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A CONCEPTUAL MODEL OF MANAGERIAL TRAINING IN THE PLANNING-PROGRAMMING-BUDGETING SYSTEM OF THE FEDERAL GOVERNMENT AND AN EVALUATION OF CURRENT TRAINING EFFORTS

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INTRODUCTION

INTRODUCTION

One of the most comprehensive management tools ever devised in the public sector is the Planning-Programming-Budgeting System (PPBS). PPBS was first introduced in the Department of Defense (DOD) in 1961 by Secretary of Defense Robert S. McNamara. In 1965, President Lyndon B. Johnson made the system mandatory for all agencies of the Federal Government.

The study of the managerial practices and systems of the Federal Government is particularly appropriate at this time. The rapid expansion of government activities is well recognized. In 1900 the Federal Government spent only $521 million. By 1940 the government's expenditures had increased to $9 billion, and by 1967 to almost $126 billion.[1] As the Federal Government consumes more of the resources of this nation, its management tools should be subjected to increasing scrutiny. Since the Planning-Programming-Budgeting System represents one of the major management tools of governmental agencies, it should come under this scrutiny.

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[1]Percival Flack Brundage, The Bureau of the Budget, pp. 242-44.

Purpose of This Study

The objective of this study is to evaluate current managerial training efforts in the Planning-Programming-Budgeting System in the Federal Government. To accomplish this purpose, two distinct sub-tasks were involved: a conceptual model[1] of managerial training had to be built; a survey of current training/educational programs had to be conducted; and these programs had to be compared to the model.

This type of study differs markedly from the current major works on PPBS. These studies can generally be divided in two categories. First, there are books which concentrate on the weaknesses of traditional budgetary practices and propose, in broad general terms, a PPBS-type system. Two major books of this type are Frederick C. Mosher's Program Budgeting: Theory and Practice (1954) and Arthur Smithies' The Budgetary Process in the United States (1955). These books are primarily concerned with the political budgetary process.

Other studies may be considered general descriptive literature about PPBS. Four major works exist in this classification. Program Budgeting, edited by David Novick in 1965, advocates the use of the DOD's PPBS by the non-defense sectors of the Federal Government. Program Budgeting

[1]The term "model" in this study is used in a descriptive rather than an analytic form.

and Benefit-Cost Analysis, edited by Harley H. Hinrichs and Graeme M. Taylor in 1969, is a collection of progress reports of the first three years of operation of a total Federal Government PPBS. Planning, Programming, Budgeting: A Systems Approach to Management, edited in 1968 by Fremont J. Lyden and Ernest G. Miller, is a collection of descriptive articles about PPBS. These three books are advocatory descriptions of the system. The Planning-Programming-Budgeting Approach to Government Decision-Making by Harold A. Hovey (1968) is a descriptive evaluation of PPBS from an opposing view.

In addition to these major works there are a large number of books and articles which discuss specific aspects of PPBS. Most of these are limited to one part of PPBS or to one benefit (or limitation) of the system.

The institution of a major system change such as the use of PPBS in the Federal Government has a major impact at the managerial level. The managerial group is expected to participate in the design of the system; they are required to implement it; and they use it as a managerial tool. The determination of what training is necessary before these managerial responsibilities can be met and the assessment of the success of this training is an essential undertaking if PPBS is to ever achieve its potential.

Methodology of Study

Conceptual Model of Training

The development of a conceptual model of managerial training on the Planning-Programming-Budgeting System may be classified as basic research. The objective of this research is to establish a hypothesis which can then be tested.

The objective of any form of training is to effect a change in behavior. Before establishing an effective training program, two determinations must be made. These are the present behavior of the potential trainees and the desired behavior of the potential trainees, and both can be inferred from the potential state and present state of PPBS.

There have been many articles and books written about the theoretical state of an "ideal" Planning-Programming-Budgeting System. On the other hand, the current state of PPBS in the Federal Government has been well documented by other writers and by investigations and reports of the General Accounting Office and Congressional Committees. Because of this available data, field research in these areas would be duplicative and was not required.

After the identification of necessary managerial behavior changes, the development of the conceptual training model required the synthesis of two defined bodies of knowledge -- the PPBS and the training concepts. It was necessary to define the specific changes in attitude, knowledge, and skills that would be required before managers could be

expected to perform the three management functions connected with PPBS -- the planning or design of the system, the implementation of the system, and the daily use of the system.

From the literature available on PPBS, the requirements for design and use of PPBS could be defined. Implementation of PPBS, however, is largely ignored in current literature. Since implementation requires an organizational behavior change, requirements in this area were developed by a synthesis of the bodies of knowledge of PPBS and planned change of organizations.

A complete program of training was not developed in this model. The choice of types of presentation -- lecture, structured discussion, case study, problem laboratory, etc. -- depends on several factors, including the qualifications of the individual instructor. Therefore, a general model including details commonly associated with a complete training plan is not feasible. The model concentrates on specific objectives of training that should be covered. It is not a trainer's handbook for a managerial PPBS course but a skeleton model for purposes of evaluation of current training programs.

Evaluation of Current Educational/ Training Programs

With the model completed, the current training programs had to be compared to the model. This sub-task involved two steps. These were data-gathering and analysis and evaluation.

During the data-gathering phase, the institutions which teach PPBS in the Federal Government had to be identified. These institutions were divided into two broad classifications -- those whose purpose is training and those whose purpose is education. Under the second classification universities which have courses that concern PPBS as a part of their curriculum were identified by a review of their bulletins. Institutions which offer short training courses in PPBS were identified by two means. First, the catalogs of specific institutions such as the armed services professional schools were reviewed. Second, agencies directly involved in PPBS training, specifically the Office of Management and Budget and the Civil Service Commission, were contacted to identify specific courses appropriate to this survey.

Next, it was necessary to gather enough data to compare the training offered to the conceptual model. A basic questionnaire was sent to each of the appropriate institutions.

After the data was gathered, analysis and evaluation was possible. Some data was amenable to objective evaluation -- e.g., the number of hours of education/training on PPBS. However, much of the analysis and evaluation was subjective in nature.

Scope and Limitations of the Study

This study was bounded by four main factors: the target of the training, the number of organizations using a Planning-Programming-Budgeting System, the institutions surveyed, and the limitations of the questionnaire data-gathering technique.

Training Target

This study was designed to identify the training needs of a specific classification of individuals involved in the Planning-Programming-Budgeting System -- the managers in the public sector. Obviously this is only one class of individuals concerned with this system. Other classifications would include those technicians who perform the technical operation of PPBS (such as the comptrollers who deal directly with the budget and the systems analysts who perform analytical tasks involved in PPBS). Since governmental budgeting is a major part of the political process, political scientists are also concerned with the study of PPBS. This study is not directed toward the needs of these classifications since their training needs may be different from those of the managerial group.

One result of this limitation concerns the summary conclusion about PPBS training efforts. While these efforts may be considered inadequate from the point of view of the manager's needs, this does not necessarily imply that they are inadequate to meet the needs of one of the other groups

concerned with PPBS.

Organizations Using PPBS

PPBS has been implemented by most of the agencies of the Federal Covernment. In addition, several states, counties, cities, and other nonfederal agencies have implemented PPBS. This study is concerned totally with the training needs of managers in the Federal Government. The efforts of the states and local governments were considered only as they gave increased knowledge of the managerial tasks required by PPBS in the Federal Government.

Institutions Surveyed

Short governmental training courses were easily identifiable. Educational courses were listed in various places in the bulletins of different schools. Applicable courses were primarily located in Political Science, Public Administration, Economics, Management, and Accounting departments.

It is possible that this method of screening overlooked some appropriate courses because of the vagueness of descriptions in university bulletins; there may have been new courses that were not included in the bulletins; and the PPBS concept may have been a significant part of the course offerings of a department not listed above. However, the screening should have ensured that the majority of appropriate institutions were contacted.

Limitations of Questionnaires

The use of questionnaires as a data-gathering device has two basic limitations. First, a sufficient percentage of the population surveyed must return the completed questionnaires. In order to ensure as high a percentage of returns as possible, the following procedures were used:

1. The surveys were addressed to the individual department involved, e.g., the Political Science Department or the Management Department, and not just to the university in general. If more than one department was involved at a single university, separate requests were sent to each.
2. Courses that appeared appropriate to the survey were identified by number and name. In addition, the department was asked to identify any other courses applicable to the survey.
3. Each questionnaire was accompanied by a personal letter.
4. A stamped return envelope was provided.
5. The questionnaire was designed to require a minimum amount of time and effort to complete.

The second limitation inherent in the use of a questionnaire for data-gathering is the possible ambiguity of communications in the questions asked and the replies received. An explanation sheet was sent with each survey questionnaire, giving a complete explanation of the type of information desired. It was also possible to adapt the covering letter to the specific circumstances of the institution involved.

Organization of Study

This study is divided into three major sections: Description of the Planning-Programming-Budgeting System, the Conceptual Training Model, and Current Training and Recommendations.

Part I: Description of PPBS

This part of the study sets the basis for development of specific behavior changes requiring managerial training to be presented in Part III. There will be a description of the "idealized" Planning-Programming-Budgeting System as presented by its advocates, as well as a historical summary of PPBS. The conceptual description of PPBS and its historical development are important not only as a basis for developing the training model, but certain aspects of these subjects will necessarily be a part of the training model. Much of the information required in the model will be brought together from the diverse and fragmentary sources on PPBS. Finally, there will be a view of the state of PPBS as implemented in various governmental activities.

Part II: Conceptual Training Model

The conceptual model to be used as a base line for evaluation of current managerial training/educational efforts is developed in this part. A general training model is at first presented and then expanded in more detail.

Part III: Current Training and Recommendations

The findings of the questionnaire survey and over-all conclusions and recommendations for future action or study will be presented in this part.

PART I

DESCRIPTION OF THE PLANNING-PROGRAMMING-BUDGETING SYSTEM

CHAPTER I

DESCRIPTION OF THE PLANNING-PROGRAMMING-BUDGETING SYSTEM

PPBS Philosophy

Premises of PPBS

The philosophy that underlies PPBS is based on two premises:

1. Policy and budgets are inseparable. The budget is a concrete plan of action that translates goals into reality. The relationship between policy achievements and budgetary actions should be explicit.[1]

2. Decisions made during the budgetary process implicitly determine the allocation of limited resources to achieve policy objectives. The government should weigh the desirability of spending money for a specific program against the desirability of spending the money in some other program or of lowering taxes. The same general criteria should be used to eliminate obsolete programs.[2]

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[1]B. D. Bradley, Some Views on Program Budgeting, p. 1.

[2]Charles L. Schultze, "The Federal Budget: The Need for Choice," Business Horizons, IX (Summer, 1966), 10.

Characteristics and Components of a PPBS System

The Planning-Programming-Budgeting System is characterized by three attributes. These are:

1. It is output oriented. Explicit identification of the objectives and goals of governmental programs is desired. The emphasis is placed on accomplishments of programs, as described by outputs, rather than on traditional input items. This output orientation is reflected in the structuring of expenditures by mission/objectives and in relating these inputs to specific program outputs.[1]

2. It is future oriented. The PPBS concept calls for explicit identification of the future-year implications of budgetary and policy decisions.[2] This future orientation is reflected in the primary use of PPBS -- strategic planning.[3]

3. It is analytically oriented. Systematic analysis to identify objectives, to determine alternative ways of carrying out these objectives, and to estimate the cost and expected results of each is a major part of PPBS. This analysis must then be integrated into the budgetary/policy-making process.[4]

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[1]Harry J. Hartley, Educational Planning-Programming-Budgeting: A Systems Approach, p. 90.

[2]Joseph H. Murphy, "The Quiet Revolution in Government Planning Techniques," Management Review, LVII (April, 1968), 7.

[3]Hartley, Educational Planning-Programming-Budgeting, p. 90.

[4]Murphy, "Quiet Revolution," p. 7.

Each of these major characteristics is reflected in the major components of PPBS. The output orientation is seen in the program structure; the future-year orientation in the multi-year program and financial plan; and the analytical orientation in the systems analysis and system of integration of other components.

Program Structure

The first component, program structure, relates the output oriented programs of the government to the specific resources required to implement these programs, in terms of budget dollars required.[1] The following terms are used in describing the program structure:

> The program structure is: A set of program categories, program subcategories, and program elements. Usually the term has reference to a single agency.
>
> A program category is: A classification within a program structure which groups programs which have the same or similar objectives.
>
> A program subcategory is: A subdivision of a program category. It combines agency programs or activities on the basis of narrow objectives within the broader objectives of the program category.
>
> A program element is: A subdivision of a program category (or subcategory) which comprises the specific products that contribute to an agency's objective(s).[2]

To illustrate these definitions a portion of the program structure for the Department of Health, Education and Welfare

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[1]Hartley, Educational Planning-Programming-Budgeting, p. 76.

[2]U. S., General Accounting Office, Glossary for Systems Analysis and Planning-Programming-Budgeting, (1969), pp. 52-53.

is shown in Table 1.[1]

The program categories reflect the major missions (or goals) of the agency. These are determined by looking outside the agency in question at the service that should be provided.[2] This idea of program structuring implies that the organization should generate services that meet the current needs of its "clients" rather than having its "clients" accept services that have historically been provided.[3] The program subcategories are a refinement of the objectives stated in the program categories.

Program elements constitute the basic building block of the program structure. The program element is a single activity or a group of activities with the following characteristics:

> (1) They should produce clearly definable products, which are quantified wherever possible; (2) wherever feasible, the output of a program element should be an agency end product -- not an intermediate product that supports another element; and (3) the inputs of a program element should vary with changes in the level of output, but not necessarily proportionally.[4]

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[1]The program structures including all program categories and subcategories for the Department of Health, Education and Welfare and two other government agencies are shown in Appendix A-1.

[2]James E. Webb, Space Age Management, p. 75.

[3]California, State Personnel Board, Program Budgeting in California: A Critical Comment, by Len Silvey, (April, 1970), p. 9.

[4]U. S., Executive Office of the President, Bureau of the Budget, Planning, Programming, Budgeting (PPB) System, BOB Bulletin No. 68-9, (April 12, 1968), p. 3.

TABLE 1

ILLUSTRATIVE PORTION OF PROGRAM STRUCTURE OF HEW PROGRAM SUBCATEGORIES

Program Categories	Program Subcategories	Program Elements
Education		
	Development of basic skills	
	Development of vocational and occupational skills	
		Improving the education of the general population
		Improving the education of the economically and socially disadvantaged
		Improving the education of the physically and mentally handicapped
	Development of academic and professional skills	
	Library and community development	
	General research (non-allocable research)	
	General support	
Health		
Social and rehabilitation services		
Income maintenance		
Executive direction and management (Office of the Secretary)		

Source: Jack W. Carlson, "The Status and Next Steps for Planning, Programming, and Budgeting," in The Analysis and Evaluation of Public Expenditures: The PPB System, ed. U. S., Congress, Joint Economic Committee, Vol. II, 1969, pp. 746 and 655.

Program elements do not necessarily correspond to the organizational structure of the agency. It is likely that more than one organizational unit contributes to a single program element and that a single organizational unit performs functions that apply to more than one program element.[1]

Program elements also do not directly correspond to the traditional appropriation categories. For example, in the program element, "Improving the education of the general population," which is shown in Table 1, the following appropriation categories supply funds:

Expansion and improvement of vocational education:

- Grants to states
- Innovative occupational programs
- Vocational and technical education construction

Higher educational activities:

- Undergraduate equipment
- Strengthening developing institutions
- NDEA student loans
- Guaranteed loans
- College work study
- Facilities construction

Research and development[2]

These appropriations can also supply funds for other program elements.

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[1] Ibid.

[2] Jack W. Carlson, "The Status and Next Steps for Planning, Programming, and Budgeting," The Analysis and Evaluation of Public Expenditures: The PPB System, U. S., Congress, Joint Economic Committee, Vol. II, 1969, p. 655.

This lack of congruence of appropriation categories and program elements creates a need for a "crosswalk" which translates dollar requirements for program elements into the traditional appropriation categories. This crosswalk imposes a heavy data-processing work-load which can be handled only by the use of automatic data-processing equipment.[1]

Multi-Year Program and Financial Plan

The second major component of the Planning-Programming-Budgeting System is the multi-year program and financial document. This document is called the Program and Financial Plan (PFP) in the Federal Government, and it projects financial and program data for a period of five years.[2] Bureau of the Budget Bulletin No. 68-9 states:

> The PFP is a comprehensive multi-year summary of agency programs in terms of their outputs, costs, and financing needs over a planning period covering the budget year and 4 future years if this is appropriate to agency programs. . . . the PFP is the basic planning document of the agency PPB System.[3]

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[1]The magnitude of this data-processing task becomes evident when one considers that the Department of Defense alone has nearly 1,000 separate program elements in its 9 major program categories and over 500 separate appropriation accounts. A crosswalk matrix would then have a size of 1000 by 500. (Committee for National Objectives, Budgeting for Economic Development, (January, 1966), p. 35.)

[2]The Department of Defense projects program data (number of aircraft wings, etc.) for a period of eight years and cost data for a period of five years. The majority of other agencies in the Federal Government project both financial and program data for five years.

[3]U. S., Executive Office of the President, Bureau of the Budget, Planning, Programming, Budgeting (PPB) System, BOB Bulletin No. 68-9, (April 12, 1968), p. 2. (italics added)

The PFP expresses the outputs[1] and costs for each program element in the program structure and aggregates these projections into program subcategories and categories. Financing needs are projected by the traditional budget appropriation categories.

The level of programs projected originally was that which the agencies felt would be required in the future. This was changed by Bureau of the Budget (BOB) Bulletin 68-9; future-year projections now include only those where the government is "committed by law or contract" or those that are "logically or morally compelled by past decisions."[2] The basic purpose of the PFP with these guidelines is to identify the future consequences of current budgetary decisions.[3]

The fact that expenses are projected for a period of five years does not imply that more than single-year appropriations are involved. Also, the projection of cost does not involve a firm commitment since circumstances may change so that "logical or moral" commitments should be canceled;

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[1]Outputs are only included when a quantitative measure (or measures) of benefit have been defined for the program element, subcategory or category.

[2]The phrase "logically or morally committed" is one that is especially ambiguous. A summary of the classification scheme used to minimize this ambiguity is contained in Appendix A-2.

[3]Carlson, "Status and Next Steps," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. II, 1969, p. 619.

even contract or legal commitments can be changed. The purpose of the projection is to improve planning -- not to prematurely and irrevocably commit the government to a course of action.[1]

Systems Analysis

The third component of the Planning-Programming-Budgeting System is systems analysis. While the program structure and the multi-year financial and program plan are the two central documents in PPBS, the use of systems analysis is the "heart" of the system.

Definition of Systems Analysis

The words "systems analysis" are particularly prestegious and are used by many writers in a casual manner. In a narrow context, systems analysis means a " . . . part of the family of analytical techniques known as simulation."[2] The users of the term in this context generally view systems analysis as a collection of techniques that are solely quantitative in nature. As such, the applicability of systems analysis to problems in the government sector is severely limited.

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[1]Charles L. Schultze, "Why Benefit-Cost Analysis," Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 3-5.

[2]Helen O. Nichol, "Guaranteed Income Maintenance: A Public Welfare Systems Model," Planning, Programming, Budgeting: A Systems Approach to Management, ed. by Fremont J. Lyden and Ernest G. Miller, pp. 315-16.

In a broader context, systems analysis may be described as " . . . a way of looking at problems."[1] As such, systems analysis does not depend on specific techniques. Many analytical techniques are useful, but not as alternatives to the use of good judgment. Systems analysis has also been called any systematic approach to the evaluation of cost, effectiveness, and risks of alternatives.[2]

One formal definition of systems analysis used in the Federal Government's PPBS effort is:

> Systems analysis may be viewed as the search for and evaluation of alternatives which are relevant to defined objectives, based on judgement and, wherever useful, on quantitative methods, with the objective of presenting such evaluations to decision-makers for their consideration. It emphasizes the system concept under which any course of action designed to achieve an objective is viewed as a system requiring inputs and producing outputs. The inputs and outputs involved may take on any of a large variety of forms. In this sense, systems analysis encompasses both cost-benefit and cost-effectiveness analyses as well as other types of analysis which may be more limited in scope.[3]

Another, and possibly more operational, definition of systems analysis because of its stress on definition of alternatives was noted by E. S. Quade (one of the early pioneers in the use of systems analysis for military problems) as:

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[1]Charles J. Hitch, "The Case for Cost-Effectiveness Analysis," Defense, Science, and Public Policy, ed. by Edwin Mansfield, p. 86.

[2]E. S. Quade, Pitfalls in Systems Analysis, pp. 1-2.

[3]U. S., General Accounting Office, Glossary, p. 67.

> . . . inquiry to aid a decisionmaker choose a course of action by systematically investigating his proper objectives, comparing quantitatively where possible the costs, effectiveness, and risks associated with the alternative policies or strategies for achieving them, and formulating additional alternatives if those examined are found wanting.[1]

Systems Analysis -- Provider of Solutions or Information?

Systems analysis required for most governmental PPBS applications is still largely a form of art. As E. S. Quade noted:

> . . . in systems analysis we have to do some things we think are right but that are not verifiable, that we cannot really justify, and that are never checked in the output of work. Also, we must accept as inputs many relatively intangible factors derived from human judgement, and we must present answers to be used as a basis for other judgements. Whenever possible this judgement is supplemented by inductive and numerical reasoning but it is only judgement nonetheless.[2]

Because of the high content of judgment involved in the application of systems analysis, it cannot be expected to determine an "optimum" solution. The purpose of systems analysis is to structure and define the problem and present to the decision-maker an appropriate set of alternatives in a summary which is as accurate, complete, and meaningful as possible.[3] In other words:

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[1]E. S. Quade, "Introduction," Analysis for Military Decisions, ed. by E. S. Quade, p. 4.

[2]E. S. Quade, The Limitations of a Cost-Effectiveness Approach to Military Decision-Making, pp. 7-8.

[3]Alain C. Enthoven, "Systems Analysis and the Navy," A Modern Design for Defense Decisions, ed. by Samuel A. Tucker, p. 161.

> . . . the function of analysis is not to automate decisionmaking but rather to present a greater stock of information in usable form to assist a decisionmaker in the selection of wiser or more rational courses of action.[1]

Systems Analysis Compared to Operations Research[2]

Since systems analysis evolved from World War II experience with operations research (OR), it is not surprising that the two disciplines are very similar. Since World War II, OR has become a discipline noted for its development of mathematical techniques (linear programming, dynamic programming, queuing theory, etc.) and for its ability to find new applications for these techniques.[3]

In most PPBS writings a distinction is drawn between OR and systems analysis by the types of problems upon which each operates. If problems could be viewed in a spectrum, operations research would operate on the end where: criterion are obvious and well defined; relatively few variables enter the system; interaction with other systems is a minimum; a minimum of technological and environmental uncertainty

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[1]William E. Hoehn, Economic Analysis in Governmental Decisionmaking, p. 1.

[2]Other terms are used in the PPBS literature as synonyms of systems analysis. The most prominent of these are economic analysis and program analysis. Some authors do not distinguish between operations research and systems analysis. In order to achieve a consistent terminology, systems analysis will be used in the broad context in lieu of the other terms and operations research will be considered only in the more restricted sense.

[3]Quade, "Introduction," Analysis for Military Decisions, ed. by Quade, pp. 6-7.

exists; quantitative factors dominate the problem; emphasis is placed on the application of techniques; and an optimal solution is desired. By contrast, systems analysis operates on the other end of the spectrum, where: choice of objectives is a major part of the analysis; the long-range nature of the problem makes most of the factors of the system variable; a high degree of interaction with other systems exists; environmental and technological uncertainty exists to a high degree; qualitative factors often dominate the problem; emphasis is placed on problem search and definition; and better and more usable information for the decision-maker is desired.[1]

As one might expect, the ends of the spectrum are better defined than its center. However, since most of the problems that are involved in budgetary allocation decisions belong to the more ill-defined class of problems, the term "systems analysis" in connection with most PPBS efforts is appropriate.

Characteristics of Systems Analysis

One way to better grasp the concept of systems analysis is to note the characteristics that distinguish this method of studying a problem. These seven characteristics -- the components of systems analysis; the unique process of systems analysis; the attempt to achieve the scientific

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[1] Ibid., p. 7.

method by being open, explicit, and verifiable, by adopting the attitude of tentativeness and experimentalism, by treating quantitative factors quantitatively, by testing hypotheses by appropriate means, and by striving toward objectivity; the orientation of analysis toward marginal costs and effectiveness; the future orientation of analysis, including explicit treatment of time; the systemic nature of analysis; and the explicit recognition and consideration of uncertainty and risk -- distinguish systems analysis from other decision processes.

Systems analyses normally have six[1] distinct components: an objective or objectives to be achieved; one or more measures of effectiveness; alternatives; costs or resources to be used; one or more models or abstractions of reality; and a criterion, or some other means of choosing one alternative over another.[2]

Another characteristic of the use of systems analysis is the process followed during the analysis itself. Analysis advances through five stages: formulation, search, explanation, interpretation, and verification.

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[1]Most authors (for example, E. S. Quade, Systems Analysis Techniques for Planning-Programming-Budgeting) list five components. Objectives and effectiveness are not normally separated. Because of the need to use proximate measures of effectiveness in most analyses the separation of these two is beneficial to understanding.

[2]The component parts of systems analysis are discussed in more detail in Appendix A-3.

During formulation, issues of concern are defined, objectives are clarified, appropriate measures of effectives are defined, the problem is limited by appropriate assumptions, and criterion are formulated. It is common that the formulation stage is repeated because of information received during some of the other stages. During search, data relative to the problem is determined. Alternatives as well as facts are the subject of the search, and relevant costs are determined. During explanation, the model which will explore the consequences of the alternatives is built. The relationships between inputs and outputs are explored and formulated. During interpretation, all of the factors not treated explicitly in the model must be considered -- nonquantifiable variables, factors omitted, uncertainties, and contingencies. Finally, conclusions are drawn. The final step, verification, includes testing the conclusion by experiment. Often this step is impossible -- for example, in many military force structure problems complete verification cannot be performed since it would involve a test war.[1]

Another characteristic of systems analysis is the attempt to adopt characteristics of the scientific method by being open, explicit, and verifiable.[2] Because of the

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[1]The process followed in systems analysis is discussed in more detail in Appendix A-4.

[2]Alain C. Enthoven, "The Systems Analysis Approach," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 160.

nature of the problems with which systems analysis deals, this goal of scientific precision is not totally attainable. However, the attempt to make all assumptions, judgments, calculations, and data so explicit that the results can be subjected to disagreements, checking, and criticisms is one of the major strengths of systems analysis.[1]

Another of the characteristics of science that systems analysis strives to achieve is that of "scientific attitude." This attitude is noted by its "hypothetical spirit" or respect for tentativeness and probable error of solutions and findings and by its "experimentalism" or willingness to subject findings to empirical tests and experimentation.[2]

The art of systems analysis adopts one other aspect of the scientific method: it treats quantitative aspects in a quantitative manner. This is not to say that all aspects of decision problems can be quantified. In fact, most uses of systems analysis must be highly supplemented with qualitative reasoning.[3] Still, one advantage of the use of systems analysis is the attempt to quantify as far as possible. This includes efforts to quantify data that was not quantifiable previously. Because of the precision which

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[1]E. S. Quade, "Methods and Procedures," Analysis for Military Decisions, ed. by Quade, p. 150.

[2]Warren G. Bennis, Changing Organizations, pp. 47-48.

[3]Gene H. Fisher, The World of Program Budgeting, pp. 12-13.

quantitative data achieves, the quantification of every element that can be quantified with any degree of accuracy eliminates one aspect of uncertainty.[1]

Another aspect of the scientific method adopted by systems analysis is the attempt to test each hypothesis by the appropriate method -- logical, experimental, or historical. The appropriate method of testing depends on the nature of the problem and the circumstances surrounding this problem.[2] To achieve this position of testing hypotheses by the appropriate method it is necessary to distinguish between questions of "fact" and "value." "Fact" can be subjected to the more rigorous tests associated with the scientific method. Questions of "value" must be left to the judgment of the decision-maker.

Finally, systems analysis attempts to emulate the scientific method by being objective -- where the analysis itself does not depend on personalities or vested interests.[3] Because of the large element of judgment involved in the application of systems analysis, the objectivity of pure

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[1]Quade, Limitations of Cost-Effectiveness Approach, pp. 4-5.

[2]Alain C. Enthoven, "Decision Theory and Systems Analysis," Readings in Command Management -- Analytical Methods, U. S., Department of Defense, Department of the Army, pp. 4-5 and 4-6.

[3]Alain C. Enthoven, "Choosing Strategies and Selecting Weapon Systems," Modern Design, ed. by Tucker, p. 139.

science (where the absolute truth of propositions is established by logical and empirical means common to the whole profession) is an unachieved goal. Institutions and personalities play too large a role in the outcome of systems analysis for it ever to achieve total objectivity. The best that systems analysis can hope for is that the major biases are identified in the analytical effort itself.[1] While systems analysis is not able to attain its goal of objectivity, neither are any alternative methods of reaching a decision. In the words of E. S. Quade:

> We have not and never may be able to make the systems approach a pure, [wholly] rational, coldly objective, scientific aid to decisionmaking -- only one far more so than its alternatives.[2]

Another of the major characteristics of systems analysis is that it works at the "margin."[3] The costs and effectiveness subjected to analysis are the total additional costs required and the additional level of effectiveness achieved -- not the absolute total costs or absolute total effectiveness of the problem.[4]

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[1]E. S. Quade, Cost Effectiveness Analysis: An Appreciation, p. 5.

[2]E. S. Quade, The Systems Approach and Public Policy, p. 28.

[3]Alain C. Enthoven, "Economic Analysis in the Department of Defense," Speech presented to the American Economic Association, Pittsburg, Pa., December 29, 1962.

[4]For example, a proper question for system analysis is not whether the United States requires a missile capability to destroy 97 per cent of 100 strategic targets instead of

Another characteristic of systems analysis is its orientation toward the future. This is one of the major complicating factors of problems requiring systems analysis.[1] The future orientation of the analysis also makes uncertainty in the problem more significant. Finally, the future orientation of analysis complicates the criterion selection since the time phasing of both effectiveness and costs must be considered.[2]

The "systemic" nature of systems analysis is another major characteristic.[3] The term "systemic" means that systems analysis takes a broad, systems view to the problem at hand. The problem is broadened until most of the major interactions are included. This characteristic also means

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94 per cent. A proper question is whether the cost of increasing the destruction capability from 94 to 97 per cent is worth the cost of the additional missiles required.

[1]Charles J. Hitch, "Analysis for Air Force Decisions," Analysis for Military Decisions, ed. by Quade, p. 14. It is obvious that the number of variables active in a problem increase as the time span under consideration increases. If the proper operations procedure for a specific bombing mission that is to occur in the near future is being considered, a number of technological and strategic elements are fixed, e.g., the basic capability of the weapon systems and the enemy's basic system of air defense. If the bombing mission is to occur five years from the time of analysis, all of these fixed aspects become variables.

[2]Gene H. Fisher, "The Role of Cost-Utility Analysis in Program Budgeting," Program Budgeting, ed. by David Novick, pp. 74-75.

[3]Richard F. Norford, "Systems Analysis: A Missing Element in Foreign Policy Planning," Naval War College Review, XXIII (January, 1971), 90.

that the number of variables is increased.[1]

The final major characteristic of systems analysis is its explicit recognition and consideration of the uncertainty which dominates many problems. The analyst must determine the consequences of this uncertainty and its impact on the various alternatives under consideration. Most importantly, the analyst can assist in developing new alternatives that negate the influence of uncertainty to some degree.[2]

Misconceptions About Systems Analysis

Before discussing approaches that are common to the application of systems analysis, it is appropriate that some misconceptions concerning the use of systems analysis be dismissed. These misconceptions were extensively held in the early history of use of systems analysis in the Federal Government.

Biased Toward "Cheapest"

One of the common misconceptions about the use of systems analysis is that it automatically leads to the

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[1]An example of this can be seen in military applications. Prior to the widespread use of analytical efforts in the Department of Defense, it was a common practice to consider a weapon system, e.g., the B-36, in isolation. With the systemic view the B-36 weapon system includes the basic system, the necessary ground support equipment, the necessary air base modifications, crews and crew training, specialized maintenance facilities, etc.

[2]The treatment of uncertainty in analysis is described in more detail in Appendix A-5.

weapon, program, or process with the lowest unit cost. This is not true. Systems analysis is neutral on the question of unit cost.[1] Systems analysis compares the incremental effectiveness of a unit to the incremental cost of that unit. This comparison is vastly different from the minimization of unit cost.

Closely related to the misconception that systems analysis is biased toward the "cheapest" program is an attitude that the goal of systems analysis is dollar savings. Again this is not true. The goal of systems analysis is to provide information that helps decision-makers make better decisions which result in increased effectiveness -- not necessarily in cost reductions.[2]

Computerization of Decisions

Another misconception is that systems analysis is an attempt to computerize all decisions. "Systems analysis is not synonymous with the application of computers. There is no essential connection between the two."[3] To understand this, it is necessary to understand something of the capability of computers.

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[1]Charles J. Hitch, Decision Making for Defense, pp. 46-47.

[2]Robert S. McNamara, "Decision-Making in the Department of Defense," Modern Design, ed. by Tucker, p. 22.

[3]Enthoven, "The Systems Analysis Approach," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 160.

The most obvious and dramatic capability of the computer is its speed. Much has been written about this; one example will illustrate this attribute. The following table shows the evolution of computers and time required for solution of a RAND Corporation missile trajectory problem:

Method	Elapsed Time
By Hand -- 1949	6 months (two clerks)
Computer -- 1949	3 hours
Computer -- 1956	1 minute
Computer -- 1961	1/2 second
Computer -- 1965	1/200 second[1]

The second noticeable aspect of a computer is the absolute accuracy of its computation. Finally computers, when they have been programmed, perform the calculations cheaper than hand labor. For example, on the missile trajectory problem the cost of hand calculation in 1949 was $6,000 and the cost of computer operation in 1965 was about one cent. (Programming cost for the computer was $100 and zero for hand calculation.)

In spite of these capabilities, it can be stated that a computer is totally unable to solve a problem. Problems are solved by men. The computer can only perform the mathematical calculations (addition, subtraction, and comparison) that it is directed to perform. Man must first solve the problem intellectually.[2]

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[1]Paul Armer, "The Use of Computers," Analysis for Military Decisions, ed. by Quade, pp. 250-51.

[2]Ibid., pp. 253-55.

Some conclusions can be drawn on the relationship of computers and systems analysis:

1. Computers can assist with the manipulation of quantifiable variables in a problem. They generally cannot consider variables which are unquantifiable.[1]

2. Computers are an aid to systems analysis because of their ability to sort data. Probably the major use of the computer in connection with systems analysis has been as a storage facility and sorting capability for the large data base required for an effective analytic effort.[2]

3. Computers have made some techniques of operations research practical for use in analysis. If a technique such as the trajectory problem required one year to work (two clerks requiring six months each), its use was not practical until the computer was available.[3]

4. Computers will allow an analyst to make more studies and review more alternatives by utilizing its speed. More detail can be investigated and sensitivity studies can be more easily performed.[4]

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[1]E. S. Quade, "Mathematics and Systems Analysis," Ibid., p. 246.

[2]B. G. Schumacher, Computer Dynamics in Public Administration, p. 107.

[3]Alain C. Enthoven, "Decision Theory and Systems Analysis," Speech presented at George Washington University, December 5, 1963.

[4]Armer, "The Use of Computers," Analysis for Military Decisions, ed. by Quade, p. 252.

Systems analysis is then not confined to the application of computers. Because of the development of computer capability, systems analysis has been stimulated and its effectiveness has been enhanced.[1] This additional capability is not without its disadvantages. Limitations of the use of computers in performing systems analysis include:

1. The variables that cannot be quantified may be ignored in interpretation of the problem.
2. Computer programs often take many years to formulate and are therefore both expensive and rigid.
3. Only selected stages of computation are visible. Some knowledge of the interaction of parameters is lost.[2]
4. Translation of the analyst's model into computer terminology through programming may involve the loss of some generality, including some additional assumptions. As more advanced computer program languages become available, allowing the analyst to interact more closely with the computer itself, this limitation may be partially alleviated.[3]
5. Because computer models are often complex, users tend to

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[1]Frederick C. Withington, The Real Computer: Its Influences, Uses, and Effects, p. 182.

[2]Quade, "Mathematics and Systems Analysis," Analysis for Military Decisions, ed. by Quade, p. 246.

[3]E. S. Quade, Cost-Effectiveness: Some Trends in Analysis, pp. 2-4.

forget that assumptions are still embodied in the model.[1]

The misconception that the use of computers is synonymous with systems analysis can be dismissed by noting that computer "experts" have not made great inroads into the systems analysis staffs of the Federal Government. In the Systems Analysis Office of the Department of Defense, there is only one computer expert on a professional staff of 130 persons.[2]

Computers are a tool of systems analysis and should be used when they will improve the analysis. The use of the computer, like the use of any other tool, involves advantages and disadvantages -- both of which must be considered in the decision to use it.

Total Quantification

One of the most pervasive misconceptions about systems analysis is that it requires total quantification. Systems analysis was criticized by James E. Webb, the former Administrator of the National Aeronautics and Space Administration, in these terms:

> In recent years a myth has grown up that with modern management tools -- and particularly those associated with the computer, the techniques of systems analysis, and a "cost effectiveness" approach -- areas of

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[1]Armer, "The Use of Computers," Analysis for Military Decisions, ed. by Quade, p. 254.

[2]U. S., Congress, Senate, Committee on Government Operations, Planning, Programming, Budgeting, Inquiry of the Subcommittee on National Security and International Operations, 1969, p. 303.

> uncertainty can be largely eliminated within even the most complex of undertakings. The assumption behind the myth is that goals and subgoals, and present and future requirements to meet these, lend themselves to reasonably precise calculation through the use of such modern tools. Any endeavor, the concept has it, can be cast in the mold of a system of measurable units and dimensions, and into this system all component programs, projects, and activities can be fitted with high precision.[1]

Admiral H. G. Rickover expressed the same opinions in testimony before Congress:

> The basis for using cost-effectiveness studies as the rationale on which to make a decision is the assumption that the important factors can be expressed in a numerical form and that a correct judgment of the situation can then be calculated mathematically.[2]

and:

> All factors of military effectiveness for which the analyst cannot calculate a numerical value have automatically been discarded from consideration.[3]

It is not difficult to see why this misconception is so widespread. Many writers in the area of systems analysis define it so narrowly that the conclusion that only quantified data is used is inevitable. For example, one author lists the steps of systems analysis as:

1. Translate objectives into quantitative terms.
2. State in an analytical way the general interrelationships among variables.
3. Quantify the relationships between variables and outputs.

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[1]Webb, Space Age Management, p. 149.

[2]U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 600.

[3]Ibid., p. 602.

4. Quantify the relationships between variables and inputs.

5. Combine these two into a quantitative input/output model.

6. Determine the optimal solution.[1]

Another reason for the persistence of this misconception is that much of the literature on systems analysis emphasizes application and manipulation of specific quantitative techniques to the exclusion of problem definition, alternative exploration, etc.

The feeling that systems analysis deals only with quantifiable data is based partially on the results of many analytic efforts. The emphasis of some practitioners of systems analysis has been with the quantitative aspects of problems.

> There is no intrinsic reason why problems of subjective evaluation cannot be dealt with under the heading of systems analysis. . . . The barrier lies in the scientific-quantitative origins of operational research, which make it psychologically difficult for practitioners to accept such a theory.[2]

If systems analysis demanded complete quantification, it would be of little practical use in most PPBS-type decisions. Most decision-type problems in the real world cannot be expressed totally or even mostly in mathematical terms. "They involve too many complexities, uncertainties, value

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[1]Guy Black, "Systems Analysis in Government Operations," Management Science, XIV (October, 1967), B43.

[2]James R. Schlesinger, "Quantitative Analysis and National Security," World Politics, XV (January, 1963), 309.

judgments, and intangibles."[1] For example, in a military problem it is impossible to quantitatively express ". . . the reliability of an ally, or the psychological and political consequences of a military operation."[2] There is nothing inherent in systems analysis that negates the importance of qualitative factors.[3] In fact, analysis that either excludes qualitative considerations or attempts to quantify the unquantifiable is inadequate analysis.[4]

While it is one thing to assert that most decisions involve a substantial element of qualitative considerations, it is quite another to assert that these decisions are totally qualitative.[5] Therefore, just as it is inadequate analysis to quantify the unquantifiable, it is equally unacceptable decision-making to abandon or neglect the aspects of a decision that are quantifiable simply because there are some qualitative considerations.[6]

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[1]Enthoven, "Decision Theory and Systems Analysis."

[2]Enthoven, "Decision Theory and Systems Analysis," Readings in Command Management, U. S., Department of Defense, Department of the Army, p. 4-8.

[3]Bradley, Some Views on Program Budgeting, p. 7.

[4]Henry S. Rowen and Albert P. Williams, Jr., "Policy Analysis in International Affairs," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 1002.

[5]Herbert A. Simon, Administrative Behavior, p. 51.

[6]U. S., Congress, Joint Economic Committee, Guidelines for Estimating the Benefits of Public Expenditures, Hearings, before the Subcommittee on Economy in Government, 1969, p. 235.

Charles L. Schultze[1] stated:

> What we do want our analysis to do is try to quantify the benefits and costs as much as they can be quantified. But then the analysis should also point out in terms as explicit as possible, the nonquantifiable benefits and costs.[2]

There are two reasons for wanting to quantify data as much as possible (including much that may not have been quantified earlier). First, quantitative data can be manipulated through mathematical computations. Through these manipulations it is possible to observe the effect of changes in the parameters of the problem.[3] The second reason for the use of quantitative data in systems analysis is to facilitate expression. "Numbers are a part of our language. Where a quantitative matter is being discussed the greatest clarity of thought is achieved by using numbers instead of avoiding them."[4] In the area of expression, numbers often must be used when finite calculations of absolute accuracy are impossible.

> The real issue is one of clarity of understanding and expression. Take, for example, the statement "Nuclear power for surface ships offers a major increase

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[1]Charles L. Schultze was the Director of the Bureau of the Budget when PPBS was introduced in the nondefense agencies of the Federal Government. He was responsible for its over-all implementation.

[2]"Inside View of the New Budget," Nations Business, LV (January, 1967), 42-43. (italics added)

[3]Enthoven, "Decision Theory and Systems Analysis."

[4]Enthoven, "The Systems Analysis Approach," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 162.

> in effectiveness." Precisely what does that mean? Does it mean 10 per cent better or 100 per cent better? When that sort of question is asked, a frequent answer is, "It can't be expressed in numbers." But it has to be expressed with the help of numbers.[1]

One distinction that helps clarify the relationship between systems analysis and qualitative factors is the one between analysis and calculation. The process of calculation is only one part (and in many cases a relatively minor part) of analysis. Obviously, qualitative factors must be excluded from the calculations but they should be isolated, described, and related to the alternatives in question.[2]

Closely allied to the misconception that systems analysis is simply a method of handling quantifiable data is the feeling that the use of systems analysis automatically involves the use of extremely complicated mathematics. While there are some complicated and sophisticated mathematical techniques available to the analyst, most of the mathematics used is of the simpler variety (e.g., elementary probability theory, statistics, calculus, and geometry).[3] Many of the more sophisticated analytic techniques are much more elaborate than the data available or the state of

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[1]Testimony of Alain C. Enthoven as cited by William W. Kaufman, The McNamara Strategy, pp. 244-45.

[2]Statement of Alain C. Enthoven, U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 229.

[3]Quade, "Mathematics and Systems Analysis," Analysis for Military Decisions, ed. by Quade, p. 249.

cause-and-effect theory.[1]

Replacement of Judgment

The most sweeping misconception of systems analysis is that it is a replacement for judgment. This is incorrect. The exercise of judgment pervades the entire analytic effort. Judgment must be used to analyze and determine the proper objective, select alternatives to be considered, determine the factors which are relevant for analysis and the interrelationship between them, and even select the types of data to be gathered and used.[2]

It is obvious that systems analysis does not totally replace judgment since the application of considerable judgment is necessary during the analytical process itself. The criticism that the use of systems analysis replaces the judgment of the decision-maker with the judgment of the analyst has more credence. This criticism is not entirely correct for three reasons:

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[1]Hartley, Educational Planning-Programming-Budgeting, p. 6. An example of this is the analysis of the comparability of Soviet and U. S. infantry divisions. After a number of attempts with sophisticated gaming devices, a rough estimate of military comparability was determined by simply asking how much a Soviet division would cost in the United States with our labor rates, materiel prices, etc. Of course, the assumption was made that costs in both Soviet and U. S. divisions were optimally allocated. (Alain C. Enthoven, "Systems Analysis in the Pentagon," Speech presented to the Association for Public Program Analysis, Washington, D. C., September 26, 1968.)

[2]Heymont, et al., Guide for Reviewers of Studies Containing Cost-Effectiveness Analysis, p. 9.

1. The analyst does not work in a vacuum. The analytical effort must be a joint effort of the analyst, the decision-maker, and the technical personnel with knowledge and/or experience to apply to the problem.

2. In its effort to make judgment explicit in the analysis, the decision-maker has the opportunity to impose his own judgment over that of the analyst.

3. Systems analysis is not usually able to recommend an optimum solution. It is only able to structure information in such a manner as to allow the decision-maker to apply judgment effectively. As Alain C. Enthoven[1] stated:

> Ultimately all policies are made . . . on the basis of judgement. There is no other way, and there never will be. The question is whether those judgements have to be made in a fog of inadequate and inaccurate data, unclear and undefined issues and a welter of conflicting opinions, or whether they can be made on the basis of adequate, reliable information, relevant experience, and clearly drawn issues. In the end, analysis is but an aid to judgement. . . . Judgement is supreme.[2]

Common Approaches to Systems Analysis

There are two standard approaches that are used in systems analysis in the Federal Government. These are normally called cost-benefit analysis and cost-effectiveness analysis. Both are required before a decision is made. Cost-Effectiveness analysis provides information about the

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[1]Dr. Enthoven was the Assistant Secretary of Defense (Systems Analysis) when the use of analytical techniques became widespread in the Department of Defense.

[2]"U. S. Agencies Get Order: Join McNamara's Band," Business Week, November 13, 1965, p. 189.

benefits and cost of alternatives under consideration. Cost-benefit analysis provides information on whether the project should be undertaken at all.

Cost-Benefit Analysis

There are three basic types of problems involved in cost-benefit analysis. These correspond to the different classification of benefits: where costs and benefits can be expressed in equivalent terms (usually dollars); where the level of benefits can be quantified but cannot be expressed in the same units as cost; or where there is no way to quantify benefits.

Benefits in Dollars

The most rigorous use of quantitative methods has taken place where benefits and costs are in the same unit. A direct comparison is possible to determine if the program is beneficial. Where the government is engaged in producing services which are essentially "market goods," the measurement of benefits using a dollar measurement is possible.

The earliest use of extensive quantitative methods has been in water development projects for flood control, hydro-power, navigation, and irrigation. The calculation of net benefits for water resource activities on a systematic basis has been standard procedure since 1936. The guidelines for this form of benefit-cost analysis include: "the ultimate purpose of an economic analysis of a project is to

ascertain the extent to which the use of economic resources such as land, labor and materials necessary for a project were not undertaken." The difference that the project makes to the national income over the life of the project is calculated, and this benefit is compared to the expected costs.[1]

When cost-benefit analysis is used in this category there are four basic considerations which become relevant: Which costs are used? Which benefits will be used? How are these benefits valued? How is time handled?[2] No totally satisfactory answer has been found to any of these questions.

The answer to the first question in cost-benefit analysis is the easiest. Budgetary costs are normally straightforward. The ability to predict accurately financial costs for any government program is largely a function of the technological certainty of the program, and of the length of the future projections required.[3] In the water resource area the financial cost estimates have become quite accurate,

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[1]Arthur Smithies, The Budgetary Process in the United States, pp. 332 and 336.

[2]A. R. Prest and R. Turvey, "Cost-Benefit Analysis: A Survey," The Economic Journal, LXXV (December, 1965), 686.

[3]For example, cost estimates are notoriously inaccurate in the high-technology military programs because the system is not well defined at the time the estimate is made. Changes in equipment, price level changes, etc. also effect cost over an extended period of time.

and often actual costs are below the projections made.[1] However, even this relatively straightforward area of analysis is complicated when one considers nonfinancial costs such as the cost of displacement of people, etc.[2]

If problems in determining which costs are to be included in cost-benefit analysis and how they are to be valued appear large, the problems in the estimation of benefits are staggering. Even in the relatively well-structured area of water resources, no totally satisfactory definition exists on what benefits should be included. The benefits that accrue from the primary purpose of each project are obviously counted. However, secondary benefits also exist. For example, the Flood Control Act of 1936 listed the primary benefit as preventing damage by floods and required calculation of the dollar damage averted. The Act further stated that "all benefits to whomsoever they accrue" should be considered. This led to attempts to measure indirect effects such as loss of business and employment by floods, temporary dislocations of business, temporary unemployment, and disruption of transportation and communications. Flood-control projects can also have irrigational,

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[1]Brundage, The Bureau of the Budget, pp. 170-71. This enviable record was not achieved immediately. Prior to World War II the cost estimates were normally understated by a considerable percentage. A 1951 study of 182 Corps of Engineers projects found overruns in excess of 100 per cent.

[2]A more complete discussion of the problems of estimating costs in systems analysis is found in Appendix A-3.

navigational, and hydro-power benefits.[1]

The problem of benefits is further complicated by the presence of intangible benefits. The primary and secondary benefits discussed above are tangible benefits -- meaning that they can be measured in terms of market dollars.[2] Intangible benefits such as recreation, municipal and industrial water supplies, waste disposal, pollution control, and preservation of "complex ecosystems" are also important.[3] Currently, tangible values are placed on some factors previously considered intangibles.[4] If the inclusion of secondary and intangible benefits is carried to an extreme, the measure of benefits becomes dubious and often totally useless.

The determination of which benefits to include in a cost-benefit analysis becomes even more troublesome in areas outside of natural resources. For example, in the health area it has often been customary to use as a measure of benefits the number of days of illness averted (where the illness prevents an individual from working) and the number

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[1]Smithies, Budgetary Process, p. 332.

[2]Ibid., p. 340.

[3]Jack L. Knetsch, "Economic Analysis in Natural Resource Programs," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, p. 1088.

[4]For example, the Auburn-Folsom-South water project in California included an estimated $90 million of recreational benefits. ("Putting a Dollar Sign on Everything," Business Week, July 16, 1966, p. 124.)

of extra productive days added because of death averted.[1] However, health should be considered a consumer good as well as an investment good since the public would be willing to pay for the avoidance of the pain and inconvenience of illness even if earnings were not lost.[2]

An even more difficult aspect of cost-benefit analysis is the conversion of benefits to dollars. Usually "market prices" of goods are used to make this conversion. The use of market prices conceals two basic assumptions: consumer sovereignty and indifference to income redistribution. Both of these assumptions can be the cause of major distortion in many government program evaluations.[3]

The first assumption of consumer sovereignty ignores the fact that many government programs are instituted largely because the private market has given inadequate direction to the use of resources.[4] Public values are not necessarily reflected in the "market" price system which is a reflection

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[1]The value of these benefits is measured by calculating a present value of increased earnings.

[2]A. W. Marshall, Cost/Benefit Analysis in Health, pp. 2-3.

[3]Arthur Maas, "Benefit-Cost Analysis: Its Relevance to Public Investment Decisions," Quarterly Journal of Economics, LXXX (May, 1966), 208-18.

[4]Lawrence G. Hines, "The Need to Develop 'Public Interest' Criteria for the Appraisal and Selection of Federal Economic Activity," Problems of United States Economic Development, II (May, 1958), 231. A prime example of this is in the area of environmental pollution.

of private values.[1]

The second assumption ignores the fact that some government programs have a primary goal of income redistribution. It would be unreasonable to assume that the flow of benefits from a government project to a single individual or firm would be considered equally desirable as the same amount of benefits dispersed throughout the general population.

While these criticisms are valid ones, they do not necessarily negate the usefulness of many applications of cost-benefit analysis where benefits are calculated in dollars. They do caution against the use of a single benefit dollar amount as a total decision guide. As a minimum, the following supplemental information is necessary:

1. The decision-maker should not rely on a single estimate of benefits. Since benefit estimation is subject to a high degree of judgment, this judgment should be specifically identified and a range of different benefit amounts presented corresponding to different circumstances.
2. An estimate of noneconomic benefits should be presented (probably in nonmonetary terms), or the use of the cost-benefit analysis could bias governmental activity toward

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[1]Ibid., p. 232, and Martin Shubik, On Different Methods for Allocating Resources, pp. 4-9.

economic goals which do not properly reflect public values.[1]

3. An estimate of the redistributional effects of the program should be given.

The final task involved in the performance of cost-benefit analysis is the treatment of time. While there is general agreement that future benefits and costs should be discounted, there is less agreement on what discount rate[2] should be applied. An excessively low discount rate for government projects would divert resources from private use to government projects, and these latter projects could become "capital intensive."[3]

The range of discount rates proposed for cost-benefit analysis is from 3.2 per cent to 15 per cent. The best approach to the practical use of a discount rate is to use a rate of approximately 5 to 6 per cent (which most economists advocate as the minimum rate that is justifiable) and test the outcome for sensitivity to higher rates.[4]

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[1]Guy Black, The Application of Systems Analysis to Government Operations, p. 38 and Maas, "Benefit-Cost Analysis: Its Relevance to Public Investment Decisions," Quarterly Journal of Economics, LXXX (May, 1966), 208.

[2]The term "discount rate" is used to indicate the percentage (i) in the formula that indicates the present worth (PV) of one dollar spent (or received) in n years.

$$PV = \frac{1}{(1+i)^n}$$

[3]Jacob A. Stockfisch, "The Interest Rate Applicable to Government Investment Projects," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 189.

[4]A more complete discussion of the discount-rate problem is presented in Appendix A-6.

In cost-benefit analysis where the benefits are calculated in dollars, the normal method of presenting the final product is a ratio of benefits to costs. If this ratio is greater than one, the program is assumed to be economically effective. Since benefits cannot be measured to a finite degree and cannot usually be translated into dollars, and since the estimation of costs is not an exact science, a decision-maker must beware of attaching undue reliance to any single ratio. He should demand supplementary information as well as indications of how the ratio varies with changed circumstances, assumptions, and judgmental considerations.

Quantified Benefits Not in Dollars

When the benefits of a program are quantifiable through either direct measurement or proximate measures of effectiveness,[1] the type of cost-benefit analysis possible may be somewhat rigorous. A cost per unit of benefit may be calculated. For example, the Department of Transportation uses "cost per reduced fatality" for highway safety measures, and the Department of Health, Education and Welfare uses "cost per reduction in mortality" for health research fund allocation.[2]

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[1]The term "proximate measures of effectiveness" is borrowed from Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age. These are practical substitutes for direct measurements of effectiveness. They are discussed in more detail in Appendix A-3.

[2]Robert N. Anthony, Management Accounting, p. 601.

The use of these quantitative measures of benefits has one distinct advantage. The amount of resources can be varied, and incremental benefits versus differential costs can be evaluated. The question of whether the incremental benefits are worth the incremental cost is, however, one that must be made on the basis of subjective judgment. (For example, "Is an additional reduced fatality worth the additional cost required?" is a question that cannot be totally answered with quantitative measures.) The most that analysis can contribute to the decision is a careful specification of all of the benefits (including those where quantification is not possible) and a complete specification of costs.

Unquantifiable Benefits

Under the category of benefits where no quantification is possible, the rigorous analysis is restricted to the cost inputs. "A careful estimate of the cost is made, and the decision-maker arrives at a subjective judgment by asking: 'Are benefits worth at least the cost?' Or, . . . 'Are the incremental benefits likely to be worth the differential costs?'"[1] Examples of this form of problem are numerous.[2] In many cases, however, it is possible to devise proximate measures of effectiveness for evaluation of

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[1] Ibid.

[2] It is practically impossible to assess the benefits accruing from Voice of America broadcasts to Eastern Europe.

benefits.[1] To the degree that proximate measurements can be devised, and are meaningful, a problem with benefits that are not capable of quantification may take on many of the characteristics of the problem where the benefits are directly quantifiable. With the use of proximate measures of effectiveness the decision-maker must be very careful that benefits (positive or negative) that are not covered by the measurement used are not ignored.

Practical Use of Cost-Benefit Analysis

Formal cost-benefit analysis has been applied in several areas of government activity, including health programs (cancer control and eradication of syphilis), vocational rehabilitation,[2] outdoor recreation, high-school dropout prevention, civil aviation, urban highways, and urban renewal,[3] as well as the traditional natural-resource areas. Analysis in each of these areas has a different degree of validity.

There has been an unfortunate trend to use dollars as a single measure of benefits by weighting factors and converting these to dollars.[4] An analyst who is bold enough

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[1]In the case noted above, a proximate measurement of effectiveness could be the increase in signal density, area covered, and length of broadcast by Voice of America.

[2]Murray L. Weidenbaum, The Modern Public Sector, p. 162.

[3]Measuring Benefits of Government Investments, ed. by Robert Dorfman.

[4]State-Local Finance Project, Implementing PPB in State, City, and County, p. 84.

can reduce anything to dollars by imposing some rather arbitrary assumptions on the data at hand.[1] The net result of this action by analysts is that cost-benefit analysis is often viewed as something which is "conceptually playful" but is of little use in practical decision-making.[2] For decision purposes it is probably preferable to use benefit calculations in dollars in areas where a dollar measurement does not imply exceptionally arbitrary assumptions (a distinction that itself requires an application of judgment); to use other quantitative measures of benefit when direct measurement and use of proximate measures of effectiveness is possible; and to use qualitative descriptions of

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[1]James R. Schlesinger, Systems Analysis and the Political Process, p. 4. One example of this is a study that establishes dollar values for proposed military weapon systems by making the value equal to the cost of the system it replaces (less depreciation), multiplied by a weighted factor for performance improvement. The number of, and importance of, implicit assumptions in this type of analysis is obvious. (U. S., Department of Defense, Department of the Army, Decision Analysis Using Present Value Techniques, by George B. Williams, James S. Sutterfield, and Mary A. Biagioli, pp. 1-22.)

[2]Virginia Held, "PPBS Comes to Washington," Planning, Programming, Budgeting, ed. by Lyden and Miller, pp. 22-23. This same tendency is often noted in attempts to use a single quantitative measure of benefits. For example, in a cost-benefit analysis for outdoor recreation, a benefit measure of weighted user-days was constructed. Value judgments in this measure included the determination of increased value of a redistributed dollar and different values of benefits for various types of outdoor recreation (e.g., a day in the country was weighted higher than a day in the park). (Ruth P. Mack and Sumner Myers, "Outdoor Recreation," Measuring Benefits of Government Investments, ed. by Dorfman, pp. 71-116.)

unquantifiable benefits instead of a simple benefit/cost ratio.[1]

The use of a simple benefit/cost ratio to determine the amount of funds to allocate to a given project is also questionable. For example, the objective of flood-control project allocation should not be to maximize the benefit/cost ratio but to maximize the benefits minus the cost. These two objectives may not be the same. Table 2 illustrates this property.[2] Note that the maximum benefit/cost ratio is for levees but the maximum net benefit is for a medium reservoir.

Cost-benefit analysis is not a substitute for cost-effectiveness analysis. Normally, only one alternative method of achieving an objective is considered in cost-benefit analysis, and other, and possibly better, alternatives are overlooked.[3]

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[1]One case where this was done was in an urban renewal analysis. Monetary benefits were calculated for the increased productivity of the renewal site land, and the total costs not offset by this direct monetary benefit were shown. Other benefits such as the higher value of neighboring land, reduced crime and poverty, etc. were described in a subjective manner. (Jerome Rothenberg, "Urban Renewal Programs," Measuring Benefits of Government Investments, ed. by Dorfman, pp. 292-366.)

[2]This example was adapted from Otto Eckstein, Public Finance (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1964) as cited in Held, "PPBS Comes to Washington," Planning, Programming, Budgeting, ed. by Lyden and Miller, pp. 18-19. A further discussion of the problem of using benefit/cost ratios as a criterion for alternative selection is contained in Appendix A-7.

[3]Knetsch, "Natural Resource Programs," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, pp. 1092-93.

TABLE 2

HYPOTHETICAL FLOOD DAMAGE PROJECTS

Alternate Projects	Annual Cost (1)	Annual Damage Reduction (2)	Benefit-Cost Ratio	Benefits Minus Cost
Without Protection	0	0	-	-
Levees	$ 3,000	$ 6,000	2.00	$3,000
Small Reservoir	10,000	16,000	1.60	6,000
Medium Reservoir	18,000	25,000	1.39	7,000
Large Reservoir	30,000	32,000	1.06	2,000

(1) Annual Cost includes operating cost and amortized investment costs.

(2) Annual Damage Reduction is the estimated flood damage in a typical year without protection compared to the damage with protection.

Cost-Effectiveness Analysis

The second major approach to systems analysis is cost-effectiveness analysis. In its broadest context cost-effectiveness analysis is concerned with the evaluation of alternative methods to achieve an objective to determine the preferred alternative (or mix of alternatives). All of the elements and methodology of systems analysis are present in cost-effectiveness analysis.

Normally cost-effectiveness analysis is conducted along two general lines -- the level of costs may be fixed and effectiveness maximized, or the level of effectiveness may be fixed and cost minimized.[1] If all costs and effectiveness could be measured on finite scales, this would be relatively simple.

However, this simplicity is seldom, if ever, the case. The problems of measuring costs are similar to the problems of cost measurement in cost-benefit analysis.[2] The cost-estimating task is somewhat simplified in cost-effectiveness analysis, since the emphasis is placed on relative, rather than absolute, accuracy.[3]

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[1]Karl Seiler III, Introduction to Systems Cost-Effectiveness, p. 98. Trying to maximize effectiveness while simultaneously minimizing cost is a nonsensical objective of analysis. The minimum cost is zero and the maximum effectiveness implies a heavy cost commitment -- possibly infinite.

[2]All of these problems are discussed in greater detail as a part of Appendix A-3.

[3]Gene H. Fisher, "Costing Methods," Analysis for Military Decisions, ed. by Quade, p. 268.

Again the measurement of effectiveness is more difficult than the measurement of costs. Even where quantitative measurements of effectiveness exist, or meaningful proximate measures of effectiveness can be divised, the problem of fixing a level of effectiveness in order to minimize costs or maximize effectiveness for a specific cost is often complicated by multiple measures of effectiveness and time.

