suited to the clientele?
- g. Does the delivery harmonize or clash with the cultural expectation of the clientele group?
- h. Are the physical surroundings in which delivery is made pleasant or offensive to the target group?
- i. Are the personnel delivering the service or product perceived as friendly, helpful and competent by the clientele group?
- j. Are there divisive factors (racial, ethnic, religious, social, economic, ideological, political or other) that would estrange the clientele group and those delivering the product/services?
- k. Is there reliability of delivery?
- l. Is the quality commensurate with the cost or price charged?
- m. Is there a systematic way to evaluate what proportion of the group is being reached?
- n. How satisfied are they with the service?
- o. For those not reached, what are the reasons? For those not satisfied, why not?

A project plan is not adequate unless the above questions have been asked and answered satisfactorily by modification of the project plan. Since the implementation of a project provides new and more reliable information, there should be provision for obtaining more current answers to these questions as the project is carried out. Specific provision for such concurrent monitoring should be built into the project plan.

A careful analysis of the product or service to be delivered, to whom, where, when, at what quantities and cost levels is helpful in designing the delivery system. Having made estimates about these aspects, then consider what existing systems can perform the various roles required. Thus, outreach services to provide information could go via the local teachers, religious leaders, radio, newspapers, etc. Technical assistance construction could go via the military, community development, other government ministries, local government, public enterprises, private enterprises, cooperatives, voluntary groups among the beneficiaries, etc.

It is also helpful to consider what mechanisms exist or need to be planned for various processes necessary for a product or service to reach its clientele: There may be a promotion function, information function, legitimation function, social reinforcement, feedback function, evaluation, coordination with other supporting services to the target group, referrals to the delivery system, etc.

Are there adequate incentives for the people in the delivery system to continue providing satisfactory service?

Are there quality controls and do they function?

Are there examples of successful delivery systems in the area planned? If so, what key factors seem to account for it? Can the same factors be designed in the project planned?

Target Group Involvement. Projects which require for their success explicit action by the target group are probably the most difficult type of development activity to design and administer, particularly if the target group is at/or near the subsistence level and significant behavioral alterations on their part are required.

In such circumstances, the interaction between project management and the target group needs to be close and continuous, and provision for this needs to be made in project design. An important focus of pre-project analysis in conjunction with such projects should be obtaining maximum knowledge about the target population, particularly factors which will influence their ability to take the actions anticipated. The most effective way to obtain such data as well as to secure the desired subsequent action on their part is to have them participate in project design either individually or through their legitimate leaders, and to carry this participation over into project implementation.

Spread Effects. There should be an explicit consideration of the extent to which benefits or disbenefits will extend beyond the direct target group. This consideration may affect the design of the project in major ways. For example in considering new varieties of seed, hybrids which require special

seeds to be purchased by the farmer are much more difficult to spread than varieties that can yield seed to the farmer after the first crop. In the latter case one can expect the new varieties to spread more rapidly beyond the project's target group with less additional effort. Explicit consideration should be given to spread effect possibilities of a project. Such consideration will often lead to modification of the proposed project. In the case of industrial projects, there may be linkages that are backward (purchases of supplies) or forward linkages (sale of products or by-products).

Spread effects must be planned and worked for rather than being assumed they will occur naturally. Traditional project planning has emphasized the vertical relationships of a personal nature between officialdom and participants. But spread may often involve horizontal relationships (such as between farmers or media inputs). Spread effects can be understood more adequately when more comprehensive social data is collected. If reliable data has been obtained it should then be possible to estimate more accurately than at present the actual numbers of potential participants and resources required to achieve change.

When should this information be produced, when should its collection be undertaken? What resources will be required to carry out this kind of work in the initial stages of data collection? In the case of a region or project area the data should be possible to obtain in two to three weeks; in the case of a national collection it would probably be advisable to obtain the help of some appropriate local institution or university, and again this should entail an exercise of not more than a few months. Social information should not, of course, stand out as being different or special but

should be collected in phase with, and integrated with, other stages of project documentation.

How to communicate with potential project participants in the projects and spread areas? This would involve devising a communications strategy, identification of points of origin for communications and points of destination, the process of communication covering who did what, and the content, nature, and frequency of the communication. The extent to which modification and improvement of existing materials was required could be determined. News media links, radio, papers, personal contacts, etc., may have to be instituted to avoid bottlenecks. Decisions should be taken on the timing and frequency of messages as well as the need to have feedback so that necessary improvements can be made. Decisions should be taken about the best type of media for particular situations.

What to communicate in order to encourage participation is the next problem. It may be possible to offer participants higher prices for products, price stability, credit below normal cost, repayment schedules longer than normal, tax rebates, cash awards for achievement of production targets. The incentives must themselves be capable of spread. Few development programs or projects explain the economic and social logic behind development measures to potential participants. But it is, or should be, true that achievement of a significant change will enable creation of a better environment. These kinds of national or regional goals can be made meaningful through communications strategies at the local level.

