STRUCTURE OF PLANNING, PROGRAMMING AND BUDGETING SYSTEM*

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What is a planning, programming, and budgeting system (PPBS)? Despite numerous publications on the subject, there is still no systematic conceptual clarification of the essential eiements of a PPB system or of the implications for its use by governmental organizations. Many advantages and shortcomings of the system have been enumerated, but the debate will go on fruitlessly if the meaning of the system is not made clear. This chapter attempts an examination of (1) the elements of norms of rationality, along with other supporting values and norms of public administration which underlie PPBS, and (2) the specific requirements and techniques of rational calculation, both proposed for, and required by, a PPB system. (Current practices, as embodied in official documents defining the operation of PPBS in selected governmental agencies, will be examined in Chapter IV).

In the midst of great excitement and doubt which have accompanied the introduction of this integrated system of administrative planning, programming, and budgeting into government, it appears that proper perspective on the system sometimes is lost. Excitement stems from the "revolutionary zeal" of proponents of the "very new system" which is intended to assist governmental managers in making more rational decisions. Doubt results from concern over an untried system and the concomitant difficulty of grasping the proper meaning of the system.

While such arguments continue, each side reinforces the conviction of the other: the more doubt expressed by the opponents or lukewarm sympathizers, the stronger becomes the reformist conviction that the vested interests and bureaucratic inertia are the main obstacles against

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proper functioning and expansion of the new system. Discussing institutional problems of the program budget, McKean and Anshen suspect that the new proposal

> will inevitably be viewed throughout the organizational bureaucracy as a threat to existing, familiar, and manipulatable institutional arrangement. Such a view will by no means be confined to the executive branch of the government. Allied to each executive unit, as sponsors or clients are legislative and private interests. To many of these interests, the program budget will probably appear as a disturbing influence, if not as an outright threat.(1)

And the more that the need for a new system is stressed by PPBS advocates, the stronger becomes the suspicion and doubt of opponents. They view democratic values and processes as being ignored, and resent (as stated previously) that the President and Congress "seem to be regarded as enemies of rationality."(2)

What are the grounds upon which each side bases its arguments? The new system is claimed to help decision making of government officials, providing more relevant information for their evaluation of alternatives for achieving desired objectives. One of the standard descriptions of the purpose of PPBS states that:

> PPBS is a system aimed at helping managent make better decisions on the allocation of resources among alternative ways to attain government objectives. Its essence is the development and presentation of relevant information as to the full implications— the costs and benefits of— the major alternative courses of action.(3)

And, the primary distinctive characteristics of PPBS are presented as follows:

1. It focuses on identifying the fundamental objectives of the government and then relating all activities, regardless of organizational placement, to these.
2. Future year implications are explicity considered.
3. All pertinent costs are considered - including capital costs as well as non-capital costs, and associated support costs (such as employee benefits, associated vehicle and building maintenance costs) as well as direct costs.
4. Systematic analysis of alternatives is undertaken. This characteristic is the crux of PPBS. It involves: (a) identification of the governmental objectives: (b) explicit, systematic, identification of alternative ways of carrying out the objectives: (c) estimation of the total cost implications of each alternative: (d) estimation of the expected results of each alternative: and (e) presentation of the resulting major cost and benefit tradeoffs among the alternatives along with the identification of

(1) Roland N. McKean and Melvin Anshen, "Limitations, Risks, and Problems", in David Novick (ed.), *Program Budgeting* (Cambridge, Mass.: Harvard University Press, 1965), p. 306.

(2) Frederick C. Mosher, "PPBS: Two Questions", in Committee on Government Operations, United States Senate, *Planning-Programming Budgeting: Selected Comment*, 90 th Congrees, 1st Session (Washington, D.C.: Government Printing Office, 1967), p. 26.

(3) *What is PPB*? State-Local Finances Project, The George Washington University (Washington, D.C.: George Washington University, 1967) p. 1.

major assumptions and uncertainties.[4]

Those who are not "sold" on the new idea doubt very much whether the new system is "new" at all, and they suspect that it will encounter many difficulties in operation.

Among the questions concerning the new system, a question both analytically and philosophically interesting, is whether economic or political rationality should prevail in the government. Hirsch argues, in his discussion of federal program budgeting, "if there are two schools of budgetary theory and practice one subscribing to economic rationality and the other to political rationality this paper clearly belongs in the former." Such an economic rationality is believed to "aid us greatly in deciding how to allocate scarce resources efficiently among the ever-increasing number of competing activities with which Federal decision-makers are faced."[5] On the other hand, Wildavsky is much concerned about the possibility of "the encroachment of economics upon politics", and suggests that economic rationality ought not to swallow up political rationality.[6]

To decide whether PPBS is really new or only a new name for an old system, one might trace the whole history of public administration in general, and budgeting in particular, but such an approach will not be taken in this paper. The particular interest here is to palce the general argument and structure of PPBS in a specific framework so that various implications and several components of the PPBS can be examined with some consistency and generality. As stated in the introduction of this paper, we will examine the system in conjunction with the concepts of organization theory in general and public administration in particular.

Viewed from the perspectives of organizational concepts and theory, this discussion of PPBS can be divided into three major categories: (1) as a structure of norms which are supported by and in turn support other adminisrtative norms, (2) as a structure of calculus which is believed to derive from these norms and to be used in the organizations, and (3) governmental agency requirement for presentation of information in a from appropriate to a PPB system. The norm is that of rationality: PPBS specifies the elements of the norm of rationality. The calculus is, of course, that of rational calculation. Requirements of official documents are discussed in terms of how the results of such rational calculation can be presented in a meaningful way, incorpo-

(4) *Ibid.*, p. 2.

(5) Werner Z. Hirsch, "Toward Federal Program Bndgeting", *Public Administration Review*, Vol. XXVI, No. 4 (December 1966), p. 269.

(6) Asron Wildavsky, "The Political Economy of Efficiency: Csot-Benefit Analysis, Systems Analysis, and Program Budgeting," *Ibid.*, pp. 292 and 310.

rating relevant information for decision-making.

With even a cursory review of the history of public administration, the definite impression is created that what is new about PPBS is that it explicitly specifies both the components of the norm of rationality and the techniques of rational calculation, within the specific context of governmental administration. Individual action as well as group activity has always been considered rational as long as the action or activity is aimed at achieving certain objectives of the actor(s). In this sense, the study of public administration has always been concerned with rationality in organizations. PPBS makes the norm more specific and the calculation more explicit.

A general survey of key features of PPBS will be undertaken in order to identify its norm contents; then the logical requirements of the related calculus will be analyzed. Discussion of the norms will enable us to understand the logical requirements of the calculus, while understanding of the norms and calculus will help define the rationale of formal documents.

Ideological issues of economic vs. political rationality in a PPBS can be resolved if analyzed within the context of organizational concepts, that is, by transforming the ideologies of economic and political rationalities into organizational variables. The logical requirements of PPBS together with their supporting norms are supposed to alter, and to be altered by, the organizational factors.

A. NORMATIVE CONTENTS OF PPBS

The rationalistic approach to public administration always defines an organization as an instrument which is intended to achieve one or more objectives. An organization is generally defined as a group of two or more persons gathered together in order to achieve grogup goals. Decision making is involved in the definition and achivement of the group goals. Adoption of PPBS is justified because it is believed to facilitate effective decision making in the government, that is, it enables government officials to make effective decisions for accomplishing government objectives through rational calculation of alternative courses of action.

But, what are the criteria for judging what are effective decisions? This question brings us back to the fundamental norms of public administration. In the study and practice of public administration, several norms have been advanced as essential to the success of publics administration. These are: economy and efficiency, effectiveness, and coordination, among other things. PPBS is generally justified on the same grounds. In essence, the justification for adoption of

PPBS is that it will enhance these norms in the government, on the assumption that these norms are the necessary requirnments for effective program formulation and resource allocation.