The existence of multiple effectiveness is a source of major problems in cost-effectiveness analysis. The decision of which alternative is preferable is simple when one alternative dominates all others. For example, if the problem is maximization of effectiveness in three separate dimensions for a given level of cost, the alternative which has the highest level of effectiveness on all three dimensions is obviously superior. This clear-cut case does not usually happen. Alternative A may dominate effectiveness measurement number 1, B dominate measurement number 2, and C dominate measurement number 3. To determine which alternative is better the analyst can:

1. Set a minimum level of all but one measure of effectiveness and maximize the one that is not fixed. This requires a subjective choice of which measure of effectiveness is the most important (not set at a minimum).
2. Determine weights to give to each measure of effectiveness. The determination of weights is in itself a matter of

subjective choice.[1]

Another problem in cost-effectiveness analysis involves the treatment of time. Time may be an explicit part of the analysis by being one measure of effectiveness and treated as above, or it may be considered in the interpretation of the analysis. The parameter of time cannot be ignored when effectiveness is gauged.[2]

Because of the above difficulties it is not always possible to perform cost-effectiveness analysis by fixing the level of effectiveness and minimizing cost. Instead, the analyst uses a fixed level of cost and determines for a group of alternatives the various levels of effectiveness. This data is then presented to the decision-maker, who implicitly weights the different measures of effectiveness by his decision.

The fact that cost-effectiveness analysis usually approaches a problem by fixing the level of effectiveness or cost does not mean that the analysis is complete when the answer is achieved for that one level. A complete analysis varies the parameter which was fixed so that marginal analysis (increased or decreased effectiveness compared to increased of decreased cost) is possible.

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[1]A. Myrick Freeman III, "Project Design and Evaluation with Multiple Objectives," Analysis and Evaluation, U. S.,Congress, Joint Economic Committee, Vol. I, 1969, pp. 570-72.

[2]Roland N. McKean, "Criteria," Analysis for Military Decisions, ed. by Quade, p. 88.

There are circumstances when cost-effectiveness analysis cannot preceed by fixing cost or effectiveness. This happens in a least two circumstances: when the alternatives under consideration are mutually exclusive and are relatively fixed in cost, and when the measures of effectiveness are incommensurate. This does not imply that cost-effectiveness analysis cannot be performed in these cases -- rather the specific form of analysis is changed.

In the case where alternatives are mutually exclusive and are relatively fixed in size, the selection of a fixed level of effectiveness or cost is tantamount to selection of the preferred alternative. Before a decision is made systems analysis can identify the costs and effectiveness of alternatives. Table 3 shows the possible outcomes of an analysis such as this when there is a single measure of effectiveness and two alternatives. Notice that two of the recommendations are indeterminate. The probability of an indeterminate outcome increases when multiple objectives are present. These can only be presented to the appropriate decision-maker so that he can apply his judgment.

Where incommensurate measurements of effectiveness are necessary,[1] there is no way to directly compare

[1]Incommensurate measures of effectiveness are often found when widely different alternatives are used to achieve the same general objective. For example, the damage reduction potential of fallout shelters and assured damage capability of strategic weapons may be incommensurate measures of effectiveness for the objective of deterring nuclear conflict.

TABLE 3

POSSIBLE OUTCOMES OF COMPARISON OF TWO ALTERNATIVES

State*	Recommendation
(1) $C_a > C_b$; $E_a > E_b$	Indeterminate
(2) $C_a > C_b$; $E_a < E_b$	Alternative B
(3) $C_a < C_b$; $E_a > E_b$	Alternative A
(4) $C_a < C_b$; $E_a < E_b$	Indeterminate

* C_a and C_b are costs of the alternatives

E_a and E_b are effectiveness of the alternatives

alternatives. The use of "trade-off" analysis has the potential of at least illuminating the basic choices. Figure 1 demonstrates the essentials of trade-off analysis. A decrease of ΔC in the costs (C_a) allocated to alternative A causes a decrease of ΔE_a effectiveness. This same cost allocated to alternative B increases its effectiveness by ΔE_b. Of course, the determination of whether it is better to have ΔE_a or ΔE_b is still a matter of subjective judgment. The major point is that some comparison can be made and the results of that comparison can assist decision-makers in their decision.[1]

Similar to cost-benefit analysis, the performing of cost-effectiveness analysis requires a high degree of judgment. As a result, single estimates of costs and of effectiveness are usually not sufficient. A range of estimates for different assumptions and environmental circumstances is generally required.

Techniques of Systems Analysis

As noted earlier, systems analysis is not simply a collection of techniques that can be applied to problems to achieve optimum solutions. Systems analysis is more an approach to, and a way of viewing, different problems. However, there are certain techniques that are often used in the practice of systems analysis.

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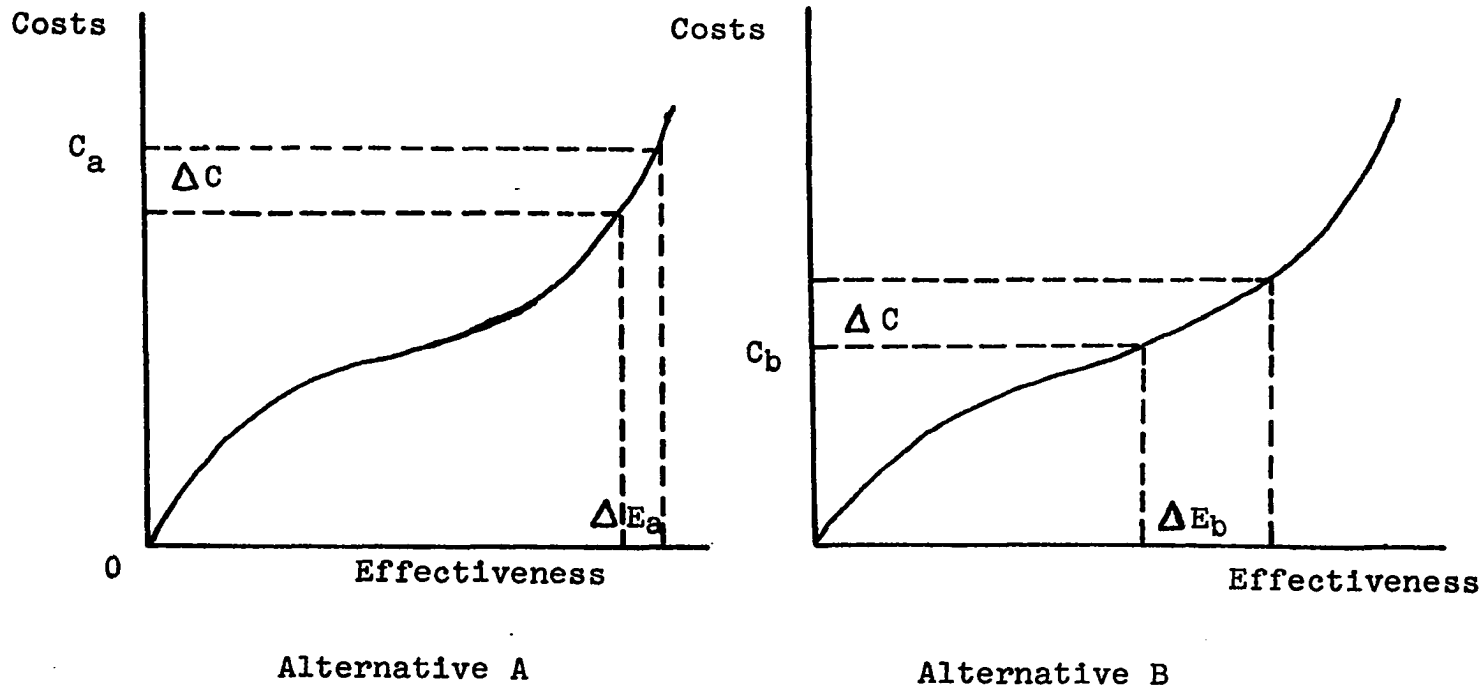
[1]Robert N. Grosse, An Introduction to Cost-Effectiveness Analysis, p. 21.

FIGURE 1

TRADE-OFF ANALYSIS



Alternative A

Alternative B

One of the basic groups of tools often used by systems analysts includes those of microeconomics. Among the microeconomic concepts and tools which often are found in systems analysis efforts are dimishing returns, indifference curves, iso-quantity curves, marginal-cost curves, and demand curves.

Another group of tools is derived from mathematics, including calculus and statistics. Prominent techniques include correlation and regression analysis, probability theory, and deductive statistics.

Another group of tools is commonly found in the operations-research discipline. These are especially useful in suboptimization portions of systems analysis. Among the techniques used are linear programming, gaming, game theory, queuing theory, simulation, dynamic programming, and inventory theory.

There are some more qualitatively oriented techniques that are used in systems analysis on a frequent basis. Two major techniques in this area are the Delphi technique and scenario writing.[1]

Benefits of the Use of Systems Analysis

Because the use of systems analysis implies a heavy investment in time and resources, it is appropriate to consider the benefits that it promises for governmental decision-

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[1]These two techniques are described in Appendix A-8.

making.

Specific Advantages of Systems Analysis

First, cost-benefit analysis, even with all of its uncertainty and judgment, is capable of becoming a quasi-rational screening device to eliminate projects that are obviously uneconomical.[1] After discussing the many uncertainties and shortcomings of cost-benefit analysis, one author concluded:

> Yet cost-benefit analysis may still be important in getting rid of the worst projects. Avoiding the worst where you can't get the best is no small accomplishment.[2]

Systems analysis contributions to decisions are not, however, limited to eliminating the worst projects. The type of information that a well-performed systems analysis provides is not routine to the decision-making process. Decision-makers do not have time to explore numbers of alternatives, many interactions of the system, and the multitude of sensitivities of a proposed program.[3] By clarifying these and pointing out the crucial considerations to the decision-maker, systems analysis definitely sharpens the use of judgment and experience.[4]

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[1]Weidenbaum, The Modern Public Sector, p. 158.

[2]Aaron Wildavsky, The Politics of the Budgetary Process, p. 159.

[3]Gene H. Fisher, Analytical Support for Defense Planning, p. 6.

[4]Donald M. Fort, Systems Analysis as an Aid in Air Transportation Planning, p. 41.

The explicit nature of systems analysis gives two major advantages. If all objectives, alternatives, assumptions, calculations, judgments, and data are made openly and explicitly, the analysis can be self-correcting. These aspects of the analysis are open to "checking, testing, criticism, debate, discussion, and possible refutation."[1] As errors are noted they can be corrected within the framework of the analysis itself, and when new information is received it can be easily incorporated into the framework of the existing analysis.[2]

The second major advantage of explicitness in systems analysis is its effect on the debate on resource allocation. Because it is open, good analysis can turn debate from statements of "noble purpose" and rhetoric to disagreements on realities.[3] The very fact that a critic can point out what is wrong with a particular systems analysis is one of the main indications that it is a good technique.[4]

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[1]John Haldi, "The Role of Analysis," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 153.

[2]Quade, Limitations of Cost-Effectiveness Approach, p. 11.

[3]James R. Schlesinger, "Uses and Abuses of Analysis," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 351.

[4]E. S. Quade, "Pitfalls and Limitations," Systems Analysis and Policy Planning: Applications in Defense, ed. by E. S. Quade and W. I. Boucher, p. 348. Admiral Rickover's criticism of the systems analysis used to support the limitation of nuclear-powered ships illustrates the possible high level of debate. He was able to point specifically at two areas in the analysis which he felt caused the improper

The use of systems analysis also helps decision-making because of its consistency. At the very minimum, systems analysis can ensure that quantitative data and assumptions are internally consistent.[1] "To the extent of our forgetfulness (and) inconsistency, our decisions are deficient."[2]

The use of systems analysis also stimulates the development of more alternative ways to achieve an objective. One of the major limitations in solving problems in an intuitive manner is that alternatives beyond the experience of the decision-maker are often ignored.[3] The use of systems analysis provides the vehicle to consider these alternatives. Also, more alternatives are integrated into the analysis because the objective of the program is investigated and the analyst and the decision-maker learn more about the

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conclusions -- oil was assumed to be available regardless of the military situation, and the original cost of the system was overemphasized compared to total lifetime cost. This raised the level of debate by focusing it on these two major areas of disagreement. The same higher level of debate is noticed in Dr. Wohlstetter's disagreement with the Department of Defense over the value of the Safeguard missile system. Again the key assumptions and judgments that formed the basis of the opinions, rather than emotional rhetoric, became the main areas of discussion. (U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, pp. 599-608, 659-683.

[1]E. S. Quade, Some Comments on Cost-Effectiveness, p. 14.

[2]Edward F. R. Hearle, "How Useful are 'Scientific Tools' of Management," Public Administration Review, XXI (Autumn, 1961) 208.

[3]David I. Cleland and William R. King, Systems Analysis and Project Management, p. 21.

problem, its components and interactions, its measures of effectiveness, and its elements of cost.

Systems analysis also assists in handling problems of great complexity. Many problems involve several different types of knowledge and technology and require different forms of expertise.

> On occasion it might be possible to assemble a group of "experts", each of whom has a good intuitive grasp of factors relevant for answering . . . a subquestion, and after discussion emerge with a fairly unequivocal answer. But in general, and especially where, as is usually the case when the choice is not between two but many [alternatives], systematic analysis will help -- or prove essential.[1]

Systems analysis allows the collection of judgment and intuition from a number of experts within the structured context of the model developed for the analysis. The model also provides the structure necessary to integrate this diverse knowledge.[2]

Another advantage of the use of systems analysis is that it provides a means whereby complex problems can be separated into meaningful components. In each of these components, the application of judgment is required, but each judgmental aspect becomes less critical and more easily handled.[3]

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[1]Hitch and McKean, Economics of Defense, p. 108.

[2]Quade, Systems Analysis Techniques, pp. 5-6.

[3]Held, "PPBS Comes to Washington," Planning, Programming, Budgeting, ed. by Lyden and Miller, p. 23.

One of the criticisms of the use of systems analysis is that it tends to oversimplify complex problems. This criticism is not too valid since it is difficult to see how a technique like systems analysis, which is open-ended and can handle all of the interrelationships and factors that are considered major to the problem, tends to oversimplify more than the application of simple intuition on a total complex problem.[1]

A final advantage of the use of systems analysis in the government is that it has the potential to force changes in governmental process in a manner similar to the profit motive in private enterprise.[2] In private enterprise firms are compelled by the promise of profits and the threat of bankruptcy to seek efficient innovations and allocations of funds. Even if a firm does not systematically work to improve its methods, it is able to copy the innovations of others or it is eliminated through the process of natural selection.

In the government there is no profit motive to ensure efficiency. The costs of inefficient methods do not impinge directly on those who make the choices and the process of natural selection operates weakly, if at all. There is "neither an adequate price mechanism to reveal the cheapest

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[1]Enthoven, "Systems Analysis and the Navy," Modern Design, ed. by Tucker, p. 182.

[2]Harold A. Hovey, The Planning-Programming-Budgeting Approach to Government Decision-Making, pp. 3-4.

methods of performing government functions nor any force which induces or compels the government to adopt such methods." One approach to assuring a high degree of efficiency (and thereby substituting in part for the lack of a profit motive) is to insist on systematic analysis "to determine the most efficient alternative allocations and methods at all levels of government."[1]

Alternative Approaches to Decisions

Another way to examine the usefulness of systems analysis is to compare it to the alternative ways of making a decision. The major alternative is the use of intuition alone (either the decision-maker's intuition or the expert's intuition). Of course intuition is very powerful and is remarkably proficient at solving some kinds of problems. The human mind has a memory that can learn from experience and has the ability to isolate important variables and suppress the unimportant in solving problems. But it is incorrect to consider intuition and analysis as complete rivals. In fact, intuition and analysis complement each other, and analysis should be considered an aid to intuition. Every systems analysis contains significant amounts of intuition and judgment. Unaided intuition, while it is often successful, can be just as spectacularly unsuccessful. Finally, there is no way to verify the results of intuition

[1]Hitch and McKean, Economics of Defense, pp. 106-8.

without some analytical check.[1]

With the use of unaided intuition it is possible to turn to experts. In complex problems it is difficult to find one expert who has a total grasp of the entire problem.[2] It is then necessary to turn to a number of experts, taken either individually or in a committee. Systems analysis has the capability to integrate and effectively use this expert advice.

It is important to note that the use of unaided intuition, either by the decision-maker alone or with expert assistance, does not mean that a model of the problem is not constructed. Unless some form of systems analysis is used, this model is likely to remain hidden and will also be highly aggregated and simplified.[3]

It is obvious that the use of analysis with intuition can hardly be worse than the use of unaided intuition. The use of intuition integrated with analysis has the potential of greatly improving the decision process.[4]

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[1]Hitch, "Analysis for Air Force Decisions," Analysis for Military Decisions, ed. by Quade, pp. 21-22.

[2]Hitch, "Cost-Effectiveness Analysis," Defense, Science, and Public Policy, ed. by Mansfield, p. 89.

[3]Quade, Limitations of Cost Effectiveness Approach, pp. 9-10.

[4]H. Sternberg, J. Renz and G. Fasolina, "Planning-Programming-Budgeting System (PPBS) in Nassau County, N. Y.," Innovations in Planning, Programming, and Budgeting in State and Local Governments, U. S., Congress, Joint Economic Committee, 1969, p. 129.

Allocation of Budget by Requirements and Priorities

The major decision that systems analysis is concerned with in the PPB system is how resources are allocated. Systems analysis makes budget allocations based on an explicit consideration of the effectiveness and costs of different programs. An alternative approach to budget allocation might be termed the "requirements approach." Under this approach the system, procedure, process, or action that is "required" is determined. It is checked to see if it is technically feasible, and if so, the necessary funds are allocated. This approach is unreasonable if the basic constraint is considered that "requirements" are greater than resources available to achieve them. It is, therefore, unrealistic for the government ever to consider embarking on a program without some consideration of cost. Eventually every government program must meet the test of cost.[1] The basic difference between the requirements approach and systems analysis is that costs are explicitly considered in the evaluation of alternatives rather than in a secondary and informal manner.[2]

Another alternative to the use of systems analysis for the allocation of resources can be termed the "priorities approach," where desirable items are listed in their order

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[1]Hitch, "Cost-Effectiveness Analysis," Defense, Science, and Public Policy, ed. by Mansfield, p. 80.

[2]Hitch and McKean, Economics of Defense, pp. 121-22.

of priority. This appears to be a systematic way of performing allocation, but the basic question is still unanswered: How much should be allocated to the item on the top of the list? Suppose the item on the top of the list can absorb funds almost without limitation. For example, the capability of a nuclear retaliatory force might be the highest-priority need in the United States. Does this mean that all federal funds should be allocated to this need and none for a limited-war capability, nuclear defense, education, natural resources, etc.? Obviously this is not desirable. What is necessary is a system that considers the marginal dollar, i.e., at what point the last dollar spent for a nuclear retaliatory force would be better used in some other area. This latter question is one of allocation, not a listing of priorities, and involves the matching of costs and objectives, or, in other words, systems analysis.[1]

Applicability and Effectiveness of Systems Analysis

Systems analysis is applicable to most decisions in the governmental sector. It is only at the lowest levels that analytical efforts are able to "make" the decision.[2] More often systems analysis has a limited (but important) input into the decision process. This is particularly true

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[1] Ibid., pp. 122-23.

[2] At the level where analytical efforts can make the decision, they should be termed "operations research" as defined earlier.

at the highest levels of decisions. Even when benefits can be converted into dollars it is not generally possible to compare programs across broad functional lines (e.g., highway programs to health programs to natural-resource programs).[1] This is because the judgments, assumptions, and environmental conditions operating on the programs are not consistent across these broad lines.[2] William Gorham, Assistant Secretary (Program Evaluation) of the Department of Health, Education and Welfare, noted this in testimony before a Congressional committee:

> Let me hasten to point out that we have not attempted any grandiose cost-benefit analyses designed to reveal whether the total benefits from an additional million dollars spent on health programs would be higher or lower than that from an additional million spent on education or welfare. If I was ever naive enough to think this sort of analysis possible, I no longer am. The benefits of health, education, and welfare programs are diverse and often intangible. They affect different age groups and different regions of the population over different periods of time. No amount of analysis is going to tell us whether the Nation benefits more from sending a slum child to pre-school, providing medical care to an old man or enabling a disabled housewife to resume her normal activities. The "grand decisions" -- how much health, how much education, how much welfare, and which groups

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[1]John Haldi, "Issues of Analysis in Cost-Effectiveness Studies for Civilian Agencies of the Federal Government," Systems, Organization, Analysis, Management: A Book of Readings, ed. by David I. Cleland and William R. King, p. 272.

[2]This means that cancer-control programs which have benefit/cost ratios of 4:1 to 9:1 cannot be considered conclusively better than vocational rehabilitation programs with 3:1 to 6:1 ratios or even water resource projects with benefit/cost ratios only slightly in excess of 1:1.

in the population shall benefit -- are questions of value judgements and politics.[1]

This does not mean that systems analysis has no input into these decisions of broad allocation. However, the best that it can do is provide a summary type of trade-off analysis by showing what can be done in two (or more) areas with the same amount of money.[2]

Systems analysis seems to have its greatest strength in areas where the alternatives are relatively similar and a common objective is being pursued.[3] Even in these areas, hoping to determine an optimum alternative is too optimistic. A more attainable goal is that systems analysis can help to avoid the more inefficient alternatives and to point out better alternatives than the one which might have been intuitively chosen.[4]

The user of systems analysis in the government PPBS should recognize that there is no truly "scientific" way to make large complex decisions. There are better and worse ways that are more or less systematic, more or less compre-

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[1]U. S., Congress, Joint Economic Committee, The Planning-Programming-Budgeting System: Progress and Potentials, Hearings, before the Subcommittee on Economy in Government, 1967, p. 5.

[2]U. S., Congress, Joint Economic Committee, Guidelines, 1969, p. 37.

[3]E. S. Quade, Military Systems Analysis, pp. 4-5.

[4]Alfred H. Weimann, "Decision-Making and Resource Allocation," (unpublished thesis, Air Command and Staff College, 1966), p. 62.

hensive, and more or less explicit. The proper use of systems analysis is one of the better ways.[1]

Integrative System

The fact that a governmental unit has a program structure, a multi-year financial and program plan, and an analytic capability does not mean that they have an operating Planning-Programming-Budgeting System. A system of procedures that integrates these components and ensures that the analytic effort is brought into the mainstream of decision-making is required.

Relationship of Planning, Programming, and Budgeting

One of the major reasons for the development of PPBS was that a separation existed between planning and budgeting. The programming function was devised to bridge the gap existing between these two.[2] When planning and budgeting were separated, the budgetary process dominated planning because the budget was where final decisions on the allocation of resources were concentrated.[3]

The tasks involved in each of these phases include:

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[1]Peter Szanton, "The Present and Future of PPBS: Status and Plans," Information Support, Program Budgeting and the Congress, ed. by Robert L. Chartrand, Kenneth Janda and Michael Hugo, p. 213.

[2]Gene H. Fisher, Some Comments on Program Budgeting in the Department of Defense, p. 6.

[3]Held, "PPBS Comes to Washington," Planning, Programming, Budgeting, ed. by Lyden and Miller, p. 13.

planning -- choosing major objectives; identifying problems; posing alternatives and evaluating them in terms of resources, effectiveness, and major inter-relationships; and making major choices of desirable alternatives; programming -- performing more detailed planning and feasibility testing; scheduling programs and making resource allocation decisions between programs and time; and budgeting -- making firm decisions for resource use for the first year of the program plan.[1]

The nature of information used in each of these steps also varies. In planning, program details are general and the costs are only "rough" estimates. In programming, more details of the program are available but the costs are still tentative. By its very nature, budgeting requires firm program details and precise costs.[2]

These three steps could also be considered checks on the feasibility of the program. During planning, fiscal feasibility is a criteria of decision, but it is not overriding because of the rough nature of cost estimates. Fiscal feasibility is a greater consideration during programming, and budgeting makes the final determination of fiscal

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[1]David Novick and Daniel J. Alesch, Program Budgeting: Its Underlying Systems, Concepts and International Dissemination, pp. 9-10.

[2]State-Local Finances Project, The Role and Nature of Cost Analysis in a PPB System, pp. 2-4.

feasibility.[1]

An ideal planning-programming-budgeting cycle would proceed as follows:

1. Planning would be performed continuously.

2. Programming (by program analysis) would occur in the first nine months of the year prior to the budget year. At the end of this time all program decisions would be made. These decisions would be firm for the first year (the budget year) and tentative for subsequent years.

3. Budgeting would be performed in the last three months, based on the program decisions which had been made earlier. The concentration in this phase would be the translation of program requirements to budgetary terms and questions of efficiency rather than program decisions.[2] As Frederick C. Mosher noted: Budgeting is the ingredient of planning which disciplines the entire process.[3] It is at this point that all of the competing program claims are reduced to one common denominator -- the need for budgeted dollars.

The entire process may then be thought of as circular, with each step affecting previous ones:

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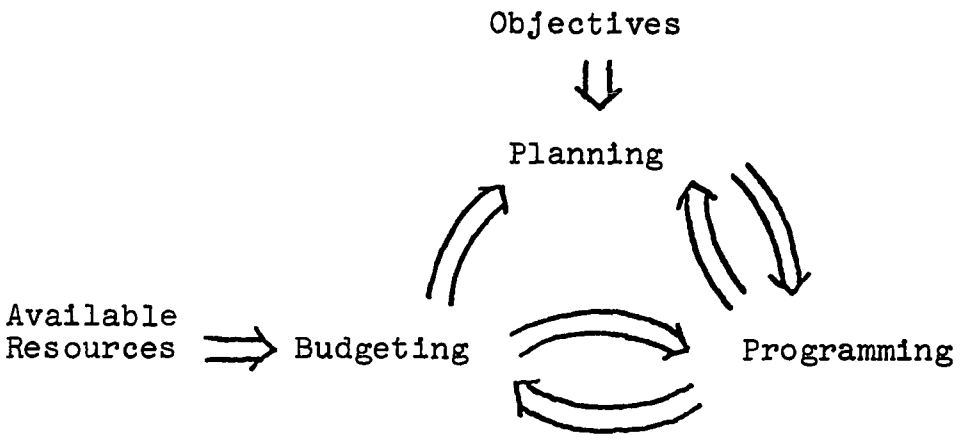
[1]Smithies, Budgetary Process, pp. 23-25.

[2]This was adapted from State-Local Finances Project, Development of Initial Instructions to Inaugurate a Planning-Programming-Budgeting System: Some Preliminary Considerations and Model Instruction to be Adapted for Local Use, p. 20.

[3]Frederick C. Mosher, Program Budgeting: Theory and Practice, pp. 49.



Each step in the process defines to a more finite degree the matching of objectives and resources.

Program Change Procedures

Within this generalized framework of planning-programming-budgeting, the system used to integrate the other three components of PPBS (program structure, multi-year program, and analytical capability) can be discussed. In the Department of Defense the system is primarily built around the multi-year program. This plan projects outputs for eight years and finances for five years. It is a record of the program decisions made and is used as a base line for change. Planning is performed continuously, and the results of these plans are translated into the multi-year program by Program Change Proposals (PCP's). The PCP's are approved at various levels in the Department of Defense in accordance with pre-established "threshold" values. All

PCP's are to be supported by analytic studies.[1]

Outside of the DOD no formal mechanism exists to routinely translate planning decisions into the multi-year program. The major documents used to integrate the government-wide system are Program Memoranda, Special Analytic Studies, and Issue Letters. Program Memoranda (PM's) are defined as:

> . . . presenting a statement of the program issues, a comparison of the cost and effectiveness of alternatives for resolving those issues in relation to objectives, the agency head's recommendations on programs to be carried out, and the reasons for those decisions. PM's . . . provide the documentation for the strategic decisions recommended for the budget year.[2]

The Program Memoranda incorporate the results of any analyses that bear on the issue in question.

The Special Analytic Studies provide the analytic background for PM's. This is a broad category of document meaning " . . . any piece of work analyzing a particular problem with the objective of coming to conclusions that can be used in the policy-making process."[3] The areas where Special Analytic Studies are performed are determined by the

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[1]David Novick, Program Budgeting: Long-Range Planning in the Department of Defense, pp. 8-11 and State-Local Finances Project, Initial Instructions, pp. 6-7.

[2]U. S., Executive Office of the President, Bureau of the Budget, Planning, Programming, Budgeting (PPB) System, BOB Bulletin No. 68-9, p. 2.

[3]Carlson, "Status and Next Steps," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. II, 1969, p. 618.

head of the agency involved and in response to Issue Letters from the Director of the Office of Management and Budget. "Issue Letters are letters from the Budget Director to the agency heads defining the major policy issues that should receive attention during the current planning and budgeting cycle."[1]

The system used to integrate parts of PPBS in the Federal Government has its basis in this Issue Letters-Special Analytic Studies-Program Memoranda cycle. The Issue Letters ensure that certain areas of policy are subjected to formal analysis. Analyses performed under this direction and from other guidance are called Special Analytic Studies. These form the background data for the Program Memoranda, which summarize decisions recommended to the President in the multi-year program. Requests for appropriations in the current budget year are based on approved PM's.[2]

PPBS and Traditional and Performance Budgets

Before drawing a distinction between PPBS and the traditional and performance budgets, it is necessary to establish a theoretical basis of this distinction. Robert N.

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[1] Ibid.

[2] It should be noted that the Department of Defense also uses Program Memoranda (called the Draft Presidential Memoranda) in addition to the Program Change Proposal cycle to integrate analysis into the multi-year program and into the budget cycle.

Anthony notes three separate but interrelated activities that are required in an ongoing organization. These are defined as:

> Strategic planning is the process of deciding on objectives of the organization, on changes in these objectives, on the resources used to attain these objectives, and on the policies that are to govern the acquisition, use, and disposition of these resources.
>
> Management control is the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objectives.
>
> Operational control is the process of assuring that specific tasks are carried out effectively and efficiently.[1]

It is unrealistic to expect a single budgetary presentation to provide the data necessary to perform all three of these tasks. The three different budgets noted earlier conform to the needs of these different tasks. This is shown in Table 4.[2]

Traditional Budget

The difference between PPBS and the traditional budget is considerable. PPBS is future oriented (five years or more) and organized by programs, while the traditional budget is historically oriented with a horizon of only one year and organized by object inputs. This difference can be easily noted in the case of the Department of Defense which is shown

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[1]Robert N. Anthony, Planning and Control Systems: A Framework for Analysis, pp. 16-18.

[2]The use of multi-purpose budgets is more developed in industry. Appendix A-9 contains a discussion of traditional, performance, and PPBS concepts in private industry to better illustrate the differences between them.

TABLE 4

COMPARISON OF ORGANIZATIONAL ACTIVITY AND BUDGETS

	Strategic Planning	Management Control	Operational Control
(1) Budget type	PPBS	Performance	Traditional
(2) Budget information	Program	Activity	Input Object
(3) General orientation	External, future, ignores organizational lines	Internal, historical, conforms to organizational lines	Internal, historical, conforms to organizational lines
(4) Required financial data	Less accurate	Relatively accurate, approximation acceptable	Precise
(5) Time horizon	Long	Short (1 year)	Short (1 year)
(6) Personnel primarily served	Top management and staff	Line management	All supervisory personnel

in Table 5.[1]

It is a misconception to believe that PPBS can totally replace the traditional budget. The input orientation of the traditional budget is required for budget execution and operational control. Generally managers do not buy outputs; they buy input objects -- people, travel, etc. Effective control requires that attention be paid to these items.[2] It is equally untrue that the use of a traditional budget implies that a PPBS-type budget is not required.

Performance Budget

There exists a great deal of confusion regarding the distinction between PPBS and performance budgets. Many writers in the area of performance budgeting see program budgeting (which they equate to PPBS) as only an interim step to performance budgeting.[3] This is not correct since PPBS is designed to serve strategic planning, and performance budgeting is designed to serve management control.

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[1]Appendix A-10 compares the traditional budget to the PPBS budget for the education part of the Department of Health, Education and Welfare.

[2]William Capron, "Development of Cost-Effectiveness Systems in the Federal Government," Information Support, ed. by Chartrand, Janda and Hugo, p. 149.

[3]Examples of this are found in George A. Terhune, Performance and Program Budgeting Practices in the United States and Canada, p. 1, and Gladys M. Kammerer, Program Budgeting: An Aid to Understanding, pp. 4-5.

TABLE 5

DEPARTMENT OF DEFENSE TRADITIONAL AND PPBS
MAJOR BUDGET CATEGORIES

Traditional	PPBS
Personnel	Strategic forces
Operation and maintenance	General purpose forces
Procurement	Intelligence and communication
Research, development, and test and evaluation	Airlift and sealift
Military construction	Guard and reserve forces
Family housing	Research and development
Civil defense	Central supply and maintenance
Revolving and management funds	Training, medical, and other general personnel activities
Other	Administration and associated activities
	Military assistance funded by the Department of Defense

There are important similarities and equally important distinctions between PPBS and performance budgets. Both of these identify programs within government agencies. It is not necessarily true that the programs are equivalent. Programs under performance budgeting are designed with an internal view and to assist management control. Programs for PPBS are designed by looking outside of the organization to the over-all purposes performed. One of the early instructions to Federal Government agencies on PPBS gave an example of these different programs in the case of the Coast Guard:

Performance Schedules	Proposed Program Structure
Vessel Operations	Search and Rescue
Aviation Operations	Aids to Navigation
Shore Stations and Aids Operation	Law Enforcement
Repair and Supply Facilities	Military Readiness
Training and Recruiting Facilities	Merchant Marine Safety
Administration and Operational Control	Oceanography and Other Operations
Other Military Personnel Expanse	Supporting Service
Supporting Programs[1]	

Even if the major programs established by performance budgeting are the same as those required under PPBS, the remainder of the program structure would not necessarily be equivalent. Under performance budgeting, programs are broken into subfunctions, departments, activities, and sub-

[1]U. S., Executive Office of the President, Bureau of the Budget, Planning, Programming, Budgeting, BOB Bulletin No. 66-3, (October 12, 1965), Exhibit 2.

activities.[1] This can be contrasted to the process of structuring programs under PPBS which was noted earlier. The main distinction is that performance budgeting requires that lines of organizational activities be noted and used in the structure since management control is exercised through the organizational lines. PPBS, on the other hand, ignores organizational lines in the designation of program elements.

Another similarity between PPBS and performance budgets is that both require output measures. There is, however, a basic distinction between the output measures. In performance budgeting the output measures are used to measure the rate of activity that is being achieved for a specific level of inputs versus the rate of activity that should be achieved. PPBS output indicators are trying to measure the benefit that is being received for the level of inputs provided. As a result, many of the output indicators used in performance budgeting include "intermediate" outputs as well as "final" outputs (those furnished directly to the client of the service). PPBS output indicators should focus on final outputs.[2]

There are many examples of output indicators that are

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[1]Municipal Finance Officers Association, Performance Budgeting and Unit Cost Accounting for Governmental Units, p. 4.

[2]Charles Christenson, "Program Budgeting" (Unpublished paper, Graduate School of Business Administration, Harvard University, August, 1968), pp. 8-9.

commonly used in performance budgeting. Some of these include requisitions processed in a purchasing department of a government organization, checks processed in a financial department, case-load in a welfare department, etc. It should be noted that it is often necessary to use output measures in PPBS that are essentially activity rates -- e.g., number of patients served in medical programs and number of students in educational programs. However, the purpose of these output indicators is not to measure the efficiency by which an organization is performing the activity but to act as a proximate measure of the benefits being achieved by the program. These should be used only in absence of a more direct form of benefit measurement.

There are other major differences between performance budgeting and program budgeting. Performance budgeting is largely oriented toward the review of past performance, with a high degree of emphasis on performance reports. PPBS relies on evaluation of past performance but only as a method to increase its capability to view the future. Performance budgeting must serve line management at all levels of the organization, from the lowest supervisor to the head of the department. PPBS is primarily designed to serve top management in the making of major decisions, and the line management becomes largely an instrument for the input of data.[1]

It should also be noted that a well-developed

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[1]Jesse Burkhead, Government Budgeting, p. 139.

performance budget is an aid to PPBS. The data on activities that is provided by performance budgets is helpful in analysis of alternatives -- particularly resource requirements.[1]

PPBS and the Federal Government's Budgetary Process

"Disjointed Incrementalism"[2]

The budgetary process in the Federal Government has been called "disjointed incrementalism," "the science of muddling through,"[3] and "five percentmanship budgeting."[4] The "base" of the budget is established on what has been conducted in the past, and the desirability of this "base" is seldom questioned. Most budget review is concentrated on the marginal adjustments made in the budget requests from the previous period. Normally for any given agency these marginal adjustments are requested increases in the budget. These increases are subjected to intense scrutiny, both within the administration and in Congress, and usually result in some reduction of, but not a total elimination of,

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[1]Stanley T. Gabis, Mental Health and Financial Management: Some Dilemmas of Program Budgeting, p. 1.

[2]A complete discussion of "Disjointed Incrementalism" is found in Wildavsky, Budgetary Process.

[3]Charles L. Schultze, The Politics and Economics of Public Spending, p. 47.

[4]U. S., Congress, Joint Economic Committee, Progress and Potentials, Hearings, 1969, p. 207.

the increase requested.[1]

The advocates of this form of budgeting state that it is preferable because the complex problem of managing the Federal Government is broken into segments small enough to be handled. The fact that the budget process is then composed of a number of small decisions means that a multiplicity of values is accommodated and conflicts are more easily resolved.[2]

Zero-Based Budgeting

The opposite of "disjointed incrementalism" is called "zero-based budgeting."

> [Zero-based budgeting] means that instead of accepting the established base of the program and challenging only the increments, that you assume that the base should be zero. The agency must therefore every year or every couple of years, justify the base of the program rather than just the incremental amounts.[3]

Some individuals view PPBS as a form of zero-based budgeting. They would regard Figure 2 as an accurate representation of the PPBS process.[4] Object inputs are converted to specific activities and these activities converted to

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[1]Wildavsky, Budgetary Process, pp. 3-60.

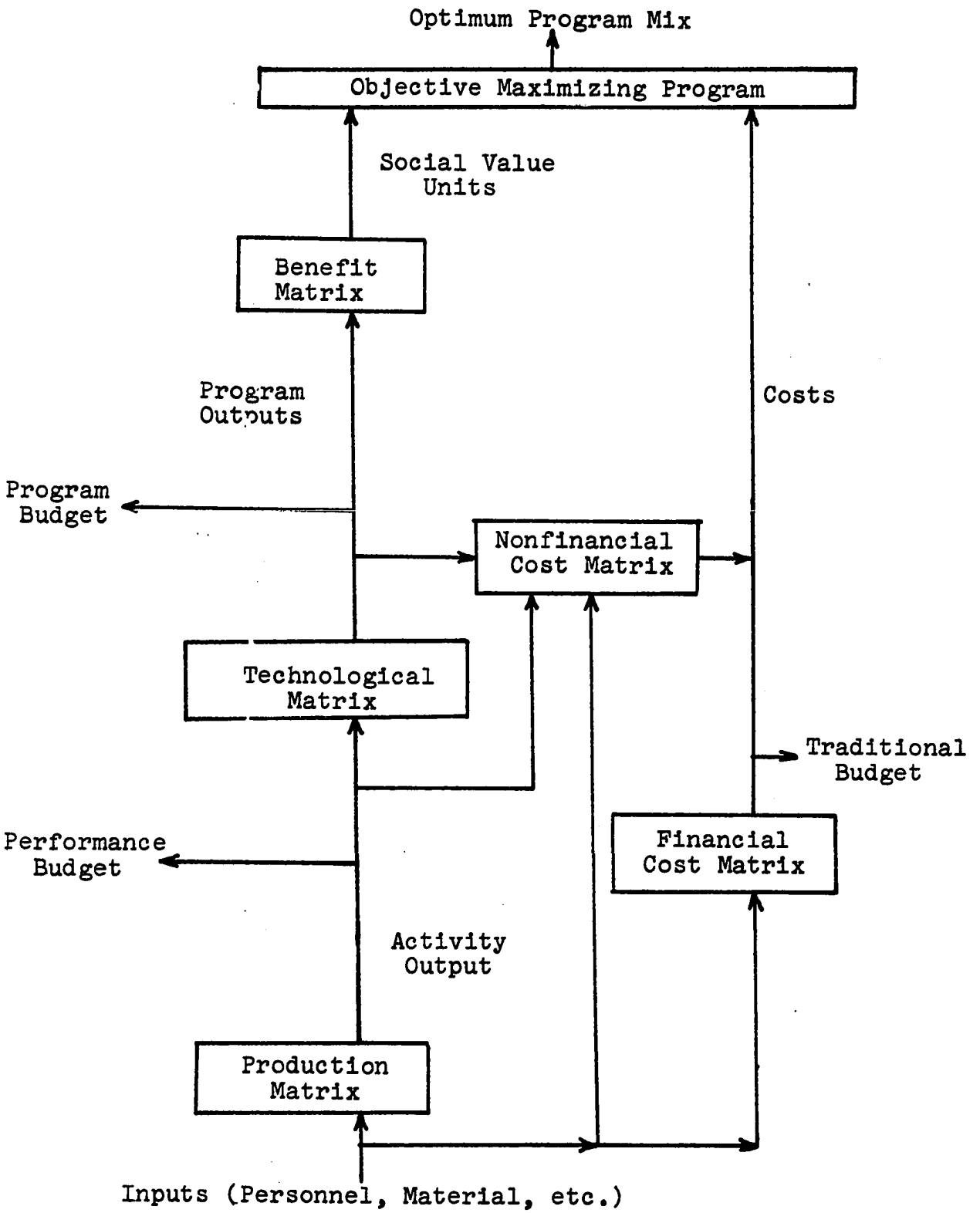
[2]Ibid., pp. 166-67.

[3]Testimony of Dr. James R. Schlesinger, U. S., Congress, Senate, Committee on Government Operations, Planning, Programming, Budgeting, Inquiry, of the Subcommittee on National Security and International Operations, p. 493.

[4]This figure was adapted from a model in Robert Stephen Brent, "A Model of the Planning, Programming, and Budgeting Problem," (Unpublished thesis, Naval Postgraduate School, 1970).

FIGURE 2

IDEALIZED PPBS MODEL



specific program outputs which are converted to a one-dimensional "social value." At the same time, costs (both financial and nonfinancial) are noted. By the use of Lagrangian multipliers (or some other mathematical program) the social value is maximized for all possible budget levels.

This equation of PPBS and zero-based budgeting can be noted by the statements of several users of PPBS. Governor George Romney, in introducing PPBS in Michigan, stated:

> This notion of "zero-base budgeting" is not new, but it is in sharp contrast to the incremental technique of budgetary analysis.[1]

Another advocate of PPBS stated:

> Approval of a particular spending project cannot be based on the certainty that it will yield some social benefits, since the variety of projects which would produce such results is virtually unlimited. Rather, it must be based on the conclusion that a program has a higher return to society than would expenditures on all alternative programs not being undertaken.[2]

This view of PPBS as a gigantic optimizing model does not consider the following major problems:

1. There is not any group of individuals who are able to construct a model such as is shown in Figure 2. This model far exceeds the capacity of man to solve problems.

2. This model does not consider the lack of a complete,

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[1]Paul H. Wileden, "Development of a PPB System in the State of Michigan," Innovations, U. S., Congress, Joint Economic Committee, 1969, p. 46.

[2]William J. Brown, The Federal Budgeting and Appropriations Process, pp. 33-34.

authoritative source of values that could convert diverse program outputs into a social value unit or even convert different inputs, activities, and program outputs into non-financial costs.

3. This model does not recognize the inadequacy of information from which the production matrix, technological matrix, and financial cost matrix would be constructed.

4. This model does not recognize the cost of analysis that would be required to develop these matrices from the raw data.[1]

The only major attempt in the Federal Government to achieve "zero-base" budgeting was in the Department of Agriculture in 1962. This attempt demonstrated that the time required for "zero-base" budgeting was not available in a normal budget cycle; that there was a noticeable lack of theory about the effect on outputs if inputs were varied; and that there was a lack of ability to compare programs with diverse outputs.[2] After this "zero-based" budget was completed it was found that more detail and documentation was generated (much more than the central staff could digest in the time available) and the character of the budget

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[1]These criticisms were adapted from the list of problems of "synoptic" decision-making in David Braybrooke and Charles E. Lindbloom, A Strategy of Decision, pp. 48-57.

[2]Aaron Wildavsky and Arthur Hammann, "Comprehensive Versus Incremental Budgeting in the Department of Agriculture," Planning, Programming, Budgeting, ed. by Lyden and Miller, p. 142.

changed slightly from previous incrementally prepared budgets.[1]

PPBS in the Budget Process

It is obvious that if PPBS attempts to become a "zero-based" budgeting device it is doomed to failure. The magnitude of that task is overwhelming. In fact, the PPBS concept has much more modest goals than "zero-based" budgeting.

A well-designed PPBS recognizes that a "grand optimum" of budget allocations is not possible. This does not imply that budget allocations should not be placed on as rational a basis as possible.

PPBS does not claim to be so comprehensive that all allocations in the budget are based on in-depth analysis. Most budget review continues on an incremental basis because of the lack of analytic capability to consider all allocation issues. PPBS is comprehensive only to the extent that over time all programs could be dealt with in an analytical manner.[2] The PPBS concept holds, however, that there are

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[1] Ibid., pp. 144-47.

[2] Selma Mushkin and Brian Herman, The Search for Alternatives: Program Options in a PPB System, p. 8. Even this degree of comprehensiveness is theoretical. Many program areas will never be subjected to in-depth analysis because they do not consume enough resources to make this analysis worthwhile and/or because the state of the problem is so intractable that the results of the analysis would not prove beneficial.

some types of decisions where analysis is essential. Some decisions are not incremental in nature, and an incremental approach to these would be inadequate.[1]

It should also be noted that uncertainty is so great in most analyses that the resulting decision causes change in small increments that closely corresponds to "disjointed incrementalism."[2] The difference between these changes is that the PPBS advocate recommends these small changes because of an explicit consideration of uncertainty and not because it is easier to "sell" in the budgeting process. Changes which should not be incremental are possible under the PPBS concept and not under the "disjointed incrementalism" process.

The major differences between "disjointed incrementalism" and PPBS are more of philosophy than of technique.[3] These differences can be summarized as follows:

1. In "disjointed incrementalism" the budgetary process is important. What is achieved with the budget is assumed to be "good" because the process is "good." In PPBS the output is explicitly examined.

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[1]Schultze, Public Spending, pp. 77-82. Examples of this type of decision are new, major programs and large, expensive military weapon systems.

[2]William M. Capron, "The Impact of Analysis on Bargaining in Government," (Paper presented at the annual meeting of the American Political Science Association, New York City, 1966).

[3]Edward A. McCreary, "That New Federal Budgeting System," Personnel Administration, XXIX (September/October, 1966), 34.

2. In "disjointed incrementalism" the bargaining process is most important. In PPBS alternatives and analysis are most important.

3. "Disjointed incrementalism" focuses on the past, with current positions protected and expanded. PPBS focuses on the future and does not consider the "base" as secure.[1]

Summary

This chapter has laid a framework for considering the training needs in the Federal Government's Planning-Programming-Budgeting System. The basic philosophy of PPBS was described by Charles L. Schultze as:

> Planning, programming, and budgeting constitutes an attempt to integrate policy formulation with budgetary resource allocation, and to provide a means for regularly bringing systematic analysis to bear on both policy formulation and budget allocation.[2]

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[1]Allen Schick, "Systems Politics and Systems Budgeting," Public Administration Review, XXIX (March/April, 1969), 138-39.

[2]Schultze, Public Spending, p. 15.

CHAPTER II

HISTORY OF PPBS

There is a tendency for some writers in the PPBS area to assume that the system was developed and implemented in the Federal Government totally without historical precedent. This is untrue. Like most governmental systems, PPBS is a product of evolution. The general history of budgeting and some specific antecedents of PPBS will be discussed in this chapter. The conditions which precipitated the need for a change from traditional budgeting will then be explored. Finally, the process of implementation of PPBS in the Department of Defense and its expansion into the nondefense sector of the government will be discussed.

History of Budgeting

Since 1789, with the passage of the Treasury Act, the budgetary process has been a part of the political history of the United States. The history of budgeting can be divided into four general phases: early history, 1789--1920; expenditure control, 1921--1949; performance budgeting, 1950--1961; and PPBS, 1961--present.

Early History

The budget became one of the first points of political conflict in the United States. One of the earliest disagreements between Alexander Hamilton and Thomas Jefferson revolved around the budget. While Hamilton was the Secretary of Treasury he received only a few lump-sum appropriations.

> For instance, from 1791 to 1794, there was one appropriation for the Civil List, one for the Department of War, one to cover Treasury warrants outstanding and one to cover other listed expenditures. The Treasury was given wide latitude in the use of funds.[1]

Thomas Jefferson opposed this offhanded way of treating government monies. When he became President, his first message to the Congress stated:

> In our care, too, of the public contributions entrusted to our direction it would be prudent to multiply barriers against their dissipation by appropriating specific sums to every specific purpose susceptible of definition; by disallowing all applications of money varying from the appropriated application or transcending it in amount; by reducing the undefined field of contingencies and thereby circumscribing discretionary powers over money.[2]

Hamilton violently opposed this proposition. He pointed out that then the Congress could conceivably have separate appropriations for oats and hay for horses and that certainly one would be oversupplied and the other undersupplied. The Army officer in charge of transportation would not have

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[1]Smithies, Budgetary Process, p. 50.

[2]Fred Wilbur Powell, Control of Federal Expenditures (Washington, 1939), p. 175 as cited by Smithies, Budgetary Process, p. 51.

the authority to divert funds from the purchase of hay to the purchase of oats. By the time Congress got around to changing its appropriation, all of the horses could starve.[1]

The Jeffersonian view prevailed and the Congress attempted to provide funds limited to precise uses. The period from 1801 to 1921 was one of Congress appropriating monies and the executive branch working to circumvent the laws which rigidly bound them to specific purposes. Only during periods of crisis -- e.g., the Civil War and World War I -- did Congress formally relax the controls.

Through this same period one other aspect characterized the budgeting process. Except under the first two Presidents, Washington and Adams, there was not an executive budget. Each department submitted its own budget request directly to the Congress and received direct authorizations to spend.[2] This meant that the President had little control over budgetary decisions of the separate departments. This situation left Congress with the feeling that the executive branch was a "rudderless ship," with no one individual able to provide the necessary cohesion and direction.[3] The amount of control that Congress actually exercised during

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[1]Smithies, Budgetary Process, p. 52.

[2]Carlson, "Status and Next Steps," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. II, 1969, p. 614.

[3]Capron, "Cost-Effectiveness Systems," Information Support, ed. by Chartrand, Janda and Hugo, pp. 145-46.

this period can be seen from the casual treatment of original appropriations by executive agencies. The agencies were certain that the Congress would not want their functions to be discontinued during the latter part of the fiscal year, so they treated the original appropriations as only partial funding and routinely approached the Congress for supplemental monies.[1]

Until 1920 there was little attempt to provide a systematic form of planning to the budgeting process. Of course, the functions performed by the Federal Government in this period were normally simple and straightforward, and there was little need for extensive plans.

Expenditure Control

The second major period of budgetary history is noted by its emphasis on expenditure control. Because of the widespread use of supplemental appropriations, the degree of Congressional control of spending was questionable. There was also no control over agency spending exercised by the President, since he was not an active participant in the budgetary cycle. The lack of active control was the force that generated the first major budgetary reform.

The Commission on Economy and Efficiency

The Commission on Economy and Efficiency was formed

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[1]John S. Saloma III, The Responsible Use of Power: A Critical Analysis of the Congressional Budget Process, p. 6.

by President Taft in 1911. This group reported in 1912:

> The best that a budget can do for the legislator is to enable him to have expert advice in thinking about policies to be determined. His review of the economy and efficiency with which work has been done should be based on facts set forth in the annual reports of expenditures which would supplement the budget.
>
> To the administrator the advantage to be gained through a budget is the ability to present to the legislature and to the people, through the Chief Executive or someone representing the administration, a well-defined, carefully considered, lucidly expressed welfare program to be financed, and in presenting this, to support requests for appropriation with such concrete data as are necessary to the intelligent consideration of such a program.
>
> To the Executive the advantage to be gained lies in his ability to bring together the facts and opinions necessary to the clear formulation of proposals for which he is willing actively to work as the responsible officer. To the people the advantage is the fact that they are taken into the confidence of their official agents. Therein lie the practical use and purpose of the budget.[1]

The Commission made five major proposals for reform:

1. The budget should show not only the expenditures and receipts that were provided by existing laws but include the "budgetary consequences of new legislation . . . proposed by the President." This meant that the President was to be recognized as a definite author of policy as well as an agent to carry out the will of the Congress.

2. The budget should be formulated in terms of "programs or functions" broken into capital and current outlays. This breakout was not to replace the traditional organizational units and object classifications (travel, personal services,

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[1] Taft Commission on Economy and Efficiency, 62d Cong., 2d sess., House Doc. 854, p. 139, as cited by Smithies, Budgetary Process, p. 68.

etc.) but was to be a supplementary breakout.

3. Congress should recognize a distinct difference between the programs recommended and the question of economy and efficiency.

4. Vertical arrangements should be established so that the authority existed to shift funds from one appropriation to another with decreasing discretion to lower levels of the executive branch. For example, the President would have more discretion to move appropriations than the department head who would have more than the next lower level, etc., until the appropriation categories were absolutely rigid.

5. A systematic procedure of review of the budget should be established by the Congress. This review would include annual reports to the Congress on what was actually spent plus increases and decreases in inventories, etc.[1]

The Commission study provided a basis for much of the ensuing reform of budgeting. The political climate of 1912 did not permit serious consideration of this far-reaching document. Only after the end of World War I and the drive for economy that accompanied the cessation of hostilities were the proposals of the Commission reviewed. These proposals laid the foundation for the Budgeting and Accounting Act of 1921.[2]

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[1]Smithies, Budgetary Process, pp. 68-71.

[2]Arthur Smithies, "Conceptual Framework for the Program Budget," Program Budgeting, ed. by Novick, p. 30.

Budgeting and Accounting Act of 1921

The Budgeting and Accounting Act of 1921 is the basic budgeting law in effect today. It made three changes to the budgeting system. First, the act provided for a comprehensive executive budget by the President. The flexibility that was recommended in the use of appropriations was not included. The second change was the organization of the Bureau of the Budget. This office was placed under the Secretary of the Treasury and was responsible for assisting the President in developing the total executive budget. "The Bureau is directed to prepare the budget and is empowered to assemble, correlate, revise, reduce or increase the estimates of the several departments or establishments." Also, the Bureau was authorized to make studies required by the President to determine which changes were necessary to achieve "greater economy and efficiency." The third change was to transfer the Comptroller of the Treasury to a new organization, the General Accounting Office (GAO), under a Comptroller General of the United States. This office was removed from direct control by the President and is generally regarded by the Congress as their agent. (The Comptroller General's appointment is by the President but for a term of fifteen years).[1]

The changes made by the act did not meet the entire scope recommended by the Taft Commission. There was no

[1]Smithies, Budgetary Process, pp. 72-76.

provision for a budget classification based on functions or programs. The main area of contention of the act regarded the placement and authority of the GAO. President Wilson originally vetoed the act but it was later accepted, unchanged, by President Harding.[1]

Expenditure Control Budget Operation

The role of the budget during this period can easily be seen from the operation and emphasis of the Bureau of the Budget. Almost all of the broader aspects of the management of government programs were neglected, and "paper clip" efficiency was enforced. In a speech by General H. M. Lord, who was Director of the Bureau of the Budget from 1922 to 1929, the primary use of the budget was noted:

> Investigation by a representative of the department of which the bureau was a part disclosed loss or theft of towels by the hundreds, while more than 500 soiled towels were discovered tucked away in desks, file cases, and closets. The simple and obvious requirement that an employee turn in a soiled towel in order to secure a clean one was immediately put into effect.[2]

It is not surprising that the most narrow function of management was given the greatest attention during this period. The activities of the government were limited, and the budget of the Federal Government amounted to a small

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[1] Ibid., p. 76.

[2] Addresses of the President of the United States and the Director of the Bureau of the Budget, Regular Meeting of the Business Organization of the Government, Ninth Regular Meeting, June 22, 1925, pp. 15-16, as cited in Schultze, Public Spending, p. 11.

percentage of the Gross National Product.[1]

Period of Transition

After the Budgeting and Accounting Act of 1921, no major change in budgeting occurred for eighteen years. At that time economic changes made the existing organizational relationships inadequate. The depression of 1929 caused a major change in the activities of the Federal Government. With the proliferation of new agencies and programs, control and co-ordination by the President became more difficult. President Roosevelt's Committee on Administrative Management proposed that the President be given greater staff assistance, and the Reorganization Act of 1939 provided for an Executive Office to advise the President directly. The Bureau of the Budget was moved from the Treasury Department to this office in that year. In this new organization, the Bureau of the Budget began to "exercise a more important and a more effective role in coordinating Federal activities and in assisting the President to formulate and enforce public policy through budgeting."[2]

Even with this organizational change, the budgeting process continued to focus on organizational entities and objects purchased. Further emphasis on budget change was provided by the Hoover Commissions.

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[1]Schultze, Public Spending, p. 12.

[2]Alain C. Enthoven, "Introduction," Modern Design, ed. by Tucker, p. 2.

Performance Budgeting

After World War II it became evident that the scope of activities of the Federal Government had undergone a massive change since the 1920's. Many writers recommended that the sole emphasis on input-oriented budgets be eliminated. This was expressed by the Hoover Commission of 1949 in its final report:

> Some of the fiscal concepts of the Federal Government come down from Alexander Hamilton. They were archaic when the total expenditures of the Government were $4,000,000,000 per annum. Now with a Government which expends over $40,000,000,000 per annum, they are totally inadequate. They have been patched up over the years, but, even so, they contribute to wasted efforts and even defeat the capable management and initiative of the best of officials.
>
> The time has come when the budgeting and accounting system of the Federal Government must be modernized. Unless this is done, the Congress, the executive branch, and the public will be unable intelligently to judge the wisdom of the proposed expenditures and the effectiveness of past expenditures.[1]

To correct this problem the Hoover Commission of 1949 recommended that "the whole budgetary concept of the Federal Government should be refashioned by the adoption of a budget based upon functions, activities and projects: this we designate a 'performance budget.'"[2]

The Congress adopted the Hoover Commission Report in

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[1]Commission on the Organization of the Executive Branch of the Government, Budgeting and Accounting, February, 1949, p. 1, as cited by Smithies, Budgetary Process, p. 7.

[2]Commission on the Organization of the Executive Branch of the Government, Budgeting and Accounting, February, 1949, p. 8, as cited by Smithies, Budgetary Process, p. 83.

the Budgeting and Accounting Procedures Act of 1950. This act made the use of traditional object classifications for budgets subject to the wishes of the individual appropriations subcommittee. The subcommittees have continued to insist on the detailed breakdown, and the "performance budget" was never achieved.[1]

The second Hoover Commission in 1955 recognized that the changes made by the law of 1950 did not reach their envisioned goal. In their report they recommended:

> That the executive budget continue to be based on functions, activities, and projects adequately supported by information on program costs and accomplishments, and by a review of performance by organizational units where these do not coincide with performance budget classifications.
>
> That the agencies take further steps to synchronize their organization structures, budget classifications, and accounting systems.
>
> That executive agency budgets be formulated and administered on a cost basis.[2]

With its emphasis on the performance of organizational units in connection with budgeting, it is obvious that the major budgetary practice advocated by the Hoover Commissions was performance budgeting as defined in Chapter I and not PPBS. The implementation of the Hoover Commission's

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[1]Smithies, "Conceptual Framework," Program Budgeting, ed. by Novick, p. 30.

[2]Budget and Accounting (Washington, D. C.: U. S. Government Printing Office, June, 1955), pp. 13-14, as cited by George A. Steiner, "Problems in Implementing Program Budgeting," Program Budgeting, ed. by Novick, pp. 313-14.

performance budget has been "slow and only partial."[1] This is not to say that these changes have not been significant. For example, the Army earlier submitted separate budgets for the Quartermaster Service, the Transportation Service, the Ordnance Service, etc. The National Security Act of 1949 with the Budgeting Act of 1950 changed this presentation to a "performance budget" using major classifications of Military Personnel; Operation and Maintenance; Procurement; Military Construction; and Research, Development, Test, and Evaluation. While this budget is still concentrated on inputs, the inputs conform to normal staff responsibilities and are more revealing than previous budget breakouts.[2]

Antecedents of PPBS

In contrast to a totally unique, revolutionary system, the Planning-Programming-Budgeting System adopted components that had been used earlier. PPBS's major contribution was that it spread these components to parts of the government which had not practiced them before and institutionalized all of the components together into one operable system. Each of the components of PPBS -- program structure, multi-year projections, and analytical studies -- have definite historical precedents.

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[1]Murray L. Weidenbaum, "Program Budgeting -- Applying Economic Analysis to Government Decisions," Planning, Programming, Budgeting, ed. by Lyden and Miller, p. 168.

[2]Smithies, "Conceptual Framework," Program Budgeting, ed. by Novick, pp. 30-33.

Program Structure

As noted in Appendix A-9, the philosophy of the program structure has long existed in private industry. The bases of most industrial budgets are program or product decisions.

The concept of grouping the Federal Government's budget into program lines was well developed shortly after World War II. As early as 1946 the total federal budget was aggregated into very broad functional programs such as major national security, labor and welfare, commerce and housing, and inter-national affairs and finance.[1] These classifications are too broad to serve as an effective basis for analysis, but they do establish the precedence of program structuring.

Another precedent to program structure in budgets was the work of the War Materials Board during World War II. During the early years this board attempted to control the demand on critical materials by controlling these materials in the contractor's plant with the Production Requirements Plan. This plan was unsuccessful because the broad program decisions were not made first -- i.e., how many tanks, planes, etc. should be made from the materials. In 1943 a Controlled Materials Plan, that allocated critical materials on the basis of end items, was instituted. For the remainder

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[1]U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 325.

of World War II this method continued to be used.[1]

Another application of a program budget in the Federal Government was by the Tennessee Valley Authority. From the time of its first budget in 1933, TVA's budget has been in program terms. TVA's operations were divided into four major programs: navigation, flood control, and power; fertilizer and munitions; resource development; and general service. Each of these were subdivided into sub-programs and individual elements which cut across the organizational lines.[2]

One of the major antecedents of PPBS in the Federal Government was the financial control system practiced by General Motors.[3] In 1920 the General Motors Corporation faced financial crisis. In the words of Alfred P. Sloan, Jr., the president of this company:

> The significance of the weakness in General Motors' organization was not clearly visible during World War I and for a time during the postwar inflation. It first took critical form in late 1919 and 1920. At this time large sums were being allotted upon request to all

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[1]David Novick, Melvin Anshen and W. C. Truppner, Wartime Production Controls, pp. 30-32.

[2]Burkhead, Government Budgeting, pp. 158-62.

[3]The connection between the system at General Motors and the Federal Government's PPBS is relatively straightforward. After World War II, Ford Motor Company hired a group of General Motors' executives to rejuvenate the company. The financial control system of General Motors is one of the techniques transplanted by these men. At the same time Ford also hired some young, former Air Force statistical control officers. One member of this latter group was Robert S. McNamara, who later, as Secretary of Defense, was the moving force behind the Defense Department's adoption of PPBS.

