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PROJECT PLANNING IN LESS-DEVELOPED COUNTRIES:

A FRAMEWORK AND MAJOR ISSUES

by

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This paper was written for those people in the less developed countries who are concerned with project planning at the working level. The argument is presented in terms which we believe to be understandable to those who have had a general background in economics. Development economists will, of course, be aware of many of the points made. However, we hope that our overall view will also be useful to these experts. We believe it highlights the most important unsolved problems in project planning arising from actual conditions of less developed countries. It should, therefore, serve to stimulate constructive thinking about these problems, both by those close to the practice of project selection in actual day-to-day situations and analysts who may be concerned with project planning at a more abstract level.

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One of the fundamental tasks in development planning is the proper analysis and selection of projects. Although the economic literature contains substantial and lengthy discussions of these matters, there is nowhere a careful and detailed framework within which the project planning problem can be properly set. The purpose of this paper is to outline such a framework and to discuss within that framework the important problems with which the planner must deal in project planning. The aim is to provide the basis for improving current practice in project analysis and selection. We hope that those who are confronted with problems of project planning will find the paper useful in providing a relevant framework for evaluating the usefulness of specific techniques. We further hope that the stress placed on certain problem areas, which in most planning agencies would benefit from careful attention, will serve a useful purpose.

The paper has also been designed to serve as a framework for a survey of the literature on project planning, which is being undertaken by the present authors. The survey will, of course, contain detailed references. For this reason no explicit references have been included here, even though extensive literature may exist on the subjects raised. Very little has been published on many of the concepts discussed here, and it is one of the purposes of this paper to draw attention to these subjects. However, the reader should not infer that no literature exists on a subject simply because no references are cited.

The paper consists of three parts. The first is an introductory section which defines a project. The second outlines the steps of project planning, putting the whole process into an idealized and formal framework. The third elaborates several problem areas which arise in project planning: (1) the effects of uncertainty; (2) interdependency among projects; (3) shadow prices; (4) non-revenue producing projects; (5) dominating projects; (6) choosing among alternative projects for the same objective; (7) the impact of foreign aid; (8) and some non-economic aspects relevant to the practice of project planning.

I. INTRODUCTION

We begin by defining a project. For purposes of the initial discussion a project is defined as the use of one or more scarce resources during a specific time period for the purpose of producing some economic return or output at a later time. The final result of a project planning system is the choice of those projects which can be accomplished with the available resources so as to provide the community with maximum benefits from the output.

The benefits considered here are economic benefits, with the term yet to be defined. The problem of defining economic benefits is one of the essential problems in project planning. We return to this problem later in this paper.

Formally projects with non-economic benefits, such as defense, could be considered in exactly the same fashion as those producing economic benefits. Perhaps subjecting projects with non-economic benefits to analysis within the sort of framework presented here would improve decisions in this area. Since, however, we are concerned here only with planning for economic development, non-economic projects will be excluded from consideration. Restricting ourselves to those projects which produce economic benefits still leaves an uncomfortably broad field to consider. Defining a project in this fashion, however, is useful because it permits us to consider many activities which would not ordinarily be thought of as development projects.

In a very general sense a project can be conceived of as an allocation of capital. Recalling the formal definition of capital

formation, allocation of capital means committing resources in the present, in order to gain output at some later time. The time element in this definition is central. However, the concept of capital, requires further elucidation. Our approach here is to take a very general view of the capital accumulation (capital formation) or investment process. Included under the concept of investment are the use of resources for education, health, research and development, agricultural extension, and other types of public sector expenditure which usually are not included in investment. We specifically want to avoid a narrow definition of investment which covers only plant and equipment expenditures.

The definition of a project offered here is so general that some examples are needed to illustrate its breadth and to distinguish among types of projects. First, a very simple example. The investment consists of the construction of a shoe factory. After completion of construction, the shoe factory produces shoes which represent the economic benefit. The kind of investment contained in this example characterizes a large class of development projects. Such projects have tangible investment requiring capital goods and taking the form of specific physical construction. They provide a future flow of services or goods. We will designate them as <u>class one projects</u>.

A second class of projects may be illustrated by expenditures to pay salaries of teachers who are working to instruct the population in new skills. As a result of such instruction the workers increase their capacity to produce, and consequently it is clear that the investment, — teachers' salaries, — results in a future increase

in output. This example illustrates a class of projects which operates to expand the supply of factors of production, and are designated as class two projects. Education works to expand the supply of trained persons. Health projects help to expand the supply of labor of all types, for example, by reducing absenteeism from jobs. (There are, of course, many other effects of health projects which are equally important.)

Projects which expand the supply of knowledge make up the third class of projects. Geological surveys or agricultural research are examples. If we were to treat knowledge as a factor of production, research and development could be put in the second category. However, it turns out to be useful to treat research and development expenditures, or any expenditures which increase the supply of knowledge, as a separate class of projects, referred to as class three projects.

The three classes noted above are aimed respectively at increasing physical plant and equipment, increasing non-capital factor supplies, and widening the spectrum of productive techniques and opportunities. They provide us with three comprehensive classes covering the possible sources of economic growth of an economy. It should be noted that it is possible that any given project may contain aspects of two or even all three classes; projects need not necessarily fall in only one class.

II. A FRAMEWORK FOR PROJECT PLANNING

The goal of systematic project planning is to choose, within the limitations of available resources, the combination of projects which provides maximum economic benefits. The process of achieving this goal may be broken into five steps. First, the possible projects must be identified. Second, the physical costs and returns relevant to determining economic benefits must be defined and prices appropriate for valuing them determined. Third, criteria for the choice of projects to maximize benefits must be set up. Fourth, for each possible project the specific costs and returns must be determined. Fifth, the criteria must be applied to the individual projects and the selection made of those to be undertaken.

Division of the process into these five steps is artificial. No planning office proceeds one step at a time through the five steps. The division chosen here is useful because it helps to focus attention on the most important phases of project planning. Much of the attention of economists has been directed to the third of these five steps, the setting up of criteria for the selection of projects. However, all of the steps are of great importance, and since the successful completion of the fifth depends upon proper completion of the first four, neglect of prior steps will lead to unsatisfactory project planning. Each of these steps is a major problem in itself, and could be discussed in some detail. However, here the purpose is only to outline the meaning of each step.