The terms used in the justification of PPBS are also employed as the empirical variables of organization. In this section of the discussion, only the normative aspects of the key concepts will be examined in order to highlight implications of these requirements.

1. Economy and Efficiency

The first and foremost consideration in introducing PPBS to government is that of econonmy and efficiency - one of the most frequently expounded criteria of good public administration. Program budgeting "involves the use of budgetary techniques that facilitate explicit consideration of the pursuit of policy objectives in terms of their economic costs, both at the present time and in the future."(7) PPBS is intended to establish a more rational basis for determining the extent of resource commitment and the allocation of resources among competing claims. Efficiency as a norm specifies that an objective should be achieved with minimum cost. If an objective is stated, the resource utilized for its achievement must be kept to a minimum. On the other hand, it means that with a given amount of resources, the objectives should be achieved to the greatest degree possible. Scarcity of financial as well as human resources necessitates and justifies such a requirement for the conduct of human activities.

In short, economy and efficiency means: (1) the greater the degee of achievement of objectives for a given amount of resources, the better: and (2) conversely, the smaller the amount of resources consumed for the achievement of a given objective, the better.

In order to fulfill such a requirement, one thing is essential: both objectives and resources must be made explicit, expressed in quantities if possible. PPBS therefore makes the explicitness of objectives and resources its basic requirements. It constantly reminds the administrators about the desirability of explicitly defining their objectives in operational terms. Its dictum is: "If you do not have an objective, determine one; if you have some abstract objective, convert it to operational terms."

Logically, most of the objectives presume implementation by activities which combine human, as well as material resources. These activities are called programs when grouped together. There are many wayn of grouping or combining human and material resources. The various ways of combining prospective activities and resources are called program alternatives. The dictum of efficiency and economy directs that the most efficient and economical program must be adopted for a specific objective. This entails comparison of outputs and inputs. From the

norm of economy and efficiency, efficiency analysis is suggested as a way of calculation in PPBS. As will be indicated later, an efficiency analysis is a limited case of cost-effectiveness analysis in which an input-output ratio can be computed.

2. Effectiveness

As suggested above, an objective can be achieved only when the activities aimed at it have some degree of attainment. Therefore, effectiveness is the next most frequently suggested benefit and requirement of PPBS. The greater the degree of effectiveness, the better the program and resource allocation.

What is effectiveness? Effectiveness is measured by the degree of realized results compared with the desired outcome. Desired results can occur only if the technology appropriate for a given problem is applied. The norm of effectiveness thus dictates that the managers must discover, adopt, or develop a technology linked to the problem at hand. PPBS constantly reminds the public administrators to arrange organizational activities in such a way as to maximize the degree of technical capability for attainment of desired objectives. This search for proper technology is expressed in the form of program arrangements, called programs and program structure in PPBS language. Clear understanding of the relationships between programs, objectives, and alternative courses of action is necessary to carry out effective implementation of objectives.

Determination of effective programs for achieving objectives is not considered sufficient by the proponents of PPBS. Government policies and objectives themselves also should be determined most effectively. "The basic point" says Smithies, "is that a government can determine its policies most effectively if it chooses rationally among alternative courses of action, with as full knowledge as possible of the implications of those alternatives" under PPBS.[8]

Elements of this norm also specify that decision makers should have clearer objectives and fuller understanding of the relationship of the program to objectives. In other words, it directs that an actor must have crystallized outcome preferences and assumptions about cause/effect relationships.

3. Coordination

Coordination is a process of bringing harmony and balance of separate parts in a system. A

(7) Arthur Smithies, "Conceptual Framework of the Program Budget", in David Novick, *op. cit.* p. 24.
(8) *Ibid.*

higher degree of coordination has always been recommended as a desirable feature of public administration, even though the concept can also be used as an empirical variable in the study of public administration. Planning, programming, and budgeting is the focus of the process of comparison, and coordination."[9] PPBS is therefore desirable when measured against the norms of public administration because it focuses on coordination.

What are the requirements of coordination? At least two components are essential before we can talk about coordination. They are objectives and activities. In operational terms, coordination is the elimination of conflicts (1) among objectives, (2) among activities for a given objective or objectives, or (3) between objectives and activities. Resolution of any conflict between objectives and activities necessitates clear knowledge of objectives on the one hand, and the relationship of activities to objectives on the other. At least some minimum knowledge of objectives and activities enables the coordinator to resolve conflicts.

4. Responsible and Responsive Government

Up to now, we have discussed the norms supported by PPBS in terms of organizational or administrative norms. These norms are in turn supported ay an underlying value of the American society. The relevant value is responsible and responsive government. Government is expected to serve the needs and demands of the people. PPBS is conceived as a system that serves this purpose. In other words, introduction of PPBS in government reaffirms in specific terms that government should be responsible and responsive so that the interests served can be maximized. Presumably, the PPBS, if it is only a management tool which is politically neutral, can serve any political system and purpose. But, some of the advocates of PPBS would like to tie the idea of PPBS with a specific notion of government's role in a society. Greenhouse says that a single "concept", dealing with accountability of the Federal agency apparatus, "forms the philosophic base for the PPBS structure." The concept is, he continues, "that each Federal agency is accountable to the President for the production of goods and services, and more particularly, for the distribution of these goods and services to the American people."[10]

Some argue that democratic government has been assumed to be responsible and responsive to the needs and demands of people: that it is not that PPBS has brought the idea of accoun-

(9) Ibid.

(10) Samuel M. Greenhouse, "The Planning, Programming, Budgeting System: Rationale, Language, and Idea-Relationships," *PAR, op. cit.*, pp. 271-272.

tablity; and thus, that there is nothing new or particular about PPBS. However, such an argument does not consider the full implications of responsible and responsive government. When the proponents and designers of PPBS present the notion of responsibility, they do so to place the structure of PPBS in an appropriate philosophical perspective, and to go a little beyond. They intend to shift the emphasis away from the legalistic idea of accountable government. They prefer to emphasize the positive operational contents of PPBS. They contend that government should actively seek out the needs and demands of people and provide necessary services, objectively determined. With this shift in emphasis, the idea of responsible and responsive government necessitates a clearer notion of governmental objectives to be achieved and the programs to be implemented for the objectives. As indicated, it goes one step further: the relationship between program and objective selected by government officials must have some objective validity in addition to satisfying legally prescribed rules and procedures.

5. Scientific Objectivity

One justification for the particular analytical and informational stucture of PPBS is that the relationships among the objectives and programs or outputs and inputs can be determined by criteria of objective validity and systematic verification accomplished before the decision makers' personal judgement is made.[11] The criteria of validity require that objectives sought by decision makers must be clearly expressed for communication and that the relationships between objectives and programs must be clearly established. Systematic verification can utilize accumulated knowledge on cause and effect in the specific public policy area under consideration.

A degree of scientific objectivity is crucial, since program analysis of PPBS relies heavily on models to represent the scope of reality in question. The model is utilized to design a workable technology. The strength of the technology depends on the merit of the model. To build a model which can be reasonably isomorphic or homomorphic with a given phenomenon, systematic knowledge accumulated in a field should be utilized.

The model can be built by the decision maker himself. But, more often, analysts draw models to clarify the relationships of elements in the phenomena and thus help the thinking of the decision maker himself. The decision maker decides whether he will accept a specific model. But once he accepts a model presented by the analysts, he must follow the logic of the model in selecting appropriate technology for solving a given problem. It is assumed that

(11) Alain C. Enthoven, "The Systems Analysis Approach", in *Planning-Programming-Budgeting: Selected Comment*, U.S. Senate, *op. cit.*, pp. 3-4.

the more sicentific the approach applied in the selection of appropriate technology, the more relevant it will be for policy formulation. It is on such contentions that PPBS advocates justify its use in government operations.