> divisions for plant-expansion programs, and, at the same time, rising material and labor costs ate up these funds before the projected expansions could be completed. There were overruns on appropriations -- that is, expenditures beyond the established limits -- by almost every division.[1]
>
> Inventories followed the same runaway course as the overruns on capital expenditure. In November 1919 production schedules for the next fiscal year were set 36 per cent higher than for the closing year. These production schedules were made by rule of thumb, or the division manager's ambition. To meet the schedules, the divisions began immediately to make heavy purchases of inventory.[2]
>
> Each division, in the absense of a corporation policy, operated independently, making its own price and production policies which landed some cars in identical price positions without relationship to the interest of the enterprise as a whole.[3]
>
> It was natural for the divisions to compete for investment funds, but it was irrational for the general officers of the corporation not to know where to place the money at best advantage.[4]

The financial control system introduced into General Motors by Donaldson Brown was one of the major tactics used to overcome these weaknesses. The basic concepts of that system are very similar to PPBS. These concepts were:

1. Major objectives for the firm were stated. The principal objective was that cars would be produced for all price lines from the lowest to the highest. The steps in this price line were specifically defined.
2. Individual cars were identified within these price lines.
3. Every investment was approved only after it had been

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[1]Alfred P. Sloan, Jr., My Years With General Motors, ed. by John McDonald with Catherine Stevens, p. 27.

[2]Ibid., p. 30. [3]Ibid., p. 60. [4]Ibid., p. 48.

thoroughly analyzed in light of these objectives -- including technical feasibility -- and after it had been proven that it provided the capability to earn a higher return on investment than possible alternative investments.[1]

In addition to these practical usages of program budgeting there were a number of recommendations that the concept of program budgeting be adopted by governmental agencies. One of the earliest of these was a study in 1907 by the New York Bureau of Municipal Research. This study recommended that budgets be presented in three classifications -- by function, by work programs, and by object of expenditure.[2]

In the special area of defense there were a number of writers who began advocating PPBS shortly after World War II. One of the first papers was by Charles J. Hitch in 1949; he advocated the use of systems analysis for the allocation of the defense budget.[3] David Novick of Rand Corporation[4] was one of the earliest advocates of a complete PPBS. Novick recommended a program structure which was remarkably like

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[1] Ibid., pp. 65-67 and 120.

[2] Schultze, Public Spending, p. 9.

[3] Planning Defense Production. Hitch later became the Comptroller in the Department of Defense and was one of the prime architects of PPBS.

[4] Efficiency and Economy in Government through New Budgeting and Accounting Procedures, (February 1, 1954), and Which "Program" Do We Mean in Program Budgeting, (May 12, 1954). The first of these is the classic work in the area of PPBS as adopted by the Department of Defense.

the one which later evolved, with the exception that he recommended a separate program structure for each service. At the same time Frederick C. Mosher was also advocating a program structure for each service.[1] One of the first advocates of a program structure that crossed service lines was Roland McKean in 1959.[2] The theory of structuring the budget in a program format in the Department of Defense was, therefore, relatively well developed by 1961.

By contrast, specific advocates of program structuring of budgets in the nondefense sector were not as vocal. As early as 1949 a program structure was recommended for the entire government.[3] This recommendation was seconded by various writers through the next decade -- including Arthur Smithies (1955), Jesse Burkhead (1956), and Gerhard Colm (1955).[4] These recommendations were general in nature. It was 1965 before specific details on how a program structure could be developed in the nondefense sector of the government were published in a collected work by David Novick.[5]

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[1] Program Budgeting: Theory and Practice, (1954). Mosher's suggested program budget appears to be oriented more toward performance budgeting than is the PPBS program structure.

[2] Evaluating Alternative Expenditure Programs.

[3] Don S. Burrows, "A Program Approach to Federal Budgeting," Harvard Business Review, XXVII (May, 1949), 272-73.

[4] Smithies, Budgetary Process; Burkhead, Government Budgeting; and Gerhard Colm, The Federal Budget and the National Economy.

[5] Program Budgeting, ed. by Novick.

In spite of all of these efforts and general recommendations, the majority of agency budgets in the Federal Government bore little resemblance to a program-oriented structure in 1961. The Department of Defense budget was more oriented toward inputs than others, but all of the agencies' budgets (except TVA) had a high degree of input orientation.

Multi-Year Projections

The problems of using a single-year horizon for budgeting were recognized early. President Truman stated in 1954:

> . . . the financial program of the Government cannot be planned in terms of a single fiscal year. It must be planned in light of security, economic and budgetary goals -- not just for the ensuing year but for three and even four years ahead.[1]

Executive Order 9384 in 1943 required all agencies to prepare five-year forecasts for all public work programs. This requirement was enacted into law in 1956 by Public Law 84-801.[2] In addition, the Bureau of the Budget began to prepare rough five-year projections of budgets as early as 1946.[3] In spite of these sporadic attempts to program over

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[1]The Budget of the United States Government for the Fiscal Year Ending June 30, 1954, p. M54, as cited by Mosher, Program Budgeting: Theory and Practice, p. 43.

[2]U. S., General Accounting Office, Comptroller General of the United States, Report to the Congress: Survey of Progress in Implementing the Planning-Programming-Budgeting System in Executive Agencies, (July 29, 1969), p. 9.

[3]U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 325.

a multi-year basis, in 1961 the majority of the governmental budget was reviewed on a single-year basis.

Analytical Efforts

As noted earlier, the first use of systems analysis was in the area of water resources. As early as 1902 in the Rivers and Harbors Act, Congress demanded cost-benefit analysis to support proposed projects.[1] Since 1935 these analyses have been commonplace in water resources.

The immediate precedent for the use of systems analysis in the Federal Government was the experience with Operations Research in World War II. Because of the success of OR on tactical problems, the military services felt that this same approach could improve planning in the postwar environment. As a result the Air Force started Project RAND in 1946. By 1958 RAND had over 480 professionals employed to study Air Force problems.[2] Immediately after World War II the Navy, in connection with Massachusetts Institute of Technology, established the Operations Evaluation Group to study operational naval problems. Later the Naval Warfare Analysis Group, to study larger scope problems, was established as a part of the Navy.[3] In 1947 the Secretary of

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[1] Ibid., p. 10.

[2] R. D. Spech, "Rand -- A Personal View of Its History," Operations Research, VIII (November-December, 1960), 825-39.

[3] Joseph H. Engel, "Operations Research for the U. S. Navy Since World War II," Ibid., 798-809.

Defense established the Weapon Systems Evaluation Group to provide top-level technical and scientific advice in the weapon systems area. In 1954 the Institute for Defense Analysis, with about 200 technical and scientific personnel, was organized to perform studies of weapon systems to be used by more than one service. These studies were performed for the Weapon Systems Evaluation Group, the Joint Chiefs of Staff, and the Secretary of Defense.[1] In 1948 the Army formed the Operations Research Office in connection with John Hopkins University. The Army used this capability and also contracted for consultant OR studies.[2]

By 1948 all three military services and the Office of the Secretary of Defense had established offices to perform operations analysis. The major problems that were faced in the postwar environment were vastly different from those faced during the war. The major reason for this is that the problems in the postwar era did not focus on the present time horizon but on systems that would be operational in ten or even fifteen years. It is not surprising that the operations research agencies for all of the services and the Department of Defense began to devote more attention to the broader questions of development and procurement of advanced

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[1]George E. Pugh, "Operations Research for the Secretary of Defense and the Joint Chiefs of Staff," Ibid., 839-46.

[2]W. L. Whitson, "The Growth of the Operations Research Office in the U. S. Army," Ibid., 809-25.

weapons than to operational tactics of existing weapons.

While the Department of Defense was gradually developing an analytical capability to study defense problems over a period of fifteen years, no comparable effort was taking place in the nondefense agencies -- with the exception of the traditional water resources area. The subjection of allocation decisions to analytical study had not, therefore, penetrated deeply into the Federal Government before PPBS.

Inadequacies of Traditional Budget

The immediate problem that precipitated the implementation of a Planning-Programming-Budgeting System in the Federal Government was the inadequacy of the traditional budget as an aid to planning. For planning purposes budgetary data should answer the following three questions: What are we trying to do? How much of a job is it? How well is it being done?[1] The traditional budget of the Federal Government, expressed in its terms of input items, did not provide a satisfactory answer to any of these questions.

The major inadequacies of the traditional budget can be summarized thus: objectives and accomplishments are obscured; the functions of planning and budgeting are separated; fund allocations are made without any rational basis; required planning data is not provided; future-year costs are neglected;

[1]Felix A. Nigro, Public Administration Readings and Documents, pp. 319-20.

a bias toward the continuation of obsolete programs is created; alternatives are obscured; and the budget is not used as a management tool.

Objectives

The traditional budgetary documents describe in massive detail how the Federal Government spends its money, but this detail obscures, rather than illuminates, the purposes for which the money is being spent.[1] It is impossible to extract from the budget document itself any aggregate information on the objectives pursued by the Federal Government in total or by any single department.[2] The only objectives that are contained in the budgetary process are found in the budget message by the President. This narrative, usually about one hundred pages long, presents the President's program in very general terms. These general terms are totally inadequate for the transmission of objectives down through the hierarchy of the government.[3]

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[1]The detail contained in the Government's budget submission staggers one's imagination. The hearings before Congressional committees on the budget in 1953 required over 25,000 pages to record. (Smithies, Budgetary Process, p. 133.) In 1960 over 500,000 pages of budget justification and associated data were generated in the Department of Defense alone. (David Novick, New Tools for Planners and Programmers, p. 4).

[2]George A. Steiner, "How to Forecast Defense Expenditures," California Management Journal, II (Summer, 1960), 87.

[3]Smithies, Budgetary Process, pp. 101-8. This message often contains little more than a statement of the statutory authority for the various programs.

The clear understanding of objectives is a critical factor in the vitality of any organization, including the government. Operating " . . . without clearly defined objectives is like steering without a compass; one may avoid the rocks and stay afloat, but one may also go around in circles."[1] The degree of effort (input) applied in any activity is not meaningful unless it is "directed effort." "Directed effort" requires that objectives be defined and all effort expended in pursuit of those objectives.[2]

While the lack of clear objectives is damaging because it hinders the effective review of the budget and limits the knowledge of private individuals of the purposes of governmental programs, its effect on the internal operation of governmental activities is even more damaging. Lacking clear specification of what a governmental program is supposed to achieve, and having detailed knowledge of inputs of a program, it is not surprising that personnel tend to become more concerned with specific items of inputs than with the objectives of the program. The exclusive use of the traditional budget then is a major contributor to the substitution of means for ends in governmental activity.[3] Internal criteria of effectiveness cease to be the accom-

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[1]Duncan Davies and Callum McCarthy, Introduction to Technological Economics, p. 6.

[2]Philip Marvin, Management Goals: Guidelines and Accountability, p. 1.

[3]Mosher, Program Budgeting: Theory and Practice, p. 81.

plishment of the objectives of the program and turn instead toward the goals of self-preservation and institutional growth.[1]

Separation of Planning and Budgeting

A second major criticism of the traditional budgetary process is that it allowed the separation of planning and budgeting. To understand how extensive this separation is, one needs to understand that planning and budgeting were performed by different people at different times and in different units. Plans were formulated by planning staffs on a continuous basis and in units of major programs. Budgets were formulated by financial staffs in a relatively constricted period of time and in units of inputs. The only point at which the two met was during review by the head of the agency, who was unable to make a valid comparison between the two because of the unit differences.

One author commented on this separation by stating:

> Traditionally, government bureaus have been split . . . between the "planners" and the "budget people," the former living in a fictitious world where programs were developed on the hypothesis that resources were free, while the latter were engaged in trimming the fondest aspirations of the planners in light of the funds available.[2]

Ideally the budget should be one part of the planning

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[1]Alain C. Enthoven and Henry Rowen, Defense Planning and Organization, pp. 19-21.

[2]Schlesinger, "Quantitative Analysis and National Security," p. 299.

process. This was not the case in traditional budgeting. Plans were based on requirements and were often "fiscally unrealistic."[1] Budgeting, by its very nature, is fiscally realistic but there is every evidence to believe that budgets were not based on carefully defined plans but were formulated in one of two methods: in the first, the costs incurred in the past were automatically transferred forward into the future;[2] in the other method, a ceiling amount was allocated to each department, service, or activity, and these activities determined the program to follow. This latter method has been described as "starting with a budget and sending it off in search of a program."[3]

Inadequate Basis for Fund Allocation

The budgetary process is the point at which the decisions concerning the allocation of funds to different governmental projects must be made. Under the traditional budgetary process there was no meaningful information given to the decision-makers on how these funds should be allocated. The actual allocation was an "accidental result" of a myriad of

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[1]Hitch, Decision Making for Defense, p. 26.

[2]Mosher, Program Budgeting: Theory and Practice, p. 47.

[3]David Novick, "The Department of Defense," Program Budgeting, ed. by Novick, p. 97.

independent decisions[1] based on "dominant enthusiasm."[2] The decision-maker had to decide which of the programs described as "vital national necessities" and "absolute essentials" would receive the funds required for operation.

Inadequate Data Base

The traditional budget did not provide the type of data necessary to evaluate programs -- either before the program or during the operation of the program. In fact, from a managerial point of view it is difficult to conceive of a less informative way to classify expenditures than by an object classification.[3]

The budget classification provided ample detail to determine that the Army had 104 years' supply of Jeep parts and that the Navy had 11,000 dozen oyster forks, but it yielded no meaningful information to be used in program design or program evaluation.[4] As a result, most government agencies did not have any statistical or financial records that could be brought together to evaluate the need, the results, or even the cost of their ongoing or proposed

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[1]Murray L. Weidenbaum, Prospects for Reallocating Public Resources, p. 47.

[2]Schlesinger, "Quantitative Analysis and National Security," p. 296.

[3]Kammerer, Program Budgeting, p. 24.

[4]Hitch and McKean, Economics of Defense, p. 51.

programs.[1]

Neglect of Future-Year Costs

As noted earlier, the single fiscal year is a convenient administrative device, but each year cannot be considered a completely autonomous unit which is independent of the years preceeding and following. Yet the single-year horizon of the traditional budget accents the tendency to consider the fiscal year as autonomous, in spite of the fact that most programs have implications that extend more than one year into the future.[2] The failure to consider more than one year's cost of a program leads to four possible dysfunctional results:

1. Ill-advised legislation may be passed because of the consideration of only one year's impact. PL 89-329, The Higher Education Act of 1965, is an example of this. Under this act, aid to certain college students was granted without the thought that the cost of this aid would double the second year, triple the third, and quadruple the fourth as additional classes entered the eligible categories. The Congress was unwilling to sustain the higher cost of the aid in these

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[1]John Haldi, "Program Monitoring, Evaluation and Control," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 344.

[2]For example, in the 1964 budget, one author noted thirty-five separate new legislative acts that had implications for future years' spending. (Murray L. Weidenbaum, Federal Budgeting: The Choice of Government Programs. Congress and the Federal Budget, pp. 54-56).

latter years, and the eligibility criteria had to be changed.[1]

2. Agencies are tempted to use "foot-in-door" tactics to gain the initial approval of desired projects. Using this tactic the agencies can begin projects and programs, implying that future years' costs will be as low as the first year's. When the request for larger amounts of money is received in the subsequent years the justification for these funds is enhanced by the fact that if the larger funds are not approved, all of the money spent previously would be wasted.[2]

3. The use of a single-year horizon creates a greater tendency to fund some programs on a "start and stop" basis. In the long run a program conducted in this manner is more costly than it would be if the funding was sufficient for a sustained effort.[3]

4. The use of a single-year budgeting horizon implies an extremely high discount rate. Agencies are reluctant to recommend an increased expenditure in the current year based on the fact that it would be economical over a long-run

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[1]Senator William Proxmire, "Efficiency in Government and PPB: Some Prosals for Reform of the Budgetary Process," Congressional Record, CXV (May 23, 1969), S5500.

[2]Wildavsky, Budgetary Process, pp. 111-12.

[3]David Novick, Lead-Time in Modern Weapons, pp. 16-17. This problem is not totally solved by using budgets with multi-year horizons since the appropriation process is still conducted on an annual basis. However, the tendency to fund a program on an ad hoc basis is less when the long-run implications of funding decisions are considered.

period.[1]

Bias Against Change

Another of the weaknesses of the traditional budget was its tendency to continue programs long after they became obsolete. Generally the traditional activities of agencies were not questioned during the budget cycle.[2]

Even more of a problem is the tendency under traditional budgeting to expand traditional programs rather than establish new innovative programs to meet new requirements. This is because the new programs were more difficult to justify than expansion of the traditional programs.

Obscured Alternatives

The traditional budgetary process also obscured alternative ways to attain objectives. The only way to determine the purpose for which most of the appropriations were being used was to note the title of the organizational entity receiving the funds. Quite often the agency organization title does not adequately describe the functions performed, and the relationships between substitute and

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[1]Enthoven and Rowen, Defense Planning and Organization, p. 24. An example of this was found in the case of military pay. It was shown that a substantial increase in pay for military personnel would be more than repaid through reduced recruitment and training costs over a long period of time. The military services were reluctant to request this pay increase because of the effect on the current year's budget.

[2]Committee for National Objectives, Budgeting for Economic Development, p. 25.

complementary programs were illdefined.[1] The major effects of the obscuring of programs which competed with or complemented each other included duplication of programs, programs which worked at cross-purposes to each other, and the lack of co-ordination on many complementary programs.

Budget Not a Management Tool

Largely for the reasons noted above, the traditional budgetary process was not adaptable to many of the most important managerial functions. As a result, operating managers in the government tended to develop managerial tools independent of the budgetary process. Even more damaging was the fact that the budget was widely regarded as a "game" which had to be played by managers, manipulating it to their own ends.[2] The primary effort in budgeting was to attempt to expand the resources available to the organization.

Implementation of PPBS in the Department of Defense

There are two reasons for isolating the Department of Defense's implementation of PPBS. The first reason is obvious. The PPBS was developed and first implemented in the DOD. The use of this system by nondefense activities represents a movement, almost intact, of the techniques and procedures of the DOD-oriented PPBS.

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[1]Robert E. Millward, "PPBS: Problems of Implementation," Journal of the American Institute of Planners, XXXIV (March, 1968), 89.

[2]Burrows, "Program Approach," p. 280.

The second reason for separate consideration of the PPBS in the Department of Defense is because of the DOD's impact on society as a whole. In 1966 the DOD employed some 3,700,000 people (including 2,700,000 in uniform and 1,000,000 civilians); spent over $50 billion a year which was over 50 per cent of the total federal budget and 10 to 15 per cent of the Gross National Product; had an inventory of real property and equipment worth over $150 billion; had some 600 major installations in the United States which included housing, utilities, transportation systems, schools, hospitals, and policing needs -- in short, actually municipalities; operated airlines, shipping lines, communication systems and maintenance establishments, world-wide, to support its forces; and procured over 4,000,000 different items of equipment and supplies annually.[1]

The size of the DOD makes its management tools of particular interest. If this one department achieves a high degree of efficiency, a large part of governmental activity is then efficient.

Historical Development of the DOD

The understanding of the use of PPBS must be preceded by an understanding of how the Department of Defense evolved. The end of World War II marked an end to a military era of the United States. Prior to that time the military policy

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[1]Robert S. McNamara, "Managing the Department of Defense," Modern Design, ed. by Tucker, p. 12.

of this nation had been to maintain a small cadre of professional military personnel with a limited amount of weapons. At the outbreak of a war, the industrial complex was activated into an all-out effort to supply the weapons that an expanded armed forces required for combat.

Two things intervened to change this long-standing policy -- one international and the other technological. At the end of World War II there began a "cold war conflict" that has continued from that time until the present. This period has been characterized by small conflicts (Korea, Vietnam, Middle East, Cuba, etc.), with the constant threat of a major war.

The military technological revolution began during the latter part of World War II. One of the things which has characterized this revolution is that the complexity of weapons has increased tremendously, with an accompanying increase in destructive power. Military weapons generally became more powerful, more effective, and infinitely more complex.

This fact is complicated by another technological factor -- the rate of technological change is constantly increasing. Weapons are consistently improving and making existing weapons obsolete. A nation must continually bring new and modern weapons into its inventory.

The end result of this technological revolution and political environment is:

1. The destructive power of weapons and the tense international system means that a continuing military state-of-readiness must be maintained. The time for mobilization of industry, technology, and military forces is a luxury that is no longer permitted. The preparation for war, including the application of industrial technology to weapons, must be complete before any hostilities begin.[1]

2. The complexities of weapons mean that the cost and lead time of a new weapon are staggering. Several major weapon systems programs cost over $1 billion, with a lead time of several years.[2]

3. The complexity of weapons and their high cost places a premium on adequate planning at all levels -- strategic and operational.

In this new environment of military readiness it was necessary to make organizational and managerial changes to control the military programs. The basic organizational authority was the National Security Act of 1947. President Truman proposed that a single Department of Defense be created and the Departments of War and Navy be reduced to branches under the DOD. The major purpose of this change was to have

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[1]Hitch and McKean, Economics of Defense, pp. 8-17.

[2]Frederick M. Scherer, The Weapons Acquisition Process: Economic Incentives, p. 2. An example of the complexity of modern weapons is found in the intercontinental ballistic missile. The guidance package for the Titan Missile contains about 100,000 separate electronic parts. (David Novick, The Cost of Advanced Weapons, p. 6).

"unified direction of the land, sea, and air forces at home as well as in all other parts of the world where our armed forces are serving. . . . [and] we should have integrated strategic plans and a unified military program and budget."[1]

The legislation which emerged from this proposal by President Truman did not provide for a unified department. Instead it was a "confederation of three military departments [with Executive Department status] presided over by a Secretary of Defense with carefully enumerated powers." The separate services (Army, Navy, and Air Force) retained "all powers and duties related to such Departments not specifically conferred upon the Secretary of Defense."[2]

This organizational arrangement was doomed to failure from the very beginning. The first Secretary of Defense, James V. Forrestal (who ironically was one of the main opponents to a unified military establishment), recommended in his first annual report to the Congress that

> the statutory authority of the Secretary of Defense should be materially strengthened . . . by making it clear that the Secretary of Defense has the responsibility for exercising "direction, authority, and control" over the departments and agencies of the National Military Establishment.[3]

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[1]"Special Message to the Congress Recommending the Establishment of a Department of National Defense, December 19, 1945," Public Papers of the Presidents, Harry S. Truman, 1945, (Washington: Government Printing Office, 1961), p. 546, as cited in Hitch, Decision-Making for Defense, p. 14.

[2]Hitch, Decision-Making for Defense, p. 15.

[3]First Report of the Secretary of Defense, 1948, (Washington: Government Printing Office, 1948), as cited in Hitch, Decision-Making for Defense, p. 15.

The next ten years included many legislative steps that strengthened the power of the Secretary of Defense. In 1949 the National Security Act was amended and the services lost their status as Executive Departments. Uniform budget and accounting procedures were prescribed for use throughout the DOD. In 1953, in another amendment to the National Security Act, the Secretary's position was again strengthened as his office was expanded. President Eisenhower, in proposing the amendment, made it clear that the Secretary of Defense was to participate in all functions of defense. In 1958 the act was again amended. The Secretary of Defense was given operational control of "unified commands" through the Joint Chiefs of Staff. Each service was no longer to be "separately administered" but only "separately organized." President Eisenhower noted at that time:

> . . . complete unity in our strategic planning and basic operational direction (is a vital necessity). It is therefore mandatory that the initiative for this planning and direction rest not with the separate services but directly with the Secretary of Defense and his operational advisors, the Joint Chiefs of Staff, assisted by such staff organization as they deem necessary.
>
> No military task is of greater importance than the development of strategic plans which relate our revolutionary new weapons and force deployments to national security objectives. Genuine unity is indispensable at this starting point. No amount of subsequent coordination can eliminate duplication or doctrinal conflicts

which are intruded into the first shaping of military programs.[1]

These unification efforts gave the Secretary of Defense control of the over-all level of the defense budget. This control, however, was primarily exercised by the allocation of budget ceilings to the separate services, who allocated their portion to specific weapons and programs.[2]

Secretary McNamara

Robert S. McNamara became the Secretary of Defense in 1961. He defined his managerial philosophy as follows:

> I think that the role of public manager is very similar to the role of a private manager; in each case he has the option of following one of two major alternative courses of action. He can either act as a judge or a leader. In the former case, he sits and waits until subordinates bring to him problems for solution, or alternatives for choice. In the latter case, he immerses himself in the operations of the business or the governmental activity, examines the problems, the objectives, the alternative courses of action, chooses among them, and leads the organization to their accomplishment. In the one case, it's a passive role; in the other case, an active role. . . . I have always believed in and endeavored to follow the active leadership role as opposed to the passive judicial role.[3]

In embarking on the "active role" of management,

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[1]"Special Message to the Congress on Reorganization of the Defense Establishment, April 3, 1958," Public Papers of the Presidents, Dwight D. Eisenhower, 1958, (Washington: Government Printing Office, 1960), p. 278, as cited in Hitch, Decision-Making for Defense, p. 17.

[2]Hitch, Decision-Making for Defense, p. 18.

[3]Extract from the transcript of an interview with Secretary of Defense Robert S. McNamara on the National Broadcasting Company's program Today, February 17, 1961, as cited in Hitch, Decision-Making for Defense, p. 27.

Secretary McNamara found that there were some basic problems. First he found that there was an inadequate amount of information available for decisions. Within three weeks after assuming office Secretary McNamara directed a long list of questions beginning with "why" to the services -- Why are you doing this? Why can it not be done in a more effective way? He asked for answers to these questions (commonly called McNamara's "76 Trombones") within three weeks. He concluded from these answers that the data base was inadequate. For example, the services did not even know the total cost for supporting a B-70.[1] Because of this lack of data to support his "active role" of management, Secretary McNamara chose to modify the DOD's budget process.

DOD's Traditional Budget

All of the problems noted earlier with the use of traditional budgeting were found in the DOD. These shortcomings were particularly acute because of the size and complexity of the Defense Department and because of the fact that its budget was more input-oriented than was the budget of most nondefense agencies.

The problem of the separation of planning and budgeting was particularly critical. Generally budgets were assigned on a "ceiling" basis to the Department of Defense,

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[1]Donald J. Smalter and Rudy L. Ruggles, "Six Business Lessons from the Pentagon," Harvard Business Review, XLIV (March-April, 1966), 70.

and these ceilings were broken down into separate service allocations. Under Presidents Truman and Eisenhower the military services received approximately one-third of all government revenues after the fixed charges of the budgets were met. These were apportioned to the services on a relatively rigid percentage basis, with the Air Force receiving 47 per cent, the Navy 29 per cent, and the Army 22 per cent. These budget ceilings did give the Secretary of Defense some degree of control, but they did not guarantee a sensible allocation by the services themselves.[1]

Planning, on the other hand, was performed by the military services and was not fiscally realistic. One estimate of the price of the basic military operating plan (Joint Strategic Operating Plan -- JSOP) in the mid-1950's came to about $150 billion.[2]

Another major problem in the DOD with the traditional budget was that the services were not forced to coordinate their programs. Technology had succeeded in erasing many of the traditional lines between the separate military services which were largely based on means of transportation -- land, sea, and air. In the allocation of funds, each separate service naturally "tended to exercise its own

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[1]Kaufmann, The McNamara Strategy, pp. 22-31.

[2]Ralph E. Hanes, Jr., "Operations Research and Systems Analysis -- Tools That Can Help Us," Army Management Views, XIII (May, 1968), 4. By comparison, the Federal Government's total spending in the same time period was about $65 billion. (Brundage, The Bureau of the Budget, p. 244.)

priorities, favoring its own unique missions to the detriment of joint missions."[1] The type of war that the services envisioned was not even the same. The Air Force was planning to conduct a short war of nuclear proportions and the Army planned to conduct an extended war of attrition.[2] The result was a military establishment which was highly unco-ordinated and imbalanced. The Air Force gave priority to bombers and missiles for a strategic mission and neglected tactical aircraft to support Army operations and the airlift capability to move conventional forces. The Navy supported their nuclear attack forces (primarily aircraft carriers) to the exclusion of antisubmarine and escort capabilities. The Army used its minority share of the defense budget to retain the existing number of divisions even though they lacked equipment and supplies for a sustained conflict.[3]

The lack of consideration of the future was also critical in the Department of Defense. Planning used a horizon of four to five years but budgeting continued to project only one year into the future even though it was obvious that the lead time for weapon development ranged from five to ten years.[4] This limited horizon for budgeting gave the services an incentive to propose a large number of new weapons

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[1]Hitch, Decision-Making for Defense, p. 24.

[2]Kaufmann, The McNamara Strategy, p. 28.

[3]Hitch, Decision-Making for Defense, p. 25.

[4]Hitch, "Cost-Effectiveness Analysis," Defense, Science, and Public Policy, ed. by Mansfield, p. 49.

whose full cost would become evident only in subsequent budgets.

All of these problems led Secretary McNamara to develop a new system of planning, programming, and budgeting. This system was primarily designed to bridge the gap between the planning function and the budgeting function and to give the Secretary of Defense the information which he required to make program decisions effectively.

DOD's Planning-Programming-Budgeting System

To implement the Planning-Programming-Budgeting System in the Department of Defense, Secretary McNamara turned to his Comptroller, Charles J. Hitch, who had previously been in RAND Corporation. All of the elements of PPBS discussed in Chapter I were initially formulated in the DOD.

The first step of the DOD's implementation of PPBS was the design of a program structure. The major missions of the Department of Defense were investigated and nine programs were chosen:

1. Strategic Retaliatory Forces: This program was broken into three subcategories -- Aircraft Forces, Missile Forces, and Command and Control. The building blocks for this and the other programs are separately identifiable weapons systems or combat units. The 1965 program for Strategic Retaliatory Forces was broken into:

Aircraft Forces:

B-47	B-58
RB/B-47	KC-97
B-52	KC-135
RC-135	

Missile Forces:

Land Based:	Atlas
	Titan
	Minuteman
Sea Based:	Fleet Ballistic Missile System (Polaris)
	Regulus Missile System

Command, Control, Communication, and Support:

SAC Control System
Post Attack Command and Communications System
Base Operating Support
Advance Flying and Missile Training
Headquarters and Command Support

Notice that both Air Force and Navy systems were included in this program. The other programs in the DOD PPBS have a comparable amount of detail in their information.

2. Continental Defense Forces: This program included the surveillance, warning, and control network -- including the radars and control systems; manned interceptors; air-defense and anti-missile missiles; and the Civil Defense programs.

3. General Purpose Forces: This was the largest program in the defense budget. As opposed to the other two programs which have forces primarily involved in operations of a world-wide nuclear scope, this program contains the forces which are designed to fight local and limited wars or engage in theatre operations in a general war. These forces were broadly broken into service lines. Further subcategories of

broad missions or types of forces were contained in each service breakdown. The basic identifiable combat units were the program elements. For example, Infantry Divisions was one program element in the subcategory of Divisions of the Army; Cruisers, Frigates, and Destroyers were program elements in the Multi-Purpose Combat Forces subcategory of the Navy; and different aircraft types such as F-4C and F-105 were program elements in the Tactical Aircraft Forces subcategory of the Air Force.

4. Airlift and Sealift: This program was composed of three major subcategories -- Theatre Airlift, Military Air Transport Service, and Military Sea Transport Service.

5. Reserve and National Guard Forces: The program elements here were arranged by service and further broken into the appropriate missions that each component supports. Reserve and National Guard elements were also reviewed as a part of the mission element that they supported -- e.g., Airlift and Sealift, and General Purpose Forces.

6. Research and Development: This program contained all of the R & D projects which were not directly associated with one of the other programs. When a system reached the stage of operational systems development which is "the effort directed toward continuing development, test, evaluation, and design improvement of projects which have already entered the production-deployment stage," it was included in the program to which it was applicable. The Research and Development

program was broken into four categories -- research, exploratory development, advanced development, and engineering development.

7. General Support: This was the overhead category of the DOD. It included all activities which were not directly allocated to mission forces or weapon systems. Some of the subcategories include individual training and education, technical training, flight training, service academies, intelligence, and medical services. In terms of dollars this program accounted for 30 per cent of the defense budget. It should be recognized that many of the costs in this program are variable and will change as levels of the major "combat" programs are changed.

8. Retired Pay: This category has costs that are largely outside of the control of the Defense Department. Rates of pay are established by law.

9. Military Assistance: This program includes the military training and equipment assistance provided to foreign nations.[1]

These program classifications have not been static. Changes are made almost annually in an attempt to have a program budget which is more illuminating. To demonstrate the evolution of programs, the 1965 budget programs are compared to those used for the 1969 budget:

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[1]Hitch, Decision-Making for Defense, pp. 34-38.

Strategic Retaliatory Forces	Strategic Forces
Continental Defense Forces	
General Purpose Forces	General Purpose Forces
Airlift and Sealift	Airlift and Sealift
Reserve and Guard	Guard and Reserve
Research and Development	Research and Development
General Support	Intelligence and Communications
	Central Supply and Maintenance
	Training, Medical, and Other General Personnel Activities
	Administration and Associated Activities
Retired Pay	Retired Pay
Military Assistance	Assistance to Other Nations[1]

The general trend of programs has been toward a more finite breakout in the "overhead" (or General Support) area. The consolidation of Strategic Retaliatory Forces and Continental Defense Forces into one program -- Strategic Forces -- simply represents a recognition that these both were part of the same general mission -- strategic warfare.

The basic element in the DOD's program structure is the individual weapon system or military unit. For each of these systems the following data is accumulated:

1. An eight-year projection of the number of units of the weapon system -- e.g., the number of wings, squadrons, and aircraft for an Air Force fighter aircraft.
2. A five-year projection of the total costs required to support the system broken into:

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[1]Carlson, "Status and Next Steps," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. II, 1969, p. 745.

(a) Research and Development, Investment and Operating; and

(b) Traditional Appropriation Categories.

3. A five-year projection of the human resources required, broken into numbers of civilian and military personnel. The "critical" resource in some systems is not the number of dollars required but the availability of qualified personnel.[1]

All of this information is contained in the Five-Year Force Structure and Financial Plan. Most of the data is contained in a machine-processable format and can be summarized in various degrees of detail for use at different levels of the Department of Defense.[2]

The use of systems analysis is also a major part of the DOD's PPBS. To ensure the inclusion of analysis in DOD decisions, a Systems Analysis Office was established. At first, this office was organizationally located in the Office of the Comptroller, but its head subsequently became the Assistant Secretary of Defense (Systems Analysis) who reported directly to the Secretary. Alain C. Enthoven, the first Assistant Secretary of Defense (Systems Analysis), described the purpose and functions of this office:

> The Systems Analysis Office integrates the costs, effectiveness, and requirements data and the recommenda-

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[1]Alain C. Enthoven, "Programming and Budgeting in the Department of Defense," Modern Design, ed. by Tucker, pp. 89-92.

[2]Ibid., pp. 92-93.

> tions of the four services into groupings arranged so that the Secretary can understand what capabilities he is buying, at what cost, and how they relate to overall defense needs. The Office routinely provides the Secretary with the staff assistance necessary to identify and analyze alternative levels and mixes of forces. This insures that his choices are not limited to the alternatives proposed by the military services and the Joint Chiefs of Staff. In short, the Systems Analysis Office helps to broaden the range of alternatives available to the Secretary, to develop explicit criteria for defining the national interest in defense programs, and to structure the debate over issues in such a fashion that it focuses on the key judgements that must be made in choosing among the alternatives.[1]

Probably the greatest emphasis to the use of systems analysis was that Secretary McNamara demanded an analytically-based study before he would make a decision.[2]

PPBS, as implemented in the DOD, also contained the integrative system. The key to this was the Program Change Proposals (PCP's). These PCP's were to be prepared by the appropriate military department and submitted to the Comptroller's office in the Department of Defense. This office co-ordinated a total review by all of the activities concerned, including the Joint Chiefs of Staff and the Systems Analysis Office. After review and recommendations, the PCP's were to go to the Secretary of Defense for his consideration. If approved, the change would become a part of the five-year

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[1]Alain C. Enthoven and K. Wayne Smith, "The Planning, Programming and Budgeting System in the Department of Defense: Current Status and Next Steps," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 960.

[2]Adam Yarmolisky, "How the Pentagon Works," Atlantic, CCXIX (March, 1967), 59.

approved program. All of these changes were to be made continuously throughout the year. The Five-Year Force Structure and Financial Program was then to be a complete record of Secretarial guidance for use by the services in preparing their traditional budget estimates for the next fiscal year.[1]

It should not be assumed that the Secretary of Defense reviewed all of the Program Change Proposals and approved or rejected each one. "Threshold" values were established. Program changes below these threshold values could be made by the secretary of the military department or lower in the organization. Secretary of Defense approval was required for changes (1) of investment costs of more than $10 million in the first year and/or $25 million in total; or (2) of operating costs of more than $20 million in the first year and/or $50 million in total.[2]

Each PCP was to be based on an analytical study. Some of the analytical studies which resulted in a Program Change Proposal were initiated as the result of direction from the Secretary of Defense. Each year the Systems Analysis Office developed a program of studies that they felt should be performed. This list was approved by the Secretary and forwarded to the services and the Joint Chiefs of Staff,

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[1]Enthoven, "Programming and Budgeting," Modern Design, ed. by Tucker, p. 93.

[2]Hitch, Decision-Making for Defense, p. 71.

who performed the studies in co-ordination with the Systems Analysis Office.

The other major integrative device in the DOD's PPBS was the Draft Presidental Memorandum (DPM). This document was designed to give major analysis to the Secretary of Defense and the President and to serve as the primary guidance to the individual services of their force structuring actions. The DPM was prepared in the Systems Analysis Office and sent to the Joint Chiefs of Staff and the services for their comments before being forwarded to the Secretary of Defense.

PPBS in the Nondefense Sector of the Government

Faced with the reality of success of PPBS in the Department of Defense, President Johnson directed the nondefense sector of the government to adopt the same system. The President stated that the goals of PPBS were to allow the Federal Government to:

(1) Identify our national goals with precision and on a continuing basis.
(2) Choose among those goals the ones that are most urgent.
(3) Search for alternative means of reaching those goals most effectively at the least cost.
(4) Inform ourselves not merely on next year's costs--but on the second, and third, and subsequent year's cost--of our programs.

(5) Measure the performance of our programs to insure a dollar's worth of service for each dollar spent.[1]

The Bureau of the Budget was made the director of the implementation effort. BOB Bulletin 66-3 directed the mechanics of implementation. A total of twenty-three agencies were directed to adopt PPBS, and seventeen others (mostly smaller, regulatory agencies) were encouraged to adopt the system.[2]

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[1]"Statement by the President to Members of Cabinet and Heads of Agencies, August 25, 1965," Weekly Compilation of Presidential Documents, I, August 30, 1965. A copy of the entire memorandum is contained in Appendix B-1.

[2]U. S., Executive Office of the President, Bureau of the Budget, Planning-Programming-Budgeting, BOB Bulletin No. 66-3, (October 12, 1965), Exhibit 1. A list of the agencies required to adopt PPBS is contained in Appendix B-2.

CHAPTER III

ACHIEVEMENTS OF PPBS

How close does the practical use of the Planning-Programming-Budgeting System come to achieving its potential in the Federal Government? It has been noted:

> . . . as interesting as observing what happens to government when confronted with PPB will be watching what happens to PPB when confronted with government.[1]

Once a firm statement of the success (or lack of success) of PPBS has been formulated, the training needs designed to raise the current level of performance of PPBS to the desired standard can be derived.

The practical application of PPBS will be discussed in two sections. First achievements in the Department of Defense will be noted, and then achievements in the remainder of the government will be discussed.

PPBS in the Department of Defense

One way to evaluate the use of PPBS in the Department of Defense is to view the changes made after Secretary McNamara left the office. Then some specific problems still

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[1]U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 16.

encountered in the DOD's PPBS and some of the positive contributions of PPBS will be noted.

PPBS After McNamara

One of the major criticisms of the Planning-Programming-Budgeting System developed during Robert S. McNamara's tenure as Secretary of Defense was that the military was downgraded.[1] Under the traditional budgeting procedure the separate services played an independent role by selecting specific weapons to be purchased. In this manner the uniformed personnel had a significant voice in force and equipment decisions.

The early advocates of PPBS in the DOD made no secret of their desire to have the Secretary of Defense and his Office of Systems Analysis play a dominant role in the decision process. Alain C. Enthoven noted that one proven way of having better systems analysis was to have the analysis performed in the Office of Systems Analysis and allow the services to comment on the completed study.[2]

Under this system it is no wonder that the primary

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[1]A strong case could be made that the use of PPBS actually enhanced the role of the military. Previously the military, including the Joint Chiefs of Staff, was isolated from the over-all budgetary process. Under PPBS this was no longer true. All Program Change Proposals were co-ordinated with the JCS, and military advice was solicited on all budgets. (Hitch, Decision-Making for Defense, pp. 66-67.)

[2]Enthoven and Smith, "Current Status," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 964.

source of power and influence over decisions shifted to the Secretary's office. Admiral George W. Andersen noted this shift of power in an address before the National Press Club on September 4, 1963:

> Both the experienced military man and the operations analysts are important contributors to the decision-making process. However, I am disturbed because now, in the Department of Defense, the operations analyst -- properly concerned with "cost effectiveness" -- seems to be working at the wrong echelon, above the professional military level rather than in an advisory capacity to the military who should thoroughly appreciate his assistance.[1]

The dissatisfaction with the actions of the Systems Analysis Office and the authority-centralizing tendencies of PPBS continued after Secretary McNamara left office. This dissatisfaction extended even to the Congress. In December, 1969, Ivan Selin, who had been Acting Head of the Systems Analysis Office, stated in his resignation:

> . . . it has become clear that I cannot be confirmed in this position. . . . As you know, the House Armed Services Committee has been trying diligently to abolish the Systems Analysis Office.[2]

Gardiner L. Tucker was, however, appointed Assistant Secretary of Defense (Systems Analysis) on December 17, 1969, and was quickly confirmed by the Senate for that post.[3]

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[1]As cited in Claude Witze, "Cost/Effectiveness -- Tool or Crib," Air Force/Space Digest, XLVI (October, 1963), 1.

[2]Donald May, "Laird Gives Systems Analysis Office A New Boss and a Changed Mission," National Journal, January 3, 1970, pp. 5-6.

[3]Ibid.

Under Mr. Tucker the nature of the operations of the Office of Systems Analysis changed considerably. Currently the individual services perform the majority of the analyses and the Office of Systems Analysis plays the role of "devil's advocate" in the review of these studies. This places the individual services back in the role of initiator of proposals and greatly increases the role and power of military judgments in decisions.[1]

Another point of contention that developed under the Defense Department's use of PPBS was the method in which Draft Presidential Memorandums were prepared. The individual services submitted their Program Change Proposals without knowledge of the financial limitations of the budgetary process. The over-all reconciliation of PCP's (which inevitably exceeded the funds available) was made by the Office of Systems Analysis when it prepared the DPM's. The individual services could appeal the decisions, but the burden of proof was on them.[2]

Under the revised system, the individual services are given tentative fiscal guidance before they submit Program Change Proposals. Many of the decisions previously made by the Systems Analysis Office in the DPM's are now being

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[1]Grover Heiman, "Defense Revises PPB Process," Armed Forces Management, XVI (February, 1970), 43-45.

[2]Kenneth L. Robinson, Jr., "The Draft Presidential Memorandum: Tool of Defense, Decisionmaking," Perspectives for Defense Management, December, 1969, p. 49.

made by the individual services before PCP's are submitted.[1]

Another change in the Planning-Programming-Budgeting System involved the depth in the organization at which systems analysis was performed. Under the McNamara-PPBS, systems analysis was performed primarily at the top of the organization. Recently it has been attempted to push the use of systems analysis "down" the organizational chain-of-command to the lowest levels so that all DOD investment decisions are supported by an analytical effort.[2]

The important thing to note about these changes in the DOD's PPBS is that they are not a refutation of the system but a refinement of it.[3] The very fact that the system survived after the departure of a strong, active Secretary of Defense such as Robert S. McNamara speaks well of its contribution to the operations of the Department of Defense.

Problems in the Defense Department's PPBS

The fact that the Planning-Programming-Budgeting System has apparently been successful in the Department of Defense does not mean that the system has achieved perfection. There still exist problems that limit the effectiveness of

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[1]Report to the President and the Secretary of Defense on the Department of Defense by the Blue Ribbon Panel, (July 1, 1970), pp. 112-13.

[2]"Economic Analysis Goes Down Chain of Command," Armed Forces Management, XV (May, 1969), 60-63.

[3]D. V. Schnurr, "Military Programming and Budgeting Practices," Air University Review, XXI (January-February, 1970), 19-27.

PPBS.

Number of Program Changes

One of the major problems in the use of PPBS has been the number of Program Change Proposals that are generated. In the early days of PPBS, the office of the Secretary of Defense was literally flooded with Program Change Proposals.[1] After a period of time the number of major decisions required leveled off to 400 to 500 a year.[2] It should be noted that the system itself did not create the need for these changes. The size and complexity of the Department of Defense, as well as constantly changing environment and technology, create the need for change. The use of tentative fiscal guidance may reduce the number of changes submitted in the future.

Calendar

One of the problems that PPBS was to overcome was that of the calendar. Charles J. Hitch stated that PPBS would:

> . . . provide for more orderly, continuous program review in contrast to the hectic program-budget review crammed into just a few months of the year which had been the practice in the past.[3]

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[1]Kaufmann, The McNamara Strategy, p. 291.

[2]Brundage, The Bureau of the Budget, p. 139.

[3]Charles J. Hitch, "The New Approach to Management in the U. S. Department of Defense," Management Science, IX (October, 1962), 4.

The system has not performed to expectations in this regard. Most of the program decisions are made during the budget review which extends from October through April. In fact, it has been estimated that some 90 per cent of all major program decisions are made after January.[1] There are three reasons for this:

1. The individual services tend to delay the submission of Program Change Proposals until late in the budget cycle. They realize that program decisions are not as "final" as budgetary decisions.[2]

2. The Secretary realizes that decisions on some changes cannot be made in isolation. Changes then tend to be held until all of those relevant to a particular program category are received.[3]

3. The Secretary wishes to retain his flexibility. He can do this by delaying the decision until the last possible moment.[4]

Cost Estimates

Another major problem with PPBS has been the lack of validity of cost estimates.[5] The record of the DOD in

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[1]John P. Crecine, Defense Budgeting: Organizational Adaptation to External Constraints, pp. 30, 41.

[2]Ibid., pp. 41-42.

[3]John P. Bloom, "The Department of Defense Programming System," Comptroller, June, 1964, pp. 2-3.

[4]Crecine, Defense Budgeting, p. 41.

[5]Novick, "The Department of Defense," Program Budgeting, ed. by Novick, pp. 104-5.

estimating development costs for new weapons has been "spectacularly bad." The DOD has traditionally understated development costs by 100 to 900 per cent. There is hope that this record will improve with the continued development of a parametric cost-estimating capability in the military services.[1]

Even when development costs are adequately estimated, the record of accurate cost estimates is not good. The tendency of underestimation because of the omission of indirect and support items, or "tip-of-the-iceberg" estimates, still continues. While systems analysis attempts to explicitly consider the relationship between primary system costs and indirect costs, these relationships are not always well understood.[2] One of the major reasons for this is that the operating costs have not been tied closely to the programs. An arbitrary allocation of many of these costs is still required.[3]

A final problem in the area of cost-estimating in the Department of Defense is the tendency to use less than full value as a price for some resources. This is the case in

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[1]Parametric cost estimating is discussed in more detail in Appendix A-3.

[2]Enthoven and Smith, "Current Status," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 957.

[3]Hitch, Decision-Making for Defense, p. 65.

manpower, land, and nuclear materials.[1] There are also some activities where the prices used in analysis reflect more than the market value. This is the case in shipping, where the requirement to use U. S. vessels increases the cost.[2]

Use of Analysis for Limited War

Another of the problems of PPBS in the Department of Defense has been its uneven capability to deal with major issues. Systems analysis has not been as useful in dealing with the problems of limited war as it has been with strategic warfare problems.[3] This is particularly unfortunate since General Purpose Forces represent some two-thirds of the Department of Defense budget, including most of the Army, all of the Marines, all of the Navy (except for Polaris), and some 60 per cent of Research and Development.

The problems of dealing with limited conflicts that can occur over a broad geographical and political spectrum can be easily imagined.[4] However, the use of systems analysis

[1]Manpower is underpriced because of the draft; land, because its "opportunity cost" is seldom considered; and nuclear materials, because the cost is charged to the Atomic Energy Commission instead of the DOD.

[2]William A. Niskanan, Jr., "The Defense Resource Allocation Process," A Commentary on Defense Management, ed. by Gordon F. Smale, pp. 21-22.

[3]Fisher, Analytical Support for Defense Planning, pp. 3-4.

[4]Charles L. Schultze, Edward K. Hamilton and Allen Schick, Setting National Priorities: The 1971 Budget, pp. 23-24.

has made some definite contributions to the study of limited war. It has brought a form of rigorous structure to these problems and has assisted in identifying inferiorities in the force that can be corrected and superiorities that can be exploited.[1] On a more limited scale, systems analysis has been helpful in the design of specific weapon systems and in trade-off's between specific weapons with similar limited-war missions.[2]

Budget Dominance

One of the most pressing problems in the DOD's Planning-Programming-Budgeting System is the dominance of the budgetary process. Most of the budgetary decisions in the Department of Defense are still made in terms of objects instead of programs.[3] There are several reasons for this. First, it is not feasible to subject all areas to systems analysis. Second, the personnel involved in the budgeting process are more familar with object classifications than with program terms. Third, many budget decisions that must be based on object data are still necessary -- particularly in the area of efficiency. Finally, the services are aware that the Congressional budget must be presented in terms of

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[1]U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 209.

[2]Schultze, Hamilton and Schick, Setting National Priorities, p. 24.

[3]Crecine, Defense Budgeting.

objects.

While the vast majority of individual budget decisions are made in the traditional object classifications, the major reductions of service budget requests are now made in program terms. In the Fiscal Year 1970 budget submission, some 75 per cent of the total dollar reduction was made during the program-review phase.[1]

An even more dangerous tendency of the DOD's PPBS is that it appears to be moving toward a performance-oriented, rather than planning-oriented, system. The Department of Defense has instituted Project PRIME to attempt to develop performance/cost reporting down to the lowest autonomous organizational elements.[2] This system is based on the need for management control. The danger to PPBS could be that the performance data requirements could dominate the planning data. The breakout of the General Support program into the four major programs of Intelligence and Communications; Central Supply and Maintenance; Training, Medical, and Other General Personnel Activities; and Administration and Associated Activities appears to be motivated more by the desire for performance data than for planning data.[3]

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[1]Robinson, "Draft Presidential Memorandum," pp. 48-49.

[2]Project PRIME and PPBS have been combined under one system called the Resource Management System.

[3]Allen Schick, "Multipurpose Budget Systems," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, pp. 368-69.

Inadequate Analysis

Another problem in the DOD's use of PPBS is the coverage of systems analysis. Analysis is used in only a small percentage of the appropriate decision-making situations in the DOD.[1] There are two basic reasons for this: first, the organizational capability for analysis is limited;[2] and second, a high number of decision areas are excluded from analysis because of the "political override," including the effect of decisions on the careers of immediate superiors.[3]

It is hoped that the recent directive to make all relevant decisions at all levels subject to systems analysis will eliminate some of these problems. As one author noted:

> Compliance [with the need for systems analysis] will depend on understanding and understanding may take a long time. But the wise manager will make the effort to learn what it is all about and "get with the program." He will find that he will make better resource allocation decisions when he does. And his decisions will "sell."[4]

One other problem in regard to the use of systems analysis in the PPB system is the inadequacy of some of the analyses themselves. There is evidence that some studies

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[1]U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, pp. 127-28.

[2]Report to the President and the Secretary of Defense on the Department of Defense by the Blue Ribbon Panel, (July 1, 1970), p. 68.

[3]U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, pp. 127-28.

[4]"Economic Analysis Goes Down Chain of Command," Armed Forces Management, XV (May, 1969), 63.

are not performed to provide inputs for decisions but to support existing decisions.[1] This problem can only be corrected as decision-makers become more knowledgeable on how to use the capability of systems analysis.

Contributions of PPBS in the DOD

The problems mentioned above do not mean that the implementation of PPBS in the Department of Defense has been unsuccessful. There have been direct benefits: It has provided the Secretary of Defense with better and more complete information needed for decisions by allowing him to relate resources to programs. It has given the Secretary of Defense a greater degree of control over the military establishment and allowed him to exercise that control in a meaningful manner rather than arbitrarily or capriciously. It has closed the gap between planning and budgeting and allowed budgeting to proceed on an orderly basis, with emphasis on long-term (five-year) effects of budgetary decisions. It has provided a data base that allowed the application of systems analysis to military decisions and a system to integrate this analysis into the actual decision process.[2]

The use of systems analysis and the PPBS has provided another benefit. The Secretary of Defense and subordinate

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[1]Report to the President and the Secretary of Defense on the Department of Defense by the Blue Ribbon Panel, (July 1, 1970), 68.

[2]Kaufmann, The McNamara Strategy, pp. 290-91.

officials are now required to make explicit decisions on forces, capabilities, and weapons. These decisions were previously obscured in budget ceilings. Now both the decision and the process by which it was made are open and subject to review and criticism.[1]

The major contribution of PPBS and systems analysis may have been its effect on the use of emotion. Secretary McNamara stated:

> I expect Defense executives to develop their recommendations on the national military strategy, operating plans, force structures, budgets, etc., based on reason rather than emotion.[2]

The use of systems analysis has encouraged this. Analysis requires the search for facts and their relationships, and then the application of these facts to the problem at hand.

The use of PPBS has also made it possible for the Secretary of Defense to manage the programs by broad mission outlines without a major reorganization.[3] Unified analyses can be performed across service lines. This has resulted in a more balanced force structure.

The real question is whether or not decisions are better as a result of the Planning-Programming-Budgeting

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[1]Enthoven and Smith, "Current Status," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 959.

[2]Robert S. McNamara, "Defense Decision Making as McNamara Sees It," Armed Forces Management, X (November, 1963), 38.

[3]Niskanan, "The Defense Resource Allocation Process," A Commentary on Defense Management, ed. by Smale, pp. 3-5.

System. Any answer to that question would be largely speculative since it is impossible to determine if decisions would have been different if PPBS had not been implemented. It can be stated that the decisions which have been made have been based on more meaningful data, on the knowledge of and explicit consideration of more alternatives, on debate which focuses on fact instead of rhetoric and emotion, and on a greater consideration of interservice effects of decisions.[1] If it can be assumed that more informed decisions are "better" decisions, it appears that PPBS, with all of its existing problems, has apparently fulfilled the promise of improvement of decision-making in the Department of Defense.

PPBS in the Nondefense Sector of the Government

As noted before, the dissatisfaction with the traditional budgeting process as a management tool was not limited to the Department of Defense. All federal agencies were experiencing the same problems. Because of this dissatisfaction PPBS was implemented in the nondefense sector of the government.[2] The problems associated with this implementation of PPBS in the civilian agencies and a general evaluation

[1]Enthoven and Smith, "Current Status," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 961.

[2]The statement of President Johnson which implemented PPBS on a government-wide basis is contained in Appendix B-1.

of how it has fared will follow.

Problems of PPBS in the Civilian Agencies

The Planning-Programming-Budgeting System was moved, almost intact, from the DOD to the civilian agencies of the government. Many authors have written that the Department of Defense's PPBS was an inappropriate prototype for use in the civilian sectors.[1] Some of the reasons for this position are based on actual difficulties, while others represent misconceptions about PPBS that must be corrected before PPBS can become effective.

Lack of Planning

One major difference in the situations faced in the Defense Department and in nondefense agencies was the connection between budgeting and planning. In the DOD the concern was that there was a separation of planning and budget. In many of the nondefense agencies this separation did not exist because there was a noticeable lack of long-range planning. Planning was often accomplished in terms of the budget, with its limited horizon of one year, and no planning staff existed.[2] Robert N. Grosse, Professor of Health Planning in the School

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[1]For example, see Keith E. Marvin and Andrew M. Rouse, "The Status of PPB in Federal Agencies: A Comparative Perspective," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 803.

[2]Oscar Disler, "Progress from Budgeting to Planning in Government," Managerial Planning, XVIII (March-April, 1970), 25.

of Public Health of the University of Michigan, noted one example of lack of evaluation of programs and needs:

> There has been little systematic planning of the department's [Health, Education and Welfare's] programs. There was "thought" as to how to get across certain new concepts or how to get more funds for existing programs, but no tradition of carefully studying our interrelated program needs and evaluation of these programs.[1]

Professor Grosse later made it clear that the problem was basically one of no departmental co-ordination and no consideration of long-range problems as well as lack of evaluation of alternatives.

> Prior to the introduction of the planning-programming-budgeting system, long-range planning in HEW was sporadic and generally not department-wide. No mechanism existed for focusing attention on longer range objectives, deciding which types of programs should be given highest priority over the next several years, and then drawing up a budget consistent with those objectives and priorities.[2]

What was true in Health, Education and Welfare was also true in many of the other agencies.[3]

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[1]Robert N. Grosse, "Cost-Effectiveness as a Tool for Decision Makers in the Executive Branch," Information Support, ed. by Chartrand, Janda and Hugo, p. 154.

[2]Robert N. Grosse, "Problems of Resource Allocation in Health," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, pp. 1220-21.

[3]This lack of long-range planning was typical of many, but not all, nondefense agencies. For example, the Post Office Department's planning effort was described as ad hoc before PPBS. (R. Joseph Novogrod, Marshall Edward Dimock and Gladys Ogden Dimock, Casebook in Public Administration, pp. 253-54.) One noticeable exception to the lack of civilian agency planning was the National Aeronautics and Space Administration. Their planning effort was largely responsible for their successful achievements. (Webb, Space Age Management, pp. 61-62.)

The use of PPBS in the DOD was to eliminate the gap between planning and budgeting. In civilian agencies, PPBS was largely required to stimulate long-range planning.

Levels of Government Involved

A major problem encountered in the use of PPBS in the civilian agencies of the Federal Government is that these agencies often are not able to exert total control over either expenditures (inputs) or services and products (outputs). Control by the Federal Government is lost when the particular program involves several levels of governmental organizations.

In contrast to most other governmental agencies, the Department of Defense is concerned with only one level of government -- federal. States and local governments do not maintain armed forces for the purpose of national security.[1] Programs of nondefense agencies are greatly complicated by the interaction of state levels in administration. The problems faced by the Department of Labor, for example, range from the program under the Manpower Development and Training Act to the program under the Unemployment Insurance system. Under the former program, the entire burden of financing is carried by the Federal Government. Federal standards are applied for eligibility, operation, and reporting, and

[1]States do exercise some degree of control over National Guard forces. However, for purposes of training and in times of national mobilization, these forces are under federal control.

data collection, analysis, and system modifications are possible on a national scale. In the latter program the system is totally administered by, and primarily financed by, the individual states. While there are federally imposed minimum standards for this program, these standards will not even allow for a nationwide uniform collection of data.[1]

The multiplicity of levels of governments involved in a program can also be seen in the Urban Renewal Program. In 1961 the Federal Government contributed $1.3 billion to urban renewal projects. This was matched by $700 million by local governments and $900 million by state governments, as well as $9 to $12 billion from private sources.[2]

The problem of levels of activity is compounded when the financial aid is given through grants-in-aid. In this case the federal organization becomes a conduit of funds to states and other government bodies who run the programs and spend the money. The agency head cannot direct men and material through a command channel like the Secretary of Defense, but can only reorient programs by recommending legislation or recommending that next year's budget be reallocated.

The use of grants has become more significant. In

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[1]Asher Achinstein, "Constraints on Policy Analysis and Policy Implementation in the Federal Agencies," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. I, 1969, p. 372.

[2]Rothenberg, "Urban Renewal Programs," Measuring Benefits of Government Investments, ed. by Dorfman, p. 292.

1929 there was only $100 million in grants to states. This rose to $900 million in 1941 and to $20 billion by 1968.[1] Currently there are over 400 different grant-in-aid programs administered by the Federal Government.[2] The use of grants is not evenly spread throughout all of the functions of the government. Table 6 shows the percentage of total expenditures involved in direct purchases versus transfer payments (grants to governmental activities and payments direct to individuals) for various areas of Federal Government activity. The effect on the operations of an agency such as the Department of Health, Education and Welfare, where a high percentage of their funds are used for grants-in-aid, is obvious.

When there are a number of levels of government involved in a program, PPBS is not inapplicable nor analysis impossible. In fact, the need for analysis to determine the effect of grants is evident. In many cases it is not known if the grants have an addition or substitution effect (i.e., does the money in the grant add to the resources available for the purpose, or are other resources which would be available simply diverted from the purpose because the grant exists?).[3]

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[1]Weidenbaum, The Modern Public Sector, p. 14.

[2]Mancur Olson, Jr., "The Optimal Allocation of Jurisdictional Responsibility: The Principle of 'Fiscal Equivalence.'" Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. I, 1969, p. 323.

[3]Schultze, Public Spending, pp. 119-21.

TABLE 6

PURCHASES AND TRANSFER PAYMENTS FOR FEDERAL GOVERNMENT ACTIVITIES

Area	Purchase	Transfer Payment
I. National Security	93.5%	6.5%
Military Defense	97.2	2.8
Defense-Related Activities	85.2	14.8
Space Research	99.5	0.5
International Affairs	18.7	81.3
II. Welfare, Health and Education	10.8%	89.2%
Social Insurance	1.8	98.2
Veteran's Programs	22.6	77.4
Poverty Programs	14.5	85.5
Education	33.6	66.4
Health	45.2	54.8
III. Commerce, Transportation, Housing	29.3%	70.7%
Commerce	42.1	57.9
Housing	56.5	43.5
Transportation	28.3	76.7
IV. Agriculture and Natural Resources	37.6%	76.7%

Source: National Industrial Conference Board, The Federal Budget: Its Impact on the Economy, Fiscal Year 1968, pp. 35-41.