1. Step One: Perceiving the Project Universe

At any point in time the planner perceives a set of projects which might be undertaken. This set of projects is part of a universe consisting of all projects which conceivably could be undertaken. The extent of this universe of potential projects depends upon existing technology and the natural resource base of the country. Hence, the set of projects which the planner perceives depends on his knowledge of these factors. It is virtually a universal feeling on the part of development economists with experience in the problems of development planning that one of the greatest difficulties facing the planner is the shortage of good projects. A basic reason for this shortage is that the planner perceives only a narrow part of the universe of possible projects. It follows that one of the areas in development planning which is most in need of improvement is in working out procedures and techniques for increasing the perception of the universe of projects.

We have termed projects to increase knowledge class three projects. The devotion of resources to class three projects will help to widen the perception of the project universe. Since this widening is a critical need, the class three type of project may deserve high priority.

In passing, one consequence should be noted of the fact that the third class of projects has as its objective the broadening of the perception of the project universe. The planner must be sure not only that his project universe is extensive now but that he is devoting sufficient resources to class three projects so that in the

future the project universe will be large enough to permit him adequate choice. Development planning in newly independent countries frequently gets off to an enthusiastic start because of the large reservoir of projects accumulated from past knowledge, but which the society had been unable to undertake previously. With the passage of time and the undertaking of many of the initially perceived projects, however, the known project universe shrinks. The danger then arises that development planning may become less effective and more a desperate scramble for ideas on how to spend money. Organizations offering development assistance are often faced with identical problems in less-developed countries. Frequently, such organizations are inclined to finance only those types of projects which are readily identifiable and which are well understood both in their technology and economic implications. As a consequence, the task of identifying projects for support by assistance organizations also tends to become increasingly difficult. This is another manifestation of the problem of the narrow view of the project universe.

A very common reason for a relatively narrow perception of the project universe is inadequate knowledge of the basic resources of a country. Often there is no firm concept of the basic requirements needed by technicians to conduct even the most rudimentary feasibility analysis. Obviously, when this situation exists, part of the available resources should be used to provide the needed knowledge.

A second cause of narrow perception of the project universe is the lack of engineering and technical knowledge on the part of development planners. The engineer may be equally at fault, frequently being

unable to see beyond the confines of the technology which has been found to be appropriate in the developed countries. It is important to recognize that factor endowments in less-developed countries are substantially different than in advanced countries. Hence, if the engineer considers only technologies appropriate to developed countries, he limits the set of perceived projects to ones which may be quite inappropriate to under-developed countries. The failure of the engineer and the economist to adopt a broader view of alternative technologies seriously limits the part of the project universe which is actually perceived.

The relative neglect of class three projects is typically matched by similar neglect of class two projects, i.e., those which increase non-capital factor supplies. By and large, class two projects are commonly not considered development projects, to be subjected to the same sort of analysis as simple plant and equipment projects. Ignoring political implications, reform of the tax structure and the land tenure system, for example, should be recognized as projects incurring present costs for future benefits. A reform project of this sort may serve only to increase productivity by enlarging the equivalent factor supply, but viewed in this light it can be treated as a development project.

The essence of project planning is the ability of the planner to make a choice. Unless there is a large set of potential projects, that is, unless the perception of the universe is broad, the planner can, in fact, exercise little choice. A planner who is not exercising choice is not planning but only keeping track of what a diverse

collection of people desire to do. It cannot be emphasized too strongly that enlarging the perception of the project universe and thereby permitting a wider range of choices to be considered, is one of the critical problems of project planning.

2. Step Two: Defining Costs and Returns, and Appropriate Prices for Their Valuation

The second step in our idealized project planning system is to define the costs and returns which are relevant to project planning, and to define the appropriate prices for valuing these costs and returns. At this point we are concerned only with these definitions from the point of view of the economy as a whole. The measurement of costs and returns for specific projects is the fourth step, and is considered below.

For purposes of this discussion, both costs and returns will be defined as goods or services which have economic value, those for which some user charge could, at least in theory, be made. Note that it is the physical goods and services which are involved at this stage of the discussion rather than their money values. For this reason we could substitute the words inputs and outputs in place of costs and returns. Note further that the requirement is that a charge could be made, not that one actually is made. For a given project, costs comprise the use of physical resources which have some economic value, i.e., those goods and services used which are scarce and have alternative uses. Returns comprise the goods and services with economic value which are produced by using the resources called costs.

The condition that charge could be rather than is made for costs and returns is imposed in order to permit the consideration of all

projects which ought to be evaluated on an economic basis. A government park for which no charge is made is a good example of a project which ought to be subject to evaluation just as any revenue producing project should. The park uses resources and creates real benefits. The real resource costs will usually have a financial cost, while the park may be used free. However, park users could be charged a fee if it were considered desirable to do so. On the other hand a defense project is ruled out of the analysis because its output is non-economic. For a defense project the community benefits collectively; individuals cannot choose to benefit or not, and the principle of a possible association between voluntary use and payment is no longer valid.

The costs and returns for a project have been defined above as those goods and services having economic value which are inputs and outputs of the project. What is the basis for the economic value of these goods and services? For a good or service to have economic value, it must have both scarcity and utility.[1/] The utility of a good or service to an individual can derive either from the direct utility enjoyed from its use, or indirectly from the utility of something else for which it might be exchanged. Since costs are the goods and services used in undertaking a project, they result in a sacrifice of utility. Conversely, most outputs result in the creation of utility.

1/ The discussion about utility in the text could be framed somewhat more elegantly in terms of a welfare function. The utility formulation, however, has the virtue of more common sense appeal. It has been used here for this reason.

Clearly it is some notion of net utility that the planner is trying to maximize. The resources going into a project, i.e., the costs or inputs, have a stream of utility associated with them which is sacrificed by their use and the returns or outputs represent a stream of utility created. The planner's ultimate goal, in these terms, would be to choose the combination of projects which would maximize the net increase in utility of the community from undertaking projects. Two obvious difficulties in this formulation are the impossibility of measuring the gain or loss of utility for any one person, and the impossibility of adding up the utility of several individuals to get some sort of total community or social utility. What, then, is the point of presenting the argument in terms of utility? First, it gives us a framework within which to discuss the general problem of project planning, and second, much of the economic theory that underlies project selection criteria relies implicitly on some sort of utility assumption. The obvious weaknesses make one question the usefulness of selection criteria which are based on such an assumption. We will raise some of these questions later. For the present we will continue the assumption that total community utility has some meaning and in some sense the planner is trying to maximize it.