Throughout our analysis of the norms that support PPBS, we recognized some recurrent elements: (1) highly coordinated and explicitly recognized objectives of the government or agency: and (2) technically and economically most feasible and well coordinated activities. In detailed terms, the supporting norms of PPBS specify the necessary elements of the PPBS procedure: explicit goals, explicit objectives, technically and economically feasible activities grouped under a broader concept of programs, alternative courses of actions, and clearer understanding of the present and future implications for resource commitments.

These elements are in essence the elements of the norm of rationality. All of the norms and values we have discussed above can be subsumed under the norm of rationality. PPBS is supported by the norm of rationality, and introduction of PPBS into government may reinforce that specific norm which is supposed to be present in every modern organization. We now have some specific notion of the norm of rationality as suggested by the language used in the justification of the introduction of PPBS into government.

The elements of the norm of rationality identified above constitute a logical structure, and such a structure implies a particular structure of calculation, which is the basic structure of PPBS. The basic structure of PPBS will be referred to as the calculus of rationality. The elements of the rational calculus are same as those of the rationality norm. Our next task is to analyze the structure of rational calculus in terms of its logical requirements. A systematic analysis of the structure of rational calculus specified by PPBS and the implications of its logical requirements will enable us to examine more meaningfully how such a structure and its elements interact with each other and with other organizational variables, which will be analyzed in Chapter III.

B. STRUCTURE OF PPBS

In addition to the norms we have discussed above, two more aspects of PPBS are distinguished: (1) analytical structure which we refer to as the structure of rational calculus, and (2) formal documentation procedures adopted by the governments. Rational calculus is only an analytical structure devoid of empirical contents, although the terms generally used are empirical terms which make the distinction so difficult. In order to apply these rational calculi, empirical

terms must be supplied. Substitution of empirical terms for analytical terms is done through applying rules of interpretation. This point should be stressed, because at least two types of rules of empirical interpretation serve different purposes. One of them is strictly for scientific purposes. The empirical interpretation of analytical terms for scientific verification has to follow the convention adopted by a specific discipline and the aim is to understand and to predict phenomena. On the other hand, specific rules can de devised by a particular organization for the purpose of making organizational decisions. Often these two rules may coincide, but not always, as is explained in greater detail in Chapter IV. The official documentation procedures which are examined in Chapter IV will provide some examples of official rules developed for applying an analytical structure.

1. The Analytical Structure of PPBS

Much of the debate and some misunderstanding regarding the meaning of PPBS can be avoided if we make clear the specific meaning of the component concepts of PPBS and the specific contexts in which these terms are used. As mentioned above, it is sometimes difficult to do so, because the analytical structure is discussed in empirical though abstract terms. One way of clarifying the concepts is to specify the contexts in which these terms are used. Two structural contexts are employed: (1) means and goals structure, and (2) input, throughput, and output format. These structures will enable us to identify the relational contexts under which various concepts of PPBS are related.

We now present PPBS concepts first under the means-ends structure. The terms to be analyzed are: agent, goal, objectives, criteria or indicators, activities, program, program structure, programming, program alternatives, resources, budget, and planning. Each of these terms will be discussed first and then later a framework of PPBS will be presented.

Agent. Usually an agent is an individual. A group of individuals also may act as the agent. In such cases, there is a specific rule by which the individnals are aggregated into a collectivity. The rule must specify which individuals qualify as members and the composition rule by which they constitute an agent. In the PPBS context, generally, an agent acts as a decision maker or decision-making group, but in some cases, they are individuals or gourp of individuals who perform analytical tasks for the authorized decison maker. They are called the analytical staff. Only with specific relation to the agents, the terms such as goals, objectives, or programs have their meaning. We must always remember that these are relational terms.

As developed later, some of the conceptual difficulties and arguments arise from the failure

to specify the agent and relations of other terms to him. Under the PPBS process, it is meaningless to talk about national objectives or goals without knowing the agent who will try to achieve these objectives or goals. On a national level, the Federal government is presumed to be the agent, but it is useless to enumerate abstract national goals if they are not specified in operational terms showing the relationships to the agent.

Goal. An agent is supposed to have at least one goal as a representative of the whole organization or some sub-unit. A goal is a specific state of affairs which a particular agent would like to have realized at a certain point in time in the future. As we mentioned earlier, the content of the goal has meaning only in relation to specific agents.

A state of affairs varies along a time dimension, in number of objects, property, or relations. Thus, it is in principle possible to articulate differences between states of affairs found at two points in time. A possible state of affairs ranges from a single property of a single object to a whole variety and series of processes which means that there can be an infinite number of possible goals. A goal can be an increased degree of a certain property of a specific object. Or it can be a change in the relationships of the properties of single object or objects. Or, it may be a certain specified stage of a specific process. How well one can specify a future state of affairs depends entirely on how well the present state of affairs is understood. And the way in which, and the extent to which, one can determine the present state of affairs depends on the present level of techniques of measurement and the degree of consensus about the relevant concept definition.

At the national, state, and local governmental levels, the problem is simplified by omitting necessary elements of a definition of a goal. For example, national security, social welfare, or education serves as some kind of a goal precisely because they are not defined in very specific terms, and because they are supposed to summarize numerous elements.

Without any knowledge of the present affairs, it is not possible to talk about the goal, and the more abstract the goal, the more it becomes difficult to determine whether it is a mere reaffirmation of the present state or any change is implied. The abstractness and ambiguity increase when the number of objects aggregated and the property or relations considered increase, since the complexity arises due to the magnitude of the number and the interactions among them. A goal can vary along the scale of complexity or abstractness. Generally, the higher an agent is on the organizational hierarchical level, the more complex and abstract is his goal. And the higher the hierarchical level, the less certain the assumption about the cause/effect relationships of the activities he commands. Such problems will be dealt with in Chapter Ⅲ

in terms of organizational variables.

Usually, governmental goals are of such a nature as to make them difficult to identify with any reasonable degree of precision. Due to such difficulty, it is sometimes argued that it is impossible or meaningless to measure governmental goals, but, in principle, goals should be measurable at least by nominal scales.

Objective. In the specific context used here, an objective can be defined as an intention to attain the difference between the present and some specified future state of affairs. Since a state of affairs can be expressed in terms of the number of specific objects, class of objects, property of object(s), disposition of object(s), events, processes, or the relationships of these things in their individuality or collectivity, an objective of an agent can also be expressed in these terms. Thus, a specific objective must be expressed as an intention to increase, decrease, or maintain a quantity or relationship.

An objective can be very specific or diffuse. If there is a very specific goal, it is relatively easy to express objectives in operational terms. But, even if there is no specified goal, an objective may be specific. In such a case, however, no one can determine the relationship between an objective and the goal toward which the objective is directed.

The specificity of an objective determines its appropriate technology. Three possibilities are suggested: (1) a diffuse objective and no identifiable technology (diffuseness of objectives automatically excludes any possibility of determining appropriateness of any available or future technology); (2) a specific objective with appropriate technology; and (3) a specific objective with no known technology. A new technology must be developed in this last case. In such a case, the technique of program analysis as developed later has considerable utility.

Like goals, the objectives can also be placed on a hierarchy from abstract to concrete ones. We assume that abstractness and concreteness of objectives are also a function of the organizational hierarchical level of the agent or decision maker.

In PPBS discussions and design, goals and objectives frequently are not differentiated, or are used interchangeably. It may be due to the difficulty of operationalizing these concepts. When they cannot be operationalized, the goal is unspecific, and consequently, the objectives also become unspecific. Thus, it makes no difference whether one calls a difference between states of affairs a goal or an objective. But, analytically, there should be a clear distinction. This distinction is necessary for a better understanding of the terms "program" and "activities" used in PPBS.