A multiplicity of government levels involved in a program does make the required analytical effort more difficult. Most systems analysis efforts in the Department of Defense assume that there is a single decision-maker with the authority to implement the recommendation. Social programs lack this structure for implementation of recommendations. The proper method of implementing recommendations (i.e., a manipulation of the system of rewards to meet the desired end) must become an explicit part of these analyses.[1]

This multiplicity of governmental levels involved in programs also has a definite effect on the data-gathering problem of PPBS. State and local integration into the data system is required to make PPBS most effective. Some projects have been implemented to achieve this goal. Five city, five county, and five state governments were given grants to implement PPBS on an experimental basis. The Department of Housing and Urban Development and Bureau of the Budget have begun an experimental project to determine the areas of state government planning, programming, and budgeting which require the most improvement. Two states were surveyed during Fiscal Year 1969 and were provided funds to effect improvements noted. Six other states were to be reviewed

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[1]Quade, Cost-Effectiveness: Some Trends in Analysis, pp. 19-20.

during Fiscal Year 1970.[1]

Interdepartmental Efforts

Civilian agencies also differ from the military because of the interdepartmental fragmentation of programs. In the area of national security, the Department of Defense is responsible for almost all of the programs. The same thing cannot be said for the other departments. For example, the Department of Commerce notes that almost every program in their Department ties in with some other federal program in some other department.[2]

The classic examples of multi-agency concern and participation in broad programs are in health and education. In the area of health there are twelve agencies, six departments, and one separate commission (administering a health trust fund), as well as the Department of Health, Education and Welfare, directly involved. This does not include the agencies which simply have employee health benefit plans. These twenty agencies spend a total of $5.4 billion annually on health. The Department of Health, Education and Welfare spends only $2.5 billion, or less than 50 per cent of this.[3]

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[1]Carlson, "Status and Next Steps," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. II, 1969, p. 634.

[2]Achinstein, "Constraints," Ibid., pp. 371-72.

[3]Marvin Frankel, "Federal Health Expenditures in a Program Budget," Program Budgeting, ed. by Novick, p. 213.

Education programs are even more fragmented. Forty-two agencies have funds in their budgets for education. The larger of these include HEW (which is primarily responsible), National Science Foundation, Veterans Administration, Department of Agriculture, Department of Defense, Atomic Energy Commission, and National Aeronautics and Space Administration.[1]

The foreign affairs area is another example of the problem of interdepartmental fragmentation. The Department of State controls only about 20 per cent of the foreign affairs budget. As one author noted, in the area of foreign affairs, Mr. Hitch would have to " . . . invent a budget, not rationalize one."[2]

Interdepartmental fragmentation should not be considered a block to the effective use of the Planning-Programming-Budgeting System. On the contrary, this should be considered an urgent reason for its use. One of the purposes of PPBS in the DOD was to offset the problems of interservice fragmentation of programs. Similarly, the use of PPBS in the civilian sector of the government should facilitate the management of programs where interdepartmental efforts are involved. A well-designed program structure would allow some consolidation of information and co-ordination

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[1]Werner Z. Hirsch, "Education in a Program Budget," Ibid., p. 179.

[2]U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 115.

of decisions across department lines.[1] PPBS is definitely more useful in this regard than the traditional object classification budget.

Fixed Costs

Another aspect of civilian agencies that is different from that of the Department of Defense is the higher percentage of funds that are relatively uncontrollable in any given budget year. The government can modify all federal spending programs and can eliminate most of them. This power is more theoretical than practical, however. In practice there are four categories of institutional barriers to changing the allocation of government funds. These are:

1. Trust Funds: These funds (such as social-security programs of old-age survivors and disability insurance) are financed by permanent appropriations and do not require annual appropriation action. Other trust-fund-type expenditures make annual appropriations a mere formality. For example, the Federal-Aid Highway Act of 1954 authorizes the states to enter into obligations which commit the Federal Government to liquidate these obligations through grants.

2. Permanent or Indefinite Appropriations: The largest of these is payment of interest on the public debt. Other permanent appropriations include removal of surplus farm

[1]Appendix A-10 shows how some educational efforts from other departments and agencies are consolidated into the program structure of the Department of Health, Education and Welfare.

commodities (30 per cent of gross customs receipts are earmarked for this purpose) and range improvements (one-third of grazing revenues from federal lands go for this purpose).

3. Other Fixed Charges: These expenditures are fixed by basic statute rather than through the annual appropriation process. Primarily these involve public assistance (the Department of Health, Education and Welfare makes grants to states to reimburse them for a fixed share of certain public-assistance payments) and veterans' compensation and pensions (paid to all qualified veterans, widows, and dependents with the amounts specified by law).

4. Partially Completed Projects: This includes funds for the completion of projects that were started with money approved in earlier budgets. The size of this can be indicated by the fact that $2.4 billion of the Fiscal Year 1969 budget was to continue construction projects for which a total of $28.8 billion had been spent prior to the budget year. There is a natural reluctance to cancel these ongoing projects after a substantial investment of public funds. (The political damage of "a half of a bridge" could be very high.) Because the Department of Defense does cancel some of their programs after substantial investment in research and development, none of the military programs are classified in this category.[1]

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[1]Murray L. Weidenbaum, "Budget 'Uncontrollability' as an Obstacle to Improving the Allocation of Government Resources," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. I, 1969, pp. 359-63.

If the above categories are used to indicate portions of the budget that are "relatively uncontrollable," a total of $96.6 billion (or about 48 per cent of the total budget authority requested) would be classified in this manner. If these "relatively uncontrollable" portions of the budget are broken into the separate agencies, Congress would control, through its normal appropriation process, the following percentages of the agencies' budgets:

	Per cent Relatively Controllable
Justice	100
Post Office	100
General Service Administration	99
Defense (Military)	97
State	97
Commerce	66
Housing and Urban Development	56
NASA	51
Agriculture	38
Interior	36
Veterans Administration	30
Defense (Civil)	26
Transportation	26
Health, Education and Welfare	12
Labor	12
Civil Service Commission	12
Treasury	0 [1]

If ongoing projects are eliminated from the uncontrollable category (assuming they are the most "controllable"), there would be three significant changes:

NASA	100 per cent
Defense - Civil	99 per cent
Interior	57 per cent

[1] Ibid., p. 364.

This "fixed payment" condition only emphasizes the need for PPBS. This feature demonstrates that a multi-year horizon is mandatory in considering governmental programs. Since changes can be made only over an extended period of time, long-range planning conducted on a systematic basis becomes absolutely essential.

Undefined Objectives

One of the primary problems of implementing PPBS in the nondefense sectors of the government resulted from the widespread feeling that the objectives of these agencies were of such a nature that they were simply not adaptable to that system. One author comments that the DOD's PPBS was not a good prototype for civil agencies because " . . . most civil agencies have more undefined (and) varied . . . objectives than the Defense Department."[1] It is difficult to distinguish between the ambiguity of objectives in the Department of Defense and in other agencies. One booklet, published in 1960, concluded that program budgeting would not work in mental health any more than it would work in the Department of Defense.[2] Only one year later PPBS was successfully implemented in the Department of Defense.

There is considerable truth in the statement that the objectives of nondefense agencies are not well defined. In

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[1]Marvin and Rouse, "Status of PPB," Ibid., Vol. III, p. 803.

[2]Gabis, Mental Health, p. 50.

the field of education there exist a number of possible objectives that could be followed. The role of the Federal Government could be to ensure or promote equality of educational opportunity or to develop new or innovative approaches to education or to promote general excellence throughout the nation's education system or some combination of these three.[1] This ambiguity of objectives should be an incentive to the use of PPBS by these agencies. One of the purposes of PPBS expressed by President Johnson was to identify our national goals with precision and on a continuing basis.

Multiplicity of Objectives

Critics also point out that the multiplicity of objectives in civilian agencies prevents the effective use of PPBS. Generally these individuals note that the government performs several basic functions: providing for a public good (something that is consumed in common); dealing with "spillover effects" (the consequences of an individual decision not only effect the decision-maker but also effect some other individual); making the distribution of income and opportunity more equal; managing publicly owned resources; performing tasks which are large scale and/or high risk; and increasing the efficiency of private markets.[2] As these

[1]John E. Brandl, "Education Program Analysis at HEW," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 1225.

[2]Fred S. Hoffman, "Public Expenditure Analysis and the Institutions of the Executive Branch," Ibid., pp. 929-30.

critics point out, national security is an area which is almost a pure example of a "public good," but most civilian programs participate in more than one of these six roles. This multiplicity of roles gives rise to a multiplicity of objectives.

The multiplicity-of-objectives argument against PPBS makes the incorrect assumption that the "public good" of national security can be measured as one item and that multiple objectives do not exist. The following four objectives are all valid in the area of national security: to prevent, or deter, war; to limit war, if it occurs, to the smallest geographical area and the lowest level of intensity; to terminate the war, if it occurs, as rapidly and decisively as possible; and to conduct the war, if it occurs, so that a minimum loss of life is involved.[1] Notice that these are not only multiple objectives but that they also conflict. For example, actions or weapons that will terminate conflicts as rapidly and decisively as possible may not ensure a minimum loss of life.

It is true that civilian programs have greater interactions with other programs than do military programs and that some of these interactions are difficult to define and measure. The existence of multiple objectives and high interactions with other programs complicates analysis and limits

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[1]Special Studies Report II of the Rockefeller Brothers Fund, International Security -- The Military Aspect, (New York: Doubleday, 1958), p. 61.

the strength of comparison of various alternatives. With multiple objectives it is doubtful that any one alternative will dominate all others. However, the existence of multiple objectives creates a stronger need for a systematic analysis. The effects of all of the alternatives on all of the objectives (some of which reinforce each other and others that conflict) can be considered explicitly by systems analysis.

The record seems to indicate that many of the programs that have been instituted without any form of systematic analysis have tended to disregard all effects except the primary ones or have tended to misstate the direction of these effects. The distributional role of the government is a prime example of this observation. One place where distributional effects have been disregarded is in transportation programs. The general income distribution effect of highway programs seems to be regressive. Highways are constructed from general tax revenues (as well as from gasoline tax), yet the benefits appear to accrue largely to those people who own automobiles, or the relatively affluent. To the extent that highway construction lowers freight costs and lowers the price of necessities, it could be a progressive redistribution. However, the net effect appears to be regressive. The major point in the case for systems analysis is that this aspect has never been totally evaluated.[1]

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[1]John R. Meyer, "Transportation in the Program Budget," Program Budgeting, ed. by Novick, p. 167.

In some other cases the distributional effects of domestic programs have been misstated. A prime example is in higher education. A study by Hansen and Weisbrod considered the distributional effect of the college-educational program of California. This program is one of the most open and accessible in the nation. The reason for this heavily state-financed program of education is so that youth from any economic class could have ready access to the possibility of upward social mobility. This study showed that contrary to intentions, the system was highly regressive.[1]

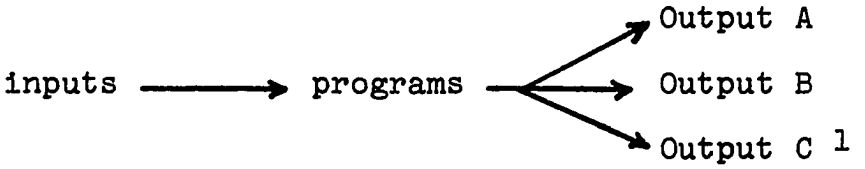
The point of this discussion is not to condemn the highway program or California's higher-education program because the objectives that they are designed to meet are not solely those of income or wealth redistribution. However, effective systems analysis is the only way that spillover benefits can be explicitly considered. The record to date indicates that they have been largely ignored in program design and decisions.

The impact of the explicit consideration of spillover benefits on the complexity of analysis should be noted. A simple analysis includes:

input ⟶ output

[1]W. Lee Hanson and Burton A. Weisbrod, Benefits, Costs and Finance of Public Higher Education, (Chicago: Markham Publishing Co., 1969) as cited in James T. Bonnen, "The Absense of Knowledge of Distributional Impacts: An Obstacle to Effective Public Program Analysis and Decisions," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. I, 1969, p. 433.

but the existence of spill-over benefits means that the analysis includes:



[1]

The analysis is necessarily more complicated in this latter case.

One other complication to analysis caused by multiple objectives is that the scope of the problem is increased. Consider the case of explicit consideration of the distributional effects of programs. This requires the making of three distinct decisions: the decision to support the general program, the decision of how the support will be given, and the decision of how the support will be financed.[2] If distributional effects were not considered, the third decision would not require analysis.

The use of a PPB type system is then made even more essential by the fact that multiple objectives exist in domestic programs. The systematic analysis of decisions will not guarantee easier decisions but only better-informed decisions. The distributional effects again provide an example:

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[1]Arthur Smithies, "Programs, Objectives and Decision Making," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 181.

[2]Frankel, "Health Expenditures," Program Budgeting, ed. by Novick, p. 240.

> A good PPB system can illuminate these distributional decisions, but cannot make them any easier. Indeed, assembling and publicizing information on who is helped by particular government programs may intensify political conflict.[1]

This political conflict over proper objectives would be directed toward defined issues and supported with adequate data instead of being based on pure emotion and rhetoric.

Impossibility of Quantification

Another limitation to the use of PPBS in the non-defense sector of the government has been that agencies believe that the programs that they are engaged in do not lend themselves to quantification.[2] This tendency was well described by Aaron Wildavsky, Professor of Political Science in the University of California at Berkley. He stated:

> If there is a demand for information the cry goes out that what the organization does cannot be measured. Should anyone attempt to tie the organization down to any measure of productivity, the claim is made that there is no truth in numbers. Oftentimes this is another way of saying, "Mind your own business." Sometimes the line taken is that the work is so subtle that it resists any tests. On other occasions the point is made that only those learned in esoteric arts can properly understand what the organization does, and they can barely communicate to the uninitiated. There are men so convinced of the ultimate righteousness of their cause that they cannot imagine why anyone would

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[1]Alice M. Rivlin, "The Planning, Programming, and Budgeting System in the Department of Health, Education, and Welfare: Some Lessons from Experience," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 922.

[2]Achinstein, "Constraints," Ibid., Vol. I, p. 377.

> wish to know how well they are doing in handling our common difficulties. Their activities are literally priceless; vulgar notions of cost and benefit do not apply to them.[1]

This argument often comes down to the fact that no value can be placed on intangibles such as scenery, time, security, or even human life.[2] No one will argue for the placing of a firm dollar value on these intangibles. However, it should be recognized that the mere act of making a decision, with or without analysis, implicitly places a value on these. For example, the allocation of funds for educational purposes instead of for health implicitly places a value on human life relative to education. The purpose of PPBS is to make this implicit valuation process better through the information that PPBS will provide.

While it is conceded that most activities of the government cannot be measured to a finite degree of accuracy by the use of numbers, it should be noted that the full potential of quantitative data has not been exploited in most areas. Just as proximate measures of effectiveness are used in place of absolute measures in military problems, the use of imagination will allow the development of proximate criteria in many domestic programs.

In general, our ability to measure benefits and costs of public activities is limited only by our imagination

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[1]Aaron Wildavsky, "Rescuing Policy Analysis from PPBS," Public Administration Review, XXIX (March-April, 1969), 189.

[2]"Putting a Dollar Sign on Everything," p. 124.

> and willingness to see them measured. We have the capability to measure many more impacts of public action than we are willing to measure.[1]

In addition to the possibility of the use of imperfect but somewhat effective "proximate measures of effectiveness, the use of some quantitative data is absolutely essential for most decisions. For example, the statement that "improving literacy in primary schools is more important than improving literacy in college" does not have much meaning. If it is said that an extra billion dollars spent on improving literacy in primary schools will contribute more to achieving universal literacy than the same billion dollars spent on improving literacy in college, the statement begins to have some meaning. Only when quantitative data that expresses cost is introduced does the choice begin to be meaningful.[2]

The use of quantitative data and cost-effectiveness analysis in some areas which were previously considered as too intangible for analysis is the best proof of the potential effectiveness of PPBS. One of these studies concerned the detection and treatment procedure of glaucoma. The study centered around the level of detection possible with combinations of permanent clinics and mobile examination units. The variables were the number of people who could reach a

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[1]U. S., Congress, Joint Economic Committee, Guidelines, 1969, p. 239.

[2]Smithies, "Programs, Objectives and Decision Making," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, pp. 182-83.

clinic versus the depth of examination possible. A combination of permanent and mobile facilities as well as an examination procedure which maximized the number of cases of glaucoma detected per dollar was formulated.[1]

Another study concerned the allocation of funds for the examinations for cancer. With this study the allocation was made so that for a given sum of money, the maximum number of deaths could be averted. The study was then expanded to include other health hazards -- motor vehicle accidents, arthritis, syphilis, and tuberculosis -- with the savings in prospective productive earnings as the criteria.[2]

In these cases the use of analysis which included quantitative data on problems which were earlier classed as totally unquantifiable facilitated the decision process. It can be seen that quantitative approaches to many domestic problems are possible and fruitful. It is true that output/benefit definition in quantitative terms is more difficult for some programs than it is for others, but basically this difficulty "has been used as justification for the slow rate of progress (in implementing PPBS) made by many agencies" which have only "avoided wrestling with benefit definitions."[3]

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[1]Augustin F. Nunez, "Disease Detection Under Uncertainity: An Applied Model," Management Action: Models of Administrative Decisions, ed. by Edward Weber and Gerald Peters, pp. 226-42.

[2]Grosse, "Cost-Effectiveness," Information Support, ed. by Chartrand, Janda and Hugo, pp. 163-69.

[3]Marvin and Rouse, "Status of PPB," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 813.

Lack of Data

Perhaps the major problem with the implementation of PPBS in the civilian agencies of the Federal Government is the lack of data. Information in many governmental areas is grossly inadequate.

The major data deficiency in civilian agencies of the government is the lack of knowledge of social "production functions." Very little is known in areas such as welfare, health, and education about what effect changes in the levels of input or in alternatives have on the attainment of the objective desired.

> Despite the fact that much research has gone on in the psychology of learning and in the sociology of social problems, and that educational and social research data have accumulated in the literature over centuries, very little is really known and understood about the instructional process as it takes place in educational institutions or about behavior as it occurs in society. The theories . . . and data that exist, fall far short of the robustness and breath needed for effective systems analysis and design.[1]

Not only is the social production function often unknown, but evaluation data to measure the benefits of Federal Government programs is "almost nonexistent."[2] Particularly in the social area, programs that are in progress are "quasi-experiments." They were based on the assumption that they would improve health, education, housing, or raise

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[1]Eugene A. Cogan, Remarks on Systems Analysis for Social Problems, p. 3.

[2]Allen Schick, "From Analysis to Evaluation," The Annals of the American Academy of Political and Social Science, CCCXCIV (March, 1971), 69.

employment, etc. There has usually been no concrete attempt to test these assumptions or to measure the degree to which these programs have achieved their goal.[1]

Some examples of this lack of evaluation data are appropriate. Manpower and antipoverty programs are designed to increase the social productivity of the participants. Yet no program has been totally evaluated with data on what happens to the participants after they have left the program. "Some . . . have pieced together the fragments of evidence available and have published their own opinions, but most of these have reflected unabashed personal judgements supported by no 'scientific' methodology."[2] Other equally large gaps in benefit data include the distributional effects of programs[3] and the effectiveness of different methods of financial support (e.g., grants, revenue sharing, and direct payments).[4]

There are several reasons for the lack of this data. The major reason is time. In the manpower and antipoverty programs, one measure of effectiveness is the increased

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[1]Joseph S. Wholey, "The Absense of Program Evaluation as an Obstacle to Effective Public Expenditure Policy: A Case Study of Child Health Care Programs," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. I, 1969, p. 451.

[2]Garth L. Mangum, "Determining the Results of Manpower and Antipoverty Programs," Ibid., Vol. III, pp. 1171-76.

[3]Bonnen, "Distributional Impacts," Ibid., Vol. I, p. 447.

[4]William B. Ross, "Policy Analysis and Housing and Urban Development Programs," Ibid., Vol. III, p. 1241.

earnings and employment experiences of participants. This requires a detailed follow-up to the program over an extended period of time, at least on the basis of an adequate sampling plan.[1]

This requirement of time for the collection of data is partially the cause of the second handicap to an effective data-collection system -- cost. An extensive follow-up system such as is needed for manpower and antipoverty programs is expensive. Secretary of Labor W. Willard Wirtz gave an indication of the magnitude of cost required:

> For example, if we were to improve our appraisal of this nation's employment problems, collecting separate data for several hundred geographic areas, and using definitions of employment that would permit quantification and analysis of the full range of employment problems, the cost would be about $10-15 million a year above our current expenditures ($8 million) for national employment statistics.
>
> Or, if we were to fully implement a management information reporting system so that it could provide both up-to-date data on individuals and the services performed for them, the cost would be about $10 million a year.
>
> Finally, if we were to analyze fully what we are achieving through our manpower efforts, we would need a more complete program participant followup system. This would include tracing individuals over a period of time in order to determine the effects of varying mixes of services.[2]

Notice that this cost is just for one limited area. The cost of routine data needed for analysis in all governmental areas would be a high multiple of Secretary Wirtz's estimates.

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[1]Mangum, "Manpower and Antipoverty Programs," Ibid., pp. 1171-80.

[2]Achinstein, "Constraints," Ibid., Vol. I, p. 385.

The earlier efforts toward evaluations of programs were created on an ad hoc basis. Most of the evaluation funds were spent on "crash efforts to serve as after-the-fact justification for program decisions." This cannot be a substitute for the routine collection of data on effectiveness of programs through the use of "scientific" evaluation methods.[1] This need has been recognized. Secretary of Health, Education and Welfare Gardner stated in his Program Memorandum to the President, "Recommended Maternal and Child Health Care Programs for Fiscal Year 1968":

> Lack of data on the effects of current programs has been a handicap to evaluation and planning. I am, therefore, directing that the Welfare Administration and the Public Health Service develop and implement improved reporting systems and intensified health interview and health examination surveys to improve our knowledge of the need for and the effectiveness of maternal and child health care programs. I am directing a continuing evaluation of the effectiveness of all maternal and child health care programs in meeting specific objectives such as the reduction of infant mortality and chronic handicapping conditions.[2]

Recently Congress has passed legislation in several areas that earmarks one-half to one per cent of the program funds for program evaluation. These funds have been included in public health grant programs, juvenile delinquency programs, work incentive programs, educational programs, and vocational rehabilitation programs.[3]

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[1]Wholey, "Child Health Care," Ibid., pp. 469-70.

[2]Ibid., p. 464.

[3]Carlson, "Status and Next Steps," Ibid., Vol. II, p. 624.

In addition to the use of routine reporting of the effectiveness of various programs, there has been a tendency to begin to upgrade knowledge and data with controlled experiments. One of the largest of these is the experiment on the effect on employment patterns of various "income guarantee plans" which was conducted in 1969 and 1970 in New Jersey.[1] Other experiments have been conducted on the effects of "negative income tax."[2] Large-scale, controlled experiments are also advocated for other social areas such as education.[3]

There are some individuals who believe that the lack of theory on the production function of social programs "paralyzes" the use of systems analysis.[4] This is not true. One of the major reasons for calling systems analysis into the public arena is that theoretic knowledge is lacking and a "model" must be developed.[5] The use of analysis and PPBS provides a framework for identifying the data which is required. At the very minimum, the use of analysis will

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[1]"Can Handouts Make Better Wage Earners," Business Week, February 28, 1970, pp. 80-82.

[2]Hoffman, "Public Expenditure Analysis," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 940.

[3]Brandl, "Education Program Analysis at HEW," Ibid., p. 1232.

[4]For example see Braybrooke and Lindbloom, A Strategy of Decision, p. 117.

[5]Quade, Systems Approach, pp. 2-3.

demonstrate where the data is inadequate.

Lack of data is evident for both costs and benefits. Data on costs is unavailable for the same reasons that it was unavailable in the Department of Defense -- the traditional budgeting and accounting system does not accumulate cost data by programs.[1] This is not a significant handicap to the use of PPBS. One of the basic purposes of PPBS is to collect cost data from diverse accounting object classifications and to group it under meaningful program headings.

The lack of data definitely limits the amount of assistance which PPBS, in its early stages, can be to governmental decision-making. Only after PPBS has been implemented will the data gaps be adequately filled.

Lack of Personnel

Another problem that the nondefense agencies have faced in the implementation of PPBS has been the shortage of qualified personnel. The success of the Defense Department's implementation of PPBS was largely based on the quality of the people involved in that effort and their confidence in each other.[2] This same situation does not exist in civilian agencies. Secretary of Commerce C. R. Smith noted the shortage of qualified personnel:

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[1]Marvin and Rouse, "Status of PPB," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 813.

[2]Thomas C. Schelling, "PPBS and Foreign Affairs," The Public Interest, Spring, 1968, p. 27.

> First, economic analysts are in scarce supply and like all other agencies we face expenditure and personnel hiring limitations. While this is patent, it would be a mistake to underestimate the limits these factors place on mounting continuing and comprehensive program analysis.[1]

Currently, outside of the Department of Defense there are about 1,145 positions identified specifically for implementation of PPBS. About 825 are professional and the remainder are support personnel.[2] These figures indicate that the quantity of personnel is not a significant problem. The General Accounting Office survey of implementation of PPBS disclosed that seven agencies (Commerce, NASA, AEC, Transportation, HEW, Labor, and HUD) have a higher proportion of their personnel working on PPBS than does the Department of Defense. Two other agencies (OEO and Interior) have about the same proportion, and nine agencies have significantly lower proportions of PPB employees than does the DOD.[3]

While the number of people involved in PPBS does not appear to be a problem, the quality of these personnel is questionable. Of the 125 professional employees, the educational level is high (averaging approximately 17 years of

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[1]Achinstein, "Constraints," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. I, 1969, p. 382.

[2]Carlson, "Status and Next Steps," Ibid., Vol. II, p. 636. The Central Intelligence Agency, Small Business Administration, Civil Service Commission, and Tennessee Valley Authority are not included in these figures.

[3]U. S., General Accounting Office, Comptroller General of the United States, Report to the Congress, (July 29, 1969), 48.

formal education), but analytical experience is low (about 47 per cent have quantitative educational experience, 25 per cent have any quantitative staff experience, and less than 25 per cent have had any PPB training).[1]

The ideal staff member concerned with PPBS must have a firm background in analytical experience. He should also be experienced in the systems and programs of the specific agency involved. Only with this experience will the analyst have enough familiarity with the program to perform valid analyses. The development of this experience can only be achieved after PPBS is implemented.

Lack of Experience with Analytic Concepts

Closely related to the two problems noted above is the difference between the long historical experience with analysis in the Department of Defense and the lack of comparable experience in the civilian agencies. Early use of systems analysis in the Defense Department made the implementation of PPBS easier. As early as 1958, Charles J. Hitch noted that the use of operations research on military problems had succeeded in changing the attitude of many military men on the applicability of quantitative techniques to military problems and had demonstrated that significant alternatives existed in methods to accomplish military

[1]Marvin and Rouse, "Status of PPB," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. II, 1969, p. 810.

objectives.[1] The widespread historical use of systems analysis caused other favorable conditions in the DOD. Some decision-makers were educated in how to use systems analysis. Staffs were developed and analysts became familiar with the military organizations, concepts, systems techniques, and constraints.[2] A specific methodology of military systems analysis was established. The key leverage point of military decisions, the selection of weapon systems, was identified. A sophisticated methodology for collecting cost data was established.[3] Finally, the years of research had yielded methods of measurement that were unattainable earlier.[4]

The civilian agencies did not have the benefit of this experience. As one author noted:

> The lack of sound theory and data with which to analyze most domestic programs points to another difference between systems analysis in the national security and domestic programs areas. For over 20 years, the Department of Defense and the military services have spent large sums of money on systems analysis of national security choices. As a result, there exist substantial analytic organizations within the Department of Defense as well as large independent ones outside. Large numbers

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[1]Charles J. Hitch, Economics and Military Operations Research, pp. 6-7.

[2]Ernest G. Miller, "Implementing PPBS: Problems and Prospects," Public Administration Review, XXVIII (September/October, 1968), 468.

[3]Weidenbaum, "Program Budgeting," Planning, Programming, Budgeting, ed. by Lyden and Miller, pp. 171-72.

[4]Robert S. McNamara, "The Analysis of Nuclear Defense: The Ultimate Case," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 168.

> of highly trained people from many disciplines have for years been working together on the analysis of national security programs. They have developed the data and analytic models needed to evaluate programs. Prior to 1965 this situation was a very rare exception in most domestic agencies. As a result the newly developing analytic organizations in the domestic agencies must begin with very little in the way of accumulated knowledge or experience in the program areas concerned.[1]

This major difference between civilian agencies and the military does not mean that the evolution of an operative PPB system will require ten to twenty years in the civilian agencies. Much of the analytic work in the DOD before the implementation of PPBS was concerned with specific policies and technical matters which contributed to the immediate decisions to be made. However, the contribution of these efforts to a better understanding of the role of analysis in the decision process is often transferable to the nondefense area. While it would be helpful to have similar experience in the nondefense areas because it would improve the quality of the current analyses, the framework of an implemented Planning-Programming-Budgeting System gives impetus and direction to the development of an effective analytic capability in the civilian agencies of the government.

The fact that analytical methods have not been used extensively in the nondefense sector of the government means that a learning process will be necessary before the analyses are refined. As Dr. Enthoven testified:

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[1]Hoffman, "Public Expenditure Analysis," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 932.

> I don't expect any spectacular breakthroughs [in the analyses in civilian agencies]. The studies that we did in the early days of PPBS in the Pentagon were terribly primitive by today's standards. I expect other areas of the Government will have to go through a phase of very primitive, very unsophisticated studies that you will want to treat with considerable caution.[1]

High Political Content of Civilian Programs

Another aspect which has inhibited adoption of PPBS in civilian agencies is the high political content of many of their programs. While special-interest groups do sometimes effect national security decisions, the role that they play is not overriding. In domestic programs which are primarily concerned with who gets what, the role of politics and special-interest groups is often dominant.[2] As one spokesman stated:

> Killing Communists on paper is easier to calculate -- and much less controversial -- than deciding which constituents deserve how much.[3]

As was noted in the discussion on distributional benefits, analysis which makes the distribution of benefits more explicit might increase political controversy.

The political sensitivity of programs in civilian areas effects analysis in many ways:

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[1]U. S. Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 307.

[2]Hoffman, "Public Expenditure Analysis," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, pp. 932-33.

[3]George B. Finnegan III, "Budgeting a la McNamara," Journal of Accountancy, CXXI (February, 1966), 17.

1. Private interest groups who anticipate that systems analysis might endanger the size of the benefits that accrue to them may prevent analysis being performed.[1]

2. Most people will admit that they do not have an intuitive grasp of complex military and technological problems. However, everyone feels that he has an intuitive grasp of even the most complex sociological problem.[2]

3. With programs that have a high political sensitivity, not only the objective that the program is to meet but the mechanics of the program become political issues. These political issues arising from the mechanics of a program are difficult to assess in analysis.[3]

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[1]Robert H. Haveman, "The Analysis and Evaluation of Public Expenditures: An Overview," Analysis and Evaluation, U. S. Congress, Joint Economic Committee, Vol. I, 1969, p. 7. For example, the appropriation act for the Federal Highway program prohibits the expenditure of any funds for economic analysis.

[2]Daniel P. Moynihan, "Policy Vs. Program in the '70's," The Public Interest, Summer, 1970, p. 96. Most people will be comfortable with leaving the design of personnel nuclear protection devices to the experts. But everyone feels that he is an expert on what constitutes a "good" education.

[3]An example of this is found in the 1967 budget for education. The President's recommended budget eliminated some $400 million of Federal Impacted School District funds. Analysis had disclosed that this program did not meet the purposes for which it was intended. The same budget recommendation contained an additional $1 billion in Title I aid to education which was to be partially financed by the $400 million reduction. Because of the high political content of the Federal Impacted School District aid, the House of Representatives restored the $400 million to that program, in addition to voting the additional $1 billion in Title I aid. (Schultze, "The Need for Choice," pp. 14-15.)

4. Because of the high political content of many civilian programs, the unitary direction that was common in the Defense Department does not exist. The DOD did not have Congress imposing its own will on the President and on the Secretary, as do many civilian agencies.[1] The use of analysis in these circumstances is less straightforward because of the more complex decision process.

The existence of areas with high political content should not preclude the use of PPBS and systems analysis. There is nothing in PPBS that automatically excluded the consideration of political factors.[2] Political feasibility can be explicitly considered in the analysis and should be considered in the recommendations resulting from that analysis.[3] At the very minimum, PPBS and systems analysis can illuminate the consequences of action even in the most politically sensitive question and allow a better-informed

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[1]Aaron Wildavsky, "The Political Economy of Efficiency: Cost-Benefit Analysis, Systems Analysis, and Program Budgeting," Public Administration Review, XXVI (December, 1966), 307. An example of this is found in the water-resource area. Based on cost-benefit analysis, the administration had recommended, in the last ten years, 282 Corps of Engineers projects worth $4.1 billion. The Congress has added another 270 projects worth $4.5 billion. (Schultze, Hamilton and Schick, Setting National Priorities, p. 167.)

[2]While this is true in theory, in practice political realities tend to be ignored in systems analysis. The major criticism of a group of systems analyses performed by aerospace firms for the State of California was that the recommendations were politically naive. (Weidenbaum, The Modern Public Sector, p. 167.)

[3]Yehezkel Dror, The Prediction of Political Feasibility.

political decision.[1]

Other Differences

There are a number of other differences between the situations which PPBS faced in civilian agencies and those in the Department of Defense. Some of the following make the use of PPBS and systems analysis easier in the civilian environment:

1. The variables are often easier to define.[2]

2. The conflict in social programs is largely against nature and not against a malevolent enemy.

3. The ability to gather data is less limited.

4. The results of programs are testable and verifiable, even though verification may require an extended period of time.[3]

5. The cost uncertainty faced in many nondefense programs is often less because of the reduced effect of technology. Nondefense programs can hope for a goal of plus or minus 10 per cent accuracy in cost estimates -- a goal that is

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[1]Hoffman, "Public Expenditure Analysis," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 939.

[2]For example, it is easier to relate the number of individuals moving across an arbitrary annual income line to the eradication of poverty than to relate the performance of a given weapon system to the objectives of national defense.

[3]Robert A. Levine, "Systems Analysis in the War on Poverty," Readings, ed. by Cleland and King, pp. 235-36.

unattainable in high-technology military programs.[1]

A final difference between the environments of military and civilian PPBS efforts concerns the stability of the environment. In the military, much of the analysis is concerned with physical systems such as aircraft and other weapons. This environment is relatively stable. The social-political environment is normally a part of most military systems analysis, but it often totally dominates civilian analyses. The social-political environment constantly changes as man acquires, protects, and changes his values.

Executive Commitment

Probably the major handicap of PPBS in the nondefense sector of the government is the lack of executive commitment to the system. The contribution of Secretary McNamara to the Defense Department's PPBS should not be underestimated. As David Novick stated:

> The interest of Secretary of Defense McNamara in planning and management sciences has led him to seek out those who could help him in this task. His interest provided the needed impetus to effect a major management change in the immense and complex Department of Defense. Equally important, the extraordinary capacity of the Secretary to master the complexities of vast programs

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[1]State-Local Finances Project, Role and Nature of Cost Analysis, p. 4. Civilian agencies do have a problem in cost-estimating that is not normally faced by military activities. In civilian programs, the total cost of the program is often not that appropriated by the Congress since costs to other levels of government and to private citizens must be considered. The total program cost in military programs more closely corresponds to the funds appropriated by Congress. (Hovey, Government Decision-Making, pp. 36-45.)

has given vitality and stature to the new planning tools.[1]

When Secretary McNamara implemented PPBS he was engaged in an "active" executive role and he found the traditional budget process incompatible with that role. He facilitated the implementation process by insisting on the data generated by PPBS and using it in his decisions. Alain C. Enthoven expressed the effect that this type of top management attitude had on the PPBS process:

> . . . an absolutely necessary condition for the successful development of a PPB system is that the head of the agency want it, understand it, be prepared to use it, and act upon it. The analysts must be able to know that their analyses are either acted upon or rejected for cause; the analytical and planning process must really interact with the decision process or else it will waste away. Good systems analysts were willing to work for Secretary McNamara because they knew that when they did good work -- work that stood up well in debate -- it would be acted upon and would influence decisions. Analysis was not simply window dressing. If the head of the agency does not understand and want a PPB system, it cannot be forced upon him. Thus, I think that we have a difficult job of public education ahead of us to get men chosen to head Government agencies to understand what the possibilities of a PPB system are so that they will want to have one and develop it into a practical and effective tool of policy decisionmaking.[2]

This type of attitude described by Enthoven was not prevalent in the nondefense sector. There were only a few agencies which were headed by men who either wanted systematic

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[1]Novick, Long-Range Planning, p. 2.

[2]Alain C. Enthoven, "The Planning, Programming, and Budgeting System in the Department of Defense: Some Lessons from Experience," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, pp. 907-8.

policy studies or were able to understand them.[1] The reactions of the heads of agencies to the Presidential imposition of PPBS ran from enthusiastic acceptance through indifference to hostility.

The attitude of the agency head "has been the single most important factor in the development of a PPB system and its integration with the agency decisionmaking system." Where the agency head was indifferent to the implementation of PPBS the use of systematic analysis has been sporadic, with most studies being produced outside of the PPBS framework.[2]

Part of the problem of the agency head's reaction to PPBS is undoubtedly the method of implementation. In the Department of Defense, Secretary McNamara was instrumental in developing the system and perceived it to be a tool to improve his ability to manage the DOD. Some agency heads do not perceive the PPBS ordered by President Johnson as one of their tools, but instead feel that it is a tool of the Bureau of the Budget.[3] This notion is probably enhanced by the technique of Issue Letters from the Budget Director identifying issues that require study and analysis. Thus, an

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[1]Wildavsky, "Rescuing Policy Analysis from PPBS," p. 294.

[2]Marvin and Rouse, "Status of PPB," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 808.

[3]Ibid., p. 809.

outside organization was identifying major problem areas rather than this being done internally, as was the case in the DOD.

When the PPBS is viewed by agency personnel as a tool of the Bureau of the Budget, the emphasis on what is done is shifted. The personnel tend to consider PPB data and traditional budgeting data as duplication and "make-work."[1] They see the PPB system as only a method to justify budget requests.

Even if the agency heads were committed to the development of an effective Planning-Programming-Budgeting System, it is questionable if they could achieve the same results as Secretary McNamara did in the Department of Defense. The implementation of PPBS in the DOD came after a decade of centralization of the authority of the Secretary. This same centralization of control has not occurred in many civilian agencies. Many of the nondefense departments represent a gathering of existing, established activities -- each with a significant degree of autonomy and political power. The heads of these departments are not able to exercise the same degree of control over subordinate activities as was the Secretary of Defense.[2] This means that the attitude of subordinate officials toward PPBS is often as critical for

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[1]Ibid., p. 807.

[2]Schlesinger, Political Process, pp. 16-17.

its effective implementation as is the attitude of the department head.

Achievements of PPBS in Civilian Agencies

As a result of the directive to implement PPBS, a total of twenty-three nondefense agencies have adopted a formal PPB system. At one time it was planned to have twenty-nine agencies with mandatory Planning-Programming-Budgeting Systems, but this number was later reduced to twenty-one. All of these twenty-one agencies, with the exception of the Department of State, have formally adopted PPBS. In addition, three agencies which were not specifically directed to implement the system have done so. The Department of State has successfully resisted PPBS and its implementation in all parts of the department except for the cultural affairs area.[1]

One of the requirements in the implementation of PPBS was that a staff organization be established. Three of the agencies with PPS systems have not formed central staffs. Of those that have formed staffs, most of these report either to the Deputy Secretary or to an Assistant Secretary. Two of the agencies (Agency for International Development and United States Information Agency) have staffs lower in the organizational hierarchy. Five of the agencies (Commerce;

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[1]Appendix B-2 contains a list of all agencies that have been directed to implement PPBS and those that have an operating PPB System.

Health, Education, and Welfare; Post Office; Atomic Energy Commission; and Peace Corps) have staffs that report to the Secretary or to the Director.[1]

One way to note the effectiveness of PPBS in the nondefense agencies of the government is to evaluate the usage of several of the key documents in the system. The use of the program structure, Program and Financial Plan, Program Memorandums, Issue Letters, and Special Analytical Studies will be discussed before an over-all evaluation is made.

Program Structure

Program structures have been established in all of the appropriate agencies except for the Department of State. The number of major program categories ranges from four to ten except for the Corps of Engineers which uses each of its twenty-one major hydrologic regions as a major category, and the Agency for International Development and United States Information Agency which use the individual countries as program categories.[2] One of the major problems in connection with the program structures developed to date is the extent to which these structures mirror the organization structure.[3]

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[1]U. S., General Accounting Office, Comptroller General of the United States, Report to the Congress, (July 29,1969), 101-3.

[2]Ibid., PP. 18-19.

[3]Marvin and Rouse, "Status of PPB," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 813.

For example, each major organizational component of the General Services Administration corresponds to a major program category. In the Post Office Department there is no program category which contains elements from more than one organizational unit. This can be contrasted to the Department of Defense where each program category has elements of each of the military services.[1]

One of the reasons for the extent to which many program structures conform to organizational lines is that nondefense agencies are usually organized more on a program basis than is the DOD. This is apparently not the only reason. The coincidence of organizational structure and program structure is also a symptom of the failure of officials to look beyond their own organization for objectives and goals. The net result of this is:

> . . . . that the PPB analyses and displays become collections of supporting information for the particular means employed by the organization, without due consideration of alternatives whose adoption might require changes in entrenched activities, or even more shattering, involve administration outside of the organization.[2]

To the extent that agencies have endeavored to develop a meaningful program structure, PPBS has helped them to identify objectives and to achieve a more specific expression of these objectives. This has not been the case in

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[1]U. S., General Accounting Office, Comptroller General of the United States, Report to the Congress, (July 29, 1969), pp. 56-57.

[2]Marvin and Rouse, "Status of PPB," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 813.

most agencies.

Program and Financial Plans

The Program and Financial Plans have not been totally successful either. The original direction for the Program and Financial Plan indicated that this document was to be a plan of the agencies to meet their objectives for the next five years. It was to "include activities under contemplated or possible new legislation as well as those presently authorized."[1] The five-year projections degenerated into a "wish-list" for the next five years that was anything but fiscally realistic.[2] Some agencies showed an increase of 25 per cent for funds for each year of the projection. The five-year projection was modified in 1967 to include only those funds that the government is legally or morally committed to as a result of past Congressional action. This has greatly limited the utility of the five-year plan.[3] Another dysfunctional result of the Program and Financial Plan is that agencies have begun to design programs that minimize cost in the first five years in order to obscure

[1]U. S., Executive Office of the President, Bureau of the Budget, Planning-Programming-Budgeting, BOB Bulletin No. 66-3, (October 12, 1965).

[2]Robert A. Levine, "Policy Analysis and Economic Opportunity Programs," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 1189.

[3]Carlson, "Status and Next Steps," Ibid., Vol. II, p. 623. The criteria for legal and moral commitments is contained in Appendix A-2.

the total cost of the programs to be authorized.[1]

The use of output measures in the PFP has also been marginal. In a 1969 survey of government agencies using PPBS, the General Accounting Office noted the output data definition and collection efforts of seven major agencies. Only the Office of Economic Opportunity was characterized as "expending considerable effort" in this area. Health, Education and Welfare and Housing and Urban Development exercise only "loose and intermittent efforts" in this direction. Labor, Agriculture, and Interior only receive partial output data.[2]

Program Memoranda

The use of Program Memoranda has not been good. Only 25 per cent of these received have been adequate. The others did not identify major alternatives,[3] did not address policy decisions, and/or did not present multi-year data. They have tended to be descriptive accounts of existing programs. The result is that they are virtually useless in making allocation decisions among programs of "urgent

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[1]U. S., Congress, Joint Economic Committee, Economic Analysis and the Efficiency of Government, Hearings before the Subcommittee on Economy in Government, 1969, p. 781.

[2]U. S., General Accounting Office, Comptroller General of the United States, Report to the Congress, (July 29, 1969), 31-32.

[3]The typical alternatives discussed in Program Memoranda are those of eliminating the program entirely, funding 400 per cent increase in the existing program, or funding a 10 per cent increase in the existing program.

necessity," "dire national need," "a must expenditure," and "vital responsibility."[1] Many of the managers in the government consider Program Memoranda a "nuisance."[2] The quality of their documents have substantiated this opinion.

The Program Memoranda have also undergone significant changes since PPBS was implemented. The original guidance stated that a PM had to be prepared for each of the program categories of the agencies. The objectives of the program were to be described as well as an analytical comparison of alternative ways to achieve these objectives. There was no specified length of PM's.[3] In 1966 the direction on PM's was changed to specify that they would be twenty to fifty pages.[4] In 1968 the maximum length was shortened again to twenty pages.[5] In 1969 the requirement for a PM was

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(Hoffman, "Public Expenditure Analysis," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 936.)

[1]Carlson, "Status and Next Steps," Ibid., Vol. II, pp. 621-22.

[2]Donald Ray Escarraz, "PPBS and the National Government: Alternative Approaches," National Tax Journal, XXI (June, 1968), 137.

[3]U. S., Executive Office of the President, Bureau of the Budget, Planning-Programming-Budgeting, BOB Bulletin No. 66-3 (October 12, 1965).

[4]U. S., Executive Office of the President, Bureau of the Budget, Planning-Programming-Budgeting, Supplement to BOB Bulletin No. 66-3 (February 21, 1966).

[5]U. S., Executive Office of the President, Bureau of the Budget, Planning-Programming-Budgeting (PPB), BOB Bulletin No. 68-2 (July 18, 1967).

deleted unless there was a major program issue involved.[1] This means that a PM is not required unless some major change is being made in the program or unless the Bureau of the Budget has identified the area for special review.

Issue Letters

In the area of Issue Letters there have been greater problems. A total of 380 Issue Letters was sent to 17 agencies for the Fiscal Year 1970 budgeting cycle. About one-half of these were analyzed.[2] Only 16 per cent of the replies in the human resource areas were "usable." The percentage of "usable" analyses went as high as 90 per cent in community and economic development programs.[3]

Special Analytic Studies

The record of the government activities in the area of Special Analytic Studies is mixed. There can be no doubt that the quantity of analysis has greatly increased. The Bureau of the Budget noted that 149 major program analyses were completed in the Fiscal Year 1970 budget cycle.[4]

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[1]U. S., Executive Office of the President, Bureau of the Budget, Planning-Programming-Budgeting (PPB) System, BOB Bulletin No. 68-9 (April 12, 1968).

[2]One reason for the small percentage of replies was that some Issue Letters were not mailed until late April.

[3]Carlson, "Status and Next Steps," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. II, 1969, pp. 621-22.

[4]Ibid., p. 762.

Some specific studies that have contributed to decision-making in the civilian sector of the government were noted earlier. However, the general quality of analyses produced so far in the nondefense agencies is suspect. To date there appear to be problems in both the analyses themselves and in the areas selected for analysis.

The analyses themselves are often of marginal use. As one individual noted: ". . . the production of useful analyses has been disappointing."[1] The major problem with most analyses is that alternatives are not considered. The usual alternatives analyzed include abandoning the program, maintaining it, or slightly expanding it.[2] There is strong evidence that much of the program analysis is performed on a crash basis to justify programs where decisions have already been made rather than to assist in the decision process.[3]

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[1]U. S., Congress, Joint Economic Committee, Guidelines, Hearings, 1969, p. 20. The General Accounting Office survey of six studies found that none were totally adequate. (U. S., General Accounting Office, Comptroller General of the United States, Report to the Congress, [July 29, 1969], 28-29.)

[2]A review of sixty program analyses in Mushkin and Herman, The Search for Alternatives, found that this criticism was almost universally true.

[3]Wholey, "Child Health Care," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. I, 1969, p. 469. One author noted that in the Department of Health, Education and Welfare there were "chaotic rushes" in September and October to produce numbers to support the budget to be recommended. (Brandl, "Education Program Analysis at HEW," Ibid., Vol. III, p. 1227.)

A part of the problem with Special Analytic Studies appears to be that the issues selected by the agencies for analysis are of marginal interest. This means that the impact of the analytic effort on substantive issues is almost negligible.[1]

General Evaluation

Within the area of general evaluation there are some specific improvements that have been noted because of PPBS. These include:

1. Many agencies have made a partial reappraisal of their objectives.[2] This is true only to the extent that agencies have not allowed their existing organizational structure to straight jacket the program structure.

2. Justifications of the budgets have been improved.[3] However, PPBS is of doubtful utility if its only contribution is the improvement of budgetary narratives. There must be improvement in the budget decision process, not just more sophisticated narratives accompanying the same decisions.

3. Agencies have become more aware of the alternative methods

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[1]U. S., Congress, Joint Economic Committee, Economic Analysis, Hearings, 1969, p. 78.

[2]Carlson, "Status and Next Steps," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. II, 1969, p. 625.

[3]U. S., Congress, Joint Economic Committee, Guidelines, Hearings, 1969, pp. 32-33.

in achieving objectives.[1] However, this awareness has not succeeded in allowing significant alternatives to be considered in most of the analytic efforts.

4. There has been a greater awareness of the legitimacy and necessity of "analytical arguments."[2] Unfortunately, this awareness has too often succeeded in only causing analytically based arguments for preconceived decisions.

5. A wider number of officials have been involved in the budget process; there has been a greater emphasis on program evaluation; and a greater number of analyses have been achieved.[3]

The overwhelming evidence concerning the civilian agencies' implementation of the Planning-Programming-Budgeting System is that most agencies have adopted the system only superficially and consider it only another form of budgeting.[4] Most agencies do not perform planning, programming,

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[1]"PPBS -- A New Approach to Government Spending," Banking, XXXIX (February, 1969), 39.

[2]Carlson, "Status and Next Steps," Analysis and Evaluation, U. S.,Congress, Joint Economic Committee, Vol. II, 1969, pp. 626-27.

[3]Ibid., pp. 625-26.

[4]One example of the attitude of many agencies toward PPBS is found in the Post Office Department. This Department had an individual transferred from the Bureau of the Budget to establish their PPBS. The primary motivation in this request was not to establish the best PPBS possible, but to make it more difficult for BOB to criticize the system that would be established. This same Department showed that it considered PPBS as just another budgetary format when the Deputy Director of the Planning and Systems Division said that his office was "backing out" of PPBS now that it was implemented

or budgeting much differently than they did before the introduction of PPBS. The only differences are additional formats for the budgeting process.[1] At the very best it can be said that PPBS has made a start in the changes necessary for an effective governmental planning, programming, and budgeting process. The following general evaluations by various writers substantiate this conclusion:

> The publicity [of PPBS] has outdistanced the performance by a wide margin.[2]
>
> . . . some progress has been made in bringing a more rational means of decisionmaking into the public sector, but -- this is only a beginning. The Government has a long way to go in applying PPBS or any similar system of program management on any kind of comprehensive basis.[3]
>
> This [inertia and resistance of the bureaucracy] has led to ritualization, overformalization, and overdocumentation -- clogging the channels of government communication . . . [and] in some cases threatened the very capability for rational action that it was supposed to enhance.[4]

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since it was now a budgeting problem. (Novogrod, Dimock, and Dimock, Casebook in Public Administration, pp. 262-65.)

[1]Stanley B. Botner, "Four Years of PPBS: An Appraisal," Public Administration Review, XXX (July/August, 1970), 423.

[2]Schick, "Systems Politics and Systems Budgeting," Public Administration Review, XXIX (March/April, 1969), 149.

[3]U. S., Congress, Joint Economic Committee, The Planning-Programming-Budget System: Progress and Potential, Report, of the Subcommittee on Economy in Government, 1967, p. 8.

[4]Bertram M. Gross, "The New Systems Budgeting," Public Administration Review, XXIX (March/April, 1969), 115.

> In many places the system exists only in name and will disappear with the first adverse wind. In others, it has been skillfully gutted by the entrenched bureaucracy.[1]
>
> Perhaps the only safe prediction, therefore, is that because of the unfortunate start PPBS got in Washington, an heroic selling job will be needed if it is to play the role in future budget administration that its merits seem to justify.[2]

This evaluation of PPBS implies the need for an extensive training program.

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[1]Emerson Markham and William C. McConkey, "PPBS as an Aid to Decision Makers," Midwest Review of Public Administration, III (February, 1969), 65-66.

[2]Marshall Edward Dimock and Gladys Ogden Dimock, Public Administration, p. 507.

PART II

CONCEPTUAL TRAINING MODEL

CHAPTER IV

GENERALIZED TRAINING MODEL

The discussion to this point has served as a foundation to the assessment of training needs in the area of the Planning-Programming-Budgeting System. A generalized model of PPBS training will now be established. The next three chapters will contain an expansion of some parts of this model; then the complete model of training will be presented.

Training is a program to be followed to change the behavior of employees. The term "training" will refer to more formal aspects of training rather than to the efforts of immediate supervisors to influence the behavior of individual employees. As defined by the Federal Government, "training" means:

> . . . the process of providing for and making available to an employee, and placing or enrolling such employee in, a planned, prepared, and coordinated program, course, curriculum, subject, system, or routine of instruction or education, in scientific, professional, technical, mechanical, trade, clerical, fiscal, administrative, or other fields which are or will be directly related to the performance by such employee of official duties for the Government, in order to increase the knowledge, proficiency, ability, skill, and qualifications of such employee in the performance of official duties.[1]

[1]U. S., Congress, Government Employees Training Act, Public Law 507, 85th Cong., 2d sess., 1958, p. 1.

Training Needs

A well-designed training program cannot be constructed in isolation from the organization in which the behavior change is necessary. The assessment of training needs must begin with the determination of the difference between the desired conditions and the current conditions within that organization. The factors causing this difference must then be isolated and the training needs built around those factors which training can change.[1]

The preceeding two chapters provide the information that is required to determine the training needs in the area of PPBS. Chapter III contains an evaluation of the current state of PPBS in the Federal Government. Chapter I describes an ideal PPB System for the Federal Government. By examining the differences between this actual state and the ideal state in light of the historical evolution of the system presented in Chapter II, a training model can be derived.

In the Department of Defense, it was concluded that PPBS is operational and effective but some problems still exist that can, and should be, corrected. The same situation does not exist in the nondefense sector of the Federal Government. In this area it was seen that the adoption of PPBS has been largely superficial and the system is not achieving its potential. The training model that will be constructed will address itself primarily to this latter

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[1]George S. Odiorne, Training by Objectives, pp. 130-31.

sector of the government. Changes in the model to adapt itself to the situation of the Department of Defense will be noted in Chapter VIII.

The discussion in Chapter III establishes that a massive program of change is essential if PPBS is to achieve its potential on a government-wide basis. Training is not the only part of the required program of change. The training required should be addressed only to those areas where behavioral change of governmental personnel will improve the current system. To identify these areas where training is the appropriate means of correcting performance, the causes of inadequate performance will be separated into the following factors:

1. Situations where PPBS cannot be applied to the governmental activity involved.
2. Situations where the environmental circumstances prevent PPBS from achieving its full potential.
3. Situations where the full potential of PPBS is not achieved because of the behavior of management personnel.

It is primarily this third barrier which is the proper subject for training efforts.

Causes of Inadequate PPBS

System Inappropriate for Use

It is difficult to visualize a given organization where it would be impossible to implement a Planning-Programming-Budgeting System. The basic concepts of

structuring program data on the basis of objectives, considering multi-year implications of decisions, and using systems analysis to structure information for decision purposes are almost universally applicable. It is obvious that some individuals believe that PPBS is inappropriate for many civilian agencies because of the lack of systematic planning, the fragmentation of programs among different governmental agencies and levels, the high level of fixed costs, the impossibility of quantification of program data, the existence of undefined and multiple objectives, and the high political content of programs. But these problems actually accent the need for -- rather than preclude the possibility of -- a Planning-Programming-Budgeting System in these areas.

While the possibility of implementing PPBS in almost any governmental activity exists, governmental managers should question whether the implementation of the system would be wise in specific areas. This determination should be based on an assessment of the benefits that the total system would allow versus the cost required to implement and operate the system. In some cases it might be appropriate to adopt only selected portions of PPBS for the activities of the agency. It is doubtful if it is desirable to adopt only the superficial, mechanistic portions of the Planning-Programming-Budgeting System that have been adopted in the majority of civilian agencies.

Under the general category of situations where PPBS

is inappropriate for use in governmental agencies, it appears that this is not a significant factor in the discrepancy between the desired system and the current system. Instead, some general training needs can be identified. First, the misconceptions about PPBS that cause individuals to believe it cannot be adopted should be corrected. Second, the concept of PPBS as a flexible management conceptual tool, that should be modified as necessary to meet the specific situation at hand, instead of the concept of PPBS as a simple list of mechanistic techniques to be applied arbitrarily to the activities of any given agency, must be developed.

Environmental Factors

There are a number of environmental factors that limit the effectiveness of PPBS in the Federal Government. The primary one is the shortage of personnel to perform the required analyses and the shortage of data to be used in these analyses. Only by following a program of implementation of PPBS that is concrete and definite can data needs be identified and the shortage of analytic data overcome. An aggressive implementation program for PPBS will be effective in developing the personnel required to use the system. It is unrealistic to expect that the data and personnel limitations of PPBS can be removed simply with the passage of time and the adherence to a mechanistic, superficial form of PPBS.

An environmental factor which inhibits the implementation of PPBS is the political atmosphere which surrounds

some of the agencies. It is difficult to achieve an operative Planning-Programming-Budgeting System if the Congressional committees which deal primarily with the agency and the clientele of the agency are openly hostile to the concepts of the system. To simply note that these groups are hostile to the concepts of PPBS and decide to limit the implementation of the system to the absolute minimum, ignores the fact that one of the primary determinants of this political climate is the professional management corps of any given activity -- including the head of the agency. This limitation of the potential of PPBS highlights a need for training. The management personnel of the activities should be concerned with the determination of the method of implementing PPBS which will overcome the problems of inadequate data and personnel as rapidly and effectively as possible.

Managerial Behavior

The key determinant of the level of effectiveness of PPBS in the Federal Government has been the behavior of managerial groups in the various agencies. For PPBS to be effective in the Federal Government agencies there must be, in each of these agencies, a responsible group of individuals who want it to be effective and who are willing to take the active steps to make it effective.

This level of active, interested participation in PPBS has not been achieved in the civilian agencies of the Federal Government. Generally PPBS has been viewed ". . .

throughout the organizational bureaucracy as a threat to existing, familiar, and manipulable institutional arrangements."[1] The management elite of many agencies has resisted, to the maximum degree possible, the implementation and effective use of PPBS. The degree to which training is necessary to overcome this resistance to implementation of PPBS is obvious.

Behavior Change Required

The necessary specific behavior changes must be noted. Generally implementation of PPBS in the Federal Government means that a change is required in the background, education, and skills of many managers.[2] A simple briefing that explains to management personnel what PPBS is and why it is required is not adequate to achieve significant behavioral changes.[3] Required behavioral changes can be discussed under three headings -- attitudes, knowledge, and skills.

Attitude Changes

Attitude changes are probably the most important

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[1]Finnegan, "Budgeting a la McNamara," p. 17.

[2]Murray L. Weidenbaum, "Planning-Programming-Budgeting Systems: Selected Case Materials," (unpublished class notes, Washington University, 1969), p. 39.

[3]This concept of using a short orientation briefing to expose top management to PPBS is recommended in State-Local Finances Project, Implementing PPB, p. 109. Only the technical personnel who perform the analyses and compile the budgets are subjected to intensive training. This practice ignores the fact that managerial behavior effectively sets the limits within which these technicians must operate.

changes made necessary by PPBS and also the most difficult to achieve and to measure. The attitude of an individual is his predisposition to view some symbol, object, or aspect of the world about him (in this case PPBS) in a favorable or unfavorable manner. These attitudes can be expressed either verbally (by stating an opinion) or nonverbally (by some behavior response).[1]

The need for attitude changes by personnel in response to PPBS can be simply expressed as the need to "sell" the system to management personnel. Unless the attitude of management personnel is changed substantially, PPBS is likely to increase the elegance by which decisions are justified, but it is doubtful that the quality of solutions and decisions will be changed.

The change of attitudes should be central to any PPBS training efforts. However, this change is extremely difficult to achieve. Attitudes about PPBS are formulated in the following manner:

1. PPBS is a cognitive factor or a stimulant.
2. This stimulant is viewed through the individual's needs and value system (his beliefs, assumptions, and convictions).
3. The individual's attitude is aroused.[2]

In order to change the individual's attitude, needs and value

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[1]Quentin W. Guerin, "Attitudes -- An Operation Definition," Training and Development Journal, XXII (December, 1968), 21.

[2]Ibid., 21-22.

systems must be changed. This can be accomplished by presenting information about PPBS in such a manner as to change principally his assumptions and beliefs about the effect of the system on his own personal frame of reference. For this reason the change of attitude is not normally a separate part of a training program but is a part of the program directed toward either changes in knowledge or changes in skill (or a combination of the two).

Knowledge Changes

There can be little doubt of the need for an increase in the knowledge of PPBS by managerial personnel in the government. As one author expressed it:

> . . . all public administrators -- but especially program managers -- must learn far more about the philosophy and techniques of cost-benefit analysis and PPBS than they can so far be expected to know.[1]

Almost all aspects of PPBS should be treated in the training to increase the knowledge of managerial personnel. Only with this base of extensive knowledge can the system be expected to achieve its full potential.

Skill Change

Not only must the attitudes of managerial personnel be changed and their knowledge of PPBS substantially increased, but many new skills must be developed. Particularly

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[1]Dimock and Dimock, Public Administration, p. 521.

important is the need for decision-makers to develop a high level of skill in the use of analytic efforts. PPBS is only a tool. In the hands of an experienced, skillful decision-maker it can be very helpful. In the hands of unqualified decision-makers its use can be dangerous.[1]

Who Should Be Trained

The broad specification of training needs can be completed with the determination of which individuals should be trained in the PPBS managerial training effort. Since PPBS is designed primarily to serve top management levels of the government, these individuals must be completely knowledgeable of the implications of, and the requirements for, PPBS.[2] The magnitude of effort required is significant when training is restricted to just this group since there are some 11,000 upper career executives in the Federal Government.[3]

However, training in PPBS cannot be restricted only to the top level of management. A decision to institute a significantly different management system could require the training of every manager in the organization.[4] While detailed training in PPBS will probably not have to extend

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[1]U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 21.

[2]State-Local Finances Project, Staffing and Training for a PPB System in State and Local Governments, p. 3.

[3]Fred Tickner, Training in Modern Society, p. 132.

[4]Malcolm W. Warren, Training for Results, p. 50.

down the organization to the lowest supervisory levels, it will be necessary to extend at least to the level where significant data and technical inputs are required. The effective use of PPBS will place heavy demands for information required at that level.[1] The willingness of these individuals to provide that input, and the quality of the input, will largely be a function of their understanding of the system itself.

It is unrealistic to expect that the same emphasis in various areas of training is required for all levels from top management to lower intermediate levels of management. The most extensive treatment of PPBS must be at the top level of management where the system is primarily used. The model to be presented will be specifically pointed at that training need. The necessity to change this model for the training efforts of lower levels of management will be discussed in Chapter VIII.

General Content of Training

Based on the above discussion of training needs, it is possible to outline the content of the recommended training efforts. The content of the required training can be divided into five general areas: History; Concepts and Techniques; Design; Implementation; and Utilization.

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[1]Weidenbaum, "Program Budgeting," Planning, Programming, Budgeting, ed. by Lyden and Miller, p. 171.