We now turn to the problem of establishing an appropriate set of prices to use for valuation of the goods and services which are the real costs and returns of projects. The inputs and outputs of a project which have value have been defined as its costs and returns, but the problem remains to measure this value, and prices are

required for this purpose. Valuation of the inputs and outputs is necessary in order to make them commensurable. The goods and services which are possible inputs and outputs are extremely diverse. How are we to say that in terms of resources used a day's work by a skilled machine operator is equal to so much ore being consumed or to the use of so much land for some time period? Similarly in terms of the returns of various projects, how are we to say that the output of so many loaves of bread per day is equal to an automobile or to the use of a house for some time period? The answer is to convert each good or service to its money value, so that all goods or services are expressed in the same unit, namely money. Since all individual goods and services have been converted to a common unit of measurement, they can be added together to get single measures of costs and returns. This is a necessary step because without it we have no way of saying whether a given project has higher or lower costs or returns than another. Once the costs and returns have been valued, those projects can be chosen for execution which give the maximum return value per dollar of cost.

Choosing prices for the valuation of real costs and returns is, in effect, determining the relative importance of each good or service. What are "correct" prices in this context? One might imagine a dictatorship in which the dictator established prices or relative valuations which were consistent with his own preferences. In this situation the dictator's problem is that he cannot do everything he may want to do and must limit the number of items which are considered to be of high priority. He might value so many tons of steel very highly

regardless of what market prices would have been if the market had been operative. Such a valuation would result in the production of a given number of tons of steel. It is, of course, theoretically possible that the entire economy be run on the basis of prices established by the dictator, without benefit of the market mechanism. In this case the "correct" prices are those that are consistent with the preferences of the dictator. Or theoretically it is possible to have the dictator establish some prices and leave the rest to be set by the market. If this is done, however, there will be inconsistencies between market prices and his own, unless he redistributes wealth in such a way as to bring about consistency. Redistribution for this purpose consists of establishing taxes and subsidies in order to take purchasing power from those who would produce excess demand in some markets, putting it into the hands of those who would have insufficient demand in other markets. Without this redistribution it would not be possible for all individual markets to be in equilibrium. The equilibrium condition is of some importance here because it shows that starting from the point when the redistribution of wealth has been completed, everyone is satisfied in the sense that he cannot improve his own position by buying more or less of various goods and services. In such a situation, the prices used for valuing goods and services reflect the preferences of the dictator superimposed on those of the public. There are limitless possible combinations of prices which could result from this sort of superposition of dictator prices on market prices, depending on what prices the dictator chose to control and the degree of redistribution he was willing to undertake.

One possible case would, of course, be for there to be no dictator and the market to determine all prices; thus prices would reflect only preferences of the public.

This last case, where only market prices would be used for valuation, would reflect the preferences of the public, but would it result in the choice of projects which would produce the maximum gain in social or community utility? This maximum is presumably the goal of the project planner. Economic theory shows that there is a unique set of prices which, under certain assumptions, will lead society to allocate its resources in such a way as to maximize its social utility. The theory shows that with each person acting in his own interest, i.e., attempting to maximize his own utility on the basis of this special set of prices, total social or community utility will be maximized. If these prices actually prevailed in an economy, the project planner would use them for those resources which he had under his control. Then by choosing projects according to a simple maximum-revenue-per-dollar-of-cost criterion, he would maximize the gain in social utility that he could achieve.

Unfortunately, while theory shows that there is a "correct" set of prices, it does not give much guidance for determining what they are. Market prices are likely to be very different from this special set of prices. Prices in perfectly competitive markets would be the desired prices if there were no external economies or diseconomies, and if everyone had perfect foreknowledge of future prices. But few markets are really competitive, external economies

and diseconomies do exist, and no one knows how future prices will behave. Hence, market prices are likely to be poor guides to the planner seeking the special set of prices which will allow him to accomplish his goal perfectly.

One characteristic of the set of "correct" prices, their time dimension, should be noted. They are prices as of a given point in time; however, they are not only for goods and services of the present but also for goods and services of the future <u>if exchanged in the present</u>. In other words, they are the present prices for both present and future goods and services. In general, a particular good or service is worth less to a person in the present if it will be received in the future than if it is received in the present. Hence, present prices for goods or services to be received in the future will generally be lower than the present prices of the same goods or services received in the present. The present price for a future good or service is more familiarly known as its present value, and the present value is obtained by discounting the future price by a suitable discount rate. Discounting is only a technique for arriving at present prices of future goods and services. Hence, a fuller discussion of it is postponed to the next section where project selection criteria are considered. For this section it is only necessary to note that present prices of future goods and services are needed in order to compare the present value of doing something now and doing it in the future.

As noted above, market prices are likely to differ from the desired "correct" prices. This being the case, the question

naturally arises as to whether or not the "correct" ones can be obtained from some other source. Extensive efforts have been made to develop methods to obtain these prices. These efforts have led to the use of artificial prices which are usually called shadow or accounting prices. The subject is an important one and it is discussed further in Part III of this paper. Other problems which affect the choice of prices for the valuation of project costs and returns are uncertainty, interdependencies between projects, and the existence of non-revenue producing projects. Each of these is also discussed in Part III.

3. Step Three: Establishing Project Selection Criteria

The third step in our project planning process is to set up criteria by which decisions are to be made about which projects to undertake. Despite its being a relatively young subject - only about twenty years old - a great deal has been written on selection criteria. Unfortunately, the very volume of the literature seems to be an index of the lack of agreement on the subject. We will discuss several proposed criteria to show how they fit into the conceptual framework outlined above, and will suggest the sort of considerations which should determine the choice of criteria for actual use.