Criteria or Indicators. Although there is no inherent reason why the concept "objective"

should be restricted to mean only certain complex and aggregated phenomena, the general usage of the term in PPBS refers to "fundamental governmental objectives." In such a restricted sense, the phenomena called objectives become very broad and complex so that, at the present stage, any single unit of measurement will be difficult to concoct. Thus, the problem of the criteria or indicator become more relevant. In the literature of PPBS these terms are used interchangeably, and this verbal convention is adopted in this paper.

As discussed above, an objective is made of one or more variabls. Variations in these variables produce differencs in the overall composition of an objective. In an engineering sense, the objectives are achieved through manipulations of these variables.

The problem of criteria and indicators is to identify such meaningful and significant variables of the objectives. Naturally, a particular definition of governmental or organizational objectives will suggest the number and types of variables and their compositions. Methodologically speaking, variables and indicators must be differentiated but, since such fine distinctions are not made in the usage of PPBS, they are used interchangaeably for the purpose of the present discussion.

The current discussion of criteria in PPBS literature does not follow the same kind of logic presented here, but the ideas presented are similar. Harry P. Hatry, in a discussion of criteria, says that the need for evaluation criteria arises "because funds and physical resources are scarce; there are not enough available to satisfy all needs and proposals."(12) Evaluation is required and to perform this evaluation, "it is necessary to identify specific criteria that can be used to evaluate peformance against the governmental objectives."(13) The selection of criteria depends upon the objectives that are formulated, which means that the definition of the objectives will determine the variables. Hatry also states that the process of selecting the criteria will often suggest the need for revision of the objective. "Thus, the establishing of objectives and criteria are interacting processes."(14) Actually, the definitions of objectives and selection of criteria are the same process, not an interacting process. In a very real way, the selection of criteria operationally defines the objectives. If objectives could be specifically defined, the selection of criteria would be unnecessary.

Ideal properties of the criteria for program analyses are given by Hatry as follows:

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(12) Harry P. Hatry, *Criteria for Evaluation in Planning State and Local Programs*, Committee on Government Operations, U.S. Senate, 90th Congress, 1st Session (Washington, D.C.: Government Printing Office, 1967). p. 5.

(13) *Ibid.*

(14) *Ibid.*

a. Each criterion should be relevant and important to the specific problem for which it is to be used. (This will depend upon the fundamental objectives to be satisfied.)
b. Together the criteria used for a specific problem should consider all major effects relative to the objectives. Enough criteria should be evaluated to cover all major effects. The use of insufficient criteria can be very misleading.
c. Each of the criteria ideally should be capable of meaningful quantification. This involves two major problems. The first is the measurement of the current and historical magnitudes of each of the criteria... The second problem is the estimation of the future magnitude for these criteria for each of the alternative programs being considered.[15]

In addition, the following qualifications are made:

a. Criteria must relate to governmental objectives.
b. There are different levels of criteria.
c. Criteria are grouped under major program areas.
d. More than one criterion will frequently be needed for individual problems.
e. Interactions occur among program areas and among criteria.
f. It will be necessary to distinguish "target groups."
g. Criteria need to be thoroughly defined.
h. Criteria can be expressed in different forms.
i. Estimates of the criteria magnitudes are needed for each year of the plan.
j. A monetary criteria is always needed.
k. The monetary criteria can be very complex.
l. The criteria are not intended for use in organizational evaluations.
m. Measurements of program size are also needed but not as evaluation criteria.
n. Criteria for government-citizen relations may be desirable.
o. Uncertainties and political considerations are additional evaluation factors.
p. Criteria frequently will be difficult to measure.
q. Intangibles will always be with us.[16]

The Educational Intermediate Unit Planning Study Project of the University of Pennsylvania defines an indicator in a much broader sense than the criteria discussed above. It is assumed that:

> Indicators are a major means for communicating *objectives*, *goals*, and *values* among the groups and people involved in an educational unit. Briefly, an indicator is a quantitative measure(providing at least a rank ordering) which measures some characteristics of the educational system or the environment in which it exists. The definition of an indicator must be accompanied by an operationally defined procedure for making the measurement and for scaling it to produce the standard indicator level value. It is not considered necessary to make the indicators compatible with each other or to produce a single overall educational objective (or even a small set of such objectives) by

(15) *Ibid.*, pp. 6-7.
(16) *Ibid.*. pp. 9-21.

weighting such indicators.

> In general, indicators can be grouped for three uses: indicators of input conditions, indicators of process and and indicators of output. (Input levels will not be called indicators, but simply input factors.)...The administrators will be preparing plans, programs and budgets designed to modify the process and output indicator levels.[17]

Activity. An activity is a series of actions of an agent as an individual or as a collectivity. An activity may have an explicit or an unstated objective.

Program. A program is a combination of activities and material resources which is intended to achieve an objective. This is very clear in PPBS usage. The Education PPBS[18] defines a "program" as "an identified set of activities carried out largely under the direction of the educational unit to achieve specific objectives." Another example of the definition of a program states: "A program is a package which encompasses each and every one of the agency's efforts to achieve a particular objective or set of allied objectives... As the foregoing discussion may have indicated, there is a strong conceptual relationship between objective(s) and program. In 'PPBS language', there are no objectives recognized except those which suggests a program designed specifically to fulfill them; and there can be no recognized entity describable as a program unless it is designed to accomplish explicit objectives (consumer-oriented market objectives)." [19]

Depending upon the objectives, the program can be a very simple summation of activities and materials. In any case, the agent should know the rules by which these activities and materials are combined to achieve the desired objectives. This rule can be decreed by the agent or developed out of the knowledge about program components and their compostition rules. When an agent is applying known knowledge about the combination of factors reguired to achieve a given or desired objective then it becomes a problem of technology. There are a number of categories of technology which, assuming that norms of rationality are adhered to, determine possible rational actions in the organization. This is the problem of rationality, which has been extensively analyzed by Herbert A. Simon.[20] The notion of our pure and simple rationality must be modified in the light of the type of available technology in order

(17) Governmens Studies Center, Fels Institute of Local and State Government, University of Pennsylvania, "General Design for an Education Planning-Programming-Budgeting System", (June 28, 1968), pp. 25-26.

(18) *Ibid.*

(19) Greenhouse, *op. cit.*, p. 273.

(20) Herbert A. Simon, *Administrative Behavior* (2d ed.: New York: The Free Press, 1957).

to increase the information regarding the kinds of organizational actions possible under a PPB system.

It is seldom easy to determine the results of any program. The more difficult it is to determine the results or outcome of the program, the more difficult it will be to determine the degree of achievement of objectives by programmed activities. Likewise, the less crystallized the contents of the objective, the more difficult it will be to establish the relationship between a program and its objectives.

In this discussion the importance of recognizing the relational characteristics of such PPBS terms as objectives and programs, and the difference between an analytical concept and its empirical contents has been stressed. An example of confusion in this area occurs in the following passage:

> Essential to PPBS is the concept of a program. However, this concept is not precisely defined, because it must be given a somewhat different interpretation in different organizations. Programs are closely related to the objectives of the organization. In fact, it is in part because the activities of large organizations are often difficult to define and that no single definition of a program is satisfactory. In practice, a number of criteria may be applied in the definition of a program.[28]

This is one example of confusion exhibited by well-informed writers which leaves no meaningful common ground for the discussion and development of PPBS. The example fails to separate the definition of concept "program", from the empirical contents called by the name "program." A program as a concept can be "precisely" defined as above. On the other hand, no observer can enumerate all kinds of programs or all kinds of activities or operations grouped under various programs found in all kinds of organizations for an extended period of time. In fact, there is no need to do so for the purpose of defining the cencept "program."

A different kind of misunderstanding leads to a mild rejection of PPBS. In this case, the relational characteristics of a program are reversed. Instead of deriving programs from the objectives of an agent, some objectives are attributed to existing programs.[22] PPBS critics rightly point out that it is difficult to assign objectives to a program because a program has many consequences and objectives. The trouble is that they are right for the wrong reason. The issue is not assigning objectives to a program, but rather assigning or devising a program or programs to achieve the objectives of an agent.