Appendix A

Present Worth Factors for Growth Rates from  
3 Percent to 50 Percent

Year	Growth Rate								Growth Rate							
	3%	4%	5%	6%	7%	8%	10%	12%	15%	20%	25%	30%	35%	40%	45%	50%
1	.9709	.9615	.9524	.9434	.9346	.9259	.9091	.8929	.8592	.8333	.8000	.7692	.7407	.7143	.6897	.6667
2	.9426	.9246	.9070	.8900	.8734	.8573	.8264	.7972	.7561	.6944	.6400	.5917	.5487	.5102	.4756	.4444
3	.9151	.8890	.8638	.8396	.8163	.7938	.7513	.7118	.6575	.5787	.5120	.4552	.4064	.3644	.3280	.2963
4	.8885	.8548	.8227	.7921	.7629	.7350	.6830	.6355	.5718	.4823	.4096	.3501	.3011	.2603	.2262	.1975
5	.8626	.8219	.7835	.7473	.7130	.6806	.6209	.5874	.4972	.4019	.3277	.2693	.2230	.1859	.1560	.1317
6	.8375	.7903	.7462	.7050	.6663	.6302	.5645	.5066	.4323	.3349	.2621	.2072	.1652	.1326	.1076	.0878
7	.8131	.7599	.7107	.6651	.6227	.5835	.5132	.4523	.3759	.2791	.2097	.1594	.1224	.0949	.0742	.0585
8	.7894	.7307	.6768	.6274	.5820	.5403	.4665	.4039	.3269	.2326	.1678	.1226	.0906	.0678	.0512	.0390
9	.7664	.7026	.6446	.5919	.5439	.5002	.4241	.3606	.2843	.1938	.1342	.0943	.0671	.0484	.0353	.0260
10	.7441	.6756	.6155	.5584	.5083	.4632	.3855	.3220	.2472	.1615	.1074	.0725	.0497	.0346	.0243	.0173
11	.7224	.6496	.5847	.5268	.4751	.4289	.3505	.2875	.2149	.1346	.0859	.0558	.0368	.0247	.0168	.0116
12	.7014	.6246	.5568	.4970	.4440	.3971	.3186	.2567	.1869	.1122	.0687	.0429	.0273	.0176	.0116	.0077
13	.6810	.6006	.5303	.4688	.4150	.3677	.2897	.2292	.1625	.0935	.0550	.0330	.0202	.0126	.0080	.0051
14	.6611	.5775	.5051	.4423	.3878	.3405	.2633	.2046	.1413	.0779	.0440	.0254	.0150	.0080	.0055	.0034
15	.6419	.5553	.4810	.4173	.3624	.3152	.2394	.1827	.1229	.0649	.0352	.0195	.0111	.0064	.0038	.0023
16	.6232	.5339	.4581	.3938	.3387	.2919	.2176	.1631	.1069	.0541	.0281	.0150	.0082	.0046	.0026	.0015
17	.6050	.5134	.4363	.3714	.3166	.2703	.1978	.1456	.0929	.0451	.0225	.0116	.0061	.0033	.0018	.0010
18	.5874	.4938	.4155	.3503	.2959	.2502	.1799	.1300	.0808	.0376	.0180	.0089	.0045	.0023	.0012	.0007
19	.5703	.4746	.3957	.3305	.2765	.2317	.1635	.1161	.0703	.0313	.0144	.0068	.0033	.0017	.0008	.0005
20	.5537	.4564	.3760	.3118	.2584	.2145	.1466	.1037	.0611	.0261	.0115	.0053	.0025	.0012	.0006	.0003
21	.5375	.4388	.3569	.2942	.2415	.1987	.1351	.0926	.0531	.0217	.0092	.0040	.0018	.0009	.0004	.0002
22	.5219	.4220	.3416	.2775	.2257	.1839	.1228	.0826	.0462	.0181	.0074	.0031	.0014	.0006	.0003	.0001
23	.5067	.4057	.3256	.2618	.2109	.1703	.1117	.0738	.0402	.0151	.0059	.0024	.0010	.0004	.0002	.0001
24	.4919	.3901	.3101	.2470	.1971	.1577	.1015	.0659	.0349	.0126	.0047	.0018	.0007	.0003	.0001	.0001
25	.4776	.3751	.2953	.2330	.1842	.1460	.0923	.0588	.0304	.0105	.0038	.0014	.0006	.0002	.0001	.....
26	.4637	.3607	.2812	.2196	.1722	.1352	.0839	.0535	.0264	.0087	.0030	.0011	.0004	.0002	.0001	.....
27	.4502	.3468	.2678	.2074	.1609	.1252	.0763	.0469	.0230	.0073	.0024	.0006	.0003	.0001	.....	.....
28	.4371	.3335	.2551	.1956	.1504	.1159	.0693	.0419	.0200	.0061	.0019	.0006	.0002	.0001	.....	.....
29	.4243	.3207	.2429	.1846	.1406	.1073	.0630	.0374	.0174	.0051	.0015	.0005	.0002	.0001	.....	.....
30	.4120	.3083	.2314	.1741	.1314	.0994	.0573	.0334	.0151	.0042	.0012	.0004	.0001	.....	.....	.....
31	.4000	.2965	.2204	.1643	.1228	.0920	.0521	.0298	.0131	.0035	.0010	.0003	.0001	.....	.....	.....
32	.3883	.2851	.2099	.1550	.1147	.0852	.0474	.0268	.0114	.0029	.0006	.0002	.0001	.....	.....	.....
33	.3770	.2741	.1998	.1462	.1072	.0789	.0431	.0238	.0099	.0024	.0006	.0002	.0001	.....	.....	.....
34	.3660	.2636	.1904	.1379	.1002	.0730	.0391	.0212	.0086	.0020	.0005	.0001	.....	.....	.....	.....
35	.3554	.2534	.1813	.1301	.0937	.0676	.0356	.0189	.0075	.0017	.0004	.0001	.....	.....	.....	.....