The method which comes closest to the conceptual ideal is a programming approach to project selection. This method is essentially a general equilibrium solution to the problem of project selection. In its most elaborate and sophisticated form the costs and returns of all feasible projects, the available factor supplies, and "correct"

prices for at least the final outputs[1/] are all fed into an electronic computer. The computer then tries various combinations of projects, calculating whether or not each combination uses all the resources and what its total final value is. Finally, the computer chooses that combination which has the maximum value of the final outputs. Such a system, conceptually reflects exactly how project planning should ideally take place. It starts with available resources and the valuations on possible final outputs and proceeds directly to the goal of maximizing the total value of the final output. It permits the interrelations between projects to be taken into account, and assuming the "correct" prices are used for final product, it would pick those projects which actually do maximize the final value and gain in social utility. Such a method has been seriously proposed, but unfortunately is as yet completely impractical. With even a small number of projects, the number of possible combinations which should be evaluated becomes staggering. Methods for eliminating unpromising combinations from consideration have not been developed, and even the most advanced computers are not capable of making the necessary comparisons in a reasonable time. Furthermore, the necessary data - including alledgedly "correct" prices - are practically certain not to be obtainable for many projects. The skills needed for applying such a system are not available in under-developed

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1/ Prices of factor inputs are not needed because it is assumed that factor supplies are fixed, and that they will be fully utilized. Under this assumption their value is constant and only the value of the returns can change; hence maximizing the value of the returns is all that need be done.

countries, and the cost would be exceedingly high. Thus, the general programming approach has not yet been of any use for project selection in the real world.

With certain simplifications, the approach suggested above can be turned into a linear programming problem for which methods yielding quick solution are available. Unfortunately, the simplifications needed have generally been fatal to the technique, and up to the present time no practical use of linear programming for project selection has occurred.

In contrast to the programming approach, where all projects are considered simultaneously, most other proposed project selection criteria are meant to be applied on a project-by-project basis. Examples of such criteria are the benefit-cost ratio, present value, internal rate of return, reinvestment rates, simple annual profitability, and product-capital ratio. In using each of these criteria, the suggested method of application is usually to calculate the numerical value for the criterion, rank all projects according to this number, and finally work down the list of projects until available funds are exhausted. Obviously, if each criterion gave the same ranking for all projects, it would make no difference which one was used. There is, however, no reason to expect the ranking to be the same, nor to expect that the projects chosen by any one of these criteria would be the same as those chosen by a simultaneous technique such as the programming method outlined in the previous paragraph. Let us examine two of these criteria more closely to see why they may differ in results and how they fit into the project planning

framework presented above. The two chosen for examination are the benefit-cost ratio and the product-capital criterion.

The benefit-cost ratio fits into the project planning framework quite neatly. More than one version has been proposed, but the only one considered here is simply the ratio of the discounted value of all returns of the project to the discounted value of all costs of the project. Choosing projects by using this criterion clearly results in undertaking those projects which maximize the value of returns per dollar of costs and the total value of the returns for a given value of total costs. If maximizing this value of returns corresponds to maximizing social utility, the criterion will work ideally. But recall that for this result to be obtained "correct" prices must be used. "Correct" prices here include the present prices for future goods and services, and they also take into account project interdependencies. Is the technique of discounting future values by a time-discounting procedure equivalent to knowing present prices of future-goods and services? And can the prices used for the valuation of costs and returns really take account of the interdependencies between projects? These questions indicate points where the benefit-cost criterion may depart from ideal choices. The last question is worth examining further. It reveals one of the important shortcomings of approaching project selection on a project-by-project basis. The "correct" prices for evaluating costs and returns take into account interdependencies of projects. But the interdependencies, and hence "correct" prices cannot be known until all the projects to be undertaken are known.

The product-capital ratio is a much cruder criterion than the benefit-cost ratio. Again there are several versions, and only one will be considered. For our purposes, it will be defined as the ratio of the value of the return per year to the capital invested, i.e., the value of product per dollar of invested capital. (This ratio is the reciprocal of the capital-output ratio.) This criterion would lead to the choice of the same projects as the "ideal" collection only if all projects had the same life and time pattern of returns, and if there were no other costs than capital. The first condition is necessary because the prices used for evaluating returns are those of the time the return is obtained, not their prices as of the present. In more conventional terminology, the returns are in current prices and not their time-discounted values. Ignoring time discounting will give the same results only if the time pattern of all returns is identical - a rather unlikely situation. The second condition is necessary because the capital cost is the only one in the denominator of the ratio. This implies that all other inputs are valued at zero, i.e., they are not considered to be real costs. This, too, seems to be an unlikely situation, or at best, unrealistic.

The use of a criterion which has only capital as a cost avoids one serious problem which exists for those criteria which include several factors as costs. If capital is the only cost, it does not matter what price capital is valued at. The project planner can simply go down his ranked list of projects until he runs out of capital, regardless of its price. If there are two or more factors

in the costs, however, it will make a difference what prices are used to value them. The denominator of the ratio reflects only total cost where there are two or more factors, and a given cost value could reflect many different combinations of factor inputs. Hence it is quite possible to run out of one factor before another. There is no assurance that all factors will run out with the same project, unless the prices used to value them are the "correct" ones. If one factor runs out before the others, its price must have been too low. Raising its price would discourage its use and lead to a better balance with other factors. Similarly factors in surplus should have their prices lowered, thus encouraging their use relative to other factors. Theory shows that all factors will run out together only when the "correct" prices have been used. Once again we confront the pricing problem.

We will not carry the discussion of specific criteria much further, but it is clear that most proposed selection criteria may be analyzed within the framework presented above. Even industries criteria (which are used in many countries for industry promotion) can be interpreted within this framework. Usually such promotion schemes are based on studies which attempt to identify profitable industries, or ones which save foreign exchange. In such studies a pricing system is implied, or yields among industries could not be compared. The government simply accepts any promising project in the favored industry. Acceptance may involve an import license or a loan, but acceptance for the undertaking of a project is nonetheless given. This is a very rough method of choosing projects,

and clearly it will not produce results equivalent to the ideal collection of projects. However, it does manage to rank high some projects which are likely to have high returns, and thus lead to improving the chances of their being undertaken.