(21) David I. Cleland and William R. King, *Systems Analysis and Project Management* (New York: McGraw-Hill, 1968), p. 115.

(22) Victor A. Thompson, "The Program Focus Challenge," a paper prepared for the meetings of the American Society for Public Administration held in Boston, March 27-30, 1968.

Programming. The concept of programming is used to identify a process of establishing the relationship between a program and its objectives. Programming itself is an activity which arranges organizational activities and other resources in order to identify or design an appropriate technology for a given objective. Programming must be continuous at all levels of an organization and at all times. What differentiates programming in PPBS is that the product of a particular programming effort is adopted as a program to be used for a certain period of time. Periodic cycles of the budgetary process necessitates that an organization has a relatively stable set of relationships with activities and resources designated as a particular program.

Programming encompasses all phases of efficiency analysis, cost-effectiveness analysis, systems analysis, and other considerations of constraints and limitations of knowledge. These specific aspects will be discussed later under the framework of PPBS calculus.

Program Structure. Program structure refers to the classification and categorization of various levels and kinds of programs found in a governmental jurisdiction. Program structure can vary from one jurisdiction to another, and there can be no "one best way" of subdividing programs into subprograms or categorizing several elements into a program. The programs can be horizontally or vertically divided into subsets. The combination of these vertical and horizontal classifications of the programs of a jurisdiction or an agency constitutes a program structure.

If the rules of PPBS calculus are strictly followed, the statements of the objectives alone should be sufficient to indicate the intentions of an organization. Since, however, many objectives are stated only in vague terms, it is at the level of program structure together with the criteria or indicators used where intentions of the organization become clearer. There is great flexibility in designing a program structure when a given objective is stated in ambiguous terms. This allows several ways of combining activities and material resources, all of which can be claimed to be valid in achieving the objective.

Program Alternative. Program alternative refers to a set of activities and resources that can be combined in order to achieve a given objective. Greenhouse defines it as "other possible programs besides those already decided upon. Consequently, it suggests a comparison of two or more programs (i.e., two or more possible approaches) toward fulfilling the same market objective(s)."[23] Alternatives vary in achieving objectives, and the assumption is that the best alternative will be selected given the criteria and constraints. An evaluation of alternatives together with resource considerations is also a part of program analysis.

(23) Greenhouse, *op. cit.*, p. 273.

Resources. Resources are the manpower, material, equipment, plant, and money that are put into programs.

Planning. Planning is the process of selecting or identifying the overall long-range goals and objectives of the organization and the evaluation of possible courses of action under the constraints and limitations of the environment and technology.

Budgeting. Budgeting under the structure of the goals-mean chain is the expression of resource arrangements with explicit relations established to the organizational programs and objectives, covering a definite period of a budgetary cycle.

The mode of analysis presented thus far is quite similar to that found in the literature of public administration concerned with rational arrangements of group activities. This approach leans more on the side of closed-system logic. In recent years, with the advance of the general systems-analysis, systems engineering and general systems theory of society, open-system logic has been introduced into the study and practice of public administration and organization. PPBS is perhaps the most direct result of this approach. The next three concepts represent the specific influence of open-systems on PPBS.

Output. Output is some product exported into the environment by the system. The definition of a system is arbitrary, and the output will be determined by the definition of a system. "An output must have", Greenhouse says, "conceptually speaking," all of the following properties:

> It is a product (either good or a service).
>
> It is produced by a Federal agency, or is produced under the agency's auspices.
>
> It is tangible outgrowth of a particular program (i.e., it is the result of a calculated program effort).
>
> It is the sort of product which can be appropriately singled-out as an indicator of program results. (Logically, therefore, it must be a program end-product, and an important one, at that.)
>
> It is considered by the agency as satisfying an explicit market objetive (or related set of objectives).

...this idea-connection is highly significant for interpreting the PPBS notion of output."[24] This example of PPBS output is somewhat confused by the different logical requirements of means-end structure and general systems analysis. In a purely analytical sense, there is no requirement that output must satisfy agency objectives. In systems analysis, objectives defined under the structure of means-goal chain become the output.

Only through an engineering type application, does a system become purpose-oriented by the designer of the system. In such cases, the system might well have the product or output which

(24) *Ibid.*, p. 274.

is intended by the designer or definer of the system; through such an engineering device, the connections between the concept of objectives and concept of output are matched. Thus, the question of what kind of output we would like to produce, is in effect a question of what kind of objectives we should have. A purpose-oriented system definition also demands that output definitions should be made explicit. An explicit definition of output will determine the arrangements of the sub-systems of the system.

Through-put or Process. The transformation of the energy available to the system is called the process. Like output, through-put is carried out by some sub-systems of the system. There are numerous ways of constructing the sub-systems and of establishing relationships among the sub-systems which will produce varieties of outputs. Basically, the through-put is the process of relating inputs to outputs through various combinations of interreltionships among the sub-systems.

Input. Input refers to some form of energy imported from the external environment or to some form of energy generated within the system. Input, in empirical terms in governmental organizations, means human and material resources as well as environmental demands and support.[25]

Conceptual Framework of PPBS. The analyitcal concepts of PPBS have been presented in two ways: means-end structure and input-output format. They are summarized below. First, in the means and ends structure the framework is as follows:

a. There is an agent, a decision maker.
b. An agent has at least one goal, and the goal should be made explicit.
c. When the goal is made explicit, it is possible to define at least one objective for the agent, or the agent himself should define at least one objective.
d. And objective is supposed to have one or more variables with associated relationships. When these variables are not readily measurable, it is necessary to identify some lower level variables, called evaluation criteria or indicators.
e. An objective itself, the variables, or the criteria are the results of the summation or interactions of some elements.
f. When these elements of objectives, variables, or cirteria are grouped in a systematic way, it is called a program. A program, therefore, is a collective name given to some group of elements which, in their summation and interaction, are believed to produce the phenomena called objectives.
g. In many cases, arrangements of the elements are made by the agent or his helpers, and the elements can be manipulated or controlled. Often, uncontrollable elements are included in the program.

(25) Definitions of terms used in this portion are from Daniel Katz and Robert L. Kahn, *The Social Psychology of Organizations* (New York: John Wiley, 1966), pp. 17-26.

h. Depending upon methods of arranging the elements, there are a number of varying degrees to which the elements have a one-to-one correspondence with the objectives.

i. When there is a perfect correspondence between an objective and program or programs, the program can be considered very effective.

j. The way of searching for such perfect or near perfect correspondence is called programming, and when all of these phenomena are examined on an extended time dimesion, it is called planning.

k. Objectives and programs must be made explicit in the mind of the agents.

l. When such a structure is applied to an agent called government, the structure repeatedly requires that the government and their officials identify their objectives and programs.

m. In order to make the objectives and programs explicit, empirical data must be gathered and grouped in some meaningful fashion. This is called information gathering.

n. There are at least two ways of assigning specific values to the objectives and elements of programs. One way is by measuring how much satisfaction is obtained by the objectives and programs: another way is by measuring how much sacrifice is incurred. The satisfaction is usually called benefits, utility, or effectiveness. The sacrifice is usually called costs or resources. The satisfaction or sacrifice can be measured by a yardstick of the agent himself or a yardstick provided by the society.

o. Thus, there can be at least two general categories of comparring objectives and programs: one is direct identification of correspondence between objectives and programs: another is an indirect way of comparing them through the comparison of sacrifice and satisfaction.

p. Since a yeardstick of measurement for costs is generally provided by the society in monetary terms, it is considered very useful and necessary to compare the benefits and costs of programs in monetary terms. A tabular presentation of such relationships between programs and costs, covering a certain period, is called a budget in PPBS. In fact, the whole effort of the PPBS is to produce such a document.