History of PPBS

The training required for PPBS must include a substantial part of the material discussed in Chapter II on the history of PPBS. The knowledge of PPBS that can be achieved is limited unless it is placed in a historical perspective. Knowledge of the historical evolution of PPBS also has a definite impact on the attitude of managers toward the Planning-Programming-Budgeting System.

A study of the historical sweep of budgeting has one other effect on the required behavior changes. By concentrating on the inadequacies of the traditional budgetary process, the need for a Planning-Programming-Budgeting System is demonstrated. An awareness of this need for change can be beneficial in establishing the attitude of the managerial personnel in government agencies toward PPBS.

Concepts and Techniques of PPBS

Training in the area of concepts and techniques of PPBS is directly applicable to the knowledge required. The necessary ingredients of this area are contained in Chapter I and in Chapter III. It is important that the misconceptions about PPBS and systems analysis be addressed during this training effort. The persistence of these misconceptions and their negative effect on the attitude of governmental personnel is obvious.

Design of PPBS

Design of a specific PPBS that takes into account the special circumstances and needs of the individual agency is an important part of the required training effort. If PPBS is viewed as a specifically defined set of procedures and forms that are arbitrarily applied to the activities of an agency without regard to their usefulness or possible modification, it is doubtful if the system will ever be completely effective.

The training on the design of Planning-Programming-Budgeting Systems to meet the specific needs of the particular agency should be pointed toward changes in the skills of the managers. More detail on the specific content of training in this area will be provided in Chapter V.

Implementation of PPBS

Another important aspect of the required PPBS training concerns implementation of the system. Managers should be as skillful at <u>how</u> to make a change in the methods of the organization as they are in diagnosing <u>what</u> should be done. This is one aspect of PPBS that has generally been neglected in most of the writings about the system in the Federal Government. It appears that there has been a tendency to believe that a simple directive to implement PPBS is all that is required to achieve an operative system. On the contrary, the implementation of a management system such as PPBS requires an organizational change of large magnitude.

This change effort deserves a high degree of managerial attention.

As with the design phase of instruction, the training on implementation of PPBS is primarily aimed at achieving the necessary skill change of managers. Here the manager should be concerned with the methods possible to overcome opposition to the system and complete its implementation as effectively and rapidly as possible. The specific content of this area of training will be discussed in Chapter VI.

Utilization of PPBS

The final major area of PPBS training is in the utilization of the system. Particularly important in this area is instruction on how to utilize properly the analytical studies that are central to PPBS. Because of the lack of historical precedence of analytic studies in most areas of governmental activity, many managers have not developed the proper skills to use these studies. This lack of skill can lead to the abuse of studies by either overreliance or underreliance. Obviously the major purpose of this area of training is to upgrade the skill level of decision-makers. More detail on this area of training will be provided in Chapter VII.

Summary

An investigation of the difference between the actual and ideal PPB System has permitted an identification of the

class of individuals who should be trained in the use of techniques associated with PPBS. Top management levels require extensive training in PPBS. Requirements for training coverage can be relaxed as the needs for training at subordinate levels are considered.

The necessary content of training has been introduced. This content was divided into five general areas. Material necessary for training in the areas of History and Concepts and Techniques was presented in the earlier chapters. The material necessary for presentation in the areas of Design, Implementation, and Utilization of PPBS must still be developed before a complete model can be presented.

CHAPTER V

DESIGN OF PPBS

The first decision that management in a specific agency must make regarding the Planning-Programming-Budgeting System concerns the general design of the system. Before beginning this design phase, the executive should be very knowledgeable in the concepts of PPBS.[1] The design phase translates these concepts into practical applications for the specific circumstances at hand.

It has been well recognized that the design of individual PPB systems should vary depending on the organizational climate of individual cases. This was noted in the case of attempts to transfer PPBS to other countries:

> . . . the precise form of the system will vary from place to place as it is implemented, reflecting the values, institutions, and relationships in those governments and nations.[2]

The same conclusion was drawn about the movement of PPBS from the Federal Government to local governments:

> The techniques of program planning and budgeting and systems analysis are promising and available tools for

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[1]J. B. Benton and A. L. Tenzer, Program Budgeting and Executive Commitment, p. 6.

[2]Novick and Alesch, Program Budgeting, p. 10.

> improving governmental decisionmaking. These terms should be used with caution, however. To say that these techniques should be used by State and local governments and that the Federal Government should encourage their use does not mean that the system of PPBS as developed by the Federal Government for its own use should be engrafted onto other governments.[1]

Even the movement of PPBS from the Department of Defense to the civilian agencies was supposed to be flexible and adaptive. "It (the DOD's PPBS) is not a model to be slavishly imitated."[2] The design of a Planning-Programming-Budgeting System should accept the fact that a diversity of institutional arrangements, documents, and procedures will be required to be adapted to individual situations.

As an example of major differences that can occur in governmental organizations, the regulatory agencies can be contrasted to the Department of Defense. In regulatory agencies, all of the cost and benefits of their decisions are external to the agency rather than internal.[3] This does not mean that many of the concepts of PPBS are inapplicable to regulatory agencies but that the form in which these concepts should be applied must be significantly changed.

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[1]Jack W. Carlson, "Federal Support for State and Local Government Planning, Programming, and Budgeting," Innovations, U. S., Congress, Joint Economic Committee, 1969, p. 17.

[2]Committee for National Objectives, Budgeting for Economic Development, p. 36. It should be noted that most of the procedures subsequently adopted in the nondefense agencies appear to be "slavish imitations" of the DOD's system. (U. S., Congress, Joint Economic Committee, Economic Analysis, Hearings, 1969, p. 779.)

[3]Guy Black, The Application of Systems Analysis to Government Operations, p. 154.

Just as it is desirable to vary specific aspects of PPBS in certain circumstances, it is not always necessary to adopt all of the components of the system. Program budgeting can be adopted without systems analysis or multi-year plans, and vice versa. Each of the components can be adopted singly or in combination.

Some of the key decisions which must be made in the design of PPBS for a given activity will follow. Then the assessment of which components of the system should be adopted will be discussed.

Key Design Decisions

There are a number of key decisions in the design of a Planning-Programming-Budgeting System. The major ones of these include the determination of proper leverage points, the general design of the program structure, the general design of the multi-year program, the general design of output indicators, the relationship PPBS will have to management control, and whether budgetary formats will be changed.

Leverage Points

The first decision that must be made in the design of a PPB System is what aspects of an agency operation are most critical in determining over-all costs and benefits. The aspect so identified becomes the key subject for systems analysis and the basic element around which program structures are constructed. In the Department of Defense the

selection of weapon systems for acquisition was this leverage point. In many civilian programs the weapon system has a direct analogy -- e.g., specific water-resource projects. In other areas the main point of leverage concerns operating characteristics (including eligibility criteria of benefit recipients) of programs.

Once the type of decision that affords the greatest leverage is selected, the time when this decision should be made is determined. In the Department of Defense the budgetary process was the time when these weapon-system selection decisions had to be made. There are organizations where the budgetary process is not the proper time for these program decisions. As noted in Chapter III, much of the Federal Government's budget is fixed by earlier action. In this case the budget is not the dominant decision vehicle and the Planning-Programming-Budgeting System should not try to force decisions into this budgetary process. While all governmental activities have budgets and the level of these budgets is critical to their activities, the major program decisions are often made entirely outside of the annual budgetary cycle by a continuing legislative process. Legislation formulated and considered by the authorization committees of Congress can recommend upper limits to authorizations for programs and establish specific details of program operation.[1] To be effective in the decision process, PPBS must provide

[1]Saloma, Congressional Budget Process, pp. 14-15.

an input into this authorization process and not just into "classic" budget decisions.

Program Structure

The next major group of decisions in the design of a Planning-Programming-Budgeting System concerns the program structure construction. The structuring of programs has a profound effect on the types of questions that PPBS will address and even on the specific decisions to be reached.[1]

In designing the program structure the overriding consideration must be a structure to facilitate analysis.[2] This means that the structure must be built on the basis of the management planning decisions that should be made. A first step of the process of structuring a program budget is the investigation of the "ideal" decision process in the activity.[3] A part of this investigation is complete when the leverage points described earlier have been determined. This should be extended to determine what information is

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[1]Melvin Anshen, "The Federal Budget as an Instrument for Management and Analysis," Program Budgeting, ed. by Novick, p. 11.

[2]Graeme M. Taylor, "Designing the Program Structure," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 45. There has been an unfortunate tendency to design program structures with little concern for the requirements of good systems analysis. In these cases the program structures are apparently designed as "window dressing" for the description of activities of the governmental agency. (California, State Personnel Board, Program Budgeting in California, by Len Silvey, p. 3.)

[3]Anshen, "Management and Analysis," Program Budgeting, ed. by Novick, pp. 19-20.

necessary to make decisions in a meaningful manner on these leverage points. The program structure is then designed to provide that information. All specific decisions on the structuring of programs must affirmatively answer the question of whether it facilitates analysis.

There are two general approaches to the development of a program structure. One works from objectives down and the other begins with specific activities and works up.[1] The first method is the one normally used.

In working from the top down, it is necessary to begin with a broad objective and break it into increasingly concrete and operational terms.[2] It is possible to begin with objectives that are too broad and never be able to achieve sufficiently finite breakouts for analytic purposes. For example, to begin civilian program structuring efforts with the objective of "promoting for the general welfare" would lead to an exercise in futility. Instead, it is necessary to begin with a more intermediate level objective and compare it for consistency to the higher level objectives. Table 7 shows how an intermediate objective of elimination of poverty can be narrowed and defined in more concrete terms. Each lower level of the objective structure more concretely

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[1]Paul L. Brown, "An Operational Model for a Planning-Programming-Budgeting System" (paper presented to the Post-Audit Seminar, Lexington, Kentucky, June 17, 1970), p. 3.

[2]Davies and McCarthy, Introduction to Technological Economics, p. 7.

TABLE 7

SUBOBJECTIVES OF ELIMINATION OF POVERTY

First Level	Second Level	Third Level
Enhancement of Earning Power	Education of Disadvantaged Youths	Student Scholarships Work-Study Vocational Education "Drop-out" Prevention Preschool Education Achievement of School District Equity
	Adult Manpower Development	Adult Literacy Labor Mobility and Relocation Job Placement Skill Development
Income Maintenance	Financial Aid	Unemployment Insurance Retirement and Disability Direct Public Assistance
	Health Programs for Poor	
Community and Environmental Improvements	Low-Income Housing Improvement Community Action Improvement Area Redevelopment	

Source: Adapted from National Industrial Conference Board, Inc., Service Extension Division, The Federal Budget: Its Impact on the Economy, Fiscal Year 1968, p. 27.

defines the programs involved.

The major problem with the deductive, or top-down, process of structuring programs is the time required to develop a meaningful structure of programs. The structure so developed can also bear little resemblence to the reality of operations in the agency. A reasonable alternative to this approach to designing a program structure is the inductive, or bottom-up, approach.

With an inductive approach the activities that the organization is currently performing are investigated by asking why the activities are being performed. From this investigation, interactions between activities are noted. Activities that serve the same purpose are grouped together. This grouping process is continued, with each level becoming broader. Ideally the major aggregations of activities (programs) would have a higher degree of interaction with activities in the same program than with any activity outside of the program. Of course it is unreasonable to expect no interactions with activities outside of the program. The best that can possibly be accomplished is to minimize these external interactions.

The major problem with the inductive approach to program structuring is the tendency is reinforced for an organization to describe as objectives the services which they have historically provided, without any consideration of

broader objectives.[1] Traditional activities are not challenged to the degree that they are in the deductive approach.

In the practical design of a program structure, both approaches should be followed, and the two results compared. The discrepancies between the two establish the framework for another iteration of program-structure design. This use of both processes gives structure to the deductive approach and overcomes the parochial viewpoint weakness of the inductive approach.

The task of designing the program structure is a significant analytical task itself.[2] The end result should be a structure that relates to the end products of the organization and is useful for agency decision-making. "Ideal" programs should be clearly defined, amenable to at least partial quantification, and interact with other programs to a minimum degree.[3] This ideal is seldom achieved and the final result is almost always a compromise.

Multi-Year Program and Financial Plan

There are three key decisions required in the design of the Multi-Year Program and Financial Plan. The number of

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[1]This tendency to describe objectives in terms of what the agency has always done exists even in the top-down approach. The use of the bottom-up approach only accents it.

[2]Appendix C-1 contains some guidelines for the handling of questions that invariably arise in the process of structuring a program budget.

[3]Werner Z. Hirsch, Integrating View of Federal Program Budgeting, p. 7.

years in the plan, which costs are to be used, and finally, the level of programs to be projected all require decisions.

The length of time for the multi-year plan cannot be specified to a finite degree for all agencies. The five years currently used in the Federal Government's PPBS appears to be an arbitrarily determined figure. The number of years that the programs should be projected should be enough to provide a "reasonable perspective" of the impacts of the proposed program.[1] Obviously this number will vary from program to program.

While the projection should ideally be long enough to observe the significant impact of the program involved, it must be recognized that the ability to project into the future is curtailed as the period of projection is extended. This means that the data projected for extremely long-run futures would be so uncertain that the projection would be virtually useless.[2]

In making the specific determination of how long the multi-year projections should be, the following factors should be noted:

1. The length of the investment cycle (the time between the

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[1]State-Local Finances Project, The Multi-Year Program and Financial Plan, p. 14.

[2]For example, an expenditure for preschool education could have a direct impact for a period that extends over twelve years. (Hartley, Educational Planning-Programming-Budgeting, p. 3.) The cost and performance projections for that long a period would be too uncertain to be of much practical use.

decision to proceed on a program and the operational state of the program) plus a reasonable period of operation that allows the program to stabilize should be a minimum requirement for the number of years projected.

2. The expected life of the program (if it is not to be conducted indefinitely) should be considered in the determination of future years to project.

3. The degree of accuracy of estimates of costs and outputs sets a maximum number of years' projection that is possible. Projections should not be any further than reasonable accuracy will permit.[1]

4. It is convenient to project both costs and outputs for all programs the same number of years. However, if the degree of accuracy possible is different for costs and outputs, the lack of accuracy of one should not prevent a longer projection of the other. If longer projections are useful for some programs and not for others, the length of time should be varied.

Regardless of the decision about the length of projections in the Multi-Year Financial and Program Plan, the period of consideration for analytic efforts should not be restricted. Systems analysis should consider the full period of effects -- both benefits and costs -- even if the

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[1]Except for the data for the current budget year, none of the projections in the multi-year plan should be expected to have "budget" accuracy. This degree of accuracy is neither possible nor necessary for the multi-year plan or for analysis.

projection in the Multi-Year Financial Plan is shorter. The uncertainty in cost and output projections can be reduced by analysis in the specific case. Where uncertainty cannot be reduced by analysis, it can be explicitly treated during the analysis.

The second key decision which must be made on the Multi-Year Financial and Program Plan is which costs will be included. The appropriations requested from Congress in any specific year do not necessarily correspond to the expenditures during that year because of multi-year authorizations. This discrepancy can be very significant. Table 8 shows the magnitude of this problem for Fiscal Year 1968. The ideal projection would project both costs and new-obligation authority for the entire period. Because this ideal would be costly to implement, it is satisfactory to project expenses over the full range and the new obligational authority only for the budget year. The projection of expenses is more meaningful because expenditures more closely correspond to inputs consumed by the program.

Another aspect of the decision concerning the cost that should be projected is whether dollar values are adequate measures of resources consumed. It is often necessary to include other measures of input in addition to dollars when some specific resource is very limited.[1] Some of the

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[1]One specific resource should never be used as the sole measure of cost since this implies that all other resources are "free." The information in the multi-year plan is then distorted.

TABLE 8

RELATIONSHIP OF AUTHORIZATIONS TO EXPENDITURES, FISCAL YEAR 1968

(Billions of Dollars)

	To be used in FY 1968	To be used in Subsequent Years	Total
New Obligational Authority Recommended in Fiscal Year 1968	$ 95.7	$ 48.3	$144.0
Unspent Authorizations From Previous Years	39.3	84.5	125.6
Totals	$135.0	$132.8	

Source: William J. Brown, The Federal Budgeting and Appropriations Process, p. 18.

resources that could be appropriate for this purpose are personnel required and land used. It is not necessary that every program in a given agency, or even every program in a given program category, use the same projections of specific inputs. The most appropriate specific resource to be projected should be individually selected for each program.

Another decision that must be made on Multi-Year Financial and Program Plans concerns the determination of what level of programs will be projected. There are two basic approaches that can be followed -- an arithmetical extension of currently approved programs and a plan that reflects the changes in program mix.

The use of projections of currently approved programs is the approach currently followed by the Bureau of the Budget. This approach has definite limitations. While it illuminates costs in subsequent years caused by current decisions, it does not assist in planning for multi-year projections.[1]

For planning purposes it is preferable to have multi-year projections unconstrained by current approvals (or requested approvals.)[2] Some sort of over-all financial constraint should be imposed on the future-year plan projections to ensure that the plans are not overly optimistic.

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[1]Schultze, Public Spending, pp. 97-98.

[2]Cleland and King, Systems Analysis and Project Management, pp. 127-29.

When the multi-year projections of costs are oriented toward planning and not just projections of currently authorized programs, distinguishing between firm projections of programs already approved and those of planned programs seems to be desirable.[1] Also, the projection of planned programs should explicitly identify critical decision points. It is also undesirable to project a single program when alternative programs are possible, since this projection has a tendency to prematurely foreclose alternatives and reduce the flexibility of future actions.[2] A method of portraying the multi-year projection that will allow for the maximum degree of flexibility as well as retain a high level of visibility of future years' actions is difficult to attain and will require several compromises between these two partially conflicting objectives.

Output Indicators

Decisions concerning the selection of output indicators for use in the multi-year plan are similar to the process of selecting measures of effectiveness in the performance of systems analysis.[3] The purposes of the output indicators in the program structure are to serve as a quick reminder of

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[1]The breakout of projections into different classifications as required by the Bureau of the Budget (Appendix A-2) also assists in understanding by providing an indication of the "firmness" of the currently approved program projection.

[2]James R. Schlesinger, Defense Planning and Budgeting: The Issue of Centralized Control, pp. 44-45.

[3]This is discussed in Appendix A-3.

the basis for past decisions, to show the change expected from projected changes in the program, and to isolate issues requiring analysis.[1] Many of the advantages of PPBS are foregone if the output indicators used are uninformative or misleading.[2]

There are two classes of output indicators that can be used -- program-size indicators and effectiveness measures. Program-size indicators indicate the quantity (or volume) of services given by the program, and effectiveness measures show the impact, or benefits, of the program.[3]

Program-size indicators are normally easier to devise than are the effectiveness measures. They can include a simple measure of the size of the program, such as number of students enrolled in educational programs. They can also include a measure of extensiveness of the service provided, such as the number of hours of education provided per child enrolled in an educational program. The extensiveness of the program can also be compared to the population to be served or to the total need for services, such as the percentage of eligible children enrolled in the educational program.[4]

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[1]State-Local Finances Project, Output Measures for a Multi-Year Program and Financial Plan, p. 7.

[2]McKean, Evaluating Alternative Expenditure Programs, p. 18.

[3]New York, Division of Budget and Office of Planning Coordination, Guidelines for Planning-Programming-Budgeting, p. 25.

[4]State-Local Finances Project, Output Measures, pp. 10-17.

As useful as these program-size indicators are as output measures, their usefulness is severely limited in that they do not disclose the impact of the program on society. Effectiveness measures are required for this purpose. Examples of effectiveness measures include per cent reductions in number of traffic accidents, reduction in morbidity and mortality rates for different disease categories, and changes in illiteracy rates by age and ethnic groups.[1]

It is difficult to define output indicators for all of the governmental programs. In theory each program element, subcategory, and category should have one or more output indicator. In practice this is not possible.[2] Even where adequate proximate measures of effectiveness can be determined during analysis, it is not always possible to transfer these measures directly to the program structure. The proximate measures of effectiveness used in a specific systems analysis may be misleading when removed from the context of that analysis.[3] However, while PPBS cannot insist on precise

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[1]U. S., Department of Health, Education and Welfare, Office of Assistant Secretary (Planning and Evaluation), Planning-Programming-Budgeting: Guidance for Program and Financial Plan, (April 17, 1968), p. 134. HEW also uses broad program category output indicators. It is difficult to assess the effect of a specific program on these indicators because of the large number of factors that effect them. (U. S., Department of Health, Education and Welfare, Toward a Social Report, January 11, 1969.)

[2]State-Local Finances Project, Output Measures, p. 5.

[3]Ibid., pp. 16-17.

output indicators for all parts of the program structure, ". . . it can insist on the value of a search for them."[1]

In the search for output indicators the following guidelines are appropriate:

1. The indicator chosen should be output oriented and directly related to the program objectives.
2. As far as possible, the measure chosen should be quantifiable.
3. The output indicator should be thoroughly defined.
4. The output measure should be simple enough to be easily understood.
5. The data required to measure the indicator should be available on a continuing basis.[2]
6. Work efficiency indicators, such as cost per individual trained, should not be used as output indicators.[3]

Relationship of PPBS to Traditional and Performance Budgeting

The final set of key decisions that must be made in the design of an agency's Planning-Programming-Budgeting

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[1]Hovey, Government Decision-Making, p. 81.

[2]Brown, "An Operational Model for a Planning-Programming-Budgeting System," pp. 43-44. This last guideline demonstrates one basic difference between output indicators in the multi-year program and measures of effectiveness in individual systems analyses. In the latter there is not a requirement for continuing measurement. However, it should be noted that the continuing measurement requirement for output indicators in the multi-year program does not preclude the use of sampling to obtain the measurement.

[3]State-Local Finances Project, Output Measures, p. 17.

System concerns PPBS's relationship to traditional and performance budgeting. It is improper to allow the traditional budget accounts, which are usually structured for operational control, to overly influence the design of the program structure.[1]

It is equally true that the design of the program structure should not unduly effect the traditional appropriation categories. To have an effective PPBS it is not necessary to realign the appropriation structure to conform to the program structure. Such a realignment has two adverse effects. First, the budgeting staffs and the Congressional committees have developed a high level of expertise in the review of object-of-expenditure classifications. This review, in addition to a broad program review, is necessary to ensure efficiency of operation. The change of appropriation categories would not allow this expertise to function as effectively as it has in the past.[2] Second, the changing of appropriation categories to correspond to the program structure would impose a degree of rigidity that could be harmful in the early stages of PPBS. As noted in Appendix C-1, the first attempts of structuring programs must remain "fluid" and adaptable to changing circumstances. The changing of the legislative appropriation categories requires much more time

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[1]State-Local Finances Project, Developing an Objective Oriented Governmental Program Structure, p. 1.

[2]Hitch, Decision Making for Defense, p. 29.

than the administrative change of a program structure.[1]

A decision must also be made on the relationship between PPBS and the performance budgeting system. While PPBS must use some of the data generated by a good performance budgeting system, there is a danger in making the relationship between these too close. Because management control and performance budgeting are more concrete and structured than are strategic planning and PPBS, the former system could dominate the latter.

Adoption of Components of PPBS

It is unrealistic to expect PPBS to have the same degree of usefulness in all of the areas of the Federal Government.[2] Therefore, the design of a PPB System for every agency must proceed in the following three steps:

1. The best way to use PPBS concepts should be determined;
2. The costs required to implement and sustain that system should be determined; and
3. The benefits that the system offers should be determined.[3]

The design and implementation of PPBS itself must meet the test that the system stresses for all government decisions --

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[1]State-Local Finances Project, Implementing PPB, pp. 63-70.

[2]Melvin Anshen, "The Program Budget in Operation," Program Budgeting, ed. by Novick, p. 356.

[3]State-Local Finances Project, Answering the Question: Is an Integrated Planning, Programming, Budgeting System Useful for Our Jurisdiction.

the benefits accruing must be worth the costs expended.[1] The problem of the cost-effectiveness of PPBS itself is a difficult one. No one has seriously collected data on either its costs or its benefits.[2] However, in making a decision to implement PPBS and in the determination of the exact components of PPBS to implement in an agency, the decision-maker should explicitly consider both expected costs and benefits of the system.

This section will explore the cost involved in PPBS and then some of the benefits accruing from the use of certain components of the system. In the discussion of benefits from PPBS, emphasis will be placed on the characteristics of a specific agency that will increase the benefits.

Costs

There are a number of costs involved in the implementation and use of PPBS by an agency of the Federal Government. These costs have generally been ignored by those recommending a government-wide implementation of the system. Cost involved in the implementation and use of PPBS can be divided into four categories: resource opportunity costs, time opportunity costs, psychological (or nonmonetary) costs, and data costs.

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[1]Steiner, "Problems in Implementing Program Budgeting," Program Budgeting, ed. by Novick, p. 350.

[2]U. S., Congress, Joint Economic Committee, Progress and Potentials, Hearings, 1967, p. 214.

The resource opportunity costs are relatively straightforward. There are definite costs involved in the hiring and training of personnel to work full-time on the Planning-Programming-Budgeting System. The General Accounting Office survey of seventeen agencies identified 2,474 "full-time-equivalent" PPB employees.[1] The significant resource cost is not the total number working on the system but the number who would not be required if the system were never implemented in the agency. Obviously some of the functions performed under the mantle of PPBS would be required even if the system did not formally exist in the agency.[2]

The time opportunity costs of implementing a Planning-Programming-Budgeting System may be more significant than the resource opportunity costs, but they are not as easily estimated. The implementation phase of PPBS requires a considerable amount of time of all executives and line managers, who will be participating in the design decisions, furnishing data, and even becoming acquainted with the new roles and skills expected of them.

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[1]U. S., General Accounting Office, Comptroller General of the United States, Report to the Congress, July 29, 1969, p. 48.

[2]The Agency for International Development estimated that it spent 179 equivalent man-years on PPBS functions in 1968. However, it required 147 equivalent man-years in 1962 to perform some functions that are now a part of PPBS. The net manpower cost of PPBS as performed in AID is then 32 equivalent man-years. (U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 414.)

The psychological costs associated with PPBS can also be very high. Any alteration of the roles and functions of the existing structure can be costly in terms of psychological, nonmonetary costs. These costs are difficult to estimate.[1]

The data costs of PPBS are substantial. By its very nature, PPBS is a gigantic consumer of data.[2] PPBS requires a substantial investment in cost data in order to be able to develop meaningful relationships to use in cost-estimating.[3] This cost data is often in a form that is not routinely generated by the traditional accounting procedures, and new accounting tasks must be imposed. In addition, an operational PPBS requires a considerable amount of data concerning the parameters of public programs and the effects that the produce.[4]

Because of the high cost of data, it is unreasonable to design a Planning-Programming-Budgeting System to furnish the absolute maximum amount of data possible. Decision-makers

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[1]Since the method of implementation is one of the main determinants of the magnitude of "psychological costs" of PPBS, these will be discussed to a greater extent in Chapter VI.

[2]S. A. Haggart, Developing a Program Budgeting System as an Aid in Planning Higher Education, p. 4.

[3]Robert N. Grosse and Arnold Proschan, Military Cost Analysis, p. 5.

[4]Selma J. Mushkin and John Cotton, "Systematic Analysis and Grants-in-Aid in a Federal System," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. I, 1969, p. 352.

are accustomed to working with fragmentary information when it is feasible, but not economical, to develop more complete information.[1] PPBS should strive for the same goal: to develop all of the usable information that is economical -- not all that is feasible.

There is no completely satisfactory way to estimate the data cost to support PPBS in the Federal Government.[2] Not only is it difficult to estimate the total cost of all of the data contained in the PPB System, but it is more difficult to determine what part of this data would be generated even if PPBS did not exist.

In spite of the difficulties concerned with the estimation of the costs associated with PPBS, it is important that the general magnitude of these costs be considered. The decision to implement the system must be based on the level of these costs compared to the benefits that are expected from the system.

Benefits of Program Structure

The use of a program structure is helpful in increasing

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[1]Harry G. Johnson, "The Economic Approach to Social Questions," The Public Interest, Summer, 1968, p. 76.

[2]The general magnitude of this cost can be seen from the experience of one of the states. The estimated annual operating cost of the automatic data-processing equipment to support California's version of PPBS is $217,000. (California, Department of Finance, The Budget Data System, p. vii.) This cost does not include the initial cost of gathering the data. Also, the system used in California is much smaller and less complex than that used in the Federal Government.

the perception and understanding of decision-makers in an agency which has a number of complex activities, which is not organized with a strong separation of missions between the separate subordinate organizational activities, and which has a heavily input-oriented traditional budget. Some agencies in the Federal Government have organizational structures that are more process-oriented than others and have traditional budgets that are less end-product oriented than others. The Department of Defense appears to be the extreme example of a highly complex, process-oriented organization with an input-oriented budget.[1] Other agencies of the Federal Government demonstrate these characteristics to varying degrees, and the program structure will be less beneficial in these agencies.

The size of the organization also seems to effect the amount of benefit that can be derived from the structuring of the budget on a program basis. A program budget makes the objectives and goals of the organization explicit. Since the physical tasks of the agency are carried out at the lowest level, the larger the organization and the greater distance from the top to this lowest "action-level," the more necessary it is to have explicit objectives to guide the actions of subordinate levels.[2]

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[1]David Novick, The Federal Budget as an Indicator of Government Intentions and the Implications of Intentions, p. 10.

[2]P. A. Don Vito, The Essentials of a Planning-Programming-Budgeting System, pp. 4-5.

Another advantage of the program structure's explicit statement of objectives is its effect on changes necessary in programs. It is never possible to be completely certain of what will occur in the future. If the objectives are explicitly defined, the probability is increased that proper adjustments will be made in the case of unpredictable circumstances.[1] It would appear that the program structure would be a greater benefit when the environment of an agency is characterized by a rapid degree of change.

The program structure also has a desirable benefit in that its explicit statement of objectives can cause a re-examination of existing programs.[2] The use of a program structure is more desirable when there is some doubt about the worth of some of the agency's programs.

The use of a program structure also has a beneficial effect on the quality of communications outside of the agency by establishing a base for better dialogue between the public and professionals of the agency.[3] The use of a program structure is then particularly desirable when the ability to communicate outside of the agency seems limited.

The need for a program-structured budget also increases when systems analysis is necessary in the agency. The

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[1]Paul M. Stokes, A Total Systems Approach to Management Control, p. 15.

[2]Christenson, "Program Budgeting," p. 11.

[3]James S. Dyer, The Use of PPBS in a Public System of Higher Education: Is it "Cost Effective?," p. 17.

relationship between the program structure and systems analysis is very strong. The program structure aids analytic efforts by:

1. Providing a framework for analysis. A program structure makes the need for systems analysis more obvious then it might otherwise be,[1] but by itself it does not ensure that analysis will be performed or that it will be used in the decision process.[2]

2. Suggesting possible trade-offs. The program structure highlights programs that are possible substitutes for each other, and those that complement each other.

3. Developing relevant information. The program structure develops information in a form that is more useful for analytical tools than is the traditional budget information.

4. Providing a means of recording the decisions that are based on analysis.[3]

It should be noted that the formalization of a program structure can hinder analysis in two ways. First, the effort devoted to developing the program structure often directly substitutes for analytic effort. Second, in some cases the program structure has been developed with no regard for the areas which require decisions or for the agency's decision

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[1]California, Department of Finance, Program Budgeting in California, by Silvey, p. 1.

[2]Committee for National Objectives, Budgeting for Economic Development, p. 34.

[3]Bradley, Some Views on Program Budgeting, pp. 6-7.

process. In this case it simply diverts attention from areas where analysis is necessary.[1] These weaknesses do not result from an intrinsic weakness of program structures but from a misapplication of the program-structuring process.

In the discussion of the benefits of a program structure it should be noted that the program structure by itself has a limited amount of utility in direct decision-making unless it is supplemented by a viable analytic capability.[2] There are three reasons for this:

1. The program structure portrays only the primary trade-offs and interdependencies. Analysis is necessary to consider other interdependencies and trade-offs which may be critical in specific decision situations.[3]

2. The costs contained in the program structure give only the roughest indication of costs relevant for decision-making since they are total or average costs and not incremental costs.[4] The costs in the program structure also usually include only the direct costs to the specific agency

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[1]U. S., Congress, Joint Economic Committee, Economic Analysis, Hearings, 1969, p. 779.

[2]Some writers such as S. A. Haggart, et al., Program Budgeting for School District Planning: Concepts and Applications, p. 17, incorrectly state that the program structure can be used directly in making decisions.

[3]Roland N. McKean and Melvin Anshen, "Limitations, Risks, and Problems," Program Budgeting, ed. by Novick, pp. 292-93.

[4]Schlesinger, Centralized Control, p. 4.

involved and exclude nonmonetary costs and costs to other government agencies and private groups.

3. The measures of effectiveness associated with the program structure are only partially informative. Systems analysis can usually devise better measures of effectiveness for the specific problem at hand.[1]

In addition to the benefits noted earlier that accrue with the use of the program structure, the process of designing the program structure itself can be the source of some definite benefits. Some of these are:

1. The process of trying to explicitly define objectives can lead to some improvement in these objectives.[2]

2. The program structure design can give some useful insights into the coverage of existing programs by revealing duplicating, overlapping, and wasteful programs as well as gaps in the program coverage that should be filled.[3]

3. The design of the program structure can provide analysts with the opportunity to learn more about the agency's programs. This knowledge will increase the capability of the analyst to furnish useful studies.[4]

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[1]Roland N. McKean, "Remaining Difficulties in Program Budgeting," A Commentary on Defense Management, ed. by Smale, p. 55.

[2]Dimock and Dimock, Public Administration, p. 498.

[3]Carlson, "Status and Next Steps," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. II, 1969, p. 617.

[4]U. S., Congress, Joint Economic Committee, Economic Analysis, Hearings, 1969, p. 780.

4. The design of the program structure is the beginning of the dialogue between the analysts and line management. This provides an opportunity for these two groups to become accustomed to working and communicating with each other.[1]

5. The design of the program structure plays a large role in the "institutionalization" of PPBS since it is concrete proof of the intention to implement and use PPBS in the decision process.[2]

It can be seen that the use of a program structure in connection with PPBS cannot be expected to have equal benefits in all of the agencies of the Federal Government. An agency which has complex programs and activities, an organizational structure based on something other than purpose, a highly input-oriented budget, a large size, an environment characterized by change, a group of programs with questionable outputs, and difficulty in external communications will benefit most from the use of a program structure. The use of a program structure in an agency which meets none of these conditions would appear questionable.

Multi-Year Program and Financial Plan

There are two separate portions of the Multi-Year Financial and Program Plan that have benefits to the user --

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[1]C. W. Churchman and A. H. Schainblatt, "PPB: How Can It Be Implemented?," Public Administration Review, XXIX (March/April, 1969), 180.

[2]State-Local Finances Project, Implementing PPB, p. 55.

the multi-year feature of the plan and the output indicators. The multi-year feature forces the decision-maker to consider the future-year implications of current decisions.[1] This feature is most important when an agency has: programs that extend for a period of time into the future; programs whose size and effects are not just arithmetical extensions of past history; and a "lag" between the expenditure of funds and the achievement of results, such as the long investment cycle for advanced military weapons.

The multi-year feature of the program plan has one other advantage. By establishing a framework and definite format for intermediate plans, it encourages planning on the part of the agency involved.[2] Planning is essential in agencies where change is likely in the future time period. With a well-established planning effort, an agency is able to anticipate areas that require future decisions and to make these decisions in a timely fashion.[3]

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[1]Don Vito, Essentials of Planning-Programming-Budgeting System, p. 8.

[2]Edwin W. Beach, "California's Programming and Budgeting System," Innovations, U. S., Congress, Joint Economic Committee, 1969, p. 31.

[3]A discussion of the benefits of the multi-year provisions of the program plan would not be complete without a discussion of one possible negative benefit. The multi-year projection of costs and benefits may inject an element of conservatism into the plans of the agency. The tendency to simply extend programs from the past into the future will exist. Once these programs are extended, ". . . unimaginative minds will accept program plans as firm commitments." (Hartley, Educational Planning-Programming-Budgeting, p. 40.) This means that it could be difficult to process changes to

The second part of the multi-year program plan that provides benefits to an agency is output indicators. These output indicators provide a reminder of the basis of past decisions and reflect the changes in output expected from changes in the program. As such, they are a major part of the presentation of the "base" from which analysis proceeds. The degree of benefits provided by the use of output indicators is then related to the need for analysis in the agency.

Output indicators are also useful to help isolate the need for analysis. This means that the benefit of these indicators increases when the agency has an environment where future change is going to be necessary.

The output indicators also provide a rough measure of program accomplishment. This is useful in the comparison of planned accomplishments versus the accomplishments actually achieved. This aspect of output indicators means that they are more useful when there is a lag between the spending and the accomplishment, and when the outputs of the spending are not immediately obvious.[1]

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the approved "base" since these changes would have to bear the burden of proof in establishing their superiority over those programs already projected.

[1]It would be incorrect to consider the multi-year program plan with its output indicators as a management-control device. The indicators in the program plan are too highly aggregated to provide more than a glimpse of the information needed for program control. More detailed organizationally oriented information from a system such as "performance" budgeting is needed to effect adequate management control within an agency.

Probably the greatest benefit which can be received from output indicators in the program plan is the ability to devise meaningful quantitative indicators. Where the indicators used are only program-size indicators, the benefits accruing from their use are less than when both program-size and effectiveness indicators are possible.

The level of benefits that are received from the use of a Multi-Year Program and Financial Plan will obviously vary between different agencies of the Federal Government. An agency which has multi-year programs, faces a volatile climate, has a number of programs with a long lead-time, and has programs where meaningful quantitative indicators can be devised will derive more benefit from the use of a Multi-Year Program and Financial Plan than one which does not meet these criteria.

Systems Analysis

The "heart" of PPBS is the use of systems analysis. One tends to agree with the thought expressed by Otto Eckstein before a Congressional committee:

> . . . I do not believe that there is any field of public expenditure which could not be improved by having high-quality . . . analysis applied to it.[1]

Even so, the power of systems analysis is not uniform in all contexts, and the benefits from the use of this analysis are

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[1]U. S., Congress, Joint Economic Committee, Guidelines, Hearings, 1969, p. 221.

not equal in all areas.[1] Some aspects that determine the amount of benefits possible from the use of systems analysis will now be explored.

The first, and most obvious, condition that must exist before the use of systems analysis will be beneficial in a particular agency is that alternative ways to achieve objectives must exist.[2] If there is no alternative way of achieving the objective, the most that analysis can indicate is whether the achievements of the single alternative are worth the cost of that alternative.[3]

Analysis is most required when the use of unaided intuition is the weakest. This occurs when the problems are extremely complex and historical precedence is lacking. The Department of Defense had these types of problems. The complexities of DOD systems and their operating environment are well known. In addition, no one had conducted a war of nuclear proportions, or even a limited war under the threat of escalation to nuclear levels. The historical lessons of warfare and weapons acquisition and use could well have been

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[1]U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, p. 135.

[2]Yehezkel Dror, "Systems Analysis and National Modernization Decisions," Academy of Management Journal, XIII (June, 1970), 143.

[3]One must guard against the tendency to preclude analysis because of the lack of alternatives when the use of analysis is required primarily to uncover new alternatives.

misleading.[1] The complexities of nondefense programs normally arise from the existence of multiple objectives, undefined objectives, and multiple levels of government. These complexities create a need for systems analysis, and the more complex the problem and situation, the greater the potential of systems analysis to provide meaningful input.

Systems analysis is more beneficial when a high rate of change is encountered. Incremental change is almost inevitable in the absence of a viable analytic capability. The absolute rate of change is not as important as the amount of change that is expected during the effective time span between the decision on a program and its implementation.[2] Benefits of the use of analysis are more limited when the rate of technological, social, and/or political change is slow and incrementally changed programs are adequate.[3]

The amount of benefits possible from the use of systems analysis also seems to depend on the degree to which

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[1]Malcolm W. Hoag, Some Complexities in Military Planning, p. 1.

[2]Clay Thomas Whitehead, Uses and Limitations of Systems Analysis, p. 13.

[3]One possible nonmonetary cost of the use of systems analysis should be noted in relation to the ability to change programs. The improper use of systems analysis can possibly stifle creativity and change. The process of getting a new idea approved can be made so burdensome that individuals may avoid trying to experiment with new ideas to avoid the work associated with approval. (Ibid., p. 61.) The application of rigid systems analysis requirements during early stages of research, development, and experimentation would appear to be the major way to stifle this creativity.

the agency is attuned to responsiveness to the needs of consumers and users of the services it provides. By insisting on adequate systems analysis, the objectives of an agency's decisions can be changed from internal orientation to the end item, and responsiveness to the needs of the consumer or user can be increased.[1] Governmental organizations which are made responsive to the consumer by some other mechanism, such as the profit motive, probably derive less benefit from the use of systems analysis than those which do not have this mechanism.

Another factor which determines the benefits possible from the use of systems analysis is the resource impact of the decisions. Obviously the greater the expenditures associated with a particular decision and the greater the adverse consequences of an incorrect decision, the greater the need for systematic analysis.

Another benefit that accrues to the agency which makes effective use of systems analysis is that the use of analysis itself becomes a means for justifying the agency's budget proposal.[2] The effective use of analysis increases the rationality explicit in a program and helps to "sell" the program. In the words of one author, analyses become ". . . powerful weapons in the arsenal of persuasion."[3]

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[1]California, State Personnel Board, Program Budgeting in California, by Silvey, p. 2.

[2]Escarraz, "PPBS and the National Government," p. 135.

[3]Held, "PPBS Comes to Washington," Planning, Programming, Budgeting, ed. by Lyden and Miller, p. 25.

Another factor which partially determines the benefits that systems analysis will offer to a specific agency is the availability of data and personnel. One author notes the following four characteristics as prerequisites to the effective use of systems analysis:

> 1) Availability of professionals able and willing to undertake high quality systems analysis.
> 2) Availability of data on which analysis can be based.
> 3) Availability of valid theories, which permit at least some reliable predictions on probable results of different alternatives.
> 4) Existence of sufficient power support to get access to required information.[1]

As noted before, the availability of data and personnel affects the speed at which adequate analysis is available more than the absolute possibility of ever achieving a position where analysis is effective. Since data and personnel are developed only after experience with the use of systems analysis, an effectiveness-time curve for systems analysis in most agencies would look like Figure 3. The availability of data and personnel at the time that systems analysis is implemented establishes the initial degree of adequacy of analyses (E_o). The method of implementation will establish the shape of the curve.[2] However, there is an upper limit to the adequacy of analyses even over a long period of time (E_m).

Probably the factor which most effects the degree of

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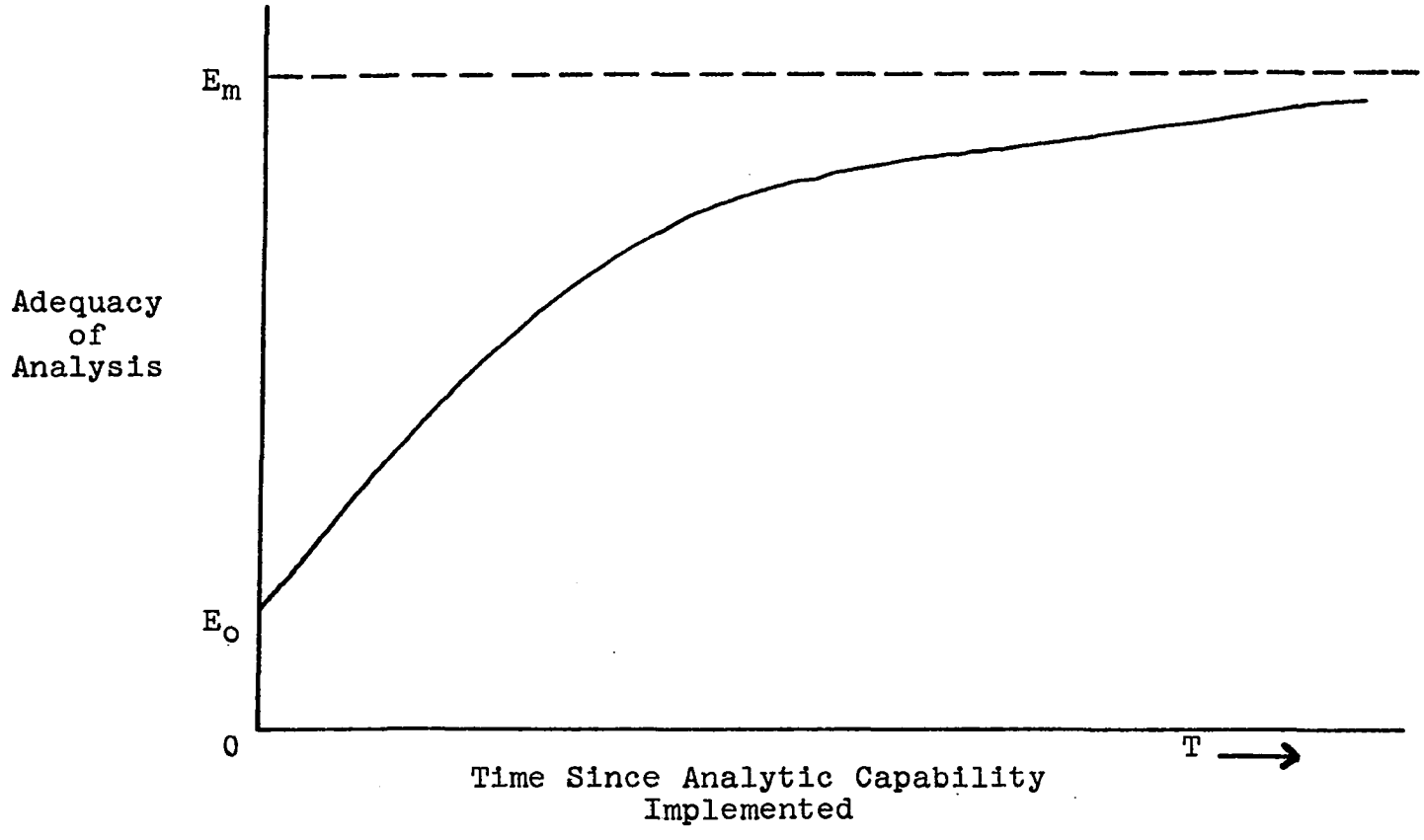
[1]Yehezkel Dror, Systems Analysis for Development Administration: Some Problems and Prerequisites, p. 9.

[2]This will be discussed in Chapter VI.

FIGURE 3

HYPOTHETICAL EFFECTIVENESS-TIME CURVE FOR SYSTEMS ANALYSIS



benefits that can be received from the use of systems analysis is the willingness of the decision-makers in the agency to use the products of this analysis. The purpose of systems analysis is not to make decisions but to present information[1] to the decision-maker so that he can make more informed decisions. The other characteristics that make the use of systems analysis beneficial are meaningless if the decision-maker ignores the product of analysis in his decisions.[2]

General Comments

The use of PPBS has two benefits which are extremely difficult to evaluate but which could very well be the most important products of the system. These are:

1. The attitudes of personnel associated with the programs of the Federal Government are changed from input-orientation to that of questioning the outputs of the program. This change could be very significant in the improvement of

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[1]It is necessary to distinguish between data, of which decision-makers generally have too much, and information, of which decision-makers generally have too little. Only after data has been converted into a form which is meaningful for the decision-maker to use on the decision at hand can it be called "information." (Tom Alexander, "Computers Can't Solve Everything," Fortune, LXXX [October, 1969], 129.)

[2]This situation appears to occur often in governmental agencies. For example, the systems analysis approach would appear to be particularly beneficial in the area of foreign affairs. Yet it has not been utilized to any significant degree because of the predisposition of the professional decision-makers in this area. (Norford, "Foreign Policy Planning," pp. 81-100, and U. S., Congress, Senate, Planning, Programming, Budgeting, Inquiry, 1969, pp. 181-82.)

governmental programs.[1]

2. The approach of governmental decision-makers to their decisions can be changed to one of disciplined judgment instead of a form of ad hoc intuition. The quality of all decisions could well be improved.

There are two other aspects of the costs and benefits of PPBS that deserve discussion. First, if the four major components of PPBS that were discussed under design of the system are considered in a possible sequence of the potential system, Figure 4 shows how the costs and effectiveness vary. It costs considerably more to implement a PPB System with all four components than to implement only the program structure, but benefits that accrue are also much higher. Whether the additional benefits that would accrue from the full system are worth the additional cost should be a matter of analysis in the specific agency involved.

The second aspect of the costs and benefits of PPBS concerns the time of their incurrence. Because of the time lag which exists between the beginning of the process of implementing PPBS and its final achievement of full operation, its early use will involve considerable costs (both monetary and nonmonetary) and will provide little benefits. After the system has become fully operational, the costs involved will be reduced and the benefits will be increased.

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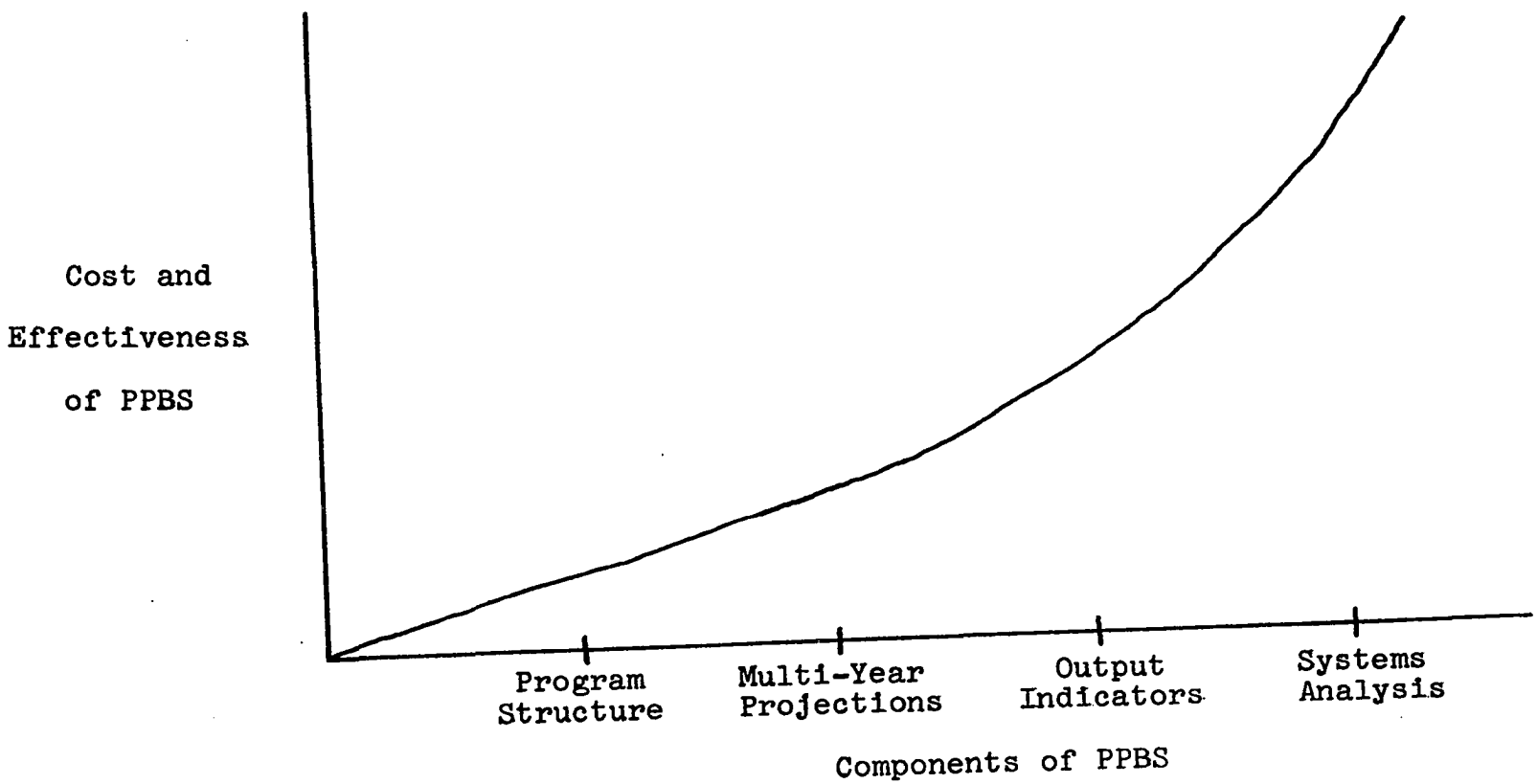
[1]Selma J. Mushkin, "PPBS in City, State, and County: An Overview," Innovations, U. S., Congress, Joint Economic Committee, 1969, p. 10.

FIGURE 4

HYPOTHETICAL COST AND EFFECTIVENESS OF PPBS



Summary

This chapter has indicated that the Planning-Programming-Budgeting System that is adopted in each agency should be specially designed to meet the needs of that agency. The design of a Planning-Programming-Budgeting System is itself a substantial analytic task. It should be approached with the same analytic discipline that PPBS encourages. In this case the variable parameters of the model are the five major decisions which must be made:

1. What are the key leverage decision points in an agency's operation?
2. What general approach should be taken to the program structure design -- deductive or inductive?
3. What general design should the Multi-Year Program and Financial Plan have, including length of projections, level of projections, and selection of cost measures?
4. What general design should the output indicators have?
5. What relationship should PPBS have to existing traditional and performance budgets?

The answers to each of these questions largely determine the cost and benefits of PPBS. The second part of the design of a PPB System is to determine if the benefits achieved are worth the cost to be expended. It appears that a PPB System will have the greatest amount of benefits in an agency which: has a number of alternative ways to achieve its objectives; is characterized by complex programs with a

lack of historical precedence; exists in an environment where the rate of technological, social and/or political change is rapid; is organizationally structured along lines other than purpose; has a traditional budget that is heavily input-oriented; is a large organization with a long scalar chain-of-command; has programs that represent multi-year commitments; has a need to better communicate outside of the organization -- including a need to better "sell" programs; appears to have programs which have not been adequate to achieve objectives; is not naturally oriented toward responsiveness of consumer's and user's needs by a mechanism such as the profit motive; has decisions characterized by large resource commitments or extremely adverse impacts when incorrect decisions are made; has personnel capable of performing analysis and data capable of supporting analysis; and has decision-makers willing to use the products of PPBS.

Agencies which do not have all of these characteristics will derive less benefit from the use of PPBS than agencies which meet all of the characteristics. Whether the benefits that accrue in a specific agency that has only some of the characteristics are worth the costs of the system must be the subject of individual in-depth analysis.

CHAPTER VI

IMPLEMENTATION OF PPBS

One of the most important tasks associated with the Planning-Programming-Budgeting System in the Federal Government is its implementation. The design of PPBS is wasted effort unless the system is put into practice by effective implementation. There is some indication that the problems of implementing PPBS have been ignored in the Federal Government, and this has been partially responsible for the lack of achievements of the system.

The task of implementing PPBS is one that is not very well understood. No single concrete plan for implementing PPBS can be formulated to work in all agencies. If all PPBS required was the institution of new forms into an agency, the implementation would be relatively easy. The concept of the Planning-Programming-Budgeting System, however, requires an organizational change of some magnitude. The attitudes, operations, and interrelationships of components of the organization must be changed if PPBS is to be effective.

The problem of changing an organization is one that has occupied a large body of theory. However, the theory of organizational change has been dominated by a narrowly defined

segment of the social-science fraternity. The major topic which has occupied its attention has been where the organization attempts to move from an autocratic managerial environment to one where it strives to maximize the "human values" of its employees.[1] For this reason there is little in the change literature that is directly applicable to the institution of a new management system like PPBS. However, the literature of organizational change abounds in guidelines and suggestions for facilitating any type of change to an organization. These guidelines will be adapted to the concepts of PPBS. First the philosophy of organizational change will be described. Then some key decisions and actions during the process of change will be discussed. Finally some guidelines on the implementation of the various components of PPBS will be covered.

Philosophy of Change

States of Changing Organizations

The process of change in an individual or an organization can be divided into three stages:

1. "Unfreezing": Stimulating the organization to feel that some sort of change is necessary.
2. "Changing": Introduction and application of new methods and guidelines.

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[1]Jeremiah J. O'Connell, Managing Organizational Innovation, pp. 5-7.

3. "Refreezing": Reinforcing the changed behavior patterns.[1]

This process of change is represented in Figure 5. The length of the arrows representing forces that are facilitating or retarding change are representative of the strength of these forces. Notice that during the "unfreezing" stage the requirement is to reduce the strength of the forces which retard the change process and increase the forces which facilitate change.

Also notice from Figure 5 that the change does not begin immediately after the forces retarding and facilitating change are imbalanced. In order to overcome the tendency of the organization to maintain the status quo, it is necessary for change efforts to reach some "critical mass" before they become effective.[2]

Problems Encountered in the Change Effort

The process of change is not as simple as the schematic representation in Figure 5 would have one believe. This is because it is not a simple matter to estimate the magnitude of the forces facilitating and retarding the change effort. Also, these forces are not independent. A change in a force that facilitates change can easily modify one of

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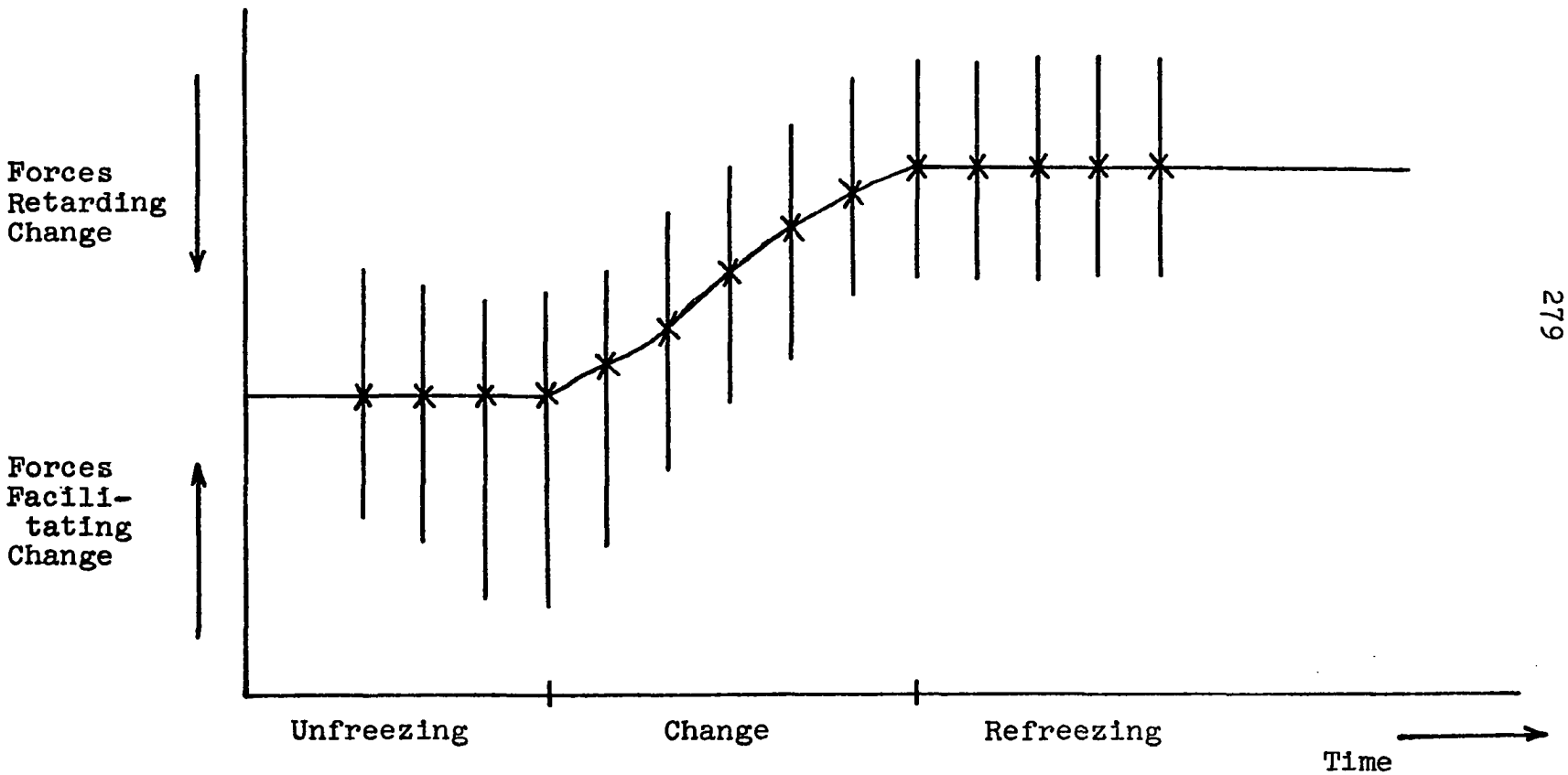
[1]Larry E. Greiner and Louis B. Barnes, "Organization Change and Development," Organizational Change and Development, ed. by Gene W. Dalton, Paul R. Lawrence and Larry E. Greiner, pp. 6-7.

[2]Yehezkel Dror, From Management Sciences to Policy Sciences, pp. 32-33.

FIGURE 5

THE PROCESS OF CHANGE



the forces that retards change. For example, a directive that decisions must be supported by systems analysis (the directive itself is a force facilitating change) may well arouse such resentment in the personnel receiving the directive that they will actively work to circumvent it (their mental attitude is a force that retards change).

Normally the instigators of change are more realistic in accepting the limitations imposed by physical laws in change efforts than they are in accepting the limitations imposed by human psychology. For this reason the development of procedural aspects of PPBS and the development of analytic staffs have proceeded much more rapidly than the change in behavior and decision processes in the civilian agencies of the Federal Government. Unless some definite attention is paid to the need to change the behavior of the organization to adapt to PPBS, the adoption of that system is likely to remain at a superficial and mechanistic level.[1] One of the first steps in implementation is to identify the sources of irritation and resistence that are inherent in the implementation of PPBS.[2]

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[1]This was noted by a writer on the use of PPBS and systems analysis in the Atomic Energy Commission when he said that ". . . until the AEC becomes convinced that economic analysis can be helpful to it in its decisionmaking and funding problems, no form of staff organization is likely to make it work." (Milton F. Searl, "Prospects for PPB at AEC," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 1016.)

[2]These are discussed in Appendix D-1.

Decisions and Actions during Implementation of PPBS

Manner of Implementing PPBS

The way in which PPBS is introduced can influence the degree of resistance toward the implementation and use of the system. While there is an almost unlimited spectrum of types of action that can be employed in the introduction of change in an organization,[1] the principal characteristics of each of these allow their division into three categories -- directive, participatory, and group-sharing.

Directive Implementation

The implementation of PPBS by directive change is characterized by some form of compulsion. By its very nature this type of change effort arouses a great deal of resentment and opposition. The initial result of implementing PPBS by directive could be the adoption of the form but not the spirit of the system.[2]

It is difficult to achieve the acceptance of a new form of management if it is instituted by force. It is, however, not impossible. The Department of Defense largely instituted PPBS by directive. In this department the system was met with massive resistance, but because of the authority

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[1]For example Garth N. Jones, Planned Organizational Change, used nine "strategies" and twenty-nine "tactics" to identify and classify organizational change efforts.