This discussion does not imply that criteria such as product-capital or priority industries are useless. The relevant question is how good the ranking of projects is. Simple, rough criteria may be sufficient for this purpose. Obviously different criteria give different results. Some of the differences can be traced to simple errors of logic, and criteria which are wrong in this regard should be corrected. Others differ, however, in the degree to which approximations are used and in the sort of assumptions which underlie them. Clearly, the choice of a selection criterion for actual use will depend on theoretical and practical considerations. Ideally one tries to compromise between simplicity and correctness. The sophistication of a selection procedure should be limited, on the one hand, by the capacity of the planning agency to carry out the requisite calculations and analysis, and, on the other hand, by the limitations on accuracy of cost and return data for individual projects. It is of absolutely no use to carry out long extensive programming analysis, for example, if the underlying data are so inaccurate that one cannot demonstrate that the selection of projects under the programming procedure is better than the selection of projects under a simpler ranking procedure. When the practical considerations are taken into account, it is clear that very often crude and simple methods of selection will be more appropriate than some of the highly

sophisticated techniques which have occupied so much of the literature on project analysis.

4. Step Four: Preparation of Individual Projects

The fourth step in our project analysis framework is project preparation, the collection and presentation of the data on individual projects which are needed to apply selection criteria. This is, of course, as important a step as any. Where data are limited, or are not assembled properly, project selection cannot be effective.

Project preparation is usually the responsibility of agencies other than the central planning office. Once prepared by these non-planning agencies, projects are submitted to the central planning authority. One of the most distressing characteristics of current project planning practice is the difficulty of securing adequate project preparation in ministry and departmental offices. Some further comments on this problem are contained in the section on organization for project planning in Part IV.

A basic task in improving the preparation of projects is the development of a standardized format for project presentation. It is not possible to establish a universal project format, good for all countries at all times. The format suited to a given country must be developed by its own national planning organization. The problem is to achieve a balance between desirable information and the capabilities of those who must prepare the projects. It is imperative that the procedures be keyed to the capacity of the average civil servant who is engaged in project preparation. Simplicity is a virtue in this area. It permits the development of

good instructional material, and it helps to develop a growing confidence in the analysis and presentation of projects. It also permits a large number of people to become qualified in project preparation, a situation which is conducive to the generation of large numbers of projects.

5. Step Five: Application of Selection Criteria to Individual Projects

The fifth and final step in our project planning framework is to make the decision about which projects to undertake. This is simply the application of the selection criteria to the projects which have been prepared for analysis.

There are two ways in which final selection can proceed. The first is to consider all projects together and choose the best. The second is to take projects as they are submitted and decide to accept or reject them individually. This second method requires some standard for comparison. Much of the theoretical literature concentrates on the first alternative, where simultaneous comparison of all projects is made, while practice generally follows the second. Usually there is a rather uneven flow of projects to the planning office and those projects considered first are simply those submitted first. This system has the obvious tendency to bias selection in favor of the first projects to come along. Government officials are human and want to get started with development projects; they cannot foresee if something better is likely to be submitted later.

Our project planning framework clearly indicates that the first method of selection should be superior to the second. However, it requires a large number of projects to be available simultaneously

for comparison purposes. In terms of the steps suggested above, the perception of the project universe should be very broad, and project preparation completed on a sufficient number to permit the comparison with each other of a wide assortment of projects. Unfortunately, this situation is practically impossible to achieve in most less-developed countries. Hence, selection criteria must be utilized which make the best possible choices under the conditions of an uneven flow of projects. Since relatively little attention has been devoted to selection criteria for use when projects are presented piecemeal, it is evident that improvements could be made in designing criteria for this situation.

The five steps in project planning which have been outlined here obviously do not represent activities which are hard and fast rules, and which must proceed in a given sequence. The first, perception of the project universe, is a process which should be going on continuously at all planning levels. Generally, the more projects available for consideration, the better the choices that are made. The second and third steps, defining and pricing the relevant real costs and returns, and construction of selection criteria, are not activities which go on continuously. They are basically steps which provide the tools for selection and are not part of the selection process themselves. Presumably these tools are subject to study and improvement, but making such improvements is not part of the project selection process itself. The fourth and fifth steps, the preparation of project analyses, and the actual

selection of projects, are, of course, steps by which the selection process is completed.

Needless to say, the real world of project planning is not as simple as the five-step scheme might suggest. The next [redacted] parts of this paper ~~are~~ is devoted to some of the very knotty problems which exist in the real world, but which, in our opinion, have received inadequate attention.

III. PROBLEMS IN PROJECT PLANNING

Part II has identified two practical steps that must be taken to utilize any adopted project selection criteria: First, the determination of which particular selection criteria will be used; second, the establishment of which prices will be used to weight the physical flows of returns and costs. Part III discusses eight specific difficulties which arise in the implementation of these two practical steps: (1) taking account of uncertainty; (2) general inter-dependency between projects; (3) use of shadow prices; (4) non-revenue producing projects; (5) dominating projects; (6) choosing among alternative projects for the same objective. (7) Foreign aid and project planning (8) some non-economic aspects.

1. Uncertainty

Uncertainty problems arise in the determination of both prices and quantities, and these problems should be considered in the development of selection criteria. In the ideal case both costs and benefits are known with certainty. However, this is an Utopian situation, and, in general, one does not know precisely that value of costs and returns. Sometimes this results merely from lack of experience in project preparation or from the administrative necessity to take certain decisions before sufficient analysis and investigation can be completed. In other cases, however, there may be inherent uncertainty which cannot be overcome. For example, projects which depend upon the rate of flow of a river contain uncertainties caused by the variability of the rainfall feeding the river. Agricultural projects are uncertain both because world prices of output of agricultural export commodities fluctuate in unpredictable ways, and because crop yields will vary with weather and unforeseen changes in soil

conditions. Finally, almost all projects require some projection of the future level of demand, and future demand is of a partially stochastic nature dependent upon a large number of random effects. Consequently the project planner cannot be entirely sure of the level of future demand for output of the project.