When a PPBS structure is presented in "system" language or an input-output format the conceptual explanation is as follows:

a. There is a system, which means that there is a specific level of phenomena composed of interacting events or interactions of objects and their attributes. This can be a government.

b. A system has at least one output which is transacted with environment. Government can produce services and goods which are consumed by an environment called the public.

c. Output is produced by the process called throughput. The throughput can be composed of one or more elements called sub-systems. The specific composition of each sub-system and the particular sub-system interactions will determine the kinds of outputs.

d. Throughput is the process of combining elements.

e. The elements used in the throughput are imported from the environment and this is called input.

f. In a restricted sense, an analysis of the relationships between the input, throughput, and output is called systems analysis. In a broader sense, the search for some durable relationships between the sub-systems of a system is called systems analysis.

g. PPBS is a way of establishing the relationship between input, throughput, and output of the

government in a manner desired by, or felt to be needed by a participant of the system, i.e., the agent or his subordinates.

h. The translation and allocation of inputs in monetary terms to various sub-systems are the process of budget preparation. A budget prepared under such a procedure is believed to be more meaningful because it is based on the knowledge of relationships between sub-systems and outputs of a system.

2. Modes of Analysis

In the previous section, the concepts and analytical structure of PPBS were identified. It must be stressed that such an analytical structure is not equivalent to empirical phenomena; it is an abstract of some phenomena, and it is especially a prescription. The purpose in identifying an analytical structure of PPBS is to construct a framework of PPBS and at the same time to establish structural similarities – isomorphism – between PPBS and other approaches or modes of analysis associated with the PPBS process. In fact, PPBS is a result of convergence between the traditional concern for rational organization and more recent techniques and apporaches of analysis. It is therefore natural to find similarities between some approaches of analysis and the PPBS structure.

The term "modes of analysis" is employed here for convenience to describe several ways of analysis. These analytical approaches range from rigorous formal techniques to nominal identification of ststem elements. Our discussion of selected modes of analysis is expected to accomplish the following:

a. Identification of the structure of a particular mode of analysis.

b. A search of similarities between the structures of PPBS and selected modes of analysis.

c. Identification of the general rules to be applied in interpreting the analytical structure in empirical terms. (It seeme that some specific modes of analysis are restricted by their rules to a particular level of empirical problems.)

d. Identification of the particular modes of analysis which are useful in explaining aspects and levels of PPBS process given the empirical phenomena which are generally considered as the proper organizational domain of government.

e. Some additional factors should be considered in employing the analytical structures in the governmental organizations, or organizations in general. (Items d and e above will be examined in Chapter III.)

Two of the most frequently recommended modes of analysis, cost-effectiveness analysis and systems analysis, are examined below. For convenience, most of the concepts of PPBS will be employed here in order to avoid the troubles of interpreting the terms back and forth between PPBS and those of particular mode of analysis under discussion.

Cost-Effectiveness Analysis. Cost-effectiveness analysis may also be called cost-benefit analysis, cost-utility analysis, and sometimes, operations research and systems analysis. In this initial discussion, "cost-effectiveness analysis" will include both cost-benefit analysis and cost-utility analysis, but will exclude systems analysis.

A generally accepted definition of cost-effectiveness anaiysis is "to compare alternative ways of accomplishing an objective in order to determine the solution that contributes the most at a given cost, or that achieves a given objective at the least cost."[26]

As we have seen above, "effectiveness" is a shorthand expression of a degree of approximation between a phenomenon called the "objective" and phenomena called activities or programs. In a strict sense, cost-effectiveness analysis has the following specifications and solutions.

A. Specifications:
   a. There are a number of existing or potential programs for a given objective.
   b. Each of these programs is called an alternative.
   c. An alternative program can be measured by a scale of effectiveness.
   d. A number of program alternatives may have the same degree or varying degrees of effectiveness, and each alternative can be arranged in the order of its effectiveness.
   e. Each alternative can be expressed by socially given costs or specifically assigned costs, and also can be arranged in the order of magnitude of its costs.

B. Solutions:
   a. If all the alternatives have the same degree of effectiveness, select the one with the least cost.
   b. If all the alternatives have the same cost, select the one with the greatest degree of effectiveness.
   c. If the alternatives vary in effectiveness,
      (1) determine arbitrarily a degree of effectiveness; then an alternative will be shown with a given level of cost, or,
      (2) determine arbitrarily a desired level of cost; then an alternative will be shown with a given degree of effectiveness.
   d. There is no solution for a comparison of the effectiveness of two or more programs for two or more objectives, unless the objectives are some sub-objectives of a higher level objective.

To have a solution for the type of problem identified in item d. above, it is necessary to assign some value to each unit of degree of effectiveness of programs for separate objectives. If a specific scale of values is assigned to the degree of effectiveness, then it might be more appropriate to call the ensuing analysis "cost-utility analysis," or "cost-benefit analysis." There can be innumerable ways of assigning values to the degree of effectiveness; this seems to be

(26) Klaus Knorr, "On the Cost Effectiveness Approach to Military Research and Development", in *Planning-Programming-Budgeting: Selected Comment*, U.S. Senate, *op. cit.*, p. 17.

the main reason why there are so many arguments about the usefulness of such a mode of analysis, because it is difficult to agree upon a particular scale of value. But, in principle, there is no difficulty in assigning any value to the effectiveness of a program. This is also the reason why there should be a clear distinction between the analytical structure and the empirical phenomena.

Cost-benefit (or cost-utility) analysis differs from cost-effectiveness analysis. Cost-effectiveness analysis is, in a strict sense, a comparison of a direct measurement of program effectiveness with an indirect measurement of cost. Cost-benefit analysis is, however, a comparison of two kinds of indirect measurement of a program. Effectiveness is converted into some other value or index.

Fisher[27] enumerates eight characteristics of cost -utility analysis, two of which seem to be relevant to this discussion:

a. A fundamental characteristic is the systematc examination and comparison of alternative courses of action that might be taken to achieve specified objectives for some future time period. It is important not only to systematically examine all the relevant alternatives that can be identified initially but also to ***design additional ones*** if those examined are found wanting. Finally, the analysis, particularly if thoroughly and imaginatively done, may at times result in modifications of the initially specified objectives.

b. Critical examination of alternatives typically involves numerous considerations, but the two main ones are: assessment of the cost (in the sense of economic resource cost) and the utility (the benefits or gains) pertaining to each of the alternatives being compared to attain the stipulated objectives,

When such a conversion of program into terms of two types of values is undertaken, the original specifications and solutions of cost-effectiveness must be modified:

A. Specifications

a. Each degree of effectiveness of a program or programs must be converted to another selected unit value, and may be ordered on a scale.

b. (This is the same as cost-effectiveness analysis.) Each program alternative can be arranged in the order of its costs, either socially given or assigned.

B. Solutions:

a. Since every program now can be assigned some common units of a value, the best alternative is the one with the greatest amount of benefits and least amount of costs.

b. If cost and benefit are measured by the same scale, the best program is the one with the greatest positive amount of benefit minus cost.

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(27) Gene H. Fisher "The Role of Cost-Utility Analysis in Program Budgeting," in Novick, *op. cit.*, pp. 66-67.

c. If there is no common scale devised or given for two or more programs of different objectives, then there is no solution.