[2]Benton and Tenzer, Program Budgeting and Executive Commitment, p. 15.

and power of Secretary McNamara, the individual services embraced the concepts of PPBS, including systems analysis, largely as a matter of self-defense.[1]

The following conditions appear necessary before the directive method of implementing PPBS can be successful:

1. The agency head must have the authority and the ability to direct the change and enforce it.
2. The enforcement must continue for a long enough period that attitude and behavior change is forced (even if it is in self-defense).
3. A high degree of creativity and ingenuity is not needed at the lower levels of the hierarchy in the design and initial use of the system. (Secretary McNamara was able to use trained "consultants" from outside the DOD in the initial transition to PPBS.)[2]

There are some definite advantages to the use of the directive means of implementing PPBS. When the conditions noted above are met, PPBS can be implemented more rapidly (at least at the highest level) than if a broader base of participation is involved. The agency head can also ensure that the design and operation of PPBS in the agency meets his

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[1]Ibid., pp. 12-13. Another aspect of this acceptance could be the military's traditional indoctrination of respect for authority and hierarchy. (Frederick C. Mosher, "Program Budgeting in Foreign Affairs: Some Reflections," Planning, Programming, Budgeting, Inquiry, U. S., Congress, Senate, 1969, p. 143.)

[2]These conditions were adapted from Arnold S. Judson, A Manager's Guide to Making Changes, pp. 69-72.

needs.

Participative Implementation

At the other end of the spectrum of methods of introducing PPBS into a governmental agency is participative change. Under the participative concept all of the affected individuals in the agency are allowed a voice in the decision process on the design and implementation of the planned system. There are many advantages to the use of participation in the implementation of PPBS. Some of these include:

1. Each individual affected by the change has an enhanced sense of importance due to his being given the opportunity to express his ideas.
2. All concerned with the system will gain a better understanding of it.
3. All concerned with the system will feel a sense of responsibility toward the success of the system, and resistance to its implementation will be effectively reduced.[1]

While most managers will acknowledge the beneficial effects of participation in the implementation of PPBS, a major problem is the way in which that participation is secured. "Participation" is a psychological attitude on the part of the individuals involved that their work, opinions, and ideas on the system will actually be respected.[2] Whether

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[1]Floyd C. Mann and Franklin W. Neff, Managing Major Change in Organizations, p. 79.

[2]Paul R. Lawrence, "How to Deal with Resistance to Change," Organizational Change and Development, ed. by Dalton,

this attitude can be established in any given agency depends largely on the past relationships that have existed in the agency.

There are three other problems in the use of participative implementation of PPBS in the agencies of the Federal Government. These are:

1. The size of the governmental agency and the number of people involved in PPBS make formal participation by everyone almost a practical impossibility.[1]

2. To have successful participation in the design and implementation of a Planning-Programming-Budgeting System, the head of the agency must be willing to accept the ideas of the subordinates and have very little predisposition on how the system will be designed or operated.[2]

3. If the concepts of the Planning-Programming-Budgeting System are dangerous to the job security of an individual,

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Lawrence and Greiner, pp. 182-84. If the individual involved feels that the participation allowed is actually a psychological gimmick, this method of implementing PPBS can generate more resistance than the directive implementation.

[1]Most of the success of totally participative change has been when it is applied to smaller groups. (Judson, Guide to Changes, p. 101.)

[2]Since the system must be designed to serve the agency head, it is difficult to conceive of a case where he does not have at least some strong predispositions in regard to its design and operation. It is also likely that the agency head will have to make some decisions that he cannot justify from the perspective of an individual who advocates a different decision. Participation in this case can be effectively negated since it depends so highly on the subordinate's perception.

or to a program with which he is closely identified, it is doubtful if any meaningful level of participation can be attained.

Group-Sharing Implementation

On the broad spectrum of possible methods to implement PPBS, between directive and participative, are group-sharing approaches. These cover methods that can be somewhat directive -- or somewhat participative -- oriented. At the first extreme, the agency head defines the general outlines of the PPB System desired and its general operating techniques. He also retains veto authority over the work of the group which fills in the details of the outlines. At the opposite extreme, only the broadest of needs is stated and the most general veto exercised.

This approach combines many of the advantages of the directive and participative methods of implementation of PPBS. In most organizational change efforts it has proven to be the most successful method of change.[1]

The method of implementation of PPBS and the level of participation in the operation of the system will be largely reflected in the organizational structures devised for the implementation and operational phase. This is discussed in Appendix D-2.

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[1]Larry E. Greiner, "Patterns of Organization Change," Organizational Change and Development, ed. by Dalton, Lawrence and Greiner, pp. 220, 227-29.

Speed of Implementation

Not only is it necessary to decide on the general method of introducing PPBS into an agency, but the amount of time to be used for the introduction of the system should be determined. There are two critical aspects to the question of time in implementing PPBS -- the time after the decision to implement a PPB System and the start of the actual implementation, and the time of the implementation phase itself.

Time Before Implementation

The time before the implementation of PPBS should be spent in determining the proper design of the system and how it should be implemented into the agency. This time is critical to the success of the system. It appears that the system has been implemented in the civilian sector of the Federal Government with little thought as to its best design or how it should be implemented.[1] There are definite risks in moving too quickly in the application of PPBS to governmental agencies. Its misapplication can discredit the system itself and do irreparable damage to its potential in the

[1]Charles J. Hitch, "Decision Making in Large Organizations," Planning, Programming, Budgeting, Inquiry, U. S., Congress, Senate, 1969, p. 580. The civilian agencies have taken their lead from Secretary McNamara in this regard. Mr. Hitch recommended that a study group work for one year to define PPBS for the DOD. Secretary McNamara said, "Fine, but I want the system implemented this year, not next." (R. L. Petruschell, Some Remarks on Planning, Programming and Budgeting, pp. 1-2.) This haste of the civilian agencies disregards the fact that the DOD built their system on some twenty years of historical and theoretical background which did not exist in the nondefense areas.

government.

This period between the announcement of the intention to implement PPBS and its actual implementation is also valuable in reducing the amount of organizational resistance to the system. As a general rule, the shorter the period between the announcement of a change and its inception, the higher the resistance it encounters.[1] This period can be usefully spent in educating the organization on the change involved so that the novelty and strangeness of the system disappears and personal accommodation and rationalization is possible.

There is no definite rule for the amount of time that should be devoted to the initial design effort. Most of the local and state governments found that one year was too short to perform this initial effort (including the initial staffing).[2] A complex agency of the Federal Government could require a longer period of time, depending on the resources committed to the effort.

There is also a practical limit to the amount of time that should be consumed in this preparatory stage. The major cost of deferring the implementation of the system is that the benefits that will accrue from its use are also deferred. The design of the Planning-Programming-Budgeting System can also be overemphasized since there are many aspects of the

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[1]Judson, Guide to Changes, p. 80.

[2]State-Local Finances Project, Implementing PPB.

design that simply cannot be resolved until experience with the system is accumulated.

Time of Implementation

The length of time that the implementation itself will require forces a significant decision. Generally personal resistance to a slow change is less because the individuals involved have a greater opportunity to assimilate the change.[1] A slower pace of implementation of PPBS will allow the individuals responsible for the system to transmit and receive information about the system, adjust the system based on that feedback, and educate the individuals who are resisting the system.[2]

There are practical limitations to the time that should be allowed for the implementation of PPBS. The slower the implementation, the longer the benefits that will accrue from the system are deferred. An extremely slow organizational change can create resistance of its own, due to the long period of social and personal disruption.[3]

There is no hard and fast rule on the length of time required to implement PPBS. Even in the Department of Defense the system is still changing after ten years, but these changes appear to be the result of the flexibility of the

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[1]Judson, Guide to Changes, p. 80.

[2]Benton and Tenzer, Program Budgeting and Executive Commitment, p. 17.

[3]Judson, Guide to Changes, p. 82.

system in accommodating itself to different environmental circumstances and different management styles of different Secretaries of Defense. Almost without exception the local and state governments that have begun to implement PPBS have estimated that the total implementation effort will require three to five years.[1] The actual length of time required before an effective, operative Planning-Programming-Budgeting System is achieved seems to depend on the degree of commitment of the agency head to the system as well as on the amount of resources that have been committed to its implementation.[2]

Communication During Implementation

The nature and extent of the communications about the implementation of PPBS is another area which should be considered by managers. Generally the more open and accessible the lines of communication are kept during the implementation process, the more resistance will be reduced. If individuals

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[1]State-Local Finances Project, PPB Pilot Project Reports from the Participating 5 States, 5 Counties and 5 Cities.

[2]One author facetiously formulated a Law of Bureaucratic Assimilation which shows the amount of time (T), in days, required for a new system to become effective. This "law" states that $T = 2 + 2 (n - 3)^2$, where n is the number of people who must accept the system. If this "law" were universally valid, an almost infinite period of implementation would be required for PPBS. The "law" does demonstrate that the total acceptance of PPBS in the Federal Government will require an extended period of time. (Ronald B. Lee, "The Law of Bureaucratic Assimilation," Public Administration Review, XXIX [March/April, 1969], pp. 203-4.)

affected by PPBS are unable to base their perception of its impact on valid, open communications, they are likely to imagine negative effects.

There are a number of communication channels which deserve special attention during the implementation process:

1. The channel of communication that will inform individuals of exactly what the system involves, their role in the system, and the demands that the system will make on them.[1]
2. The channel of communication concerning the implementation process itself that includes a specific designation of the distribution of responsibilities for the implementation of specific aspects of the system.[2]
3. An ad hoc communication channel which allows discussion of the implementation and use of PPBS with any member of the organization who is dissatisfied with the proposed system. Not only will this channel of communication help to reduce some of the resistance to the system,[3] but it can serve as a source of identifying possible inadequacies.
4. A channel of communication that indicates to higher management how well the system implementation is progressing.

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[1]Haggart, Developing a Program Budgeting System, p. 6.

[2]Ibid., p. 7.

[3]Researchers in the social aspects of change have found that even the process of "beefing" to management often helps employees release pent-up resistance and adjust to a changed environment. (William J. McLarney and William M. Berliner, Management Training: Cases and Principles, p. 597.)

Informal as well as formal means of obtaining feedback should be used to ascertain the effectiveness of PPBS.[1]

The amount of attention devoted to these channels of communication throughout the implementation process and the quality of the communications transmitted by these channels could be two of the more important factors determining the ultimate success of PPBS in an agency. Only when information passes comprehensively and smoothly through well-designed channels can the implementation effort begin to be effective.

Training

Another key decision in the implementation of the Planning-Programming-Budgeting System in the Federal Government is the part that training will play in the implementation process. Without some form of training a high degree of reliance is placed on informal information, direct exhortation, and supervised learning.[2] Training can be useful in reducing resistance of personnel to PPBS by directly attacking their preconceived attitudes about the system, by providing a means of communication on how the system is to

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[1]Formal methods of feedback will probably emphasize the mechanistic aspects of PPBS, such as whether or not a program structure has been established, whether there is an analytical staff in existence, etc. Informal feedback should concentrate on such questions as: 1) What is the degree of improvement of analytic studies? and 2) Is analysis being used as "window dressing" for preconceived decisions?

[2]O'Connell, Managing Organizational Innovation, p. 129.

be implemented and operated, and by upgrading the skills of the personnel who must use the system.

The expectations of the results of a training effort should not be set too high. Attendance at training, and even enthusiasm during the training session, does not ensure a change in the organization.[1] Training must be reinforced by an organizational and procedural climate that allows successful implementation.

Organizational Climate

The greatest determinant of successful efforts to implement PPBS has been the organizational environment that prevails. A high degree of correlation has been demonstrated between the ability of an organization to successfully assimilate any specific change and the existing receptiveness of the organization to change.[2] Top management of an agency preparing to implement PPBS should evaluate the factors that determine the receptiveness of the organization to change. Some of these factors can be altered by the behavior and actions of top management, and others must only be accepted as indicators of the magnitude of the task of implementation. Factors which favorably influence the climate of an organization toward the implementation of PPBS include:

1. A top leader who supports the need for the implementation

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[1]Richard Beckhard, Organizational Development: Strategies and Models, pp. 21-22.

[2]Jones, Planned Organizational Change, pp. 92-93.

of PPBS is necessary. The greater the prestige and power of this top leader, the more effective is his support in establishing a favorable climate for implementation.[1]

2. An individual with high prestige who is known as the direct initiator of the implementation of PPBS and who devotes the majority of his efforts toward its implementation will facilitate the process.[2]

3. The organization which is accustomed to operating in a changing environment and modifying its managerial systems to adapt to that environment will more easily implement PPBS.[3]

4. A capability for the organization to be directly rewarded for its use of PPBS facilitates implementation.[4]

5. A high degree of mutual trust between the principal parts of an organization (upper and lower management, and line and staff) will increase the ease of PPBS implementation.[5]

6. Either a great deal of pressure from the external

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[1]Gene W. Dalton, "Influence and Organizational Change," Organizational Change and Development, ed. by Dalton, Lawrence, and Greiner, pp. 237-39. This top management support is primarily manifested in the agency head's demand for analysis and the use of analysis in his decisions.

[2]Gordon L. Lippitt, Organization Renewal, p. 151.

[3]Ibid. Organizations which have been growing rapidly are likely to be more accustomed to changing managerial systems.

[4]Beckhard, Organization Development: Strategies and Models, p. 97. This means that PPBS will be more easily implemented in those agencies that anticipate rising future appropriations.

[5]Lippitt, Organization Renewal, p. 148.

environment (Congress and clientele) for some sort of change or insularity from this environment will facilitate the implementation of PPBS.[1]

Sequence of Implementation

Another of the major decisions that must be made in the implementation of PPBS is the sequence of the implementation. Two questions are involved in this decision. First, in what sequence should the components of PPBS be implemented; second, in what sequence should the system be implemented throughout the organization.

Sequence of Components

There are essentially three possible sequences that can be followed in the implementation of components of PPBS:

1. The program structure can be designed and implemented first. After this step is essentially complete, the multi-year plan can be formulated and then systems analysis seriously undertaken.
2. A start of systems analysis is made. After experience with analysis, the program structure process can be undertaken and the multi-year plan formulated.
3. Both systems analysis and program structuring are undertaken simultaneously. After the program structure is complete, the multi-year plan would be formulated.

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[1]Beckhard, Organization Development: Strategies and Models, p. 97.

The first method of implementation was largely followed in the Department of Defense. This department had the advantage of a number of years of analytical experience, even if the results of those early analyses had not been incorporated directly into the decision process. The major advantage in the design and implementation of the program structure first is that it lends substance to the entire effort of implementing PPBS since the results of the program-structuring effort are much more evident and concrete than the initial results of the analytical effort. The program structure also gives guidance to, and provides data for, the analytical effort. Finally, the process of developing a program structure is a source of less conflict than the use of systems analysis and can likely be implemented with less abrasiveness than can analysis. This early amicable task may facilitate the implementation of the total PPB System.

There are some definite handicaps to the attempt to implement PPBS by first designing and implementing the program structure. The program structure's major contribution to PPBS is its ability to illuminate decision alternatives for analysis. By constructing the program structure without a historical analytic background, decisions are forced into an almost arbitrarily determined program structure; otherwise, the program structure would be built around the necessary decisions. The second major product of the program structure is to provide data suitable for use in analysis. Unless some

experience in the use of analysis exists, the determination of what data is required must be rather arbitrary. Excessive attention to the design of the program structure without knowledge of the requirements of data for analysis may turn it into another accounting system whose product is of little more use for analytic purposes than the accounting system based on traditional input items.[1]

The second method of implementing PPBS has advantages and disadvantages that are almost opposite to those listed for the first method. Probably the major problem is that the products of analysis during the early stage of implementation are normally so marginal, and the natural opposition to the use of analysis is so large, that the entire system could be discredited and discarded before it has an opportunity to contribute significantly to the decision process.

The attempt to implement both systems analysis and the program structure simultaneously is most difficult. Normally the same group of individuals is directly concerned with the implementation of both. Because time is limited it is almost inevitable that one of the efforts is compromised. Since the task of implementing the program structure is more concrete, this phase seems to dominate that of securing

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[1]Haggart, et al., School District Planning, p. 185.

systems analysis.[1] If it can be properly enforced, this compromise of simultaneous implementation offers a reasonable alternative to the other two methods.

Sequence of Organizational Activities

The extensiveness of the implementation of PPBS is another decision that must be made before beginning its implementation. One method of overcoming resistance to the implementaticn of PPBS is to introduce it on a pilot-study basis and let the results be seen and spread elsewhere.[2] One study found that most successful change patterns begin on a small scale and expa[illegible]

There are def[illegible] to the attempt to "piece-meal" the [illegible]stem:

1. When the pro[illegible]plemented first, it is difficult [illegible]of PPBS into different organiz[illegible]e of the interaction

[1]This observat[illegible] in the experience of New York City's use of P[illegible]e of the dominance of the program structure over the development of an analytic capability in the early stages of New York City's PPBS, the attempt to develop a program structure was subsequently deferred until a viable analytic capability was achieved. (State-Local Finances Project, Implementing PPB, p. 141.)

[2]Beckhard, Organization Development: Strategies and Models, p. 85. The Bureau of the Budget recommended that PPBS be tried in five or six of the more advanced nondefense agencies before a government-wide implementation was attempted. President Johnson vetoed this recommendation. (Cross, "The New Systems Budgeting," p. 113.)

[3]Greiner, "Patterns of Organization Change," Organizational Change and Development, ed. by Dalton, Lawrence and Greiner, p. 219.

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There are definite disadvantages to the attempt to "piece-meal" the implementation of the system:

1. When the program structure is being implemented first, it is difficult to divide the application of PPBS into different organizational activities because of the interaction

[1]This observation was confirmed in the experience of New York City's use of PPBS. Because of the dominance of the program structure over the development of an analytic capability in the early stages of New York City's PPBS, the attempt to develop a program structure was subsequently deferred until a viable analytic capability was achieved. (State-Local Finances Project, Implementing PPB, p. 141.)

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[3]Greiner, "Patterns of Organization Change," Organizational Change and Development, ed. by Dalton, Lawrence and Greiner, p. 219.

of programs. If the analytic capability is to be implemented first, this "piece-meal" approach can be pursued.

2. It is possible that the introduction of PPBS on a "piece-meal" basis would create the impression that it is an experiment and that management is not serious about its eventual total adoption.

3. It is possible for organizational elements awaiting implementation of the system to build up resistance to the system.[1]

Guidelines for the Implementation of Specific Components

There are some specific aspects which should be considered during the implementation of each of the components of PPBS. Those that concern the implementation of systems analysis will be discussed; then some aspects concerning the other components will be noted.

Systems Analysis

One of the most difficult problems in the implementation of PPBS in the agencies of the Federal Government has been to combat the misconception that the mere existence of analytic groups in the organization ensures good systems analysis.[2] Before systems analysis can be effective, the

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[1]O'Connell, Managing Organizational Innovation, pp. 128 and 144.

[2]Martin L. Ernst, "Operations Research and the Large Strategic Problems," Operations Research, IX (July-August, 1961), 442.

following tasks must be accomplished: determining where analysis will be applied, determining how analysis will be scheduled, achieving "good" analysis, determining who will perform analysis, gathering data necessary for use in analysis, and ensuring that the analysis is integrated into the decision process. None of these tasks is easily accomplished.

Even if PPBS is implemented across-the-board in all of the activities of the agency, it is not likely that all of the possible areas can be analyzed in the initial stages. It is probably best to concentrate the analytic efforts initially rather than try to perform a comprehensive analysis of all of the activities in the agency. Some guidelines to be used in selecting the areas where initial analytic efforts should be directed include:

1. One of the most obvious criteria is to start where the resource commitment is the greatest.
2. Analytic efforts should be started in the area where the greatest need for change is indicated.
3. Analytic efforts should generally begin with areas that are simple and that can be more easily defined (including a relatively high degree of data availability). The analytic efforts can then move to the more complex areas.[1]

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[1]Haggart, et al., School District Planning, p. 191. This allows the analytic efforts to have some degree of immediate pay-off which lends credibility to the use of the tool in other decision areas. One should be cautioned, however, against allowing the analytic efforts to be concentrated on

4. Analytic capability can be more easily applied to new, expanding programs than it can to the older established programs that are protected by an entrenched bureaucracy.[1]

5. The analytic efforts that already exist in the agency should be used as a starting point for analytic efforts under PPBS. Analytic efforts are often found in consultant efforts and studies by planning staffs.

Because systems analysis is to be an aid to decisions that are normally reflected in the budget, it is usually necessary to tie, to some degree, the process of systems analysis to the budget cycle. The budget cycle is characterized by a rigid set of dates and deadlines that must be met. This means that some sort of timetable must be constructed, expressing dates for formulating possible new courses of action and/or problems and selecting those for analysis; forwarding these to the analytic offices for analysis; transmitting the analyses to decision-makers for decision; incorporating the results of these decisions into programs; and formulating the specific budgetary implications

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areas that are narrow in scope for an extended period of time since the largest pay-off from analysis will come from the consideration of more complex areas.

[1]Schultze, Public Spending, pp. 90-92. This application of analytic efforts to new programs means that the data for analysis is normally more difficult to develop than it would be for existing programs, but the interests of personnel and their resistence to the analytic efforts will be considerably reduced. One must be cautioned against the tendency to justify only new programs using the terminology of systems analysis. This is not effective. Analysis should be used to develop information for decisions on new programs and not simply as a method of justification.

of the decision.[1]

In deciding on schedule and timetable procedures for analyses, the implementor of PPBS must balance two conflicting goals. First, analysis is by its very nature irregular and sporadic. Problems do not arise according to some predetermined schedule, nor is it possible to schedule the completion of analytic efforts to any finite degree. If analytic efforts are firmly scheduled, they will tend to emphasize methods and procedures and will lose a great deal of their substance.[2] At the same time the crucial aspect of PPBS is that it does bring analysis into the mainstream of decision-making by systematically introducing it into the budgetary process.[3] As long as analysis remains isolated from the program decision process, it is likely to remain a virtually sterile, academic exercise.[4]

A reasonable compromise can be reached if the procedures established for scheduling analytic efforts recognize the following factors:

1. Some analytic studies may require much more time than the normal budget cycle allows for completion. These studies should not be truncated simply to conform to an arbitrary

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[1]Don Vito, Essentials of Planning-Programming-Budgeting, p. 8.

[2]Schlesinger, Political Process, p. 4.

[3]Schultze, Public Spending, p. 77.

[4]Smithies, "Conceptual Framework," Program Budgeting, ed. by Novick, p. 60.

budget-process-imposed date.

2. If a decision is required for the current budget cycle and the analysis is incomplete, a partial analysis can be used for the decision and the analysis continued. The decision can be changed as the result of subsequent analytic efforts.

3. Not all problems can be identified on a specific date. A method should be available to identify and incorporate problems into the analysis process at any time. The establishment of a specific date to identify problems can stimulate the specific identification of problems, but it should not foreclose their identification at any other time.

The implementor of systems analysis in a PPB System should not expect the initial analytic efforts to meet high standards of sophistication. The attainment of a viable systems analysis capability is a slow and costly process.[1] Much of the initial analytic efforts will of necessity be less rigorous and use a great deal of crude estimates instead of firm data.[2]

As an admission of the difficulties of early analytical efforts, it may be desirable to concentrate on issue papers for many early analyses. The issue paper concentrates solely on the initial step of analysis -- formulating the problem.

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[1]Benton and Tenzer, Program Budgeting and Executive Commitment.

[2]Hirsch, Integrating View, p. 25.

It does not carry the analytic effort forward into comparisons of costs and effectiveness. The use of issue papers has the following advantages:

1. They do not make heavy demands for technical analytical talent or for a vast amount of data.
2. They can be completed in a relatively short period of time.
3. They can provide an improved perspective for the use of government decision-makers.
4. They are not perceived by operating personnel as totally radical departures from the current way of making decisions.[1]

The use of issue papers to the complete exclusion of total analysis can be detrimental to the effective use of PPBS. By not completing the analysis of costs and effectiveness of alternatives, the utility of systems analysis is considerably diluted.

Another problem that must be faced in the implementation of systems analysis is the determination of where the analysis is to be performed. Generally the most effective use of the limited resource of qualified systems analysts is to have all of the analyses performed by a central staff.

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[1]State-Local Finances Project, Implementing PPB, pp. 76-77. The content of issue papers normally includes a complete definition of the problem; suggested objective, criteria, and effectiveness measures; a description of the current activities in the area; a discussion of significant factors that constrain the problem; and a list of the major alternatives to solve the problem. (State-Local Finances Project, A First Step to Analysis: The Issue Paper, pp. 3-4.)

This could, however, lead to a dilution of over-all capability because of the resistance of line management to the authority of that staff and the almost inevitable biases that will exist when all analyses are performed in one office.[1] Over an extended period of time it seems inevitable that a substantial analytic capability will have to develop in subordinate levels of the organization.[2]

One of the major tasks that faces a manager in the introduction of systems analysis in the Federal Government is the development of data needed for analysis. Because the acquisition of data is expensive it is probably desirable to defer the definition of specific data needs until after some experience with analysis is gained.[3] Otherwise, data which is not required will be routinely gathered, and data which is required for analysis could be neglected.

Even after experience with analysis it is unreasonable to expect that the data required for analysis can be

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[1]This is discussed in greater detail in Appendix D-2. One compromise that is possible in the early stages of PPBS is to have the line management identify problems by issue papers and have the analysis of these problems performed by a central staff. (Nicholas M. Meiszer, "Developing a Planning-Programming-Budgeting System in the City of Dayton, Ohio," Innovations, U. S., Congress, Joint Economic Committee, 1969, pp. 213-14.) However, it is doubtful if line management will continue to identify significant issues for analysis if they know that both the analysis and the decision itself are going to be completely removed from their authority.

[2]Edward E. Winchester, "Ordering Spending Priorities," Defense Industry Bulletin, VI (May, 1970), 5.

[3]State-Local Finances Project, Implementing PPB, pp. 85-86.

determined to a finite degree and a routine data collection system which completely solves future data problems imposed. The data required by large, complex problems is so haphazard that any data system which attempted to totally meet this need would not only be prohibitively expensive, it would be almost impossible to design.[1] The best that can be achieved is the routine collection of the most significant elements of data that will have the greatest demand during future analyses. Specific analytic studies will continue to require a considerable data-collection effort themselves through sampling and/or experimentation to satisfy their individual data needs.

One of the first efforts in developing a data base for use in systems analysis should be the establishment of a program to systematically gather data about the effectiveness of major ongoing programs.[2] This step will provide much of the data needed in subsequent analytic efforts. Also data should be developed on the production function of different programs. As a result, a meaningful research program may need to be established.[3]

Finally, a comprehensive attempt to develop data to be used in estimating the resource impact of various

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[1]Anthony, Planning and Control Systems, p. 45.

[2]State-Local Finances Project, Implementing PPB, pp. 87-88.

[3]Selma J. Mushkin, "PPB in Cities," Public Administration Review, XXIX (March/April, 1969), 168.

alternatives should be developed. The data developed on costs must be related in some manner to the performance and physical characteristics of the activity under consideration.[1] This development will require the work of an in-house group of specialists who develop significant cost-estimating relationships.[2] However, it should not be surprising that the initial systems analyses performed under PPBS have cost models built almost entirely on sample data that is drawn during the analyses themselves. After a period of operation under the PPB System, the need for an extensive sampling step to gather cost data may be reduced with the development of a meaningful, comprehensive cost data bank.

The final major consideration in the implementation of systems analysis in the agencies of the Federal Government is that the results of the analysis must be integrated into the decision process. This means that the results of analysis must be communicated to the responsible decision-maker; he must accept the analysis as relevant and valid; and he must base his decision on the information in the analysis.[3] The most effective way to ensure that analysis

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[1]Gene H. Fisher, Cost Functions and Budgets (Cost Considerations in Systems Analysis), pp. 25-27.

[2]F. S. Pardee, The Financial Portion of a Management Information System, pp. 17-22.

[3]Hovey, Government Decision-Making, p. 5. This does not necessarily mean that he has to accept the results of the analysis uncritically or even make the decision conform

becomes a part of the decision process is for the top executive to ask the right types of questions and insist on the answers to these questions.[1] There is little to be gained from making an activity ritualistically adhere to the mechanistic requirements of reporting and communicating in a systems analysis format if it is incapable of or unwilling to undertake analysis.[2] However, when the top executive of an agency continues to insist on the answers that can be provided only by the application of systems analysis -- and not just the format or terminology of systems analysis -- the required analytic capability will soon evolve.[3]

Other PPBS Components

The implementation of PPBS requires the accomplishment

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to the recommendations of the analysis. However, the information presented by the analysis should have a significant impact on the decision that is made.

[1]California, Department of Finance, Programming and Budgeting System, (March 1, 1969), p. 29.

[2]Allen Schick, "Systems for Analysis: PPB and Its Alternatives," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 825.

[3]A case example of this attitude of the top executive in an agency is found in Secretary of Defense McNamara's continuous insistence on a cost-effectiveness study to support the Navy's proposed CVA program. Finally the Navy complied with the Secretary's demands for a cost-effectiveness study, but only to the extent that they disguised their same justification under a large quantity of numbers -- most of which were arbitrarily derived. (Whitehead, Uses and Limitations, pp. 115-34 and 150.) While this insistence did not produce an adequate analysis in this specific case, the same insistence over a long period of time produced a substantial improvement in the analytic efforts produced by the individual services.

of some specific tasks in regard to components of the system other than systems analysis. The development of cost data for the program structure, the initial preparation of the multi-year program plan, and the institution of a procedure for changing the program plan are all required.

In the implementation of the program structure it is often necessary to develop some form of allocation formulas to translate input-oriented costs into program allocation formats. One way of making this initial translation is to develop a number of cost-estimating relationships (CER's) that relate parameters of the program to resource requirements. These CER's are then applied to the historical experience of each of the programs, a historical program budget is constructed, and the totals contained in this budget are compared to the actual historical expenditures. If these historical figures are relatively accurate, the CER's developed can be used as a basis for allocation of costs.[1]

The initial preparation of the multi-year projections of programs is another problem in the implementation of PPBS. Theoretically the programs should be projected with a stable level of services and no changed mix of programs. The changes to this basis of projection should be made as a result

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[1]One case where this procedure was followed was in the Police Department of New York City. (A. J. Tenzer, J. B. Benton, and C. Teng, Applying the Concepts of Program Budgeting to the New York City Police Department.) This is discussed in greater detail in Appendix C-1.

of systems analysis.[1] Because of the minimum capability of systems analysis in the early stages of PPBS, the insistence on firm, in-depth studies to support all changes appears unreasonable. At the very best, the majority of changes in program projections will have to be based on a less rigorous preliminary analysis (perhaps only an issue paper formulation of problems). Many other changes will probably be required without being based on any form of analysis at all. An insistence on analytic support of all changes to an arithmetical extension of programs will result in all analyses' being superficial because of the dilution of analytic effort, and/or an undesirable degree of rigidity in the projection of programs.

It is also necessary to devise a system for the revision of plans on a periodic basis. Generally the plan should be changed at least annually.[2] The completion of a budget year means that the current year is dropped from the projection and a new year must be added. This almost forces an annual review of the projected programs. It would be undesirable to attempt to force all changes to the projected program into a very short time frame for the same reasons that analysis cannot be rigidly scheduled. The same is true of attempting to preclude changes from being made to the plan

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[1]State-Local Finances Project, Multi-Year Program, pp. 15-16.

[2]Ibid., pp. 13-14.

at any time during the year when the need for, and extent of, these changes become known. This means that a routine, year-round system of translating decisions made on the basis of analysis into the multi-year plan must be established.

Implementation Plan

Based on the decisions reached regarding the process of implementation, a plan for implementing PPBS should be constructed that will guide the implementation efforts. This plan should contain: a list of the major tasks involved in the implementation of the system, including the training efforts; a designation of who is responsible for each of these tasks; a specific deadline for the completion of each task (and interim deadlines of the task will require an extended period of time); and a method of monitoring the completion of the tasks in the plan.

It would be unrealistic to expect this plan to be totally complete or even rigid during the implementation process. It must be realized that replanning of the implementation effort will be necessary as implementation itself progresses.[1] The fact that this implementation plan will change does not diminish its importance in achieving a systematic, meaningful implementation program for PPBS.

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[1]Mann and Neff, Managing Major Change in Organizations, p. 65.

Summary

The task of implementing PPBS in an agency of the Federal Government is extremely important. There are six major items which must be considered before undertaking the process of implementing PPBS. Decisions made on these items must balance the advantages and disadvantages discussed in this chapter. The six items are:

1. What general method of implementing PPBS is appropriate--directive with a central staff, participative with an ad hoc committee, or group-sharing with a combination of these two?
2. What should be the speed of implementation, including the amount of time between announcing that the system will be implemented and the actual start of implementation, as well as the time of the implementation effort itself?
3. What communication channels should be utilized during implementation?
4. What training should be used during implementation?
5. What organization climate for implementation of PPBS exists and how can it be improved?
6. What sequence of implementation of organizations and components should be followed?

In addition to these major considerations, the following nine decisions will improve the implementation of PPBS: how to select areas for analysis; how to schedule analytic efforts; how to ensure that moderate demands are made of early analytic efforts; how to organize for analysis; how to begin gathering

data for use in analysis; how to ensure that analysis is used for decisions; how to integrate costs into the program structure; how to handle early multi-year projections in PPBS; and how to ensure that the multi-year program does not become dysfunctionally rigid.

The process of implementing PPBS is too important to be left to random efforts. No matter what the ultimate potential of the system may be in a particular governmental agency, the system will never be beneficial until it has been adequately implemented. This task of implementation deserves as much attention as the design of the system to be used.

CHAPTER VII

UTILIZATION OF PPBS

The most critical area of training of managers in PPBS is the utilization of the system. The Planning-Programming-Budgeting System is a tool for managers, and like all tools, it can be helpful only if it is properly employed. If it is improperly employed its use can be harmful. Training in the utilization of the system will also facilitate its implementation by reducing the uneasiness that managers feel when they know that they are going to have to use a new managerial system requiring new skills.

Some of the aspects of use of components of the Planning-Programming-Budgeting System other than systems analysis will be discussed first. The major part of the chapter will concern the use of systems analysis under PPBS. This latter area of PPBS creates the greatest need for acquisition of new skills by governmental managers. This corresponds to the finding of the head of the Administrative Staff College in Great Britain, who noted that the major problem of executives who attended his school was their inability to handle experts.[1] In the case of PPBS the

[1]Sir Noel Frederick Hall, The Making of Higher Executives: The Modern Challenge, p. 39.

"experts" that must be handled are the systems analysts. Sir Noel Frederick Hall stated:

> They [the executives] could not sufficiently clarify the issue upon which they wanted expert advice and they got confused in discussions with experts between issues of policy which were for others to decide and the analysis of facts and their rearrangement, which was the proper role of the expert advisor.[1]

This represents one of the major challenges in behavior change required by managerial training in PPBS.

Use of Components of PPBS Other than Systems Analysis

The proper use of the program structure, multi-year program and financial plan, and integrative system of PPBS is not automatic once these systems have been well designed and implemented in an agency. They require the constant attention of the managerial corps of the agency.

The program structure should be under constant review to ensure that it is serving its purpose. There are two aspects of the program structure that deserve special attention. First, just as the analyst in performing his analysis cannot allow himself to be constrained by the manner that programs are packaged in the program structure,[2] neither can the managers in the agency become so mesmerized by the program structure that they do not view the agency in other ways.

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[1] Ibid.

[2] Schick, "Systems for Analysis," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, pp. 826-27.

The program structure chosen is just one of many possible ways to view the objectives and activities of the agency, and overconcentration of attention on this one view of the organization can lead to serious disorientation.[1]

Managers should not be surprised to find that there will be questions that must be investigated that are not illuminated to any degree by the program structure. This occurrence (if it is not too frequent) is not an indication that the program structure should be revised to routinely answer these questions.

The second aspect of the program structure that needs constant review is the need for it to furnish usable information. If the data furnished by the program structure does not remain useful on a routine basis for analysis or for the illumination of the agency's activities, the structure should be redesigned to eliminate the data which is not used. The compilation of data based on the chance that it may be useful sometime in the future is very wasteful.[2] All of the

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[1]A well-designed program structure can facilitate a multiple view of an organization by allowing program elements that deal with a specific area to be withdrawn from the total program structure for separate investigation. For example, it might be necessary to pull out all of the activities that are associated with Research and Development in an agency, even if these are located in several different program categories. This total view of R&D might be used to determine the best allocation of R&D funds in view of the over-all long-range goals of the agency.

[2]Stuart J. Yuill, "Quantitative Information for Strategic Planning," Naval War College Review, XXIII, (November, 1970), 26.

data breakouts provided by the program structure of PPBS must pass the test of PPBS itself: the benefits provided by having that piece of data must exceed the cost of accumulating the data.

The major consideration in the use of the multi-year program and financial plan must be that it does not decrease the flexibility of the agency. Innovative changes to the plan must be allowed to occur. If the multi-year plan begins to assume an aura of invincibility that implicitly discourages any changes to the plan and effectively straightjackets the future options of the agency, this plan should be modified to extend less information into the future and thereby retain flexibility. The conflicting needs of flexibility of future actions and visibility of the future programs must be continuously balanced to ensure that one does not dominate the other.

Similarly, the use of the system to integrate analytic efforts into the multi-year plan should be subjected to continuous evaluation. The need for analyses to be integrated into the decision and budgetary process should not be allowed to dominate the requirement for analytic efforts to be episodic and free from the fixed routines, procedures, and deadlines of the budgetary process. The appearance of either budgetary domination of the analytic studies that makes analytic studies procedure-and-format-oriented with little real substance, or the situation where the results of analysis are

sterilized by never entering the actual decision process, should be detected early and corrected.

There is another problem of the integrative system that requires constant attention. There is a tendency by some writers to recommend that all major programs should be subjected to complete analysis at least annually.[1] There is no reason for an annual review of each major program. Over an extended period of time it might be desirable to review each program of an agency (as long as it is felt that the benefits of the analysis required outweigh the costs of the analysis). However, on programs that operate in an environment which does not change rapidly, an annual review would be wasteful and nonproductive. These programs should be analyzed only periodically (maybe every five or six years, depending on the conditions of the program and the availability of analytic talent). The attempt to extend analysis to a routine annual review of each major program in an agency will almost inevitably lead to a degradation of the analytic capability. Analyses will become superficial in all areas -- including those areas where analytic efforts can and should have substantive impacts.

The major area of concern in using the components of PPBS other than systems analysis must be to continuously review the design of the system to ensure that proper balance

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[1]For example, see Harry P. Hatry and John F. Cotton, Program Planning for State, County, City, p. 29.

is retained between the many conflicting needs and purposes of this managerial system. The Planning-Programming-Budgeting System, like all management systems, can become a burden to effective management, instead of an aid, if it begins to take on aspects of the "end" result of efforts rather than the "means" to more effective management.

Use of Systems Analysis

The most critical skill acquisition that is necessary in the effective use of PPBS in the Federal Government is that of training managers in the use of systems analysis. This need is more critical than the need for competent analysts to perform studies.[1]

When confronted with the need to train managers to be competent users of systems analysis, the common reaction is to train them as analysts. This is unnecessary. In fact, the concentration of managerial training on the techniques of manipulating hard quantitative data is probably harmful to the results required.[2] Managers will tend to be overawed by the sophistication of the model manipulation as the result of this type of training and could overlook some of the more meaningful and critical aspects of the analysis.

The need for managerial knowledge of systems analysis

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[1]Laurence F. Lynn, Jr., "Systems Analysis--Challenge to Military Management," Readings, ed. by Cleland and King, p. 224.

[2]Geoffrey E. Nunn and Lloyd L. Byers, "Quantitative Decision Tools and Management Development Programs," Training and Development Journal, XXI (November, 1967), 22.

can be better defined if the manager's role in the use of systems analysis is noted. The decision-maker must play a large role in the formulation of the problem for solution, a somewhat smaller role in the data-gathering process, an almost negligible role in the mechanical manipulation of the data, and the most important role in the interpretation of the results.[1] From this specification of roles, the following needs of managers in connection with systems analysis can be identified:

1. They must have the capacity to recognize problem areas where systems analysis should be used.[2]
2. They must have a degree of familiarity with the types of models and tools to be used so that their limitations and potentials are known.
3. They must be familiar with the "language" of systems analysts so that they can communicate with them.
4. They must have an appreciation of the task involved in building the model, collecting the data, and using it.[3]
5. They must be able to take the results of analysis and apply them with due caution and reservations.

If governmental managers do not gain this required level of appreciation of systems analysis, its use could be very harmful in governmental agencies. In the hands of a

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[1] Ibid., pp. 16-18.

[2] Ibid., p. 13.

[3] Ibid., pp. 20-21.

naive decision-maker, the systems analyst either has policy implications far beyond his role or the meaningful input that he could provide is ignored.

The discussion in this chapter on the use of systems analysis will concentrate on the required managerial considerations during: 1) the process of selecting specific problems for analysis; 2) the process of analysis itself; 3) the process of using the results of analysis for decisions; and 4) the requirements for actions concerning analysis after the decision.

Problem Selection

The first action in the effective use of systems analysis in a Planning-Programming-Budgeting System is the selection of specific problems to be analyzed. A capable analytic staff can be totally wasted if the management corps of the agency selects the wrong problems for analysis.

The selection of problems to be subjected to analysis should be guided by the following factors:

1. The problem should require a decision. Systems analysis under PPBS is designed to be an aid to decision-making. The application of substantial analytic resources to problems where no decision is necessary, or even wanted, will transform the analytic capability to a theoretical, academic study

group.[1]

2. The problem should be one where the information gained by analysis will make a difference in the decision. If the decision-maker is not able (or is not willing) to do anything but make one decision and any information disclosed by analysis would not change the preconceived decision, the use of analytic capability on that problem, simply to satisfy some administrative requirement, is wasteful.[2]

3. The problem should be of a nature so that the time available before a decision is essential does not preclude analysis. A sophisticated analysis requires a substantial amount of time. While a limited analysis, such as the formulation of the problem, can be useful for decision-making, the attempt to perform a complete comparison of cost and effectiveness of alternatives in a limited time almost invariably leads to the imposition of such arbitrary assumptions that the results

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[1]This does not imply that some analytic resources should not be committed to the development of theoretic data for use in later decision-oriented analysis. The development of cost-estimating relationships is an example of the type of theoretic analysis that is required. However, the majority of analytic effort should be concentrated on immediate decision requirements, and any theoretical studies should be guided by the need for the results of this analysis for decision-oriented studies to be performed in the near future. As a practical matter, it might be preferable to have much of the theoretical analysis performed by consultant and academic activities and use the in-house capability for analyses that are oriented more toward immediate decisions.

[2]Gloria Grizzle, "PPBS in Dade County: Status of Development and Implementation," Innovations, U. S., Congress, Joint Economic Committee, 1969, p. 68.

of the analysis are virtually useless, or even misleading.[1]

4. The problem should be of the proper scope. It is wasteful to apply analytic resources to simple problems that are amenable to adequate solution by the exercising of intuition.[2] Similarly, the application of analysis to the most broad problem is not as useful as the use of analysis on more restricted problems. Analysis is most powerful in comparing somewhat limited alternatives that have the same general objectives and employ the same general means.[3]

Another relevant question in the selection of problems to be subjected to systems analysis is whether the analysis should be concentrated on new programs or on existing programs. While it may be desirable to begin analytic efforts by concentrating on new programs, any mature analytic capability must operate on both new and existing programs.[4]

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[1]Klaus Knorr, On the Cost-Effectiveness Approach to Military R&D, p. 4.

[2]Cleland and King, Systems Analysis and Project Management, pp. 32-33.

[3]Schick, "Systems for Analysis," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, pp. 825-26.

[4]Some authors attempt to draw a sharp distinction between analysis and evaluation. One states that "Evaluation is retrospective; its concern is with what has been accomplished under existing or terminated programs. Accordingly, analysis tends to be associated with new public actions while evaluation concentrates on past decisions." (Schick, "From Analysis to Evaluation," p. 60.) This distinction is overdrawn. The application of systems analysis for decision purposes follows the same general procedures whether it is applied to existing or to old programs.

Performance of Analysis

Once the manager has decided that a problem should be subjected to analysis, it is necessary for him to pass it on to the analytic staff. He must endeavor to state the problem clearly enough that the analyst is guided to attack the right problem. At the same time, the decision-maker should try to ensure that the form of the problem being passed to the analyst is not so constricted that the analysis is straight-jacketed.[1] The most dangerous form of problem definition for systems analysis is the one which effectively closes out all of the alternatives except for the "pet" solution of the decision-maker and asks systems analysis to justify the already existing solution. This practice must be avoided.[2]

There is a tendency in the use of systems analysis for decision-makers to feel that the designation of a problem to be analyzed ends their responsibility for the analysis until they receive a completed product to implement. This is not possible because of the nature of problems involved.[3] One of the greatest advantages of PPBS, if it is properly employed, is that it compels a continuing dialogue between

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[1]Yuill, "Quantitative Information for Strategic Planning," p. 22.

[2]John G. Honig, "Let's Talk About Systems Analysis and Operations Research," Army Management Views, XIII (May, 1968), 29.

[3]Churchman and Schainblatt, "PPB: How Can It Be Implemented," p. 187.

the decision-maker and the analyst.[1] The need for the participation of the decision-maker in the analysis itself can be easily seen when it is noted that:

1. The decision-maker is the most valuable source of the analyst's search for ideas and insights to the problem at hand.

2. The decision-maker is the individual who is best equipped to ensure that the analysis is consistent with the realities at hand.

3. Because the decision-maker is the person who must act on the results of the analysis, he must have an intelligent understanding of the analysis itself. The depth of understanding required cannot usually be achieved by the simple review of a completed report of analysis.[2]

Not only is it necessary for there to be a high degree of interaction between the analyst and the decision-maker, but there should also be a high degree of participation by various types of experts in analysis. Often the crucial details and variables of a problem are obscured by statistical data. The analyst who works only with the hard data and neglects information from experts -- particularly about the practical realities of the areas being investigated -- is

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[1]Hatry and Cotton, Program Planning for State, County, City, pp. 7-9.

[2]William P. Snyder, Case Studies in Military Systems Analysis, pp. 116-17.

likely to develop an analysis that is impractical and misleading.[1] This means that individuals in expert advisory positions -- particularly line-management positions -- must become immersed in the details of the analysis to ensure that the necessary technical input is provided. The decision-maker plays a key role in facilitating this interaction between systems analysts and line managers.

A climate of acceptable interaction between analysts and the experts in operative positions is difficult to achieve and maintain. There is almost an inevitable conflict between these two groups. Part of this conflict is generated because of the different interests of the two groups -- the analyst is primarily concerned with the future, and the operational personnel are primarily oriented toward the solution of current operating problems. The conflict is intensified because of the frequent communications breakdowns between the two groups. The vocabulary that the analyst uses is considerably different from the language of operational personnel. Also, the analyst, in his communications, is prone to become concerned with a wealth of statistical and mathematical trivia that is of little concern to, and even less understood by, operational personnel.[2] At the same time,

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[1]The need for expert advice that conveys knowledge of "people institutions" is well established in Olaf Helmer and Nicholas Rescher, "On the Epistemology of the Inexact Sciences," Management Science, VI (October, 1959), 38.

[2]Yuill, "Quantitative Information for Strategic Planning," pp. 20-21.

operational personnel, in their communications, tend to become overly concerned with minute details of operations that are of little interest to the analyst.

The maintenance of a climate that will facilitate meaningful interaction between the systems analysts and line personnel is a task that requires the continuous attention of the manager who hopes to achieve an adequate systems analysis capability. One of the ways of achieving this improved relationship between the systems analysis staff and operational personnel is to ensure that the staff is properly oriented. Recommended staff procedures that will help accomplish this follow:

1. Do not let individual staff members become so overly identified with one type of program that they encounter undue opposition when attempting to deal with another type of program.
2. Convince the systems analysis staff that the act of winning acceptance of a new idea is as creative as the process of giving birth to a new idea.
3. Have the staff use understandable terms in all of its communications with operational personnel. It is not necessary that operational personnel have an understanding of the analysis in the same reference as the systems analyst, but they should be able to visualize the analysis in terms of their own job experiences.
4. Have the staff develop a healthier respect for operational

personnel, particularly regarding their possible resistence to new ideas generated by the staff. Opposition to an idea should not be automatically conceived of as something that must be overcome but as an indication that the idea may need some further refinement.[1]

Even with this orientation of the central analytical staff, it is probable that the relationships between the central staff and line management will become strained. If these relationships become so hostile that the adequacy of analysis is severely constricted, the decision-maker should take steps to alleviate the hostilities between the two groups. This might be done by a "confrontation meeting" between the two. The gist of this technique is that the two groups are brought together and asked to concur that the tension between them must be reduced. Then in separate locations each group is asked to write what it thinks the other group's attitude is in the relationship. These two listings then serve as the basis of another meeting between the two groups.[2] Whether confrontation meetings or some other procedure are used to smooth the relationship between the systems analysis staff and members of line management, the deterioration of these relationships cannot be ignored because of its direct effect on the adequacy of analytic

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[1]Adapted from Lawrence, "Resistence to Change," Organizational Change and Development, ed. by Dalton, Lawrence and Greiner, pp. 191-95.

[2]A detailed procedure is described in Richard Beckhard, "The Confrontation Meeting," Ibid., pp. 270-80.

efforts.

A major decision of the decision-maker in the performance of specific analytic tasks is the one that determines the amount of resources that will be committed to any particular analytic effort. Generally the amount of resources committed to perform a specific analysis should be related to the importance of the decision under question. To make a valid decision about the form of analysis that is necessary in any particular case it might be desirable to perform a preliminary analysis that highlights the complexity of the problem, the degree of uncertainty involved, and the resources represented by the problem.[1] The selection of the depth of analysis deserves no less retionality than the decision itself.

After the analysis has begun some decision must be made about the point at which the analysis effort will be terminated. There are two tendencies that exist that can cause analysis to continue after it should be terminated. First, decision-makers have an almost insatiable appetite for information. Second, the analyst involved with the problem tends to become enamoured with the specific application of technique to the problem at hand.[2] As noted in Appendix A-4, any analysis of a complex problem is almost inevitably

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[1]Weimann, "Decision-Making and Resource Allocation," p. 47.

[2]Snyder, Case Studies, p. 148.

incomplete. The temptation to continue the analysis after the point where the additional effort costs more than benefits of the additional information received must be continuously resisted.

Another aspect in the use of systems analysis in an agency of the Federal Government is particularly applicable when a number of subordinate analytic activities are performing analyses. In this case it is probably desirable that the central analytic staff furnish some common information to be used for analyses. Examples of the type of information that should be centrally developed include future trends of population, employment, wages, and prices. Unless this information is developed by a central office, each subordinate analytic activity will have to develop its own estimates. This results in duplication of efforts as well as inconsistencies of analyses.[1]

It mignt also be desirable to have some form of central guidance on such analytic matters as the number of sensitivity studies required and the discount rate to be applied to future costs and benefits.[2] This type of guidance must be used with a great deal of discretion, though. If central staff guidance becomes too explicit, the subordinate analytic staffs will tend to perform analysis on a mechanistic basis and substitute

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[1]State-Local Finances Project, Demographic and Economic Data Guidelines for a Planning-Programming-Budgeting System, pp. 3-5.

[2]U. S., General Accounting Office, Comptroller General of the United States, Report to the Congress, (July 29, 1969), p. 34.

adherence to a check list of analysis for substantive analytic effort.

Decisions Based on Analysis

While the decision-maker cannot divorce himself from the process of making the analysis, he becomes completely responsible for the use of the results of analysis after it is complete. No matter how good the analysis is, unless the decision-maker uses the information in making the decision required, the effort is totally wasted. In the use of analysis the decision-maker does not have to accept the recommendations totally or uncritically.[1]

One thing that the decision-maker should insist upon with the presentation of every analysis is that the results should be presented in a language that he can understand.[2] Despite the immense amount of data that is normally contained in a systems analysis the basic structure of the analysis is always simple and should be simply and logically explained. If the analytic product is voluminous, contains a large quanity of technical jargon and elegant mathematics and charts, but does not simply and concisely explain its basic structure, the analyst is probably trying to conceal inadequacies behind a technical facade.[3]

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[1]Specific guidelines for the review of the products of systems analysis are contained in Appendix E-1.

[2]Hanes, "Operations Research and Systems Analysis," p. 5.

[3]Malcolm W. Hoag, An Introduction to Systems Analysis, p. 21.

When the results of the analysis are received, the recommendations of the systems analyst should not be automatically accepted. In fact, one of the major potential problems in the use of systems analysis is that the user becomes awed by the massive array of quantitative data gathered and presented, and accepts the recommendations accompanying that quantitative data without any further consideration.

Just as it is an error of decision-making to accept the recommendations of the analysis without question, it is an equally large error to reject all of the information provided by the analysis simply because the analytic effort cannot give a clear, unequivocable recommendation for decision.[1]

There are many reasons why the decision-maker will make a decision that is different from the one recommended by the analyst. Some of these include:

1. The decision-maker is influenced by factors that are not considered directly in the analytic effort. Political factors operate more strongly on the decision-maker than they do on the analyst, and the decision reached considering these political factors may be significantly different from the one

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[1]Historically, many areas of governmental activity have been dominated by qualitative considerations to such an extent that it is doubtful if any form of overreaction to quantitative data is probable for an extended period of time. For this reason the major problem of the decision-makers is not their "rubber-stamping" the results of analysis but their ignoring of them. (Markham and McConkey, "PPBS as an Aid to Decision Makers," p. 69.)

which analysis indicates.[1]

2. The decision-maker may disagree with the analyst's handling of objectives, assumptions, alternatives, and measures of effectiveness.

3. The decision-maker may disagree with the explicit weighting of multiple measures of effectiveness by the analyst.

4. The decision-maker may disagree with the identification of relevant factors and the strength of these relevant factors.

It is important to emphasize that simply because the decision-maker does not completely concur with the recommendations of the analysis, this does not mean that he has repudiated the effort. The purpose of systems analysis is not to make decisions but to provide additional illumination and insight into a problem so that the decision-maker can make a more knowledgeable decision. When a decision is made based on an analysis, the decision-maker should make his reasons for the decision explicit and inform the analyst of these reasons. In this manner the quality of analysis can be improved and the analysts will not feel that their work is being ignored in the decision process.

One other aspect of the decision process using analysis should be mentioned. Some of the reasons for making a decision contrary to the one recommended by the analyst may be sufficient to return the analysis for additional work.

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[1]Petruschell, Some Remarks, p. 15.

The desirability of doing this should be decided by weighing the cost of the additional work against the value of the additional information possible with additional analysis. One of the dangers of the use of systems analysis is the tendency to continue to return the analysis for further refinement and more information and thereby postpone the decision indefinitely. In some cases the cost of delaying the decision may be as high as, or higher than, the cost of an incorrect decision.

Another tendency in the use of systems analysis that must be resisted is to return the study for further analysis because the difference between the alternatives is slight and a rational basis for the choice of one over others does not exist. In this case the cost of additional information invariably outweighs its benefit. The "rational" action is to make a decision by some "irrational" means such as "flipping a coin."[1]

Actions After Decision

After a decision has been made based on analysis, it is often necessary to have a continuing analytical follow-up of the program that is instituted (or continued). Generally, a form of analytic follow-up is almost essential when the program represents a substantial recurring commitment of resources and/or there is a high degree of uncertainty involved

[1]Kenneth E. Boulding, "The Ethics of Rational Decision," Management Science, XII (February, 1966), B-162.

in the decision and analysis.

There are normally two ways that the follow-up to an existing program can be conducted:

1. A continuous reporting/control system can be instituted to monitor the cost and effectiveness parameters of the program, and threshhold values can be established which, if exceeded, call for a re-evaluation of the program.[1] One danger in the use of a reporting/control system of this nature is that it tends to build an undesirable degree of rigidity into the programs by implicitly regarding changes as bad.[2]

2. A periodic complete analysis of the existing program can be conducted. This analysis can be facilitated by the routine collection of cost and effectiveness data during the performance of the program.

These two approaches to post-decision evaluation of major programs are not mutually exclusive. The reporting/control system can be used to routinely collect data for the subsequent evaluations and can be used as a "triggering" device to identify the need for a complete analysis of the

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[1]The Development Concept Paper (DCP) in the Department of Defense accomplishes this for major weapon systems. (N. Waks, Top Management Decision-Making in Large Organizations, p. 3.)

[2]For this reason there have been some recommendations that these reports on major weapon systems be eliminated. (Report to the President and the Secretary of Defense on the Department of Defense by the Blue Ribbon Defense Panel, 1 July 1970, pp. 125-26.)

existing program.

This complete analysis is not only useful for determining if changes are necessary in the existing program, but the comparison of the analysis of the existing program to the analysis performed before the program will have a disciplining effect on the entire analytic process. By viewing the divergence of actual and projected program performance, the participants in the analytic process can learn to perform increasingly better analyses.

This ability to learn from past analyses means that it could be desirable to perform total ex post evaluations of some completed programs. The aim of these ex post evaluations must be to improve future analyses and not just to criticize earlier analyses and decisions. The process of ex post evaluation is one of comparing the effects of the program to what the effects would have been if the program had not been conducted. This represents a significant analytical task in itself.[1]

[1]Effects with the program versus those without the program are not necessarily the same as the conditions before the program versus those after the program. If the program were never instituted, the conditions that existed before the decision would have probably changed during the period that the program operated. For this reason the analytical task involved in an adequate ex post evaluation is much more complex than a simple before/after study. There are some who contend that the analytical task is so large that it is impossible. However, it is difficult to justify the position that pre-analysis is helpful but post-analysis is impossible. (U. S., Department of Defense, Department of the Army, The Expost Evaluation of Federal Water Resource Projects in the United States, by Jim J. Tozzi [October, 1970], p. 321.)

Regardless of whether the follow-up to analysis is conducted while a program is in progress or after it is complete, the fact remains that some sort of rigorous and persistent review of the results of major analytic studies after they have been translated into an operational environment is almost essential. This is the only way that continued improvement in analytic studies can be ensured.

Summary

Training in the proper utilization of the Planning-Programming-Budgeting System is essential in any PPBS managerial training program. As a tool, PPBS must be properly used or it can be dysfunctional to the performance of the agency. It is not necessary that managers become skilled systems analysts or even skillful in the use of techniques of systems analysis. However, they should become skillful in diagnosing the problems which should be subjected to systems analysis; participating in the proper manner in the analysis task itself; using the results of the analysis in the decision process; and directing the necessary follow-up to analytic efforts.

CHAPTER VIII

DETAILED TRAINING MODEL

The discussion in the last three chapters completes the basis of the proposed training model. The complete model will now be presented. First, specific learning objectives in each of the five major areas of required training identified in Chapter IV will be presented. This model is specifically designed for the most extensive training need. This need is found in the upper management levels of the civilian agencies of the Federal Government which have not successfully adopted a Planning-Programming-Budgeting System. The need for adjusting this model to accommodate other groups of individuals will be discussed after the model has been outlined. Finally, some of the mechanics of training will be presented.

Specific Learning Objectives

The description of an adequate training model must include an identification of specific learning objectives in each of the areas where training is to be conducted. These objectives state the knowledge, attitude, or skill that the trainee is to gain during a specific area of training. These

objectives will be stated in three forms that imply different degrees of intensity:

1. Knowledge[1]: This is accomplished by a simple intellectual acquaintance with the subject.

2. Understanding: This requires an intellectual ability to comprehend the subject matter and the basic underlying concepts, as well as an acquaintance with the subject.

3. Skill: This requires both understanding and the ability to translate this understanding into a practical application.[2]

The specific learning objectives are:

A. History of PPBS

1. Knowledge of the early historical budgetary emphasis on minute control of the executive branch by the Congress.

2. Knowledge of the Taft Commission's recommendations in 1912, how these are the early forerunners of PPBS, and how the control function dominated the resulting Budgeting and Accounting Act of 1921.

3. Knowledge of the recommendations of the Hoover Commissions in 1949 and 1955, and the resulting movement toward performance budgets.

4. Knowledge of the early antecedents of program

[1]The term "knowledge" is used in this model in the limited sense of "cognition," or becoming acquainted with.

[2]In the presentation of specific learning objectives some of the objectives that could have been included in other broader objectives are separately identified because they should be specifically stressed during the training.

structures in budgeting, including industrial use, broad national categories of the federal budget, the War Materials Board, the Tennessee Valley Authority, and state and local governments.

5. Knowledge of the early academic writings that advocated program orientation in budgeting -- particularly in the Department of Defense.

6. Knowledge of the considerations of multi-year implications of aspects of the Federal Government's budget since 1943.

7. Knowledge of the use of analysis in the area of water resources since 1902.

8. Knowledge of the evolution of the use of analytical techniques in the Department of Defense since World War II.

9. Understanding of the inadequacies of the traditional budget system, including:

a. The degree to which the changed governmental functions required a change of budgeting emphasis.

b. The danger of obscuring objectives and accomplishments.

c. The problems of separating planning and budgeting.

d. The difficulty of rational fund allocations.

e. The absense of adequate planning data.

f. The neglect of future-year costs.

g. The bias against changing programs.

h. The problems of obscured alternatives.

10. Knowledge of the implementation of PPBS in the Department of Defense, including:

a. The historical development of the DOD that led to PPBS.

b. The specific problems with the traditional budget in the DOD.

c. The PPB System as it operates in the DOD.

11. Understanding of some of the systems that have been established in the Federal Government and their accomplishments to date.

12. Understanding of the Presidential directive to implement PPBS on a government-wide basis.

B. Concepts and Techniques of PPBS

1. Understanding of the basic concepts that underlie PPBS and the characteristics of a PPB System, including an understanding of:

a. What the program structure is and why it is part of the system.

b. What the multi-year program is and why it is part of the system.

c. What systems analysis is and why it is part of the system.

d. What the integrative system of PPBS is and why it is part of the system.

2. Understanding of systems analysis, including:

a. The evolution of systems analysis from operations

research and its distinct differences from that discipline.

b. The components of systems analysis.

c. The process of systems analysis.

d. The relationship of systems analysis to the scientific method.

e. The relationship of "marginal analysis" to systems analysis.

f. The "systemic" nature of systems analysis.

g. The treatment of uncertainty in systems analysis.

3. Understanding of the common misconceptions of systems analysis, including:

a. Its bias toward the cheapest.

b. Its computerization of decisions.

c. Its total quantification of decisions.

d. Its replacement of judgment and of decision-makers.

4. Understanding of the relationship of cost-benefit analysis and cost-effectiveness analysis and when and how these are to be applied.