How can the planner take account of this situation? There is no clear solution to this problem. However, there are three approaches which should be mentioned. The first is simply for the planner to be cautious and make some allowance for uncertainties and contingencies. Costs would be estimated with an added margin and demand would be projected conservatively. Applied crudely this technique does not discriminate between projects with different levels of risk, although it is conceivable that the planner can adjust the extent of the contingency factors on the basis of his intuition about the risk involved. The second approach is for the planner to make some assumption about the probability distribution of the uncertain factors and use the expected (i.e. average) values for them. This approach might be modified by analysing a project using deviations from the expected values with some given probability in order to eliminate projects which have unacceptable consequences if an unexpected result occurs. This sort of modification leads naturally to the third approach. In the third approach the planner recognizes that in general one has a choice of high-return, high-risk projects versus low-return, low-risk projects. Taking this viewpoint the treatment of risk is explicitly identifiable. The planner attempts to obtain guidance from the central political authority as to the acceptable level of risk. For example, one might argue that the Chinese "great leap forward" program was a high-risk, high-rate of return approach to development planning, whereas

the Indian approach to development has been based upon a preference for a low-risk, low-rate of return strategy. The Chinese government may feel that it can better control the situation which arises if its development program is unsuccessful (as it apparently was) while the Indian government may judge that given its ideological outlook, it is not in a position to deal with the consequences of a high-risk approach, should it fail. The riskiness of a development program is really a measure of the riskiness of the projects which make it up, and this third approach, in which the degree of risk is explicitly identified as a target variable needs much more analysis than it has so far received.

Uncertainty effects in project planning are extremely important, particularly in the development of export and import-substitution industries, where it is vital that the level of world prices be projected. Such prices are inherently uncertain and it is exceedingly difficult to make a proper determination of the level of riskiness in such projects. Often the riskiness is concealed in some particular assumption of the project analyst; and the rate of return of the project may be determined without clear recognition that the situation is subject to an unspecified degree of risk.

2. Shadow or Accounting Prices

In the development of the five step framework above, one central consideration in the second step (Defining Relevant Costs and Returns) was the determination of the prices at which the physical flows of goods and services should be valued. In the discussion accompanying the description of step two the broad problem of establishing appropriate prices was discussed. The planner has essentially two alternatives: to use the observed market

prices if they are available, or to work out some other set of prices with appropriate properties. These artificial prices (i.e. prices not observed in the market) are frequently called shadow or accounting prices. Such prices are determined with the intention that they will improve the results obtained from applying selection criteria. The theoretical assumptions underlying such prices have been reviewed; in this section only some of the practical problems will be noted.

Shadow prices may be needed either on the cost ~~of~~ or return side of projects. In both cases there is considerable difficulty in calculating satisfactory shadow prices. For costs, market prices for factor inputs usually exist, but these markets tend to be in chronic disequilibrium in less-developed countries, and hence factor prices do not reflect the relative scarcity of the factors concerned. For returns, many outputs, particularly of public projects, are not marketed and therefore there are no prices at all for guiding the planner. Other outputs may, like factor inputs, be exchanged in markets which are chronically in disequilibrium. Shadow prices for factor inputs have been carefully studied, but much less work has been done on shadow prices for output.

The usual use of shadow prices is to help to determine an investment program, where pricing the scarce factors is of central importance. Logically, however, shadow prices are equally applicable to the pricing decisions about output, yet output price decisions are usually determined by managers of a project without the use of shadow prices. A valid question, therefore, is to what extent day-to-day pricing on a non-shadow price basis results in the misuse of investment, originally allocated on the basis of shadow prices? The implications of this procedure are not clear. To get

day-to-day pricing which is consistent with the use of shadow prices for investment, it may be necessary to carry out an elaborate program of special subsidies and taxes if the managers of projects are to be allowed autonomy. Such a program would be very expensive as it would require considerable administrative talent to calculate the appropriate subsidies and taxes. Yet there is the danger that if only the investment program is affected by shadow prices, substantial resources may be wasted once the projects are in operation.

As a practical matter, shadow prices are really significant only if they lead to substantially different choices of projects than criteria which do not make use of them. There is some question as to whether they really do make a significant difference. Therefore, the planner should be sure they will cause real rearrangements of the alternative resource uses before making them part of a planning system. One important use may be to help to identify projects in which the private sector may not invest, but in which such investment would be desirable and would take place if special incentives were provided by the government.

One last warning on shadow prices is needed. The use of an overly-simplified analytical framework for calculating shadow prices for factor inputs may be very dangerous. In working out shadow prices for factors, the usual procedure fails to recognize the multiplicity of skilled levels of labor and the many intermediate goods that are typically required for industrial production. What happens, for example, when a general shadow price for labor is calculated well below its market rate, and this adjustment is applied indiscriminately to all skill levels? Such treatment obviously might lead to serious misuse of skills in short supply.

The pricing problem in project planning is probably the area which is most unsatisfactory at the present time. The desirability of using shadow prices for investment decisions to achieve better allocation of resources is balanced by the practical difficulties in determining and using correct shadow prices. Furthermore, the use of artificial prices for outputs opens the door to abuses of the technique. Obviously, any project can be made to look attractive by raising the price of its output. By so doing a decision which is really based on non-economic grounds, such as political ideology, can be made to seem reasonable. Clearly, one of the most critical decisions a planner must make is what prices will be used for project evaluation and he should be aware of the critical consequences his pricing decisions imply.

3. Interdependency Among Projects

Perhaps the most universal characteristic of projects in less-developed countries is their interdependency. That is, the costs and benefits of a particular project depend upon the other projects which are undertaken. This concept is fundamental to a great deal of the literature on economic development dealing with the "big push" or balanced growth. Despite the central importance of interdependency in the conceptual framework of development planning, little progress has been made towards providing the planner with useful procedures for incorporating interdependency into selection criteria.

As an example of this, consider the selection procedure which is almost universally suggested, that of ranking the projects under consideration in order (according to a given criterium or criteria) and then accepting projects in this order until funds for investment are exhausted. This selection rule assumes independence between projects; hence, the most common approach

to project planning assumes away a problem that the development economist believes to be of considerable significance.

There are many types of interdependencies that are significant for project planning. These are listed briefly:

(a) Demand interdependency: The demand for the output of one project depends upon which other projects are carried out.