What the students of cost-effectiveness call the "limitations" are those cases where there is no common denominator of values or costs:

> First, the cost-effectiveness approach has unlimited power when normative problems are answered by the givens, so that we face a pure and simple problem of maximization, and when all costs as well as benefits are known and can be quantified. This means that the technique is most useful when the objective or output is definitely fixed - that is, when there is only one dependent variable, and the sole task is to minimize the costs which are readily and accurately measured. In these cases, alternative means for achieving the objective differ only in this key variable, and choosing the cheapest means in this sense is the only problem.
>
> On the other hand, it is generally agreed that the approach is less useful in clarifying choices when the employment of defferent means leads to appreciably different outputs. Its usefulness is the more restricted, the more incommensurable the outputs and the more appreciable and unmeasurable the social costs other than those quantifiable in terms of money. This is to say, the usefulness of the technique is more limited, the less the problem is capable of uniform quantification. This limitation is really obvious since rational decisionmaking requires us to maximize the value of all benefits minus the values of all costs or disadvantages...
>
> A second great limitation of the cost-effectiveness approach results from imperfect informtion...[28]

In fact, the above statement of the limitations of cost-effectiveness analysis, though it is more relevant to cost-benefit analysis (or cost-utility analysis), is not very helpful. The kinds of limitations cited above are not limited to a specific type of analysis: they are true in any kind of calculations. Without knowing the values and information, one cannot even add two things.

Yet there is no reason why different scales of measurement cannot be used for benefits on the one hand and costs on the other. A special case exists when one scale can be applied both to the benefits and costs. This scale need not be money value indications. It can be a measurement of some energy. In such cases, it is possible to compute the ratio of cost and benefit, or input and output. The most efficient program is the one which maximizes the input-output ratio. This provides a very specific meaning of efficiency, and this should be kept in mind throughout the discussion because only in case of pure efficiency as defined above is it possible to talk about "economic effiiciency," whether the scale is money or otherwise.

A reasonable conclusion from the analysis of the structure of cost-effectiveness analysis is that cost-benefit analysis is a variation of cost-effectiveness analysis, and the efficiency test is

(28) Knorr, *op. cit.*, pp. 17-18.

the most limited case. It is the same line of logic that makes Wildavsky distinguish "pure", "mixed", and "total" efficiency,[20] although he thinks that cost-effectiveness analysis belongs to "pure efficiency." In this discussion, only the limited case of efficiency tests can belong to "pure efficiency", and cost-effectiveness analysis seems to belong to "mixed efficiency", if such a distinction is justified.

It has been pointed out on several occasions that the analytical structure of an analysis and the empirical contents substituted for the structure must be distinguished for a better understanding of the usefulness of analysis. It seems that the main difficulty of applied analysis is to devise an acceptable measurement scale. We cannot go into the discussion of the problem of measurement here. However, we would argue that for explanation and prediction of phenomena, some objectively valid and reliable scale is needed. Such a scale is the product of a methodology in which a fair amount of inter-subjectivity is necessary. But, if such a scale is not available, then there can be no measurement. To the extent that external and objective criteria are available, an internal and subjective criteria will be restrained from application. Conversely, to the extent that internal and subjective criteria are predetermined, an external and objective criteria will lose usefulness as an explanation and prediction of phenomena. This is not the problem of techniques *per se*. It is the problem of the basic outlook or approaches in handling a given phenomenon.

It seems almost trivial to mention that there are many types of scales: nominal, ordinal, interval, and ratio. These types of scales differ in their logic and power of calculation. In PPBS, the possibility of applying a particular scale may determine the type of analysis. When a ratio scale can be used, the pure efficiency test is possible, and when an interval or ordinal scale can be used, cost-effectiveness and cost-benefit analyses are possible.

As an empirical question, it appears that the higher the level of objectives and programs in a hierarchical order, the less powerful will be the scale available. When there is a possibility of applying only some nominal scale, what type of analytical structure can be used? It seems that systems analysis can cover even such cases. It is somewhat paradoxical that the most complicated and dynamic phenomena should be analyzed by a structure which allows also the least powerful scale of measurement. Conversely, the applicability of such a simple logic of scale allows systems analysis to be very helpful or useful in many areas and levels of phenomena, because even a simple dichotomous scale of, for example, existence or nonexistence

(29) Wildavsky, *op. cit.*

of certain variables and relationships can enhance the level of understanding of components and their interactions.

Systems Analysis. Several additional aspects of systems analysis remain to be discussed. First, the idea of system is a concept and a way of defining an object or related objects. Second, from a concept and object definition, varieties of analysis are derived depending upon the area and the level of phenomena to be dealt with. Third, as a specific application, decision-making in an organization is frequently treated in a framework of systems analysis. In such cases, systems analysis becomes a methodology for solving a given problem. And finally, decision-making analysis within an organization viewed as a system forms the paradigm of analysis for the PPBS process.

"System" as a concept is a way of representing some elements or events which interact over time, or elements in a state of affairs and their relationships. The concept "system" may be defined "as an organized or complex whole; an assemblage or combination of things or parts forming a complex or unitary whole."(30) It is also a way of defining an object or making some demarcations of certain events or levels of phenomena. In such cases, a phenomenon which manifests certain characteristics is called a "system" by definition. Since any level of any phenomenon can be called a system, it almost reaches a point of triviality, but at the same time, it enables an analyst to consider a given level of phenomenon as a whole instead of examining separate elements in isolation.

Systems analysis as an analytical consept is,however, an abstraction of an empirical phenomenon called "system." The distinction between an analytical and an empirical system is emphasized in formal systems analysis. To repeat, certain events and levels of phenomena may be defined as an empirical system using the concept of a system; such an empirical system may be composoed of certain patterned interactions of the elements and these interactions and elements can be abstracted out; in formal analysis, these abstract elements and their interactions in turn form a system in themselves - an analytical system or a model of an empirical system. Such a distinction is necessary for an understanding of many applications of systems analysis.

General systems analysis in a formal sense is an analysis of abstracted elements of systems defined either empirically or analytically. It is a comprehensive examination of interacting elements. The elements are usually called sub-systems and sub-systems are in turn composed of some items which are sub-systems of sub-systems. In this sense, systems analysis is an

(30) Cleland and king, *op. cit.*, p. 10.

analysis of interactions of sub-systems of a system.

At a more general level of discussion, it may not be necessary to differentiate the various applications of general systems analysis. At a lower level, what differentiates systems analysis in one field from another is not due to its formal system, but due to the specific phenomenon which is defined as a system and handled by such formal analysis. The phenomena that can be treated by systems analysis encompass the whole universe, from physical things to biological living organisms to human interactions. Among the latter, organizational behavior and decision-making phenomena are frequently examined.

Decision-making in an organizational context is presented as follows: there is a decision-maker, and he is faced with selecting alternative courses of actions to pursue his objectives; he needs, in the organizational context, a set of concepts and procedures which will aid him in identifying and developing alternatives; and the ideas and techniques associated with systems analysis are believed to provide such a base.(31)

Approaching systems analysis in this way suggeests the following process:

a. Systematic examination and comparison of those alternative actions which are related to the accomplishment of disired objectives.
b. Comparison of alternatives on the basis of the resource cost and benefit associated with each alternative.
c. Explicit consideration of uncertainty.(32)

"Systematic examination and comparison" of alternatives can be done by using many types of scales of measurement and techniques of analysis, but, very often, a general category of cost-effectiveness or cost-benefit analysis is suggested as an appropriate approach. It is not necessary that systems analysis must be associated with existing techniquses or an approach which is narrowly defined. This point will be elaborated further after one more example of systems analysis in the organizational decision-making context.

John K. Parker, in his "Introduction to Systems Analysis,"(33) defines systems analysis as "both a general approach to problem-solving and a group of scientific techniques drawn from many fields and disciplines that are used in solving particular problems", and suggests that "Even though the systems approach is so broad that it may be applied widely, the typical use of the systems approach in business and government has to do with finding the best alternative (or at least one good anternative) for achieving a specific objective". Defined as such and

(31) *Ibid.*, pp. 20-21.
(32) *Ibid.*, p. 23.
(33) "Introduction to Systems Analysis", Management Information Service, International City Managers' Association, Report No. 298 (November 1968), pp. 1-2.

related to governmental problems in this way, the process of systems analysis is thought to comprise the following eight steps: (1) determination of need, (2) definiton of objective, (3) identification of constraints, (4) generation of alternatives, (5) analysis and selection of an alternative, (6) development and pilot implementation, (7) evaluation, and (8) feedback and modification. Up to step four, systems analysis can proceed without comparing efficiency or effectivenss of a program. It is basically a "yes-no" operation - nominal measurement. One of the advantages of the above example is that it does not associate systems analysis with narrowly defined techniques: otherwise systems analysis becomes merely the summation of all existing techniques of problem solution.