5. Understanding of the relationship of systems analysis to specific analytic techniques.

6. Understanding of the contributions of systems analysis, including its advantages over alternative methods of decision-making.

7. Understanding the differences between PPBS and traditional budget.

8. Understanding of the differences between PPBS and performance budgets.

9. Understanding of the relationship of PPBS to the Federal Government's budgetary process, including incremental budgeting and zero-based budgeting.

10. Understanding of the conditions which are commonly misconceived as obstacles to the use of PPBS but actually give emphasis to the need for the system. These conditions include:

a. Lack of planning.

b. Multi-levels of government.

c. Interdepartmental fragmentation of programs.

d. High levels of "fixed" cost.

e. Undefined objectives.

f. Multiple objectives.

11. Understanding of the effect on PPBS of:

a. Problems of quantifying programs.

b. Lack of data.

c. Lack of personnel.

d. Lack of historical experience with analysis.

e. High political content of programs.

12. Understanding of the centrality of the top executive's commitment to PPBS as a condition of its effective use.

C. Design of PPBS

1. Understanding that PPBS is not a collection of techniques that can be arbitrarily applied to a given agency, but

a flexible management tool that is to be specifically designed for the activity involved.

2. Skill in isolating the key decisions that determine the effectiveness of the agency.

3. Skill in structuring a program-oriented budget that is applicable to the agency involved.

4. Skill in deciding on the most effective type of multi-year program for the given agency.

5. Skill in designing output indicators to be used in the program structure.

6. Skill in integrating PPBS into existing traditional and performance budget systems.

7. Skill in determining the costs and benefits of the various components of PPBS. This should include a complete understanding of the aspects of an agency that increase the benefits of program structures, multi-year programs, and systems analyses.

D. Implementation of PPBS

1. Understanding of the relationship between the process of organizational change and the implementation of PPBS.

2. Skill in assessing the sources of personal resistance to the implementation of PPBS.

3. Skill in using the variables in the implementation process so that PPBS can be implemented as effectively and rapidly as possible. This skill must include knowledge of how the following affect the implementation of PPBS:

a. Directive, participative, or group-sharing implementation patterns.

b. Speed of implementation.

c. Communication during implementation.

d. Training.

e. Proper organizational environment for implementation.

f. Modifying the sequence of implementation.

4. Skill in determining the best organizational and staffing patterns for an agency's PPBS.

5. Skill in implementing analytic capability.

6. Skill in implementing other components of PPBS, such as:

a. Initial allocation of costs to program structures.

b. Initial preparation of multi-year plans.

7. Skill in preparing and using implementation plans.

E. Utilization of PPBS

1. Skill in monitoring the operations of PPBS to ensure that:

a. The program structure remains useful and does not restrict managerial vision.

b. The multi-year plan does not significantly reduce flexibility.

c. The mechanics of scheduling analysis do not cause analysis to become superficial.

2. Understanding of the techniques and language used by

systems analysts.

3. Skill in selecting problems for analytical treatment.

4. Skill in defining problems for analysis.

5. Skill in interacting with systems analysts in the process of analysis.

6. Skill in maintaining an organizational climate that allows the proper degree of interaction between analysts and "experts."

7. Skill in determining the depth of analysis required and when analysis will be terminated.

8. Skill in using a central analytic staff in its relationship with subordinate analytic staffs.

9. Skill in using systems analysis for decisions, including:

   a. Reviewing analyses.

   b. Making a decision based on analysis.

10. Skill in making post-evaluations of analyses.

Modifications to the Model

As noted before, the model of training presented above is specifically designed to meet the training needs of the top executives in the civilian agencies of the Federal Government who do not have a satisfactorily operating Planning-Programming-Budgeting System. These individuals are characterized by their authority to influence the design and implementation of the system.

In training lower managerial levels of the organization,

it is doubtful if the individuals involved would have a great deal of influence over the design, implementation, and modification of the PPB System of the agency. The same specific learning objectives are appropriate, but the need to develop "skill" levels in some of the objectives could be decreased to the need to develop "understanding" levels. The only "skill" levels necessary at the lowest level that PPBS training should penetrate would involve the use of systems analysis (specific learning objectives E-3 through E-10).

When an agency has a viable Planning-Programming-Budgeting System the need for emphasis on the design and implementation phases of training can also be reduced. However, the requirement for a "skill" level in monitoring the operations of PPBS (specific learning objective C-1) must, of necessity, build on some of the "skill" levels developed in the design and implementation area of training. It appears that a "skill" level of training is necessary in the following areas when an agency has an adequate PPB System:

1. Structuring the program-oriented budget (C-3);
2. Designing the multi-year program (C-4);
3. Designing output indicators (C-5);
4. Assessing sources of personnel resistance to PPBS (D-2); and
5. Implementing the analytic capability (D-5).

The remainder of "skill" levels noted in the training model

above for design and implementation of PPBS could be reduced to "understanding" levels.

Mechanics of Training

Lesson Plan Design

The model presented above, with its specific learning objectives, does not constitute a complete lesson plan for PPBS training. The sequence of training from history to concepts and techniques, to design, to implementation, and finally to use is a logical general sequence. However, this general sequence can be modified in the design and timing of specific blocks of instruction. For example, some aspects of concepts and techniques may be taught before some aspects of history.

Since the specific design of blocks of instruction depends heavily on the methods of instruction employed, some general principles of instruction design will be presented. The first principle of training instruction is that the need for "unfreezing" should be first on the training agenda. Before the training presented can effectively change behavior, the trainee must feel a need for accepting the training and for changing his behavior. This means that the old habits and practices need to be questioned by focusing the training on needs that cannot be satisfied by existing behavior patterns.[1] The following learning objectives should

[1]Rolf P. Lynton and Udai Pareek, Training for Development, pp. 37-38.

then be incorporated into the training effort as soon as possible:

1. Understanding of the inadequacies of the traditional budgeting system (A-9); and

2. Understanding of the contributions of systems analysis to decision-making (B-6).

This principle does not mean that these two learning objectives must be satisfied at the very inception of the training effort. However, they should be incorporated into the training as soon as it is possible when the other principles of learning are considered. These principles are:

1. The principle of progression: Instruction should always progress from simpler concepts to the more advanced ones. Before presenting any aspect of training, the conceptual basis for that aspect must be presented.[1]

2. The principle of repetition: The more complex the subject matter and the higher the level of training desired, the more the instruction must be presented over and over.[2]

3. The principle of spacing: Lessons and concepts should be spaced far enough apart that the trainee is able to

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[1]In the case of PPBS training this means that some of the concepts of PPBS and traditional budgeting will probably have to be presented before the inadequacies of traditional budgeting can be understood. Also, some of the concepts and misconceptions of systems analysis must be presented before the benefits that will accrue from its use can be understood.

[2]This does not mean that exactly the same instruction should be repeated. Different methods, such as readings, lecture, discussion, etc., should be used to comply with this principle.

assimilate them, but they must be presented rapidly enough that the trainee does not lose interest.

4. The principle of duration: Because of the fatigue factor, the duration of any continuous block of instruction -- particularly when one method of instruction is used -- should not be extended beyond the endurance of the trainee.

5. The principle of action: When the subject matter is complex, and higher levels of learning are required, the trainee learns better when he is able to put the lessons into practice in a training situation.[1]

Methods of Training

Assigned Readings

There are many educational methods that are applicable to training in PPBS. One of these methods that probably should be used in PPBS training for managers is assigned readings, but it should not be the only method. Assigned readings, without interaction with instructors, will not be effective in achieving the necessary behavior changes because of the complexity of the material to be presented. Another problem with the use of assigned readings as the major method of presentation is the lack of a single, authoritative, and

[1]These principles of learning were adapted from Howard S. McCord, Jr., "The Universality of Learning Principles," Training and Development Journal, XXII (September, 1966), 49-50.

comprehensive work on all areas of PPBS.[1]

Lecture

Another method of training that will probably be required in the PPBS training effort is the lecture. The use of a lecture for disseminating a large amount of information to a large group in a short period of time is very effective. The initial exposure to new ideas and methods can often be most effectively presented in a lecture format. Particularly lectures can be used to pass on general knowledge and to allow the trainee to acquire basic concepts and terminology.[2]

However, the utility of lecture in a PPBS training situation is limited. Because of the nature of lectures, the trainee plays an inactive role. For more advanced levels of training, any method that does not allow some activity by the student is suspect.[3] Also the sole use of the lecture as a

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[1]One should be cautioned against the assignment of extensive readings prior to the beginning of training. Experience with this practice has indicated that the reading is not normally done before the training, and if this omission is not questioned, it leaves a great deal of doubt in the minds of the trainees about whether the subsequent work must be done. (Lynton and Pareek, Training for Development, pp. 99-100.) If readings are assigned before the inception of the formal training effort, the quantity should be greatly restricted.

[2]Frederick C. Brent and Joseph E. McLean, "Teaching Methods -- Course Instruction," Education for Administrative Careers in Government Service, ed. by Stephen B. Sweeney, Thomas J. Davy and Lloyd M. Short, pp. 84-85.

[3]William McGehee, "Are We Using What We Know About Training," Readings in Industrial and Business Psychology, ed. by Harry W. Karn and B. Von Heller Gilmer, p. 164.

training device minimizes the amount of feedback that the instructor receives.[1] This feedback is essential in order to space the training effort effectively.

As a result of these advantages and disadvantages, the method of lecture appears adequate for the "knowledge" learning objectives stated in the model. However, the "understanding" objectives appear to require some form of action training for reinforcement of the knowledge gained by lecture and readings. Action training would appear indispensible for the "skill" level of training.

Action Training Methods

There are four forms of action training that appear applicable to the PPBS training effort -- discussion, cases, problems, and role-playing. One caution is necessary on the use of these methods. The trainee cannot be expected to make a proper response during action training unless the response is in his repertoire. This means that some method of training -- such as assigned readings or lecture -- is necessary before the action training to set the intellectual basis and establish the initial skill level that the action training will sharpen.[2]

The discussion method of action training is particularly

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[1]Wallace Wohlking, "Teaching Effectiveness and Feedback Mechanism," Training and Development Journal, XXI (June, 1967), 4-5.

[2]McGehee, "Are We Using What We Know About Training," Readings, ed. by Karn and Gilmer, p. 164.

appropriate for PPBS. The use of discussion allows a considerable degree of feedback to the instructor so that he can assess the required spacing of training and the effectiveness of the training provided.[1] As a matter of practice, the use of structured instead of unstructured discussion appears more appropriate for PPBS training. In the former case the instructor guides or leads the discussion, and in the latter case the discussion is controlled almost totally by the participants. The major handicap to the use of unstructured discussion in PPBS training is the high degree of inter-personnel conflicts and group-problems that arise. The time required to resolve these problems could detract from the learning about PPBS.[2]

Structured discussion periods by themselves are most effective when the subject matter is somewhat controversial and a high degree of participation results.[3] For this reason the use of this method appears particularly applicable in the learning objectives:

1. Understanding of the inadequacies of the traditional budgeting system (A-9);

2. Understanding of the common misconceptions of systems analysis (B-3);

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[1]Wohlking, "Teaching Effectiveness and Feedback Mechanism," pp. 6-8.

[2]Warren, Training for Results, pp. 74-77.

[3]Wohlking, "Teaching Effectiveness and Feedback Mechanism," p. 8.

3. Understanding of the contributions of systems analysis, including its advantages over alternative methods of decision-making (B-6); and

4. Understanding of the conditions which are commonly misconceived as obstacles to the use of PPBS but actually give emphasis to its need (B-10).

The method of structured discussion can also be used in combination with one of the other forms of action training -- case studies, problems, and role-playing. This combination is normally an effective means of allowing the trainee to participate actively, while retaining the ability to furnish immediate feedback to the trainee on his performance.

The use of case studies and problems[1] as a training method in PPBS appears particularly appropriate. Cases and problems are especially useful to reinforce the theoretical concepts introduced to the student by some other method.[2] They are also useful in teaching, and giving practice in applying, the skills of decision-making and problem-solving in an environment that retains some of its operational, real-

[1]These two are combined because many of the "cases" used in training actually require the trainee to work a specific problem. Both are handled in training situations in the same manner. The major difference between the two is that cases are based on "real-life" situations and problems can be totally hypothetical.

[2]Brent and McLean, "Teaching Methods -- Course Instruction," Administrative Careers, ed. by Sweeney, Davy and Short, pp. 97-98.

life aspects.[1] Because of the high degree of attention that must be paid to these two areas in PPBS training, the case-study and problem methods should play a major role in this training. Specifically, problems and case studies should be used as necessary in the most complex "understanding" learning objectives and extensively in the "skill" learning objectives.

The greatest limiting factor in the use of case studies and problems in PPBS training is the availability of case and problem material. Appendix F-1 lists a total of fifty-one cases that were identified as applicable to PPBS training. These cases are not appropriate for all of the learning objectives noted in the training model.[2] The majority of cases (twenty-nine) are most applicable to the learning objective: Understanding of the techniques and language used by systems analysts (E-2). Because of the disorientation that could result from excessive concentration on techniques of analysis in managerial PPBS training, only those cases which could be used to meet some other learning objective would appear to have a wide application in the training model that has been formulated. Therefore, it appears that a well-developed training program for managers in PPBS will require the development of additional case studies and problems to meet some of the learning objectives. This task

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[1] Odiorne, Training by Objectives, pp. 282-83.

[2] Review of Appendix F-1 indicates that there are no cases that are directly applicable to the following "skill" learning objectives: C-4, C-6, C-7, D-2, D-6, D-7, E-5, E-6, E-7, and E-8.

may not be as formidable as it appears since existing analyses and PPB Systems in the Federal Government can be used as case studies in some areas without the need for total hypothetical development.

The role-playing method also appears to have some application in PPBS managerial training. Under role-playing it is possible to attain a high degree of face-to-face interaction in a carefully controlled environment.[1] This method appears to be particularly applicable when trying to develop a "skill" level in areas where the personal reaction of individuals in the organization plays a major part. Role-playing might be effectively used for the following specific learning objectives:

1. Skill in assessing the sources of personal resistance to the implementation of PPBS (D-2);
2. Skill in manipulating the variables of implementation of PPBS (D-3); and
3. Skill in maintaining an organization climate that allows the proper degree of interaction between analysts and "experts" (E-6).

Syndicate System

One other method of training that might be effective in this training model is a derivation of the "syndicate" system used by the Administrative Staff College in Great

[1]Warren, Training for Results, pp. 82-83.

Britain.[1] Under this system a "syndicate" (or group of trainees, usually numbering ten or less) is assigned a general task. This group makes a comprehensive study of documents and meets with various experts. Finally the group gives a full report on the area and has this report criticized by all of the trainees. In the case of PPBS training the task assigned could be the generation of an issue paper in one broad area. This task would be especially appropriate for the two learning objectives:

1. Skill in selecting problems for analytical treatment (E-3); and
2. Skill in defining problems for analysis (E-4).

Other Considerations

There are a number of other aspects that influence the exact methods used in the PPBS managerial training. Some of these include: the physical facilities and budget available for the training effort, the geographic location of the training effort, the reaction of the trainee to the methods used, and the interests and skills of the instructors involved.[2] It seems obvious that an effective program of training will use a combination of methods -- assigned readings, lecture, discussion, case studies, problems, and role-playing --

[1]This system is completely described in Hall, Making of Higher Executives, pp. 42-48.

[2]Brent and McLean, "Teaching Methods -- Course Instruction," Administrative Careers, ed. by Sweeney, Davy and Short, pp. 79-80.

for reinforcement and repetition when necessary.

Trainee Selection and Time

Two other aspects of the mechanics of training deserve mention. First, there appears to be an advantage to having trainees from as homogeneous an environment as possible in each separate training session. This is because the more closely the training effort is tied to the work environment, the more the behavior change carries over into the work situation.[1] The existence of a relatively homogeneous group for training means that the cases, problems, and role-playing can be selectively drawn from an environment that more nearly approximates the work situation of the trainee. This could aid in both the speed at which he assimilates the material and the degree to which he recognizes its applicability in his personal work situation.[2]

Second, the amount of time that this training would require should be questioned. The methods chosen to conduct the training will have a major effect on the amount of time required. Based on the magnitude of the behavior change required, the complexity of the system, number of learning objectives, and the amount of action training methods necessary,

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[1]Mason Haire, "Encapsulated Training," Readings, ed. by Karn and Gilmer, pp. 157-58.

[2]This recommendation corresponds to the finding that the most effective training in PPBS in state and local governments has been when the training was conducted internally. (State-Local Finances Project, Implementing PPB, pp. 17-18.)

it would appear that approximately 108 hours of classroom time would be the minimum amount that would be acceptable for the total model.[1] With the modifications noted earlier, where less extensive training is necessary, this time could be reduced.

Summary

The training model presented is a summary of the entire research effort to this point. All of the learning objectives presented under the heading of History of PPBS were expanded in the discussion contained in Chapter II. The learning objectives under Concepts and Techniques of PPBS were expanded in the discussion contained in Chapters I and III. All of this material is readily available in the multitude of books, papers, and articles which have been written about PPBS. This material has been collected in these three chapters to provide a single, unified source which did not exist in the current literature. The learning objectives under Design, Implementation, and Utilization of PPBS were expanded in Chapters V, VI, and VII, respectively. For the implementation portions of the model this separate treatment of the subjects in Chapter VI was especially necessary, since a synthesis of PPBS and organizational change

[1]This estimate was based on approximately one hour each for "knowledge" objectives, two hours each for "understanding" objectives, and three hours each for "skill" objectives. Adequate time for case preparation, problems, and readings would be required in addition to these classroom hours.

concepts was required. The consolidation of design and utilization of PPBS concepts in the other two chapters of this part consolidated all of the information from diverse sources in one location.

In effect, Chapters I through III and V through VII show the model of training. The explicit treatment of the training model in this chapter has simply stated the model in training terms. Modifications to the model to make it more applicable to lower-level managers and to agencies that have existing and adequate PPB Systems were also presented. Finally, some of the mechanics of the training required, including the use of different training methods, were discussed. Based on this model, an evaluation of the existing PPBS training efforts can be presented in Chapter IX.

PART III

CURRENT TRAINING AND RECOMMENDATIONS

CHAPTER IX

EXISTING PPBS TRAINING EFFORTS

Based on the complete training model outlined in Chapter VIII, it is possible to evaluate the training concerning the Planning-Programming-Budgeting System that is currently utilized in the Federal Government. The data required to evaluate these training efforts was gathered by means of a survey of different government activities and educational institutions.[1] This chapter will discuss first the training efforts in the civilian sector of the Federal Government, then those in the Department of Defense, and finally the efforts at educational institutions.[2]

PPBS Training in the Civilian Sector of the Federal Government

The first task in assessing the effectiveness of training in PPBS for the nondefense sector of the Federal Government was to isolate the training efforts that were

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[1]The survey instruments used are shown in Appendix G-1.

[2]In order to achieve a greater understanding of the training effort which is possible, a survey was also made of the PPBS training efforts of state and local governments. The results of that survey are contained in Appendix G-2.

currently available. The Office of Management and Budget[1] is the organizational entity in the Federal Government that is responsible for the over-all implementation of the Planning-Programming-Budgeting System. This office was contacted and asked to identify those courses that were being taught in this area. Mr. Ray W. Niemela of the Evaluation Division of that office replied that all of the courses on PPBS were conducted by the Civil Service Commission.[2] Separate correspondence from the United States Civil Service Commission identified the specific courses involved.[3]

A total of seventeen separate programs of training conducted by the Civil Service Commission were identified as applicable to the Planning-Programming-Budgeting System. The Management Sciences Training Center was requested to complete the survey of these training programs but declined to do so because of the time required. The information necessary to compare these programs to the model was gathered from existing documents and from surveys of other organizations.

Planning, Programming, and Budgeting Seminar

The major course offering by the Civil Service Commission in the area of PPBS is a two-week Planning, Programming, and Budgeting Seminar. Because of the refusal of the Civil

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[1]Formerly the Bureau of the Budget.

[2]This letter is shown in Attachment 1 to Appendix G-3.

[3]This letter is shown in Attachment 2 to Appendix G-3.

Service Commission to complete the survey form for this course, a 1968 study of the Seminar[1] was used to determine the specific material presented and to compare it to the training model. The major difficulty in the use of this study as a basis for evaluation was that the course length was shortened from three weeks to two weeks subsequent to the study. However, most of the items deleted from the course offering were identified in the study, and the evaluation which follows considers these modifications.

The description of the Planning, Programming, and Budgeting Seminar is:

> A two-week course designed to provide a grasp of the economic base of PPB, a working knowledge of the structure and operation, and an exposure through case work to economic analysis. The program provides an in-depth study of essential elements of PPB and extensive participant involvement in small group work sessions.[2]

The purpose of this course is:

> . . . to retrain experienced analysts [financial analysts, budget analysts, and management analysts] and PPB output user managers for immediate assignment in and near newly created PPBS units.[3]

This course was created in 1966 to meet the major training requirement of PPBS implementation in the nondefense

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[1]U. S., Civil Service Commission, Bureau of Training, A Follow-up Study of the Three Week Residential Seminar in PPBS, (1968).

[2]U. S., Civil Service Commission, The Management Sciences Training Center, The Schedule for January-June, 1971, Washington, D. C., n.d.

[3]U. S., Civil Service Commission, Bureau of Training, Follow-up Study, (1968), p. 3.

sector of the government. From the first session in February, 1966, until the session in May, 1968, a total of 1,095 persons in twenty-eight separate departments and agencies of the Federal Government had attended the course. The course is currently offered approximately four times a year, with twenty to twenty-five participants each time.

Using the rough guide of one classroom hour for each "knowledge" objective, two for each "understanding" objective, and three for each "skill" objective to determine the approximate amount of time required in each area of training, the amount of emphasis required by the model of Chapter VIII is compared to this existing course in Table 9. From this table it is obvious that the existing seminar devotes a much higher percentage of time to the area of utilization of PPBS than does the model in Chapter VIII. The model, on the other hand, demands more emphasis on the history, design, and implementation of PPBS than this existing course provides. Each of these areas will be discussed separately.

In the area of history of PPBS, only two segments of training are devoted to the specific learning objectives formulated in the training model. One of these concerns allocation decisions in the public sector (two lecture hours), and the other segment concerns new developments of PPBS (one lecture hour). The content of these blocks of instruction includes information on the following specific learning objectives: Understanding of the inadequacies of the

TABLE 9

MAJOR AREAS OF EMPHASIS IN PROPOSED TRAINING MODEL AND PLANNING, PROGRAMMING, BUDGETING SEMINAR

	Proposed Model		Seminar	
Area	Hours	Percentage of Time	Hours	Percentage of Time
A. History of PPBS	15	14%	3	3%
B. Concepts and Techniques of PPBS	24	22%	18	21%
C. Design of PPBS	20	19%	8	9%
D. Implementation of PPBS	20	19%	2 1/2	3%
E. Utilization of PPBS	29	27%	55 3/4	64%
Total	108		87 1/4	

traditional budget system (A-9); and Understanding of some of the systems that have been established in the Federal Government and their accomplishments to date (A-11). The remainder of this major area of training, which shows the Planning-Programming-Budgeting System as only one step in the continuous sweep of budgetary change and reform and as a consolidation and expansion of existing techniques, is totally neglected.

From the gross number of hours spent in the seminar on the area of concepts and techniques of PPBS, it would appear that the offering of the seminar and the model that was devised in Chapter VIII are similar. The seminar hours devoted to this area are in seven blocks of instruction. These are:

1. PPB Concepts -- 2 lecture hours
2. PPB as a National Planning Tool -- 1 1/2 lecture hours
3. Program Memorandum and Financial Plans -- 3 1/2 lecture hours
4. Systems Analysis -- 3 lecture hours
5. Private and Social Costs -- 1 1/2 lecture hours
6. Decision-making under Uncertainty -- 3 1/2 lecture hours
7. PPB and Federal Budget Decision-making -- 3 lecture hours.

Table 10 shows the specific learning objectives that are covered by each block of instruction. From this table it can be seen that all of the specific learning objectives in this area are covered except B-8, B-10, B-11, and B-12. There

TABLE 10

CONCEPTS AND TECHNIQUES OF PPBS COVERED IN PPB SEMINAR

Specific Learning Objectives		Seminar Blocks of Instruction						
Number	Description	1	2	3	4	5	6	7
B-1	Understanding of basic concepts of PPBS	X	X	X				
B-2	Understanding of systems analysis				X	X	X	
B-3	Understanding of misconceptions about systems analysis				X			
B-4	Understanding of the relationship between cost-benefit and cost-effectiveness analysis				X			
B-5	Understanding of the relationship of systems analysis to specific analytic techniques				X			
B-6	Understanding of the contributions of systems analysis							X
B-7	Understanding of the differences between PPBS and traditional budgets	X						
B-8	Understanding of the differences between PPBS and performance budgets							
B-9	Understanding of the relationship of PPBS to the budgetary process							X
B-10	Understanding of the conditions which are commonly misconceived as obstacles to PPBS but actually give emphasis to its need							
B-11	Understanding of the effect on PPBS of lack of data, etc.							
B-12	Understanding of the centrality of the top executive's commitment to PPBS							

is, therefore, a correlation between the concepts and techniques portion of the model and the concepts and techniques portion of the Planning, Programming, and Budgeting Seminar.

The seminar does not cover the required training on design of PPBS as well as it covers the concepts and techniques area. Only three of the seven specific learning objectives are covered. These are:

C-3, Skill in structuring a program-oriented budget that is applicable to the agency. This is directly addressed by three blocks of instruction -- The Distributed Output Concept, 1 1/2 lecture hours; Establishing and Applying Agency Criteria, 2 1/4 lecture hours; and Budgeting by Objectives and/or Constructing a Crosswalk, 1/2 lecture hour.

C-5, Skill in designing output indicators. This is directly addressed in one block of instruction -- Clarifying Agency and Office Goals and Outputs, 1 lecture hour.

C-6, Skill in integrating PPBS into existing traditional and performance budget systems. This is addressed in one block of instruction -- PPB as a Decision-making System, 2 3/4 lecture hours.

The major gap in this training effort concerning design of PPBS is that it implicitly assumes that one relatively rigid set of techniques, tools, and components of the system is universally applicable to all governmental agencies. This assumption that all of the components of the "classical"

Planning-Programming-Budgeting System are universally applicable in the same manner to all governmental agencies leads to the ignoring of some necessary aspects of PPBS design such as the identification of key decisions in an agency and the determination of the proper length and type of multi-year projections necessary for the agency.

The seminar coverage of the implementation of PPBS is even more sketchy. Only parts of two specific learning objectives are covered:

1. D-4, Skill in determining the best organizational and staffing patterns, is partially covered by a half-hour lecture on Hiring and Training PPB Analysts.
2. The data problems inherent in D-5, Skill in implementing the analytic capability, are covered by a two-hour lecture on Management Information Systems.

All training needs that concern the achievement of an organizational change effort of the magnitude of implementation of an adequate PPB System are completely ignored. It is apparently assumed that an operative PPBS can be placed in existence by simply issuing a directive and instituting new reporting and budgetary forms. The multitude of possible organizational configurations of PPBS and their various advantages and disadvantages are also neglected by the seminar.

The seminar devotes the largest percentage of time in its program to the area of training that covers utilization of PPBS. However, most of this training is devoted to one

specific learning objective -- E-2, Understanding of the techniques and language used by systems analysts. A total of 48 hours of training (or almost 54 per cent of the total the course) is devoted to this area.

This seminar training in the techniques and language of systems analysts can be divided into three blocks:

1. 10 1/2 hours of economic theory, including:
   a. 3 hours of lecture on macroeconomics;
   b. 4 hours of lecture on microeconomics;
   c. 2 1/2 hours of lecture on supply-and-demand analysis; and
   d. 1 hour of lecture on price theory.
2. 14 3/4 hours on specific techniques of analysis, including:
   a. 3 1/2 hours of lecture and problems on linear programming;
   b. 2 1/4 hours of lecture on statistics for managers[1];
   c. 2 1/2 hours of lecture on regression analysis;
   d. 3 hours of lecture and problems on discounting and present value techniques;
   e. 1 1/2 hours of lecture on decision trees; and
   f. 2 hours of lecture on model-building.
3. 22 3/4 hours in cases and games using these analytic techniques, including:
   a. Post Office (B) -- 2 hours
   b. Land and Facilities Development Administration --

[1]Most of the instruction in this area was eliminated in the shortened course taught after 1968.

1 3/4 hours

c. Bureau of National Capital Airports -- 2 1/2 hours

d. Bureau of Mines -- 2 hours

e. Office of Economic Opportunity -- 2 1/2 hours

f. Disease Control Programs -- 2 hours[1]

g. Development of the Supersonic Transport -- 2 1/2 hours

h. Smart Corp. Game -- 4 1/2 hours

i. Budget Game -- 3 hours (illustrating game theory)[2]

This heavy orientation toward the techniques of PPBS is understandable when it is recalled that both analysts and managers are being trained. In fact, approximately one-half of the participants in the training have been from analytical positions. This large amount of training in techniques is not necessary for managerial training in PPBS. As was noted before, an excessive concentration with the techniques of data manipulation could prove dysfunctional in managerial training since it could lead to managerial neglect of the more difficult and meaningful aspects of PPBS and systems analysis.

The remaining 7 3/4 hours of the seminar that are devoted to utilization of PPBS cover the following specific learning objectives:

1. E-1, Skill in monitoring the operations of PPBS, is covered by a 2 1/4-hour lecture on operation of a PPB System.

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[1]This case and the preceding five cases are discussed in Appendix F-1.

[2]This game was eliminated when the course was shortened to two weeks.

2. E-3, Skill in selecting problems for analytical treatment, is covered in a one-hour lecture on deciding what to analyze in program memorandas.

3. A part of E-5, Skill in interacting with systems analysts in the process of analysis, is covered in a half-hour lecture on generating alternative programs to reach goals.

4. E-9, Skill in using systems analysis for decisions, is covered in a four-hour case involving a discussion of a Corps of Engineers' Program Memorandum.

Five of the specific learning objectives of the utilization of PPBS area of the model are not treated in this seminar. These include: E-4, Skill in defining problems for analysis; E-6, Skill in maintaining an organizational climate that allows the proper degree of interaction between analysts and "experts"; E-7, Skill in determining the depth of analysis required and when analysis will be terminated; E-8, Skill in using a central analytic staff in its relationship with subordinate analytic staffs; and E-10, Skill in making post-evaluations of analyses.

It would be unreasonable to expect that this training course would correspond exactly to the model formulated since there is more than one approach possible to the teaching of PPBS to managers. However, one would not expect the wide divergence between the model and this seminar that is shown in Table 11.

The major problem of the training that is conducted

TABLE 11

TREATMENT OF SPECIFIC LEARNING OBJECTIVES
BY THE PPB SEMINAR

Adequately Covered	Marginally Covered		Not Covered	
A-9	A-11		A-1	A-2
			A-3	A-4
			A-5	A-6
			A-7	A-8
			A-10	A-12
B-1	B-3	B-4	B-8	B-10
B-2	B-5	B-6	B-11	B-12
B-9	B-7			
C-3	C-5		C-1	C-2
C-6			C-4	C-7
	D-4		D-1	D-2
	D-5		D-3	D-6
			D-7	
E-1	E-3		E-4	E-6
E-2	E-5		E-7	E-8
E-9			E-10	

in this seminar is that an excessive amount of time is devoted to the teaching of the techniques of analysis and too little time is spent on the managerial functions of the Planning-Programming-Budgeting System. Because of this, the net result of this training effort will probably be that little change in behavior of the managerial participants is achieved.[1] To be successful in affecting managerial behavior changes, the course should be reoriented away from techniques and toward substantive managerial knowledge. This would require having separate courses for analytical and managerial personnel.

Educational Program in Systems Analysis

The second major training effort on the Planning-Programming-Budgeting System in the Federal Government is the Educational Program in Systems Analysis (EPSA). This is a one-year academic program which is conducted at civilian universities. Its primary purpose is to train analysts to perform PPB analyses. This program was started in 1966, and some 225 middle-level personnel completed the program in its first three years.[2]

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[1]A representative of one of the states which used this seminar extensively for their training effort noted that the participants viewed the analytic exercises as a "textbook chore" and outside of their area of responsibility. Even after taking the course, any attempt to apply analysis to their own problems was "resisted." (Reply to the author's survey by the Arkansas Planning Commission, April 26, 1971.)

[2]U. S., Congress, Joint Economic Committee, Economic Analysis, Hearings, 1969, p. 782.

A total of six universities participate in this program -- University of California at Irvine, Harvard University, University of Maryland, Massachusetts Institute of Technology, University of Michigan, and Stanford University. Each of these six universities was asked to complete a survey form on the training provided. All except the University of Michigan replied to this request. The programs offered at the other five universities will be described in summary fashion:

1. University of California at Irvine:

This university offers a program based on co-operation with the Rand Corporation. Generally a background in micro-economics, operations research, and public finance and administration is set. The Planning-Programming-Budgeting System is not directly addressed in the program of study. All of the emphasis is placed on how analysis is to be performed.

2. Harvard University:

This university does not have a specific academic program established for EPSA. Individual programs are tailored from the normal curricula of Harvard University. Most of the participants take courses in economics relevant to systems analysis and work in fields that correspond to their area of governmental interest.

3. University of Maryland:

This university has a special program designed for EPSA

students. The tools for systems analysis are developed in economic analysis and economic statistics courses. The students then proceed to courses which demonstrate the use of systems analysis in governmental decision-making by the use of case studies. Only the systems-analysis portion of PPBS is covered in the program.

4. Massachusetts Institute of Technology:

This university has a special program for EPSA students. This program concentrates totally on the mechanics of applying systems analysis techniques to governmental-type problems. The total concept of PPBS is never stressed.

5. Stanford University:

This university also has a special program for EPSA students. The cornerstone of this program is a 90-classroom-hour seminar, Industrial Engineering 237, Seminar in Planning, Programming, and Budgeting. This seminar is primarily oriented toward the role of analytic techniques in the PPB System, but some of the broader concepts of PPBS are also presented.

These individual academic programs for the training of systems analysts have been successful. At the end of the program the participants have been able to perform analyses in a closely supervised environment. It is not surprising, though, that the program is not adequate for the training of managers in PPBS. The subject matter presented is too concentrated cn one narrow aspect of PPBS -- systems analysis.

The instruction is, almost without exception, technique-, instead of managerially, oriented. While the program is successful in presenting how to perform analyses for analysts, it would be less successful in presenting information that the managers in the Federal Government require -- such as how to select problems for analysis, how to manage the analysis effort itself, and how to use the results of analysis in decision-making.

Other PPBS Courses

In addition to the two major programs that have been discussed there are another fifteen short courses, taught by the Civil Service Commission, that deal with one or more aspects of PPBS. These are discussed in Appendix G-3. Generally there are two orientation courses for managerial personnel in PPBS (a three-day program for top executives and a two-day program for middle-level executives). These two programs are so short that only a rudimentary acquaintance with the concepts and techniques of PPBS is possible. These orientations are too short and superficial to cause the significant change of behavior required by the institution of a Planning-Programming-Budgeting System.

There is one short course on the total Federal budgetary process that covers some of the history of budgeting as it applies to PPBS. There are also three courses which can be used to give managers an appreciation of systems-analysis techniques. These two groups of courses are directly applicable

to the managerial training needs in PPBS. However, they are too superficial and fragmentary to meet the total training needs of governmental managerial personnel.

The other PPBS courses taught by the Civil Service Commission are directly oriented toward the teaching of specific techniques of analysis. They would be particularly applicable for the training of analysts to work in a given agency, but they are not adequate to meet the specialized training needs of managers.

PPBS Training in the Department of Defense

The Department of Defense maintains a substantial training capability apart from the courses conducted by the Civil Service Commission. The catalog of Department of Defense courses of instruction was reviewed, and a total of twenty-four programs of training that could teach managerial PPBS were identified. Directors of these twenty-four programs were each requested to complete the survey, and replies were received from twenty of them.[1] These programs can be divided into two general classes -- professional military schools and technical training courses.

Professional Military Schools

The professional military schools are designed to give broad career training to officers and to selected

[1]A list of those that were contacted and those that replied to the survey is contained in Appendix G-4.

civilian employees in the Department of Defense. These programs are directly applicable to this study because their mission is educating line managers of the Department of Defense. A total of eleven professional military schools were requested to participate in the survey, and nine of these returned completed survey forms. Table 12 gives a summary review of the responses to this survey.

From Table 12 it is possible to divide the types of instruction into three general classes -- those that offer a very short orientation to PPBS, those that provide an orientation of three days' length or less, and those that have a relatively extensive treatment of PPBS. The short-orientation approach to PPBS is taken by the National War College and the Armed Forces Staff College. In the three hours of instruction in the National War College, a degree of familiarity with PPBS is assumed and a short lecture with a seminar is used to discuss the strengths and weaknesses of the PPB System as practiced in the DOD. The five hours of study in the Armed Forces Staff College are devoted primarily to a lecture presentation designed to make the student familiar with the PPB System -- its forms, documents, and procedures -- as practiced in the DOD. Both of these presentations are too superficial to achieve the significant behavior change required.

The Planning-Programming-Budgeting System is given more extensive treatment by the Squadron Officers School, the Command and General Staff College, and the Marine Corps

TABLE 12

PPBS TRAINING IN PROFESSIONAL MILITARY SCHOOLS

School	Grades of Participants	Annual Number of Participants	Classroom Hours of PPBS
Air Command and Staff College	Maj.	600	30
Air War College	Lt. Col./Col.	213	52
Armed Forces Staff College	Maj./Lt. Col.	500	5
Command and General Staff College	Maj./Lt. Col.	1,250	21
Industrial College of the Armed Forces*	Lt. Col./Col.	135 (45)	30 (60)
Marine Corps Command and Staff College	Maj./Lt. Col.	125	23
National War College	Col.	140	3
School of Systems and Logistics	Lt. thru Lt. Col.	75	26
Squadron Officer' School	Lt./Capt.	2,100	13

*The numbers in parentheses represent the individuals taking the PPBS elective in this school. Their PPBS training is more extensive than that of the entire 180 participating officers.

Command and Staff College. All of these courses extensively treat the historical development of PPBS in the Department of Defense. The final product of the DOD's PPBS is also covered in each course in some detail. At this point the three presentations differ.

The Squadron Officers School treatment of PPBS goes beyond the structural aspects and discusses the concepts and procedures of systems analysis in a summary manner. These are illustrated by a seven-hour analytical problem.

The Marine Corps Command and Staff College's presentation builds on the basis of knowledge of DOD's PPBS to explain the budgeting process at the unit level. The analytical portion of PPBS is covered by two major analytic problems that require some twelve hours to complete.

The most extensive treatment of PPBS with this short orientation is by the Command and General Staff College. About six hours of lecture and discussion are spent on the history and description of the DOD's existing PPB System. The remainder of the instructional time is spent on the analytic aspects of PPBS. This instruction is primarily oriented toward giving the student the basic vocabulary of systems analysis and some insights into its applicability in the operations of the Department of Defense.

These short three-day, or less, orientations on PPBS do not meet the training requirements as specified in the training model. The required depth of treatment of complex PPBS material is not possible in this short time period. The

best that can be expected as a result of this form of training is a slight reduction in the degree of unfamiliarity that the PPB System arouses in the managerial personnel.

A special case of the professional military schools is the School of Systems and Logistics. This is a graduate degree granting institution that educates military personnel and civilian employees of the Department of Defense. As such, it should be expected that the treatment of PPBS by this institution would be significantly different than the broader oriented professional schools. Two courses at that school directly address PPBS. The structure of the DOD's Planning-Programming-Budgeting System is discussed in about six hours in the Defense Financial Management Course. This basically describes the program structure and integrative system used in the DOD. Approximately twenty hours of instruction are also devoted to the systems analysis portion of PPBS in the Cost and Economic Analysis Course. About four hours of this course are spent in lectures and the remaining sixteen hours are devoted to case studies and problems designed to give the student an understanding of the concepts, methodologies, and techniques of systems analysis in the Department of Defense. This training is too superficial to achieve the basic behavior change required by a PPB System, but it is adequate to give the student a high degree of familiarity with the PPB System.

Three of the professional military schools of the

Department of Defense -- the Air Command and Staff College, the Air War College, and the Industrial College of the Armed Forces[1] -- devote a substantial amount of their training effort to PPBS. Table 13 relates these course offerings to the specific learning objectives noted in Chapter VIII.

From Table 13 can be drawn some general conclusions about the extensiveness of instruction of PPBS in these schools. The first noticeable difference between the model of training and the instruction presented at these schools is in the area of history of PPBS. Generally the evolution of PPBS is ignored in all but the ICAF presentation. However, all of the programs cover the evolution of analytical techniques in the DOD (A-8); the inadequacies of the traditional budget (A-9); the process of implementing PPBS in the DOD (A-10); and study of some existing systems, usually the DOD's (A-11).[2]

The second major difference between the model presented and the courses of instruction offered at these schools is the lack of emphasis by ACSC and AWC on the aspects of concepts and techniques that cover: the difference between

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[1]The information presented for the Industrial College of the Armed Forces is for the approximately 45 out of 180 students in each class who take the elective in their program that deals directly with PPBS. In the basic program taken by all of the students about one-half of the hours noted are spent on PPBS.

[2]The ICAF course covers some systems in the civilian sector of the government as well as the systems in the Department of Defense.

TABLE 13

INSTRUCTION IN PROFESSIONAL MILITARY SCHOOLS COMPARED TO SPECIFIC LEARNING OBJECTIVES OF THE MODEL

Objective Number	ACSC	AWC	ICAF
A-1			
A-2			P
A-3			P
A-4			
A-5			P
A-6			
A-7			
A-8	C	C	C
A-9	P	C	C
A-10	C	P	C
A-11	P	P	C
A-12			C
B-1	C	P	C
B-2	C	C	P
B-3	C	C	P
B-4	C	C	C
B-5	P	C	P
B-6	C	C	C
B-7	C	P	C
B-8			P
B-9	P	C	C
B-10			P
B-11			P
B-12			
C-1			P
C-2		P	P
C-3		P	P
C-4			
C-5			
C-6			P
C-7			
D-1			
D-2			
D-3			
D-4			
D-5			
D-6			
D-7			
E-1			
E-2	C	C	C

Table 13 continued:

Objective Number	ACSC	AWC	ICAF
E-3		P	P
E-4			P
E-5	P	P	P
E-6			
E-7			
E-8			
E-9	P	C	C
E-10			

Abbreviations:

ACSC - Air Command and Staff College

AWC - Air War College

ICAF - Industrial College of the Armed Forces

C - Completely covered

P - Partially covered

PPBS and performance budgets (B-8); the conditions which tend to be misconceived as obstacles to the use of PPBS but actually give emphasis to the use of the system (B-10); the effect on PPBS of lack of data, personnel, etc. (B-11); and the absolute essentiality of support of the top executive (B-12).[1]

A third major difference between the instruction at these schools and that proposed by the training model of Chapter VIII is the lack of emphasis on design and implementation of PPBS. Except for a cursory treatment of the isolation of key decisions and design of program structures in the AWC program and a slightly more extensive treatment of questions of design of a PPB System by ICAF, these two major areas of training are completely ignored.

Finally, there are some aspects of the utilization of PPBS presented in the model that are ignored in the training. The ICAF program is the most extensive of the three in its coverage of the utilization of PPBS, and even it ignores the following learning objectives: skill in ensuring that the PPB System does not become imbalanced (E-11); skill in maintaining an organizational climate that allows the proper interaction between analysts and line "experts" (E-6); skill in determining the necessary depth of analysis (E-7); skill in the use of a central analytic staff (E-8); and skill in making post-evaluations of analyses (E-10).

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[1]The ICAF course also neglects this last learning objective.

The reasons for all of these omissions in the training provided are not totally illogical. Recall that the model was established for top management positions in an agency which does not have a viable Planning-Programming-Budgeting System. The typical students at professional military schools would be considered upper-level, but not top-level, managers, and the Department of Defense has an operable PPB System that has been in existence for almost ten years. As a result, it would appear reasonable that less attention would be paid to the historical development of PPBS, its initial design, and its implementation since these hurdles have already been passed. For this reason the coverage of these programs appears adequate to meet the needs of its managerial students, with the following exceptions:

1. The areas of design and implementation that establish the conceptual framework for learning objectives under utilization of PPBS should be stressed to a greater degree.[1]
2. The specific learning objectives of the area of utilization of PPBS that are not covered should be incorporated into the training effort.

The general orientation of these three programs is closely geared to the model. Table 14 shows the distribution of hours by different training methods for the three programs. The cases and problems used in all of these programs are

[1]These would include the following specific learning objectives: B-1, B-3, B-4, B-6, and C-5.

TABLE 14

PPBS INSTRUCTIONAL METHODS AT THREE PROFESSIONAL MILITARY SCHOOLS

School	Lecture	Discussion	Cases and Problems	Total
Air Command and Staff College	17	3	10	30
Air War College	8	30	14	52
Industrial College of the Armed Forces	36	16	8	60

designed to acquaint the manager with PPB concepts and with the concepts of systems analysis, and not to have the student learn how to perform the analyses themselves. This is in contrast to the predominate use of cases and problems in the Civil Service Commission's Planning, Programming, and Budgeting Seminar to teach the student specific analytic techniques. In this regard, the training at these professional military schools is more acceptable for managers than the seminar discussed earlier.

Notice also from Table 14 the different proportions of time spent in the use of lectures as an instructional technique at the different schools. The high percentage of time spent in lecture by ICAF compared to that of AWC allows ICAF to cover a larger number of the objectives stated in the model of Chapter VIII.

These three programs of training in PPBS should be adequate in achieving the managerial behavior change required by PPBS in the Department of Defense. However, they could be improved by broadening their coverage as noted above.

Technical and Managerial Short Courses

In addition to the professional military schools, thirteen technical and managerial courses in the Department of Defense were identified as applicable to PPBS. Eleven of the thirteen activities conducting these courses replied to the survey. Of these eleven replies, four of the courses

have material directly applicable to the managerial training of PPBS. Six of the courses are more applicable to the training of technicians directly involved in the PPBS process than of managers responsible for the use of the products of the system.[1] One of the course offerings was not applicable to this study.

Table 15 presents summary information on the four courses that are directly applicable to PPBS. Two of these courses have short orientation programs on PPBS. The Financial Management for Managers Course gives a brief overview of all of the financial management tools, including PPBS, that have historically been used in the Federal Government. However, the majority of this forty-hour course is devoted to the use of financial management for control purposes. The major part of the instruction on PPBS is a two-hour lecture on the PPBS cycle, and a four-hour orientation lecture and brief exercise on economic analysis. The other six hours of training that are PPBS-oriented include lectures on the history of budgeting, the resource allocation properties of budgets, and the use of financial data for decisions. This course treats PPBS too superficially to make a significant behavior change in participants.

The second orientation-type course is the Top Management Seminar. This course devotes two hours of lecture to the structural aspects of PPBS. An eight-hour review of the

[1]These six courses are described in Appendix G-5.

TABLE 15

MANAGERIAL AND TECHNICAL TRAINING EFFORTS IN DOD'S PPBS

Course*	Hours Devoted to PPBS	Number of Participants	Number of Times Offered Each Year	Remarks
Financial Management for Managers	12	25	7	Both structural and analytical aspects of PPBS covered
Top Management Seminar	14	25	10	Both structural and analytical aspects of PPBS covered
Quantitative Decision-making	20	24	2	Analytical aspects of PPBS only
Operations Research Appreciation	40	24	6	Analytical aspects of PPBS only

*All courses taught by United States Army Management Engineering Training Agency

techniques and concepts of systems analysis and a four-hour lecture on the types of qualitative considerations that must supplement quantitative data are also presented. Again the coverage of PPBS in this orientation is not sufficient to cause a significant change of managerial behavior.

The other two courses shown in Table 15 are particularly appropriate to the training needed by managers in PPBS. Table 16 shows the coverage of these courses of the learning objectives in the model that deal with the analytical aspects of PPBS. The twenty-hour course, Quantitative Decisionmaking, is particularly impressive in its coming to grasp with some of the more difficult questions of managerial utilization of systems analysis, including the following specific learning objectives: skill in implementing analytic capability (D-5); skill in selecting problems for analytical treatment (E-3); skill in interacting with systems analysts in the process of analysis (E-5); and skill in maintaining an organizational climate that allows the proper degree of interaction between analysts and "experts" (E-6).

The second course shown in Table 16, Operations Research Appreciation, is twice as long as the Quantitative Decisionmaking Course but it does not cover as much of the managerial learning objectives as the first course. This is because the majority of the course (some twenty-four hours of instruction) is spent in acquainting the manager with a broad spectrum of operations research techniques. The coverage of these techniques is more detailed than is required in a

TABLE 16

TWO DOD MANAGEMENT TRAINING COURSES AND LEARNING OBJECTIVES ASSOCIATED WITH ANALYTICAL ASPECTS OF PPBS

Learning Objectives	Courses: Quantitative Decision-making	Courses: Operations Research Appreciation
A-7		
A-8	P	P
B-2	P	C
B-3	P	P
B-4		
B-5	P	
B-6	C	P
D-4		C
D-5	C	
E-2	P	C
E-3	C	
E-4	P	P
E-5	C	
E-6	C	
E-7	P	
E-8		
E-9	C	P
E-10		

P - Partially Covered
C - Completely Covered

managerial PPBS training effort.

While extensive training in the Planning-Programming-Budgeting System must of necessity include a considerable amount of training in the concepts and use of analytical techniques, it is incorrect to suppose that training in the structural aspects of the system is not also essential. The courses noted in Table 16 do not afford training in these structural aspects of PPBS and as a result, cannot be considered totally satisfactory as a PPBS training vehicle.

Comparison of Civilian and DOD Training Efforts

The training efforts discussed to this point in this chapter constitute the majority of the formal training in PPBS in the Federal Government. The magnitude of all of these training efforts, including those in Appendix G-3 and Appendix G-5, is reflected in Table 17.

There are almost 250,000 man-hours devoted to PPBS training in the Federal Government each year. Over 130,000 of these man-hours are devoted to acquainting management personnel with the PPB System, and the remainder is spent in the training of technical specialists to operate the system.

Some of the differences between the magnitude of civilian and military training in the PPB System are significant. First, through the use of the professional military education program, the military services are able to train a significantly higher number of personnel in the managerial use of PPBS than are the civilian agencies. The quality of

TABLE 17

MILITARY AND CIVILIAN[1] PPBS TRAINING EFFORTS

	Number of Courses		Number of People Trained Annually		Total Annual Man-Hours of Training	
	Civilian	Military	Civilian	Military	Civilian	Military
1. Substantive PPBS Training	1	4[2]	100	1068	8,725	37,776
2. Training in Analytic Portion of PPBS	3	2	400	192	11,700	2,720
3. PPBS Orientations of Less Than 3 Days in Length	2	7[3]	400	4540	5,760	64,945
Subtotal	6	13	900	5800	26,185	105,441
4. Technical PPBS Training	10[4]	6	1470	470	27,900	39,440
5. Educational Program in Systems Analysis	1		75[5]		50,625	
Total	17	19	2445	6270	104,710	144,881

(1) Civilian programs means those conducted by the Civil Service Commission for all agencies of the government, including the DOD.
(2) All of these courses are in the professional military schools.
(3) Five of these programs are in professional military schools.
(4) This includes the one course in the Federal Budgeting Process.
(5) This is the average annual number of participants in this program from 1966 to 1969.

the training in these professional military schools appears at least comparable to that given in the Planning, Programming, and Budgeting Seminar of the Civil Service Commission, which is heavily oriented toward the training of analysts.

The civilian agencies appear to devote a substantially higher amount of training effort to use of systems analysis than does the Department of Defense. Perhaps one reason for this relative lack of emphasis by the DOD is the extensive treatment of analytic techniques in the professional military schools.

It is obvious that the DOD has a much higher incidence of exposure to the PPB System than do civilian agencies through short indoctrination programs. While these indoctrinations are not capable of causing a significant change of behavior of managers, they at least are valuable in removing some of the unfamiliarity with the system.

The total amount of managerial training in PPBS is unevenly divided between civilian and military agencies, with the military training over six times as many people and devoting over four times as many man-hours to this training. It appears that only the Department of Defense has been willing to perform the substantial training effort necessary to ensure that there exists adequate managerial knowledge and support to achieve an operative Planning-Programming-Budgeting System.

The training of technical personnel to operate the

PPB System appears evenly divided between the military and civilian sectors of the government. While the civilian sector trains over three times as many people as does the military sector, the amount of training in man-hours that is provided shows that the military sector has about 50 per cent more training. This results largely from the broader scope and greater length of most military courses in this area.

The inclusion of the Educational Program in Systems Analysis as a totally civilian training effort makes the total amount of PPBS training appear more evenly balanced than is probably the case. The Department of Defense also utilizes this program to train analysts. In fact, one of the universities that participates in the Educational Program in Systems Analysis, the University of California at Irvine, has its program oriented heavily toward the requirements of military systems analysis. If EPSA is deleted from the total training shown in Table 17, the military sector of the Federal Government trains 6,270 people annually in PPBS, compared to 2,370 in the civilian sector. The military agencies devote 144,881 man-hours to this training, compared to 54,085 man-hours by civilian agencies. This strongly accents the different degree of emphasis given to this system in the two governmental sectors.

University Education in PPBS

University education in the Planning-Programming-Budgeting System is applicable to this study in two manners. First, the college courses in PPBS can be used to satisfy part of the training of managers in the Federal Government by utilizing these courses through a part-time study program. For this purpose the evaluation of the courses must proceed on the same basis as the evaluation of governmental training efforts.

However, colleges and universities do not function primarily as training facilities to meet the immediate training needs of the Federal Government or any other governmental or private body. Instead, the primary purpose of these institutions is to prepare students for a broad spectrum of jobs after the end of college. One class of these jobs is public service. An adequate educational course in PPBS will probably not include all of the details of PPBS necessary for managerial training.

The exposure of college students to the concepts of the Planning-Programming-Budgeting System in their early college years is important to the achievement of an adequate government-wide PPB System. If the individuals who will eventually become the managerial elite of the Federal Government are educated in the concepts of PPBS while they are young and are not as skeptical of their ability to deal with analysis which contains even a minimum amount of quantitative manipulation, the task of reducing the "fear" of systems

analysis is greatly reduced.[1]

Identification of Areas for Survey

As noted earlier, the basic method used to determine the educational institutions that should be surveyed was by screening the school catalogs of universities and colleges for courses that appear to contain a significant amount of PPBS instruction. The courses that were identified included those from the following four general academic areas:

1. Political Science, including Government and Public Affairs Schools and Departments. Most political science departments have a basic course in Public Administration. Because of the broad nature of these courses, it is assumed that the PPBS concept does not occupy a significant role in the offering and they were not included in the survey. The political science courses that were more specifically directed toward the use of budgets as decision tools (normally identified as Public Financial Management) were included. Any other courses which specifically identified the use of systems analysis or PPBS in the course description were included in the survey.
2. Public Administration, including Administration, and Government and Public Administration Schools and Departments. The courses in Public Administration are normally similar to those in Political Science. Any courses that appeared to be

[1]Statement of William W. Kaufman, U. S., Congress, Joint Economic Committee, Economic Analysis, Hearings, 1969, p. 718.

specifically directed toward the use of financial data for governmental decisions were included.

3. Economics. Economic courses which stressed the macroeconomic significance of government budgets were not included. Courses which stressed economic analysis in general and did not restrict themselves to the use of this analysis in the government sector were not included because of the apparently insignificant part of the PPBS concept in these offerings. Particularly appropriate to this study were the courses concerning the use of economic analysis in governmental decision-making.

4. Business, including Business and Public Administration, Government and Business Administration, and Economics and Management Schools and Departments. Two subsections of this area were particularly appropriate:

a. Management: Management courses which were directed toward the use of systems analysis (or quantitative methods) in general were not included. Most of these courses were directed toward the use of these techniques in private enterprise, and the PPBS concept in the public sector is assumed to be an insignificant part of the course offerings. Management courses which were specifically directed toward managerial aspects of the public sector and indicated that decision-making was the major focus of the course were included in the survey.

b. Accounting: Accounting courses which stressed the

difference between accounting methods in the government and private enterprise were not considered. Only where budget development and the use of budgets for governmental decision-making was apparently a significant portion of the course offering was the course surveyed.

In the University of Oklahoma library, the catalogs of approximately 1,100 universities and colleges were reviewed. From this review were identified a total of 149 courses in 93 different departments[1] that could potentially contain a significant amount of PPBS instruction. These departments were located in 82 universities and colleges.

In each of these cases a letter was sent to the head of the department, by name if that information was available.[2] He was asked to complete one copy of the survey form for each of the courses under his jurisdiction that contained a significant amount of PPBS instruction. Table 18 shows the number of replies received to the survey, by general academic area. Thirty-six of the ninty-three departments (or approximately 39 per cent) replied to the survey.[3] These replies represented 55 of the 149 courses (or about 37 per cent) that

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[1]The term "department" is loosely used in this case. In some instances the lowest subdivision of a university that could be identified as responsible for a particular course was the School or College.

[2]A sample copy of the letter and form is contained in Appendix G-1.

[3]A list of the fifty-seven departments that did not reply to the survey request is contained in Appendix G-6.

TABLE 18

REPLIES TO PPBS SURVEY OF COLLEGES AND UNIVERSITIES

Academic Area	Number of Departments Contacted	Number of "Potential" PPBS Courses Identified	Number of Departments Replying to Survey	Number of "Potential" PPBS Courses in Departments Replying	Number of Actual PPBS Courses in Departments Replying
Political Science	59	85*	25	37*	23
Public Administration	9	23	3	8	4
Economics	17	25	5	6	2
Business	8	16	3	4	2
Total	93	149	36	55	31

* Includes one course taught jointly by Economics and Political Science Departments

were identified as potentially containing a significant amount of instruction in the area of PPBS. The completed surveys showed that only 31 of these 55 initially identified courses had a significant amount of PPBS instruction.[1]

One reason for the relatively low percentage of replies to this survey could be that negative replies were not requested.[2] Many of the departments might not have replied to the survey because none of the courses identified in the request, nor any other courses under their jurisdiction, had significant amounts of PPBS instruction.

Some comment should be made about the distribution of PPBS courses between the various academic areas. It is not surprising that the majority of academic courses that deal with PPBS are found in the Political Science Departments. The Department of Political Science has historically been the academic area that is primarily concerned with the operation of governmental activities, and the PPB System is a tool of these governmental activities. The small number of Public Administration courses identified is more a reflection of the relatively few separate Public Administration Departments. Most public administration is taught as an area of political

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[1]No additional courses were identified by the 35 departments.

[2]A total of eight departments with nine "potential" courses furnished negative replies which stated that PPBS was not a significant part of the course identified or of any other course under their jurisdiction. These eight departments are identified in Appendix G-7.

science.[1] However, the relatively small number of Economics and Business area departments that could be identified as having significant PPBS courses is surprising. Since both of these academic areas exist in many different universities and colleges, it appears that their instruction in economic analysis, quantitative techniques, and management systems is largely limited to applications in the private, instead of public, sector. From the limited numbers of replies to the survey received from these academic areas, it appears that even the small number of courses in these two areas that were identified as potentially containing a significant amount of PPBS might be overly optimistic.

Another factor in this survey that is significant is the apparent lack of extensiveness of PPBS education in the colleges and universities. Of the approximately 1,100 universities and colleges whose course offerings were reviewed, it was possible to identify courses with PPBS in only 82 of these schools. The replies to the survey indicate that maybe even this small percentage (less than one per cent) of schools with significant PPBS offerings is optimistic.

The adequacy of educational efforts in PPBS can be further evaluated by investigating the thirty-one courses that were definitely identified by the survey as containing significant PPBS material. Table 19 contains summary data

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[1]Lloyd M. Short, "Introduction: Educational Organization for Instruction in Public Administration," Administrative Careers, ed. by Sweeney, Davy and Short, p. 25.

TABLE 19

UNIVERSITIES AND SCHOOLS WITH SIGNIFICANT PPBS COURSE OFFERINGS

School	Department	Hours Devoted to PPBS	Class Size	Frequency of Offering (Times a Year)	Remarks
California State College, Long Beach	Political Science	24	50	1	Emphasis on part PPBS plays in political budgeting process
Kent State University	Political Science	10	20	2	Both structural and analytical portions of PPBS covered
Northeastern University	Political Science	24	15	1	Both structural and analytical portions of PPBS covered
Purdue University	Political Science	9	25	1	Historical view of PPBS
San Diego State College	Public Administration and Urban Studies	10	15	1	PPBS as a conceptual tool for allocation of resources
	(2 Courses)	2	50	1	General orientation as emerging tool of governments
State University of New York at Albany	Graduate School of Public Affairs	**64	10	1	Detailed examination of analytical portion of PPBS
Southern Illinois University, Edwardsville	Government and Public Affairs	6	20	1	History of budgeting including PPBS and orientation of entire system

TABLE 19--Continued

School	Department	Hours Devoted to PPBS	Class Size	Frequency of Offering (Times a Year)	Remarks
USAF Academy	Economics and Management	48	30	1	Use of analytical techniques in DOD's PPBS
University of Arizona	Public Administration	16	25	2	Emphasis on analytical portions of PPBS
University of California, Berkley	Political Science	3	Unknown		Description of the budgets (including program budgets) of governmental agencies
University of California, Los Angeles	Political Science	40	22	2	Both structural and analytical aspects of PPBS covered
University of Colorado	Political Science	8	4	2	General overview of PPBS
	School of Business	12	30	1	Both structural and analytical aspects of PPBS covered
University of Idaho	Political Science	8	30	1/2*	Both structural and analytical aspects of PPBS covered
University of Iowa	Political Science (2 Courses)	3	25	1	General overview of PPBS

TABLE 19--Continued

School	Department	Hours Devoted to PPBS	Class Size	Frequency of Offering (Times a Year)	Remarks
University of Iowa (continued)		9	15	1/2*	Both structural and analytical aspects of PPBS covered
University of Maryland	Economics (2 Courses)	40	10	1	Emphasis on analytical portion of PPBS
		40	10	1	Emphasis on analytical portion of PPBS
University of Miami	Politics and Public Affairs	5	40	1	Overview of political consequence of PPBS
University of Nebraska at Omaha	Political Science	20	20	1/2*	Historical, structural, and political study of PPBS
University of Nevada	Political Science	10	15	1	Historical development and description of PPBS
University of North Carolina	Political Science	24	10	1	Both structural and analytical aspects covered with emphasis on analytical
University of South Carolina	Political Science	8	20	1	Overview of both structural and analytical aspects of PPBS

TABLE 19--Continued

School	Department	Hours Devoted to PPBS	Class Size	Frequency of Offering (Times a Year)	Remarks
University of Southern California	School of Public Administration	12	25	8	Analytical aspects of PPBS
University of Virginia	Government and Foreign Affairs	45	23	1	Both structural and analytical aspects of PPBS covered
University of Washington	Graduate School of Public Affairs	10	45	2	Overview of both structural and analytical aspects of PPBS
Washington State University	Political Science	10	25	1/2*	Historical and political-process view of PPBS
Wayne State University	Political Science (2 Courses)	3	20	1/2*	Historical view of changing budgets
		3	10	1/2*	Overview of systems analysis in government
Wichita State University	Political Science and Economics	25	12	1	Both structural and analytical aspects of PPBS covered

*Course taught once every two years

**This is a two-semester course sequence

for each of these courses.