(b) Cost interdependency: The cost of one or more inputs of one project depends upon which other projects are carried out. This type of interdependency is closely related to the first one, since what is a demand for one project is a cost for another. A road project, for example, might simultaneously produce both demand and cost interdependencies. It would increase the demand for cement, thereby possibly making a cement factory attractive for investment, and it would reduce transportation costs, thereby reducing costs for all projects which depended on the road being constructed.

(c) External economies and diseconomies: There are two kinds of external economies, the pecuniary and the technical. The pecuniary are essentially covered by (1) and (2) since their effects could in principle be felt via ordinary markets. Technical external economies, however, cover interdependencies arising from a direct relationship between the output of one project and the output of another. The relationship here is viewed as technological, conceptually at least, not operating through the market. True external physical economies are unusual and the literature on the subject falls back on rather contrived examples, e.g., the assertion that establishing a bee hive may increase the output of a neighboring orchard through the increased pollinizing activity of the bees. External physical diseconomies, however, are common and may be of considerable importance. Two examples will

illustrate the concept. The first is a specific proposal which has actually been made, the production of swamp rice on unused land in the vicinity of the rubber plantations of Liberia. This project has the potential for fairly specific external consequences. The slow moving water pools created by the rice cultivation is likely to provide breeding places for mosquitoes. The result may very well be increased incidence of malaria and falling productivity of labor in other activities. A second example is more general. Most industrial facilities require concentration of labor, and establishment of factories leads to increased urbanization. Urbanization in turn imposes real costs on society, in terms of resources which must be used for additional law enforcement and other necessary government functions. Thus industrial growth seems to imply some external diseconomies, in the sense of increasing social costs.

(d) Conditional interdependency: In this type of interdependency, one project must be undertaken as a condition for undertaking another. For example, a dam may be necessary before an irrigation system can be built.

(e) Blocking interdependency: In this type of interdependency undertaking one project precludes undertaking another. For example, the use of crude oil for petro-chemicals precludes its use for fuel.

To take interdependencies into account it would seem logical to move towards the use of mathematical programming procedures. Programming can take account of some types of interdependencies without difficulty. Others, however, pose problems even for mathematically sophisticated techniques. The practical shortcomings of programming approaches in project planning have been noted above. Currently it is not possible to say whether or not programming approaches to the interdependency problem will provide operational guidance

to the planner. Up to the present time they have not done so. At the present stage of project analysis, trial and error is the most usable method of incorporating interdependencies into the planning process.

4. Non-Revenue Producing Projects

A large number of projects have streams of physical outputs which are not valued explicitly in the market place. This is true of health and education projects for example, or for construction of non-toll roads. Projects of this nature are called non-revenue producing. The difficulty associated with planning for this type of project is the determination of the quantities of benefits, as well as the appropriate prices at which to value such flows. Since non-revenue producing projects constitute a substantial percentage of the total investment expenditures of most development plans, adequate procedures for preparing and selecting this type of project are important.

The reasons for the difficulty in determining the physical quantities of benefits as well as the correct prices are pervasive. The benefits are often far removed in time from the costs and it is very difficult to make any real estimates of the correct prices. For example, a project to send a person to university would require estimates of the expected income well into the future. Projections of gains in income based on education are by their nature highly uncertain. Another complication is that many non-revenue producing projects will have both current and future returns and these may be very different from each other. Education provides both current pleasure and future increase in productivity. Similarly, a public health project contributes to improved health of people, a direct contribution to utility,

and also increases worker productivity, an indirect contribution to utility by permitting increased output.

The planner must develop adequate procedures for handling these non-revenue producing projects. The straightforward approach is to try to work out prices for the project benefits. However, a real hazard in using this approach for non-revenue projects is the ease with which almost any project can be made to look attractive by assigning high valuations to the returns. A possible alternative would be to use some sort of multi-sector model. The application of this model would provide the levels of investment to be allocated to each sector, the sectoral interdependencies having been taken into account. Then projects which arise within a particular sector are compared only with other projects in the same sector and not with projects for other sectors. Thus, one would try to work out the proper level of resources allocated to education, and having determined such a budget limitation, would then choose the particular educational projects which seem to be best. This approach has the advantage of narrowing the margin of error, for if one makes a mistake in evaluating benefits, it is less likely to have serious consequences if both projects which are to be compared are educational than if, for example, an educational project is compared with a steel plant. This argument, of course, simply shifts the difficult analysis to the sector model, but at the sectoral level one can hope to have a more satisfactory explanation of the inter-connections between sectors.

5. Dominating Projects

A dominating project is a project which is so large that it takes a substantial part of the total investment budget. There are many countries in th

world in which dominating projects exist, e.g. the Aswan dam in U.A.R., and the Volta River Project in Ghana. Where this is the case, the development plan is centered upon the dominating project and much of the rest of the plan consists of working out the implications of the central large project. Because such large projects have heavy impact on so many different parts of the economy, the usual methods of project selection must be reconsidered. The project selection criteria utilized when there are many small projects are no longer appropriate when a dominating project is being studied. Since there are many small countries in the world today, the problem may be a common one in the next few years. It is, therefore, important to study this type of situation to provide more satisfactory guidelines for analysis of this type of project.

6. Choosing Among Alternative Projects for the Same Objective

One deficiency which is common to most project planning agencies is the failure to carry alternative projects for doing the same thing far enough through the planning process. The usual approach is to identify a task to be accomplished and look for different ways to carry it out. For example, shoes are needed and the alternative technologies for building a shoe factory are considered. From the alternative technologies the project planner selects the best method of carrying out the task, and the alternatives are dropped from consideration. This same procedure is followed for other tasks, with a best way being chosen for each task which has been identified. Finally, all of those ways of carrying out tasks which are deemed best ways are compared with each other to determine which tasks shall be performed. A better procedure is to carry forward several alternative ways of carrying out

the same task and to make the final choice from this wider collection of projects.