It is, however, unfortunate that many writers on this subject do not differentiate the scope and power of various modes of analysis associated with the PPBS process. Often a discussion of cost-effectiveness analysis extends into systems analysis, and a discussion of systems analysis ends with the presentation of cost-effectiveness analysis.[34] Of course, they are closely related in two aspects: they are addressed to the same types of problems and the analytical principles are quite similar.

In order to clarify later the relationship between these modes of analysis and PPBS, it is necessary to differentiate the modes of analysis identified above. This will be done on the basis of their scope of application and power of calculation. Using the four types of scales mentioned above, the moder of analysis are compared in Table 1.

TABLE 1. TYPES OF SCALES AND MODES OF ANALYSIS

	Types of Scales			
Modes of Analysis	Nominal	Ordinal	Interval	Ratio
Systems Analysis	×	×	×	×
Cost-Effectiveness Analysis		×	×	×
Efficiency Test				×

Systems analysis can be used in all cases; cost-effectiveness analysis is possible only when at least ordinal or interval scales for measurement of variables (or cost and benefit indicators or descriptors of outcome or program results) are available; and finally, efficiency tests can be performed only when a ratio scale is available. These three modes of analysis, in their scope and power of calculation, form in a sense a Guttman scale. Systems analysis is the most

(34) See, Fisher, *op. cit.*, Alain C. Enthoven in *Planning-Programming-Budgeting*, *op. cit.*, and Cleland and King, *op. cit.*

extensive in its scope while the efficiency test is the most limied; on the other hand, systems analysis can sometimes be less rigorous in calculation, while the efficiency test is the most powerful and rigorous in its calculation (in that few would dispute the results of calculation).

It may be such relationships that lead writers to include cost-effectiveness analysis and efficiency tests in dicussions of systems analysis, because when it is possible to do meaninful cost-effectiveness analysis, then it is also possible to perform a systems analysis; but, sometimes, not vice versa. In this respect, Wildavsky's penetrating analysis of cost-effectiveness analysis, systems analysis, and program budgeting seems to be quite relevant.[35] He shows at least that the range and scope of problems dealt with by each of these modes of analysis differ from each other, although his concern for the dominance of economic rationality seems to be overdrawn.

The fourth point set forth at the beginning of this section was that decision-making within the framework of an organization as a system forms the paradigm of a mode of analysis for the PPBS process. Since the structure of PPBS is formulated as a problem solver in organizations, a similarity between systems analysis when presented in the context of organizational decision making, and the recommended modes of analysis for PPBS is expected. It may not be necessary to enumerate the steps recommended for PPBS systems analysis, but one example will be useful.

In *Program Planning for State, County, City,*[36] John Cotton says that systems analysis is primarily focused on "the interpretation of broad objectives and guideliness, and the structuring of information in such a way that the decision-maker can see and evaluate the options available to him", and that the realistic goal of systems analysis is "the improvement of decision-making process, not the creation of a mechanism that automatically produces ideal decisions". The following identifiable steps are considered to characterize the systems analysis process:

a. Definition of the public problem.
b. Projection of determinants of the problem.
c. Generation of alternative approaches that government might use to attack the problem.
d. Cost-effectiveness evaluation of the alternatives.
e. Interpretation of quantitative results.

These steps can be elaborated further as three distinct phases. The first phase is the deter-

(35) Wildavsky, *op. cit.*
(36) Harry P. Hatry and John F. Cotton, *Program Planning for State, County, City*, State-Local Finance Project of the George Washington University (Washington, D.C.: 1967).

mination of the organizational domain in which the possible range of organizational actions are examined and enumerated. In this phase of search and selection, technical feasibility and economic efficiency have very little to do with the problem, and the determination of organizational domain can be done simply by counting the elements to be included in the domain. The second phase is the selection of technically feasible solutions for the selected and enumerated state of affairs consi-dered to be desirable. Still, no consideration of cost and benefit is involved. At the third phase of the process, the costs and benefits of selected alternatives become relevant to evaluation of the alternatives. The point is that ultimately, in rational decision-making, all of these three phases must be considered together in order to achieve an objective for which cause/effect rela-tionships can be established, and for which a cost-benefit ratio can be max-imized. At the same time, there is no reason why the first or the second phase alone cannot be done in organiza-tional decision-making.

This discussion has indicated the structural similarity between systems analysis and the PPBS process: in fact they are identical when PPBS is described in terms of systems analysis, or systems analysis is described in terms of PPBS concepts. To give an example that such a point is sometimes not made clear, the following passage is quoted:(37)

> Although there is *no theoretical connection* between the planning-programming-budgeting system (PPBS) which has been instituted in the Federal government in recent years and any individual's narrowly defined field of inquiry called "systems analysis", there is *a definite link* between analysis and PPBS. In practice, *the basic ideas* of systems analysis and the approaches which lead to successful planning, programming, and budgeting are the same. (Emphasis supplied)

It is very confusing to hear that PPBS and systems analysis have no theoretical connection but at the same time there is a definite link between the analysis and PPBS. Such a statement could be construed to mean that there is no connection between systems analysis and PPBS as empirical theories, if they were, but there are structural similarities between systems analysis and PPBS both as calculus. The possibility of using systems analysis as an analytical model for PPBS justifies its use in the PPBS process. Otherwise, there is no point in talking about systems analysis as relevant to PPBS.

It has been argued in this chapter that PPBS is composed of justifying values and norms, calculus, and empirical interpretation rules, and that a conceptual framework of PPBS can be built more meaningfully if these component aspects are differentiated and recognized. The point may be made calearer with an example.

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(37) Cleland and King, *op. cit.*, p. 114.

The phenomenon called "voting" involves three aspects: (1) a political philosophy which justifies the phenomenon as a way of making a collective decision for a political system, (2) a simple arithmetic rule of addition, and (3) rules for empirical interpretation of symbols of arithmetic - in this case, rules that enable us to define what constitutes a "vote". In the above example, no one would argue that the "voting" is arithmetic and therefore claim that philosophy and rules of interpretation are not relevant, or claim that the rules of empirical interpretation are so varied in several countries that simple arithmetic addition rules are invalid, or claim that, since such arithmetic is also used in a dictatorship, we should not use the arithmetic and 1+1 should henceforth become 3.

In PPBS discussion, these aspects are either misunderstood or omitted from the discussion. It must be reiterated that PPBS is based on particular justifying beliefs and norms, uses some specialized calculi, and has organization-specific rules of interpretion - the solutions to which are not as simple as voting, because PPBS uses more complicated and "sohpisticated" rules than those of addition, and empirical phenomena covered by PPBS encompass virtually all aspects of human life in collectivity.

Thus far the norms and calculi of PPBS have been identified. The next task is to discuss some of the problems associated with rules of interpretation. The problems will be treated by an analysis of the dimensions of rationality.

C. RECAPITULATION

The basic approach of this paper was presented, in Chapter I, in terms of administrative theory. Continuing this theoretical focus, this chapter has connected the norms and calculus of PPBS with norms of public administration. In other words, the philosophical and analytical framework of PPBS have been emphasized. The present discussion of PPBS extends the current literature by emphasizing (1) integration of PPBS with administative theory, (2) differentiation of norms and calculus of PPBS, (3) development af a framework of PPBS based on its core concepts, and (4) differentiation of the selected modes of analysis associated with PPBS.