Unfortunately, the range of alternative ways of carrying out a task is usually a very wide one, and, indeed, often not even recognized by the project planner. It is important to develop procedures which lead to the consideration of many alternatives and to avoid premature rigidity of the technology. This implies that economists should play a broader role in the stage of project planning in which the specific choice between different ways of carrying out a task is made. At present, this is a function which is usually left to the engineer. As an example, consider the steps required in developing a road project. The alternative technologies here consist of the specifications of the design characteristics of the road: its width, surface, drainage characteristics, maximum curvature, maximum slopes and bearing capacity. Different combinations of these specifications will affect the construction cost for the road, its future maintenance costs, as well as the cost of transporting goods along the road after it is constructed. Too often, the road engineer is left to specify a design for the road, without sufficient consideration of the economics of the matter. The alternatives have all been suppressed and the specifications based upon those which are used in developed countries. In short, these considerations suggest that the economist's role in project planning should enter into the planning for a specific project when alternative technologies are considered, as well as in the broader framework of selection of which projects shall be done. The existing framework for project evaluation does not adequately recognize this distinction. As a consequence, techniques which have been developed for choices between projects to carry out different tasks are often carried over to problems which are really choices between technologies, and vice versa.

7. The Impact of Foreign Aid on Project Planning

Foreign aid has been one of the strongest institutional influences to have affected the practice of project planning. Many of the effects have been beneficial, some detrimental. In this section some of these effects are examined within the project planning framework presented above.

(a) Foreign Aid and Project Perception

Foreign assistance often helps a country to improve its perception of possible projects. One source of this improvement is the experience and knowledge of personnel made available through technical assistance. Perhaps more important, foreign aid organizations may sponsor projects (class three projects) which are designed to widen project universe perception. Such projects range from basic resource surveys to studies identifying potentially profitable industrial investments.

One important process which affects project perception is the transfer to the less-developed countries of knowledge of modern technology. The problems in this field are enormous, but they have been neglected. Accelerating the flow of technology, and better adapting it to the needs of less-developed countries constitute a major challenge to developed countries in their efforts to promote rapid growth in the less-developed countries.

(b) Foreign Aid, Costs and Returns of Projects, and Project Selection Criteria

Foreign assistance may significantly distort the calculation of costs and returns of projects. Distortions are likely to arise because project analyses carried out for a foreign assistance agency concentrate

on the costs and returns of projects from the perspective of the aid-giving organization. Typically, these analyses concentrate on financial and engineering feasibility, with the probability of financial success being the principal selection criterion. This approach leads to a treatment of costs and returns which is quite different from the ideal for the aid-recipient. Many costs and returns accrue to the national economy which do not affect the financial feasibility of a project, but which do affect the desirability of the project for development. Furthermore, from the viewpoint of the aid-recipient, it is not clear how costs borne by the aid-donor should be treated. For all of these reasons, project analysis oriented toward aid-giving countries does not provide the basis for the best choice of projects from the developing country's viewpoint.

(c) Foreign Aid, Project Preparation and Selection

In the area of project preparation, foreign aid has exercised a strong but unbalanced influence. Insistence by foreign aid donors on detailed project preparation has led recipient countries to devote considerable effort to the preparation of financial and engineering studies for their aid-financed projects, and to neglect project preparation for projects <u>not</u> financed by foreign aid. The most talented people are assigned to work on projects financed by foreign aid, despite the fact that non-foreign aid projects may be of equal or greater importance. In some cases this tendency is somewhat overcome by foreign technical assistance to agencies working on the analysis of domestically financed projects.

Foreign aid relates to project preparation in another very

important way. In many cases, though not all, the amount of foreign aid is dependent on the number and size of acceptably prepared projects. Here there is a danger that project preparation will become mainly a device to raise external capital. However, the principles by which foreign aid is allocated are usually not explicitly known to the planner; in fact, they are often unclear to the donor-country itself. Hence, the amount of aid and the costs involved are, at best, uncertain. Under these conditions, rational project analysis, particularly the comparison of alternative projects to make choices, is discouraged. Instead there may develop a strategy of simply preparing many projects with the hope of getting aid for a large share of them. Project selection then is really performed by the aid-donor, and there is little spread effect toward improvement of the practise in the less-developed country. To avoid perpetuating the tendency toward foreign aid inducing misallocation, project planning efforts should be improved and redirected toward an overall domestic planning focus. This will require re-examination of basic issues in the field. Treatment of costs and returns, and selection criteria themselves, must be adapted to conditions in less-developed countries, rather than those of the donor countries. There is also a need for greater recognition of this problem on the part of aid-donors. In establishing project requirements for the granting of aid, flexibility and adaptation to the planning needs of developing countries are needed.

8. Some Non-economic Aspects

Apart from the central planner's responsibility for the content of project selection he has an important role to play as an innovator

in the administration of project planning. There are three particular tasks which are of vital importance in this respect: (1) the development of an orderly, simple and effective administrative system; (2) the centering of project planning on the budget process; and (3) the training of a cadre of project analysts at the ministry and department level.

The development of an efficient administrative system for project planning is an obvious necessity. However, in promoting improvement, it is important to recognize that the task is not simple and requires sustained effort over several years; that the system should provide standardized methods; and that the skills required to carry out the process should be compatible with the local supplies of technical competence.

The central role of the budget in project planning arises from its importance as an administrative device to determine government expenditures. In fact, the budget process provides an ideal framework within which to carry out project planning. It provides a central decision-making authority for coordinating projects with one another and it helps to keep recurrent costs at a level compatible with the overall budget.

The need for training project analysts requires little emphasis. It is useful, however, to centralize this training function in order to develop officials who can operate the project planning system in a consistent manner throughout the government.

In most less-developed countries there are several agencies involved in project selection. In particular, many governmental

organizations may be concerned with the encouragement and control of the private sector through allocating foreign exchange, issuing industrial licenses or import permits, providing low interest loans or equity participation, approving tariff concessions or protection, or allowing tax holidays, reduced rates, and similar incentive devices.

One essential task of the central planning office is to coordinate all government activities affecting project analyses, selection and promotion to avoid working at cross purposes. This can be a task of some complexity since the role of the government in private project planning is different from its role in public sector projects. On the one hand, the government has a "yes" or "no" decision to make in the case of most public sector projects. On the other hand, possible government actions in the private sector usually involve a whole spectrum of actions. Ideally the project planner seeks to provide minimum incentives compatible with a favorable decision by the private entrepreneur to proceed with the project. To the extent that the planner can help develop a common general approach, the decentralization of project selection can be increasingly made into a rational, integrated procedure escaping the hazards of over-centralization or the chaos of each organization following its own devices.