The thirty-one courses identified in the survey have varying degrees of depth in their coverage of PPBS. A proximate measure of the depth of presentation in these courses is the number of hours of the course that are devoted to the area of PPBS. Table 20 summarizes the number of courses in six classifications based on the number of classroom hours. There are five courses with three hours or less devoted to PPBS.[1] Three of these courses are totally concerned with the place of PPBS in the historical evolution of budgeting. They are primarily concerned with the effect of PPBS on the political process of decision-making. One of the other courses gives a brief orientation of systems analysis in the Federal Government, and the other discusses PPBS only as it effects the program structure of the Department of Defense. None of the presentations in these five courses is capable of giving the student a level of knowledge that exceeds an elementary ability to recognize the key words associated with PPBS.

The two courses that devote four to six hours of classroom time to PPBS offer only slightly more depth to the treatment of the subject.[2] One of these courses is concerned

[1]These courses are taught by San Diego State College; University of California, Berkley; University of Iowa; and Wayne State University.

[2]These two courses are taught by Southern Illinois University, Edwardsville, and the University of Miami.

TABLE 20

LENGTH AND LEVEL OF COURSES CONTAINING SIGNIFICANT PPBS INSTRUCTION

Hours of Instruction	Course Level			
	Undergraduate	Graduate	Both	Total
1-3	0	1	4	5
4-6	0	0	2	2
7-12	0	4	8	12
13-18	0	1	0	1
19-24	0	2	2	4
Over 24	1	6	0	7
Total	1	14	16	31

totally with the political ramifications of the use of PPBS. The other course attempts to cover the history, structural components, analytical base, and political consequences of PPBS in six hours of structured discussion. The major emphasis appears to be the investigation of the effect of PPBS on the political process of budgeting in the Federal Government.

There are twelve courses that devote seven to twelve hours to PPBS.[1] These twelve courses represent four different approaches to the teaching of PPBS. Three of the courses present PPBS as a part of the historical evolution of budgeting in the government. One of these three courses is almost totally concerned with the impact of PPBS on the organizational structure of the Federal Government. The other two courses provide a relatively comprehensive overview of the nature and purpose of PPBS in a historical setting.

Seven of the courses in this broad classification provide relatively complete descriptions of both structural and analytical aspects of PPBS. Three of these courses provide this information to establish a basis for investigating the effect of PPBS on the political process. The other four

[1]These courses are taught at Kent State University, Purdue University, San Diego State College, University of Colorado, University of Idaho, University of Iowa, University of Nevada, University of South Carolina, University of Southern California, University of Washington, and Washington State University.

courses[1] describe PPBS and its components to make the student aware of its capabilities and use in a managerial setting. Of the courses discussed to this point, these four course offerings are the first that appear to make a significant contribution to management education in PPBS. Because of the relatively short amount of time devoted to the teaching of PPBS in these courses the offerings still can be characterized as only short orientations. Their managerial orientation does, however, make them applicable to the task of educating future public managers in the area of PPBS.

There are two other approaches to the instruction in PPBS found in the courses that devote seven to twelve hours of instruction to that system. One of these courses discusses PPBS from the point of view of a broad fund allocation device. This approach accents the conceptual basis of PPBS but the specific system requirements are not covered. Because of its lack of specific details, this educational effort is not too appropriate for managerial education. The other course is devoted solely to the analytical properties of the PPB System. In this limited field this latter course is applicable to the management training requirements of PPBS.

There was only one course identified that devotes thirteen to eighteen hours to PPBS.[2] This particular course

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[1]These courses are taught by Kent State University, University of Colorado, University of Idaho, and University of Washington.

[2]This course is taught by the University of Arizona.

is primarily oriented toward the analytic phases of PPBS and is applicable to the managerial educational needs in this limited part of the system.

There are four courses that devote nineteen to twenty-four hours to PPBS instruction. Two of these courses[1] are primarily concerned with the political process of budgeting and the way in which PPBS affects this process. While the methods and concepts of PPBS are covered in these courses, their primary orientation toward political effects makes the courses less useful than others for managerial education.

The other two courses[2] in this broad classification are more applicable to the required managerial educational efforts in PPBS. Both of these courses survey all of the components of PPBS by lecture and structured discussion. The emphasis is to acquaint the student with the concepts and techniques so that they can be used as decision tools. One of the courses[3] uses a number of problems and cases to illustrate the concepts and techniques of PPBS. Because of the amount of time that is spent on PPBS, these courses satisfactorily perform the necessary managerial educational tasks

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[1]These courses are taught by California State College, Long Beach, and University of Nebraska at Omaha.

[2]These courses are taught by Northeastern University and the University of North Carolina.

[3]This is the course taught by Northeastern University.

for PPBS. However, while the treatment of PPBS is adequate from the point of view of broad, general education, it is too superficial to be of much use as a direct training device for Federal Government activities.

The most extensive treatment of PPBS is provided by the seven courses which devote over twenty-four hours to that subject. Six of these courses deal solely with the analytical portion of PPBS.[1] Four of the courses are directly concerned with the broad role of systems analysis in governmental decisions. One of these[2] gives a broad, general survey of the use of analysis in the government. The other three courses[3] develop the concepts behind the use of systems analysis in the governmental sector and are particularly useful in the managerial education required on the analytical portion of PPBS.

The other two courses that have over twenty-four hours of PPBS instruction and are oriented toward the use of systems analysis in connection with PPBS are more limited in scope. One of the courses deals exclusively with the use of analysis in connection with defense-oriented problems.[4]

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[1]These courses are taught by the State University of New York at Albany, USAF Academy, University of Virginia, University of Maryland, and Wichita State University.

[2]This is the course taught by Wichita State University.

[3]These are the courses taught by the University of Virginia and University of Maryland.

[4]This is the course taught by the USAF Academy.

Because of its special oreintation, the course is particularly appropriate for that limited field, but it should not be considered relevant to the problems of agencies outside of the Department of Defense. The other course, in the analytical portions of PPBS, is concerned almost solely with the economic aspects of systems analysis.[1] Because of its heavy emphasis on the specific techniques of economic analysis and the way in which they should be applied, the course is more applicable to the education of analysis technicians than it is to the education of managers.

The most comprehensive course in PPBS that was identified in this survey is conducted at the University of California at Los Angeles. This course covers all aspects of PPBS in a relatively comprehensive manner. If the material in this course is related to the training model, the specific learning objectives shown in Table 21 are covered. Notice that this course is particularly strong in the coverage of the areas of History of PPBS and the Concepts and Techniques of PPBS. As one would expect in a course that is primarily designed for educational purposes, there is not a high degree of emphasis placed on the more practical areas of training such as design, implementation, and utilization of the system. However, the course is at least comparable to most of the training offered in the Federal Government.

[1]This is the course taught by the State University of New York at Albany.

TABLE 21

SPECIFIC LEARNING OBJECTIVES COVERED IN UCLA'S PUBLIC PLANNING, PROGRAMMING, AND BUDGETING COURSE

Covered at Level Stated in Model	Covered in Course but not as Intensively as in Model
A-1	B-10
A-2	C-3
A-3	C-5
A-8	D-2
A-9	D-5
A-11	E-1
A-12	E-9
B-1	
B-2	
B-3	
B-4	
B-5	
B-6	
B-7	
B-8	
B-9	
B-11	
B-12	
E-2	

It is obvious that the original identification of thirty-one courses that are applicable to managerial education in PPBS is overly optimistic. Most of the courses that were identified in the survey are oriented so heavily toward the effect of PPBS on the political process that they have a minimum amount of applicability to the task of managerial education. Only fifteen of the thirty-one courses initially identified in the survey appear to have a significant amount of managerial content in the instruction. These fifteen courses are summarized in Table 22 in the approximate order of the intensiveness of their treatment of PPBS-related subjects. Only one of these fifteen courses contains enough depth to be directly usable for managerial training efforts by off-duty education. The other fourteen courses appear adequate to provide some general education in PPBS to prospective public service managers. Even in this regard, the treatment of PPBS in most of these courses is sketchy because of the relatively small amount of time devoted to the instruction.[1]

Due to the small number of adequate managerial PPBS training courses that could be identified in the survey it is reasonable to conclude that the instruction in this area in colleges and universities is not extensive enough to provide a reservoir of entry-level managerial talent that has

[1]Four of the seven total PPBS efforts and two of the six analytically oriented efforts devote twelve, or less, hours to PPBS instruction.

TABLE 22

COURSES WITH SIGNIFICANT MANAGERIAL PPBS OFFERINGS

A. Courses with total PPBS coverage:

University of Idaho	Public Management Techniques
University of Washington	Public Management
Kent State University	Public Budgeting Policy
University of Colorado	Business and Governmental Budgeting and Control
University of North Carolina	Statistical Analysis and Program Evaluation
Northeastern University	Systematic Analysis and Public Finance
University of California at Los Angeles	Public Planning, Programming, and Budgeting

B. Courses with emphasis on analytical portion of PPBS:

*USAF Academy	Defense Economics
*State University of New York at Albany	Economics of the Public Sector
University of Maryland	Public Sector Workshop
	Case Studies in Benefit-Cost Analysis
University of Southern California	Administrative Systems Analysis
University of Arizona	Fiscal and Budgetary Administration
Wichita State University	The Budgetary Process
University of Virginia	Systems Analysis

*These two courses have an extensive treatment of sharply limited aspects of systems analysis.

adequate knowledge of PPBS. There are approximately 137 individuals educated each year in one of the seven courses in Table 22 that give total PPBS coverage and approximately 375 individuals educated in the eight analytically oriented courses.[1]

One of the problems in the teaching of PPBS in the colleges and universities is the lack of a suitable college-level textbook. In the fifteen courses identified with significant managerially oriented PPBS offerings, the major text in use is Program Budgeting and Benefit-Cost Analysis, edited by Harley H. Hinrichs and Graeme M. Taylor. Six of these fifteen courses use this book as a basic text.[2] However, seven of the fifteen courses have not been able to find a specific text adequate for their purposes and rely on collections of articles, unpublished papers, and readings from Congressional sources. The other two courses use a variety of textual material for instruction, including Program Budgeting, edited by David Novick; The Economics of Defense in the Nuclear Age, by Charles J. Hitch and Roland N. McKean; and Planning, Programming, Budgeting: A Systems Approach to Management, edited by Fremont J. Lyden and Ernest

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[1]A total of 888 individuals attend the thirty-one courses each year. The sixteen of these courses that were identified as not directly applicable to managerial educational needs account for 376 of these attendees.

[2]Three of these six courses are among those that are primarily analytically oriented.

G. Miller.

The same general conclusion about the scarcity of acceptable textbooks in this field is supported when the sixteen courses not directly usable for managerial education are investigated. The most popular textbook in this group of courses is the Lyden and Miller book, which is used by five courses. Again six of these courses do not use a specific textbook but rely on collections of articles, Congressional testimonies, etc. for outside readings.

One other aspect of this managerial educational effort should be noted. From Table 20 it can be seen that only seventeen of the thirty-one courses that contain a significant amount of PPBS material can be taken by undergraduate students. All but two of these seventeen are in the group that have twelve or less hours of instruction devoted to PPBS. The outlook for undergraduate managerially oriented education in PPBS is even less encouraging. Of the eight courses identified that cover the analytical phase of PPBS from a managerial orientation, only two will permit undergraduate enrollment (one of these is at a service academy with no graduate students and the other devotes only twelve hours to systems analysis under PPBS). Of the seven courses identified that cover all aspects of PPBS from a managerial point of view, only two will permit undergraduate enrollment, and these two courses devote only eight and twelve hours respectively to this instruction. It then appears that there

is only a slight possibility of the Federal Government's recruiting managerially oriented personnel, trained in PPBS, from universities and colleges at the Bachelor's degree level.

CHAPTER X

CONCLUSIONS AND RECOMMENDATIONS

A summary of the earlier chapters will be presented and then some general conclusions will be drawn. Finally, some recommendations for action and further study will be formulated.

Summary of Study

This study developed a conceptual model of PPBS training. This model was structured by examining the "ideal" Planning-Programming-Budgeting System and comparing it to the system that currently exists in the Federal Government. The overwhelming evidence about the existing system is that it has been largely adopted on a superficial, mechanistic basis in the nondefense agencies. In the Federal Government, only the Department of Defense has a PPB System that can be characterized as operating with any degree of significance and depth. The system has not resulted in the necessary changes to the decision processes of the government because governmental managers have not changed the way in which they view their problems and translate the solutions of these problems into action through the budget. This means that the primary requirement is for managers to make a significant

change in their behavior. This change in behavior is the purpose of training.

The cornerstone of this study is the training model. Training should be provided extensively to managers in agencies of the Federal Government. A viable Planning-Programming-Budgeting System depends on its enthusiastic acceptance by a large percentage of all managers in critical line and staff positions of a governmental agency. This training cannot be presented in a sterile manner that aims only at acquainting managers with the vocabulary of PPBS. Instead, the government should pursue a training program that causes significant changes in the actions of managers by modifying their attitudes, knowledge, and skills.

There are five major areas of training required in this managerial training program -- history of PPBS, concepts and techniques of PPBS, implementation of PPBS, and utilization of PPBS. Specific learning objectives required in each of these areas are described in Chapter VIII. In addition, each of the areas is discussed in detail in other chapters.

The second major task of this study was an evaluation of the current training efforts in the Federal Government. This evaluation was performed by comparing the training provided against the conceptual model that had been formulated. Three specific classifications of training were investigated -- that for nondefense agencies; that for the Department of Defense; and that of universities and colleges.

Conclusions

This study supports a number of conclusions about the Planning-Programming-Budgeting System in the Federal Government. First, it can be concluded that PPBS can play a major role in the management function of the Federal Government. Its potential for increasing the rationality of the governmental decision process is so high that the goal of achieving a viable government-wide PPBS is one that must be pursued. Senator Proxmire expressed the view that:

> . . . PPB is the most basic and logical planning tool which exists.[1]

The second conclusion of this study is that, with the exception of the Department of Defense, the Planning-Programming-Budgeting System has not been implemented in the agencies of the Federal Government to any depth. The PPB System which now exists appears to be little more than the acceptance of a new vocabulary and format with the same decision and budgetary process being followed that PPBS was designed to change. Further, it can be concluded that one of the major reasons for this superficial acceptance of the system is the lack of change of behavior of managerial personnel in the Federal Government.

The survey conducted to compare current training efforts on the Planning-Programming-Budgeting System in the Federal

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[1]William Proxmire, "Foreword," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. I, 1969, p. vi.

Government to the model supports the following conclusions:

1. For civilian agencies:

a. The only major PPBS training effort for civilian agencies of the Federal Government -- the Planning, Programming, and Budgeting Seminar -- is so dominated by its joint purpose of training technicians to operate the PPB System that the amount of managerial training provided is severely limited.

b. Most of the courses other than this seminar taught for the civilian agencies of the Federal Government are either too brief to achieve necessary behavioral changes of governmental managers or they are too heavily oriented toward the needs of technicians who operate the system to be of much use to managerial personnel. There are a few courses that are directed solely toward the analytical phase of PPBS that appear to provide adequate training in this limited area. These courses cannot substitute for a training effort that encompasses the entire PPB System.

c. The total investment in training in the civilian agencies is not adequate to achieve viable PPB Systems.

2. For military agencies:

a. The training in PPBS given in most military professional schools is too sketchy to achieve a dramatic change in behavior. However, some of these schools contain relatively extensive PPBS training and only slight changes would be necessary to make this training conform to the model as modified for an agency which has an adequate PPB System in

existence. The major difference between these DOD professional military schools and the PPB Seminar used by civilian agencies is the managerial orientation of the DOD programs as opposed to the technician orientation of the civilian program.

b. The short training courses used in the Department of Defense for PPBS training are adequate for the analytical portion of that system but do not cover the total system.

c. The Department of Defense has indicated its willingness to make the necessary heavy investment in training to ensure an effective operation of its PPB System.

3. For educational efforts in colleges and universities:

a. There are apparently only a few colleges and universities that have courses containing a significant amount of PPBS education.

b. Most of the educational efforts in those courses responding to the survey are oriented so heavily toward the political process of budgeting that they are not highly applicable to the managerial educational needs of PPBS.

c. Only one PPBS course could be identified that would be directly applicable to the training needs in the Federal Government. The treatment of the total PPB System in another six courses and the analytical portion of PPBS in eight courses was adequate for educational purposes, but not detailed enough for specific governmental training needs.

d. Unless PPBS education becomes more extensive in

colleges and universities, the opposition to the PPB System will not be gradually reduced by the entry of new college graduates into the managerial ranks of the Federal Government.

Recommendations

The recommendations as a result of this study can be classified under two general headings -- recommendations for action and recommendations for further study. The first recommendation for action is that an effective Planning-Programming-Budgeting System be adopted as far as possible by all of the agencies of the Federal Government. This adoption should not be a simple transplant of the existing forms and procedures from the Department of Defense but an attempt to adopt the concept of PPBS throughout the entire organization. This action will require a concentrated effort to design a system that is best for the particular agency involved and to implement this system into the agency.

As a part of the process of implementing PPBS into an agency of the Federal Government, a well-co-ordinated, complete managerial training effort will play an essential role. The alternatives to changing the behavior of managers of the agency by training are either (1) to replace all of the managers in the agency with individuals who have existing behavior patterns that coincide with the one desired, or (2) to forego the effective use of the system. Either of these alternatives represents a significant cost of not training.

The training effort necessary in the implementation process can be guided by the model presented in Chapter VIII.

The major training effort in connection with PPBS that is taught by the U. S. Civil Service Commission, the Planning, Programming, and Budgeting Seminar, should be significantly upgraded. This upgrading will probably require the separation of this seminar into two programs -- one for analysts and one for managers. In the managerial section of this seminar, less attention should be devoted to the specific techniques used by analysts and more attention paid to the managerial tasks associated with PPBS. Along with the changed emphasis of this training program, the course should be presented to a much broader population of managers of the Federal Government.

Similarly, the training efforts in PPBS should be upgraded in the Department of Defense. If it is desired to keep the basic managerial training in this department in the framework of professional military schools, this can be accomplished by a significant increase in the number of hours spent on the subject in some of the schools and a broadening of the PPBS curriculum in the three schools that already have considerable PPBS offerings.

In addition to these direct changes by the Federal Government, the instruction in colleges and universities on PPBS should also be significantly improved. Basically this requires two simultaneous movements. First, PPBS should be incorporated in the course offerings of more universities so

that more students can be exposed to the system. Secondly, the courses should be altered to devote more attention to the necessary managerial knowledge associated with PPBS, instead of the current situation where there is such a high instructional dominance of political aspects of the system.

The development of adequate training efforts on PPBS in the Federal Government and the development of better managerially oriented PPBS courses in colleges and universities can have a synergetic impact on each other. As training causes the effectiveness of PPBS in practice in the government to increase, more courses will be added in colleges and universities in recognition of the higher degree of importance of the system. These courses in the colleges will develop new managers for governmental activities who will be better able to use the system, and its effectiveness will again be increased.

In the course of this study were noted a number of areas where knowledge about the Planning-Programming-Budgeting System was still fragmentary and sketchy. Further study of these areas is desirable. Some of the most critical needs for further research include:

1. Much more needs to be known about what an operating PPB System costs and what effect it has on the quality of decisions.
2. More needs to be known about the training required and the adequacy of the current training efforts in the technical skills associated with PPBS.

3. More needs to be known about how a PPB System should be implemented in governmental agencies.

4. A need exists for better action training techniques in areas such as the design, implementation, and utilization of PPBS.

The Planning-Programming-Budgeting System represents such a potentially significant tool for the improvement of the operations of the Federal Government that training in this area should be afforded a high degree of emphasis. This study has shown that the most neglected area in PPBS has been the training of the managers who are so central to the effective operations of the system. Training by itself cannot be expected to transform the behavior patterns of managers. These new behavior patterns have to be reinforced by the total environment of the organization, including the actions of the individual's superiors, subordinates, and peers as well as the general organizational climate and culture. However, an extensive and effective managerial training effort is the necessary first step in transforming the behavior of managers and the operation of governmental activities.

APPENDIXES

APPENDIX A-1

PROGRAM CATEGORIES AND SUBCATEGORIES OF THREE SELECTED GOVERNMENT AGENCIES

Department of Defense

- Strategic Forces
  - Offensive forces
  - Defensive forces
  - Civil Defense
- General Purpose Forces
  - Unified commands
  - Army forces
  - Navy forces
  - Fleet Marine forces
  - Air Force forces
  - Other
- Specialized Activities
  - Intelligence and security
  - National military command system and communications
  - Special activities
  - Other activities
  - Military assistance
- Airlift and Sealift
  - Airlift
  - Sealift
  - Traffic management and water terminals
- Guard and Reserve Forces
  - Strategic forces (defensive)
  - General purpose forces
  - Specialized forces
  - Airlift and sealift
  - Logistics
  - Personnel support
  - Administration
- Research and Development
  - Research -- Army
  - Research -- Navy
  - Research -- Air Force
  - Research -- ARPA
  - Research -- DASA
  - Exploratory development -- Army
  - Exploratory development -- Navy
  - Exploratory development -- Air Force
  - Exploratory development -- ARPA
  - Advanced development -- Army
  - Advanced development -- Navy
  - Advanced development -- Air Force
  - Engineering development -- Army

- Engineering development -- Navy
- Engineering development -- Air Force
- Management and support -- Army
- Management and support -- Navy
- Management and support -- Air Force
- Management and support -- Other

Logistics
- Supply
- Maintenance and service activities
- Other

Personnel support
- Training, medical, and other actitities

Administration
- Command undistributed adjustments
- Net unfinanced

Health, Education and Welfare

Education
- Development of basic skills and attitudes
- Development of vocational and occupational skills
- Development of advanced academic and professional skills
- Individual and community development
- General research
- General support

Health
- Development of health resources
- Prevention and control of health problems
- Providing health care
- General support

Vocational Rehabilitation
- Rehabilitation for disabling conditions
- General rehabilitation

Social Services
- Improving the social functioning of adults
- Improving the social functioning of the child and family
- Improving the organization and delivery of social services
- General support

Income Maintenance
- Aged assistance
- Disability assistance
- Other individual and family support
- General support

International
- Bilateral activities (State Department)
- Bilateral activities (AID)
- Bilateral activities (Other)
- Multilateral activities
- General support

Department of Labor

Manpower Development Assistance
- Education
- Training
- Special manpower programs
- Work training
- Research
- Administration

Employment Assistance
- Employment market information
- Placement services
- Special manpower programs
- Civil rights compliance
- Research
- Administration

Income Maintenance
- Unemployment insurance
- Workmen's Compensation
- Pension and retirement
- Research
- Administration

Wage and Labor Standards
- Wages and working conditions
- Occupational safety
- Utilization of women workers
- Research

Labor-Management Relations
- Administration of the Labor-Management Reporting and Disclosure Act and the Welfare Pension Plans Reporting and Disclosure Act
- Veterans reemployment rights
- Labor-management relations assistance
- Research and policy development
- Administration

Data Collections, Analysis and Dissemination
- Manpower and employment statistics
- Prices and living conditions
- Wages and industrial relations
- Productivity and technological developments
- Industrial hazards
- Foreign labor conditions
- Research
- Administration

General Support
- Executive direction and management
- Legal services
- International labor activities

Source: Listing Furnished by Bureau of the Budget, March 15, 1967, (U. S., Congress, Senate, Committee on Government Operations, Planning, Programming, Budgeting, Inquiry, of the Subcommittee on National Security and International Operations, 1969.)

APPENDIX A-2

PROGRAM AND FINANCIAL PROJECTIONS IN THE MULTI-YEAR PROGRAM AND FINANCIAL PLAN (PFP)

The projection of governmental programs over an extended period of time requires two decisions:

1. Which programs are to be considered in the projection?
2. At what level of activity are these programs to be projected?

In the Federal Government, both of these questions are addressed in the guidance to the agencies from the Office of Management and Budgeting (formerly the Bureau of the Budget).

Only those programs which are authorized by current legislation and those programs which will be proposed for enactment during the budgetary year in question are contained in the PFP. When activities require annual authorization it may be assumed that this authorization will be secured in the form last approved by the President. When programs or activities have been authorized for several past years but the authorizations expire in the current year, it may be assumed that the authorization will be renewed, but the requirement for renewal must be separately noted. This means that an agency which plans to begin a new program, substantially modify an existing program, or expand an existing program in a period subsequent to the budgetary year in question would not show this change in the PFP. The PFP then becomes a record of the consequences of current program

decisions, but it is not a plan of an agency for its future activities.

The level of programs that are projected is based on the extent to which current and past decisions legally, contractually, logically, or morally commit expenditures of the government. This commitment is difficult to define. In order to increase the precision of definition, projections are divided into the following six classes:

Class 1 -- Programs controlled by statutory formulas: To be in Class 1 the recipients and the amounts they are to receive must be specified by law. Social Security Payments and Veteran's Compensation are examples of this type of program. Future projections are made by specifying the number of recipients for the future years.

Class 2 -- Programs controlled by work-load level: This class includes programs where a specified need is to be met with a given quality of service for all qualified recipients. The Postal Service is an example of this type of program.

Class 3 -- Market-oriented programs: These programs are characterized by government commitment to respond to market conditions and are usually met by permanent budget authority. Agricultural price supports and interest on the public debt are examples of these programs. Usually the PFP includes supplementary material that shows the probable range of estimates with different environmental assumptions for future years.

Class 4 -- New programs requiring legislation: All new programs are included in this classification. Future-year projections are based on the classification the program would otherwise be in.

Class 5 -- Administration commitments: This classification includes the programs that the President has publically and specifically committed the administration to change, and the changes are to occur after the proposed budget year.

Class 6 -- Programs controlled by the level of appropriations: This classification includes most grants, foreign assistance, construction, research, service, and lending programs. Projections are made on a flat or declining trend, regardless of the projection of program needs (such as population served). There are two subdivisions of this classification:

Class 6a -- Construction and acquisition of major capital items: Equipment should have a five-year cost of $5 million or more to be included in this classification. Major modernization or mechanization of equipment in programs that are normally in other classes is included here. The projection includes the full cost even if budget authority is not to be requested until subsequent budget years.

Class 6b -- Ongoing costs: All ongoing costs and minor capital items are in this class. No increases can be shown beyond the budget year. Decreases are shown when appropriate, e.g., when pilot or demonstration projects are completed.

Normally price levels and federal pay rates are

assumed to be constant. However, where the program is highly sensitive to price-level changes (e.g., debt interest, agricultural price supports, and payments to retired personnel), future-year trends are based on the assumption that the price levels will change the same as they have in the past five years.

These projections of expenses are expressed for each agency in a summary table by each classification of commitment. The totals in this summary table correspond to the totals for all of the agency's programs.

Source: U. S., Executive Office of the President, Bureau of the Budget, Planning-Programming-Budgeting (PPB) System, BOB Bulletin No. 68-9, (April 12, 1968), Attachment B.

APPENDIX A-3

COMPONENTS OF SYSTEMS ANALYSIS

There are six components of systems analysis:

1. Objectives
2. Criteria
3. Effectiveness
4. Costs
5. Model
6. Alternatives

All of these are present in each analysis even if not explicitly stated. The relationship between the components is shown in Figure 6.

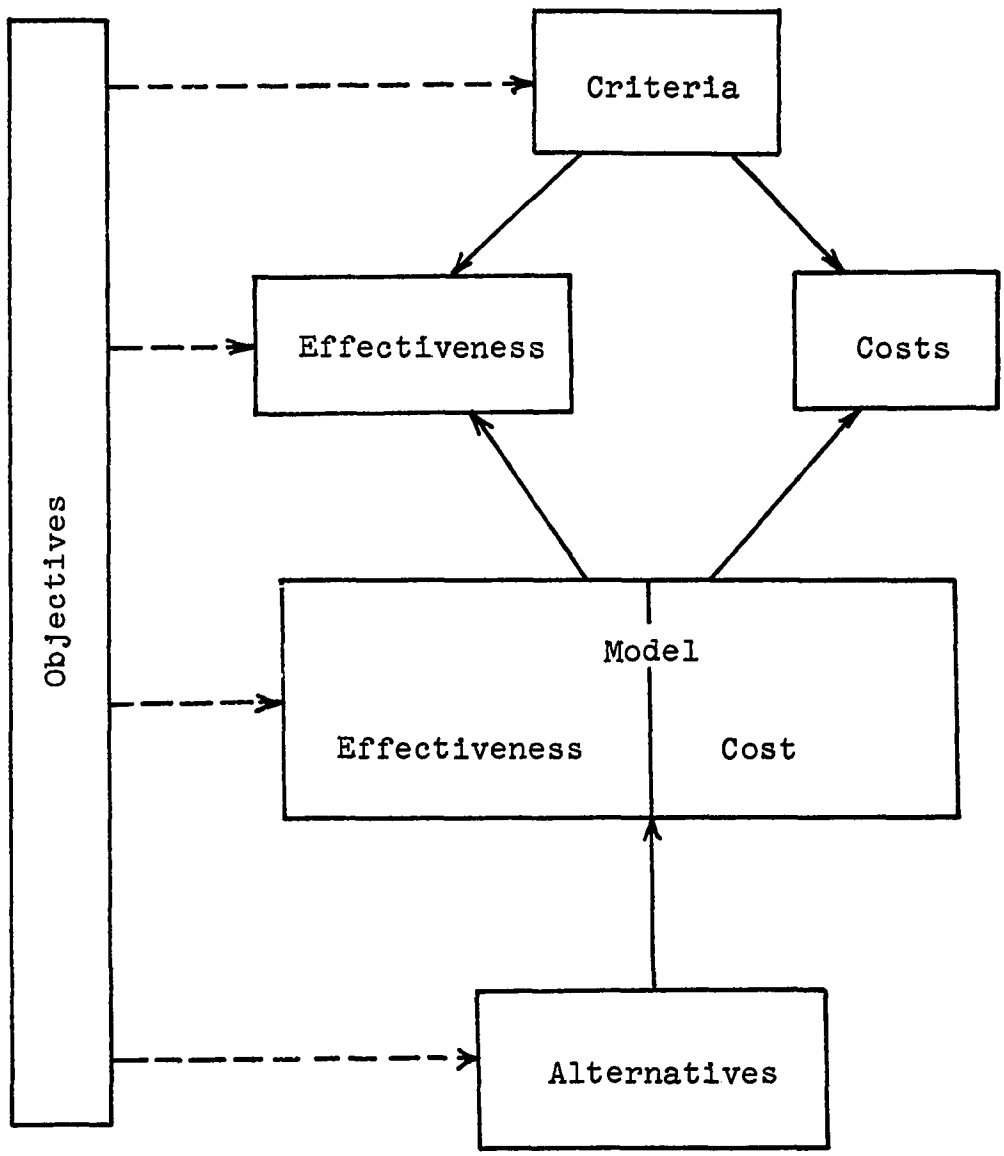
Objectives

The primary purpose of undertaking systems analysis is to assist in decision-making. The first, and probably the major, task of the systems analyst is to determine what the objectives of the decision-maker are -- or, more importantly, what they should be. The determination of the objective is central to all components of analysis. Alternatives, models, costs, and effectiveness are all derived from the statement of objectives. Until one knows exactly what is to be accomplished, any information about what is currently being accomplished or what can be accomplished is largely irrelevant.

If the objective chosen is incorrect the wrong problem is solved. This means that the analyst cannot simply accept

FIGURE 6

RELATIONSHIP OF COMPONENTS OF SYSTEMS ANALYSIS



the objective as originally stated but must subject it to extensive analysis. This is done by broadening the objective and seeing what effect this process has on the problem at hand. For example, in the area of transportation an analyst might be given an objective of building highways. If this is broadened to transporting people and goods effectively, efficiently, and safely, there are more alternatives -- e.g., rail, air, and water modes of transportation -- and the analysis is substantially changed.

During analysis of objectives the analyst is required to balance two extremes. At one extreme almost all governmental objectives could be called "contribution to national welfare," but this objective is too broad for any practical use. At the opposite extreme, objectives can be defined so narrowly that significant alternatives are foreclosed (as was the case in the objective of building highways). Between these two extremes the analyst must define in operational terms the objective of the analysis, keeping the objective low enough to be tractable and high enough not to eliminate significant alternatives.

In establishing the objective of an analysis it is important not to lose sight of the common need for multiple objectives. While analysis is simpler when a single objective can be defined, it should be remembered that the purpose of analysis is to provide information to the decision-maker and not to make life simple for the analyst. Many governmental

problems have multiple, incommensurate, and often conflicting objectives.[1] Any analysis which ignores these or tries to force them artificially into a single objective can seriously distort the decision.

Criteria

The component of criteria in systems analysis is the rule or standard used to weigh the cost and effectiveness of alternatives to determine a preferred alternative and to decide if the effectiveness achieved by that alternative is worth the cost to be expended. Obviously if the objectives of a problem are multidimensional, the criteria must also be multidimensional.

Criteria are seldom simple. Only if there is a single objective which can be measured on a single scale can the criteria be simply stated as maximizing effectiveness for a specified cost or minimizing cost for a specified level of effectiveness. Often only a part of the problem can be handled by a direct application of quantifiable criteria, and the decision-maker must be presented with data on effectiveness and cost without a firm recommendation.

In devising criteria to be used in systems analysis the following rules are appropriate:

1. The criteria should be specifically related to the

[1] An example of this occurs in the area of law enforcement. The objective of reducing crime is constrained by the objective for ensuring that the basic rights of individuals are protected.

objectives of the problem at hand.

2. Suboptimization criteria (criteria for a part of the problem) should be used with great care. It should be ensured that the achievement of the suboptimization criteria will assist in the achievement of the larger objectives of the problem.

3. The attempt to define a single criterion for an analysis should be handled with great caution. All aspects of the objective must be considered, and any arbitrary weighting of objectives that obscures, rather than highlights, meaningful information should be rejected.

Effectiveness

All of the problems in defining criteria also exist in defining effectiveness. Effectiveness is the measure of the extent to which the objectives of the problem are achieved within an established time frame and under specified environmental conditions.

A separate measure of effectiveness is obviously required for each objective of the problem. Ideally each measure of effectiveness should be quantifiable but this is not always possible, and narrative analyses of qualitative considerations are often necessary.

One of the major contributions of analysis is devising proximate measures of effectiveness.[1] These are practical

[1]The term "proximate measure of effectiveness" is borrowed from Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age.

substitutes for direct measurements of the effectiveness of programs. For example, the assured destruction capability of offensive strategic military forces is often used as a proximate measure of effectiveness for the deference of nuclear war. In the use of proximate measures of effectiveness it is necessary to remember that the scales are also only proximate. A specified per cent increase of the proximate measure does not necessarily mean the same per cent increase in effectiveness. Sometimes the best that can be hoped for in proximate measures of effectiveness is some measurable unit that points in the right direction, with the scale becoming almost meaningless.

In devising measures of effectiveness in systems analysis the analyst again has to balance his efforts between two extremes. Generally the broader the measure of effectiveness the better it relates to the objectives of the problem, but the more difficult it is to quantify and use in the analytic portion of the analysis. The more narrow the measure of effectiveness, the easier the analytic effort becomes, but the less it relates to the problem at hand.

Some rules on devising measures of effectiveness are:

1. Measures of effectiveness must be related to the objectives of the problem, and generally there must be at least one measure of effectiveness for each objective.
2. Measures of effectiveness must be thoroughly defined.
3. The limitations of comprehensiveness and scale must be

recognized on all measures of effectiveness.

4. Measurements of program size are necessary, but they are not sufficient as measures of effectiveness (e.g., the number of aircraft that can be purchased by using an alternative is important, but complete measures of effectiveness must consider what these aircraft will do in relation to the objectives of the problem).

5. Ideal measures of effectiveness are quantifiable, but it should be recognized that complete, comprehensive, quantitative measures of effectiveness are normally impossible. Qualitative measures of effectiveness should not be ignored.

Costs

Measurement of costs associated with alternatives is easier than measurement of effectiveness largely because quantitative data supporting cost measurement is available and data supporting measures of effectiveness is sketchy or nonexistent. It should, however, be recognized that the use of dollars in the measurement of costs is itself a proximate measure. Actually the concern in evaluating alternatives is the amount of resources consumed. Market value of these resources is a convenient measure of the amount of resources used, but it is not a perfect one. On occasion it might be preferable to use a more specific measure of costs (especially when the resource in question is critical or in limited

supply) in addition to the dollar measurement.[1]

There are several principles of costs that are relevant to systems analysis:

1. Future costs are used. The first and most complicating feature of cost is that the analyst is concerned with future cost, not with present cost. This fact introduces many forms of uncertainty into the analysis: uncertainty that the system will change before completion of the relevant time frame; uncertainty that the environment will change before completion; uncertainty about the cost-estimating relationships themselves -- basic data, extrapolation errors, etc.

2. Time of cost incurrence must be considered. A second principle of systems analysis is that cost must be time-phased. To be comparable to other alternatives, costs must be discounted.[2]

3. Incremental costs must be used. In the comparison of alternatives it is incremental, and not total costs, which are important. The concept of incremental costs will vary depending on the exact analysis involved. While total cost is important for many purposes, "sunk costs" do not have a place in cost-effectiveness analysis.

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[1]Even if it were cost-effective, it would be nonsensical to have a program that required a semiannual medical examination for every person in the United States if the medical personnel and facilities did not exist that could handle this work-load.

[2]Discounting of costs is discussed in Appendix A-6.

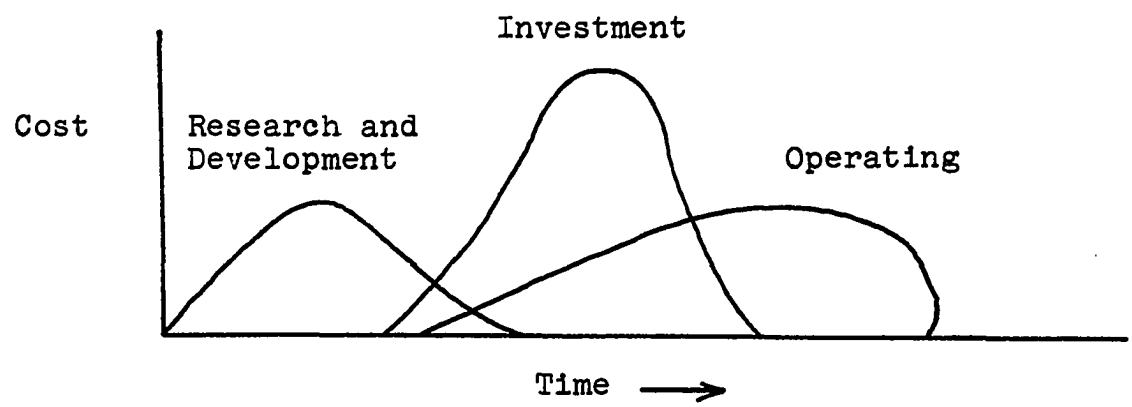
4. Opportunity costs must be used. The problem of costs is further complicated by the necessity to use opportunity costs. "Opportunity costs" means the cost of benefits that are foregone because of the choice of a particular alternative. The use of opportunity cost modifies the rule of "sunk cost" to some degree. To say unequivocally that there is no cost in a piece of equipment on hand implies a lack of understanding of opportunity cost. If this equipment can be used for another purpose, or sold, it has opportunity value and this value is the cost of retaining the equipment in its present use.

5. Full cost must be used. The principle of the use of full cost does not conflict with the principle of the use of incremental cost. "Full cost" means that all costs of an alternative must be considered regardless of where they are incurred. It is common practice for public agencies to operate to minimize their costs and, in so doing, shift costs to other agencies or to the general public. Included also in the principle of full costs is the need to consider costs which are nonfinancial. These are difficult to estimate, and qualitative estimates may be necessary.

6. Meaningful cost categories are necessary. In systems analysis a meaningful division of cost categories should be devised. In the Department of Defense, costs are broken into three categories -- Research and Development, Investment, and Operating. The timing of the typical incurrence of these costs and their definitions is noted in Figure 7.

FIGURE 7

DOD COST CATEGORIES



Research and Development - Development of a new capability to the point of introduction into production

Investment - Costs required beyond the development phase to equip forces with new capability

Operation - Recurring costs to operate and maintain the capability

The use of these three breakouts of cost is advantageous from two points of view. Visibility of the effect of the expenditure is increased since each of these cost categories has a different impact on capability. Operation funds have a definite impact on current capability but a negligible impact on future capability (other than keeping existing systems in "good" condition). Investment funds do not affect current capability, but they have a significant effect on the short-term future capability. Research and Development funds do not affect current or short-term future capabilities, but they have a significant impact on the long-term future capability.

In addition to this advantage, the broad division of funds into these categories ties into the "branch point" where a critical decision on a program is necessary. The decision to proceed from R&D to investment represents a major decision on the allocation of significant amounts of funds in future years for investment and operation.

In nondefense agencies some other breakout (such as distinguishing between operating and "grant" costs) may be appropriate. A meaningful classification scheme for costs greatly increases the illumination properties of systems analysis.

7. Relative rather than absolute accuracy is necessary. Since costs in systems analysis are future costs, absolute accuracy of prediction is impossible. In analyzing costs for cost-effectiveness analysis, it is more important that

relative accuracy be attained rather than absolute accuracy. With relative accuracy as a goal, only costs which change from one alternative to the next need to be considered.

For the purposes of cost-benefit analysis all of the costs that the alternative creates are the proper subject for analysis. The question of whether the benefits accruing are worth the costs being expended is one that can be answered only if all costs are identified with some degree of precision. This is a major reason why cost-effectiveness analysis is normally more helpful in decision-making than cost-benefit analysis.

8. Uncertainty must be considered. The final principle of costs in systems analysis is that uncertainty existing in the estimates must be explicitly recognized. This means that ranges of costs must be presented for possible statistical errors and for various contingencies.

Model

The model is the component of systems analysis that abstracts important relationships between alternatives, effectiveness, costs, and the environment. In order to cope with the host of variables in any problem, the model identifies the interrelationships and variables which are crucial and suppresses the others. For these crucial variables, cause-and-effect interrelationships are determined so that effectiveness and cost consequences of various alternatives can be explored.

It is not necessary that all of the relationships in a systems analysis model be stated in a mathematical format. Logically derived relationships often must be used, especially where qualitative aspects of the problem are important.

In the construction of the model it is essential that assumptions regarding which factors are relevant and their interdependencies be explicit. These assumptions are then open for study, criticism, evaluation, and improvement.

It is important to note that the model is not equivalent to the real problem. By definition, all models are incomplete, idealized abstractions of the real world. The test of adequacy of a model is not complexity but ability to predict the consequences of alternatives.

It is also important to understand that there is no single form of model best for all problems. The model in a specific systems analysis depends both on what is being modeled and on the questions that are being asked.

The process of structuring the model has benefits beyond the ability of the finished model to predict costs and effectiveness. The breaking down of a complex system into its component parts and observing their interactions provides the analyst and decision-maker a clearer understanding of the problem. Also the model, with component parts and interactions explicitly exposed, serves as a precise structure for communication between the analyst, decision-maker, and appropriate experts.

To this point in the discussion it has been assumed that there is a single model for each systems analysis. In reality, most systems analyses require a multiplicity of models. These can usually be classified into effectiveness models and cost models. The effectiveness model translates the output of alternatives described in operational terms into measures of effectiveness. For example, in a strategic warfare model the performance characteristics (speed, payload capacity, etc.) of the aircraft and missiles under consideration would be the description of the alternatives. The model translates these performance capabilities into a meaningful measure of effectiveness such as assumed destruction capability for a selected group of targets. In the effectiveness model environmental characteristics play an important role. In the strategic warfare example the type of war, the political constraints, and the enemy's capability are central factors for consideration.

In concept the cost model is much easier to construct and operate. The steps involved in cost-estimating include:

1. Defining the alternative in detail, including a complete description of the equipment or program, and its operating concepts and policies;
2. Collecting cost data;
3. Converting the alternative into a description of all of the resources needed;
4. Costing out the resource requirements.

Cost model construction is, however, seldom that simple. An attempt to individually cost out all of the items in a large complex system becomes expensive drudgery, and because of the lack of accuracy that is usually found in early system descriptions, the finite accuracy implied by such an approach is misleading.[1]

For this reason it is often necessary to find methods that allow quick estimates of costs in systems analysis. This is usually accomplished by relating some broad performance characteristic of the system to an element of cost in a statistically derived equation. For example,in the Department of Defense one equation used for the nonrecurring engineering cost of airframes is:

$$\text{Dollars} = 14\ S_k^{0.54} W^{0.88}$$

where S_k is the maximum speed in knots for the aircraft and W is the estimated weight of the aircraft in pounds.[2] The Department of Defense has formulated many of these equations, called Cost-Estimating-Relationships (CER's) for different equipment, Research and Development, and Investment costs.

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[1]For example, the detailed "grass roots" approach to pricing the C-5A required the efforts of sixty persons for approximately four months each on a system that was relatively well defined at the time the estimate was made. The high degree of cost-error in that estimate is a testimony of the futility of attempting to precisely price each part of a complex system during the early stages of analysis. (Donald B. Rice, "Cost Analysis in the Department of Defense," Readings in Command Management -- Analytical Methods, U. S., Department of Defense, Department of the Army, p. 31-23.)

[2]J. D. McCullough, Cost-Analysis for Planning-Programming-Budgeting Cost-Benefit Studies, p. 27.

It is obvious that the final product of the cost model is dominated by uncertainties. CER's themselves contain statistical error. In addition, the performance parameters of the proposed alternative as well as the environmental and operating conditions of the problem are all highly uncertain.

A final complication in cost models is the need to time-phase the cost. The model cannot be indifferent to the time of cost incurrence. Of course environmental aspects greatly effect the time when cost will be expended. The necessity for time-phasing then adds another element of uncertainty to the model.

Alternatives

Systems analysis is predicated on the assumptions that alternative ways exist to achieve given governmental objectives and that these alternatives should be considered by the decision-maker. If there is, in fact, only one way to achieve a properly defined objective, it would be inappropriate to expend time and money conducting a systems analysis.

The process of conducting analysis is itself a source of alternatives. The investigation of the objective, especially when the objective can be broadened, suggests alternatives that might have been neglected. Also the determination of criteria and measures of effectiveness suggests new alternatives to the analyst and the decision-maker. Finally

the process of constructing the model to be used in analysis is a powerful source of alternatives. By exposing the major variables and interactions, the model can suggest better ways to accomplish a given objective.

Summary

Each of these components has been discussed separately. It is obvious that they interact greatly with one another. For example, the capability of the model partially determines the measures of effectiveness that can be used since it would be nonsensical to devise a sophisticated effectiveness measure if the different alternatives could not be compared using that measure. The interaction of the components can be seen more easily by the discussion in Appendix A-4 of the process followed in the analysis of a problem. All of these components exist in almost every decision-making situation. A virtue of systems analysis is that they are made open and explicit rather than remaining hidden.

Sources: The following sources supplied most of the background for the above discussion of components of systems analysis:

1. Analysis for Military Decisions, ed. by E. S. Quade.

2. Systems Analysis and Policy Planning: Applications in Defense, ed. by E. S. Quade and W. I. Boucher.

3. Hitch and McKean, The Economics of Defense in the Nuclear Age.

4. McCullough, Cost Analysis for Planning-Programming-Budgeting Cost-Benefit Studies.

APPENDIX A-4

PROCESS OF SYSTEMS ANALYSIS

The process of systems analysis is distinctive and can be divided into the five stages shown in Figure 8. In this figure the iterative nature of this cycle is emphasized. At any stage of the analysis the analyst can return to an earlier stage to refine it on the basis of additional information received. This commonly occurs in the analysis of most complex problems.

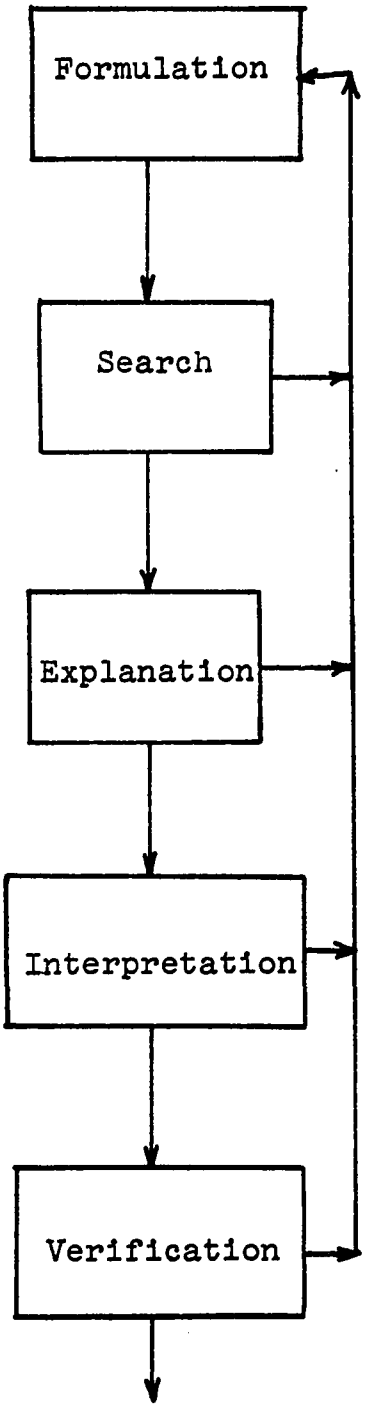
Formulation

The formulation stage of the process of systems analysis is perhaps the most important. During this stage questions to be answered are determined and the context in which these questions are to be answered is defined. This determination of the questions to be answered is central to the analysis. By determining the objectives to be sought, the scope of the problem is effectively set. The general rule in establishing the scope of the problem is to expand it until the most important interactions are included. This general rule must be tempered with the knowledge that the problems must be in a tractable form. If any important interactions are excluded from the scope of the problem in order to retain manageable proportions, they should be considered in the interpretation stage.

Tentative measures of effectiveness and assumptions

FIGURE 8

PROCESS OF SYSTEMS ANALYSIS



to be used in the analysis are formulated, and the important variables that will be operating on the problem are determined during formulation. Important variables are determined by their effect on the problem. If the variable does not significantly effect the problem, it should be excluded. Insensitivity of the problem to the values of certain variables can occur because the variable is trivial or because the variable affects all of the alternatives under question in the same manner. Once the important variables have been identified, they are usually aggregated to make the problem more manageable.

When this tentative list of important variables has been established, tentative relationships between them are established. These relationships are often sketchy at this point because of the lack of empirical data.

It is important to note the general process that is followed in the formulation stage. First the problem is expanded as far as possible. Then it is decomposed to note significant variables. Finally these variables are aggregated to make the problem size more manageable, and relationships are established between these variables.

The end result of the formulation stage is a set of hypotheses concerning:

1. the proper scope of the problem;
2. the proper objectives of the problem;
3. the major variables acting in the problem; and
4. the interactions between these variables.

All of these hypotheses are tentative and are usually revised in subsequent stages of the analysis. This is the primary reason that the cycle in iterative. However, it is important that these hypotheses be formulated at this stage of the analysis. This gives structure to the remaining steps in the analysis. It is equally important that these sketchy hypotheses not be accepted as absolute in subsequent stages. They must each be subjected to analysis to determine if they are in fact valid. The scope of the problem and objectives must be continually investigated to ensure that they are correct. Variables that were excluded from the analysis because of the insensitivity of the problem must be assessed continually to ensure that this exclusion is still correct. Interrelationships between variables must be defined more explicitly in the subsequent stages and should be subjected to continuous testing for validity.

Search

This phase is concerned with the collection of data to be used throughout the analysis. The search phase is guided, but not totally restricted, by the hypotheses formulated earlier. In addition to facts to support or reject the hypotheses already formulated, possible alternatives are a subject of search. Not only obvious alternatives but hidden alternatives and improvements of the obvious alternatives should be the subject of this search. The active search for alternatives does not imply that all possible

alternatives will be investigated. To make the analysis manageable it is normally necessary to exclude some alternatives from detailed consideration. This exclusion should not be performed arbitrarily, but should be a subject of analysis itself. The reasons for excluding some alternatives from consideration should be explicitly stated and periodically re-evaluated.

A major part of the search phase is devoted to filling out the relationships between major variables. Detailed cause-and-effect relationships should be formulated and verified. Cost-estimating relationships are also formulated.

The search phase could be extended indefinitely since there is no end to the amount of information possible in any major analysis. Most search phases are incomplete because of time and cost limitations of data-gathering. Even if cost and time were unlimited, it is doubtful if all data could be gathered. Some tests that would provide valuable information are practically impossible.[1] As a result of this, one of the most difficult decisions during analysis is where to stop gathering data. There is no set rule for determining this. The time available for decision, the cost of additional data and the probable impact if the information is not received must be considered and a decision on when to

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[1]For example, the reaction of a military enemy to the use of a tactical nuclear weapon in a limited conflict could be a valuable input to some analytic efforts. The political cost of using a nuclear weapon merely to gather information for analysis would be prohibitively high.

proceed to other phases made.

Explanation

The first step in the explanation phase is the construction of the model to be used to investigate effectiveness and cost implications of various alternatives. This model integrates the variables and their interactions which are important to the problem.

Once the model has been formulated, computations and comparisons of the various alternatives take place. The end result should be a listing of all alternatives and their effectiveness. Because of the uncertainty existing in most systems analysis, it is doubtful if any one presentation of effectiveness and cost measures is possible.[1]

Interpretation

The interpretation phase of systems analysis is where the analyst and decision-maker view the product of the model and subject it to critical questioning. These questions investigate the effect of variables omitted from the model (particularly qualitative aspects of the problem); investigate the reasonableness of the assumptions made; and consider uncertainties. Finally a conclusion is reached.

It is possible that during interpretation none of the alternatives are acceptable. In this case it might be

[1]The treatment of uncertainty is discussed in more detail in Appendix A-5.

necessary to redefine the problem, including the objectives and criteria, and search for new alternatives.

Verification

This phase normally involves the testing of the conclusions by experiment. It should be recognized that verification in a rigid sense is not always possible since experimentation in many real-world situations, particularly most military problems, is virtually impossible. The closest that one can come to scientific precision in this case is to open the analysis for criticism and debate.

Summary

Based on the discussion above, a more detailed process chart of the process of systems analysis can be constructed (Figure 9). This figure shows the major steps in each of the five stages. The normal flow of systems analysis is noted by solid lines. Broken lines show the major elements causing the process to cycle. For example, during Step 9, "Build Model," it is often necessary to return to Steps 6 and 7.[1]

In view of the potentially infinite cycling of the systems analysis process, a decision must be made when each step is adequate and no further cycling is necessary. Analysis of a complex system is never perfectly complete.

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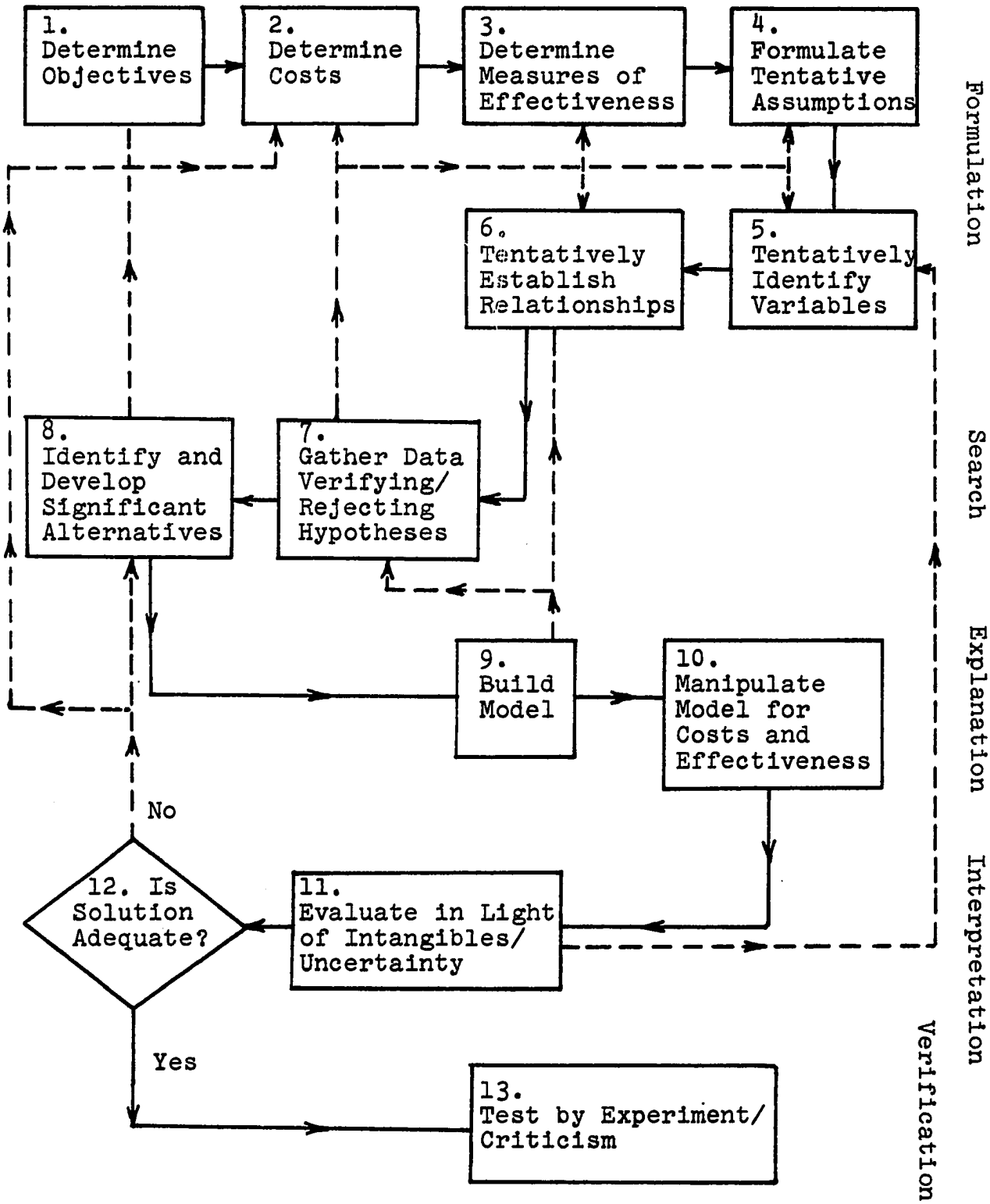
[1]All of the cycle movements of the process are not shown. For example, it might be necessary to go from Step 9 to any of the previous steps in the cycle and not just to Steps 6 and 7.

FIGURE 9

DETAILED PROCESS OF SYSTEMS ANALYSIS



The object is to have a partial analysis which is as meaningful as possible. All systems analyses follow this general process. One of the aspects of systems analysis that distinguishes it from alternative forms of decision-making is the open and explicit nature of the various steps shown in this process. This is considerably different than decision-making by purely intuitive means, which obscures the entire process between determining objectives and reaching a solution.

Source: This discussion was adapted from E. S. Quade, "Methods and Procedures," Analysis for Military Decisions, ed. by E. S. Quade, pp. 156-76.

APPENDIX A-5

TREATMENT OF UNCERTAINTY IN SYSTEMS ANALYSIS

One of the characteristics of the problems upon which systems analysis operates is that a large amount of uncertainty exists. One of the major advantages of the use of systems analysis is its explicit treatment of this uncertainty.

Actual Uncertainty and Risk

Before discussing the treatment of uncertainty, it is necessary to draw a technical distinction between two forms of uncertainty:

Situations of risk where the uncontrollable random event comes from a population which has a known probability distribution;

Situations of actual uncertainty where the uncontrollable random event comes from a population where the probability distribution is not even known.[1]

Two aspects of these definitions should be accented. Both risk and uncertainty are characterized by uncontrollable random events. If the event is controllable it becomes a variable in the analysis itself. The difference between risk and uncertainty is knowledge of the probability of a random

[1]For purposes of convenience, actual uncertainty will be referred to as uncertainty without continual reference to the "actual" in the remainder of this Appendix.

occurrence. Of course this knowledge of the probability of occurrence is often sketchy itself.

It is improper to consider these two as interchangeable during analysis. Analysis which arbitrarily assigns probability values to uncertainty in order to make it more tractable to calculation has to make some rather arbitrary assumptions which could lead to incorrect conclusions.[1] Of course some situations of uncertainty can be converted into situations of risk by further analysis, data-gathering, or experimentation. This may contribute to a more usable analytic product.

Use of uncertainty in analysis implies some knowledge about the possible events even if the probability of the occurrence of these events is unknown. If knowledge is so limited that possible states cannot even be predicted, it is doubtful if systems analysis will be able to provide much insight into the consequences of uncertainty.

Sources of Uncertainty and Risk

The basic source of uncertainty comes because analysis is concerned with the future. The further into the future that analysis attempts to penetrate, the more pervasive becomes the element of uncertainty. The sources of uncertainty

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[1]The treatment of uncertainty by assigning probability values is improperly recommended by some writers. For example, see U. S., Department of Defense, Department of the Army, Decision Analysis Using Present Value Techniques, by George B. Williams, James S. Sutterfield, and Mary S. Biagioli, and Frank J. Husic, Cost Uncertainty Analysis.

and risk can be described by four broad classifications: planning factor uncertainty, environmental uncertainty, technological uncertainty, and personal reaction uncertainty.

There are both uncertainty and risk involved in planning factors in systems analysis. The way that a program is to operate in the future is always unknown. Some elements can be assigned specific probabilities and others cannot. For example, the chance variation of dispersal in bombing errors can usually be assigned a probability distribution. However, in an advanced system there is an element of uncertainty on even the average size of the bombing error to be achieved. Planning factor uncertainty is most often seen in the formulation of cause-and-effect relationships and operates on both the cost and effectiveness parts of the model. In developing cost-estimating relationships, statistical error is always present since a relationship that allows "perfect fitting" of data is seldom possible. The translation of alternatives into performance rates and then into measures of effectiveness is subject to a high degree of uncertainty which is usually greater than the possible statistical errors faced in cost analysis.

Probably the most pervasive form of uncertainty in systems analysis comes from the environment. These uncertainties often dominate all others. In military situations the scope of future conflicts (local or general), their location, and the political constraints are all critical to

analysis. In nondefense programs the state of the economy, price-level changes, etc. often have a major bearing on the analysis and the proposed alternatives.

Technological uncertainty is also everpresent. Of course technological uncertainty increases the further one attempts to push the state of the art. Technological uncertainty is then a major factor in programs with a high technological content.

Finally there is a source of uncertainty regarding the reactions of individuals who interact with the system. In military systems analysis this is primarily manifested in the reaction of the enemy and is one of the most complicating factors of analysis. It cannot be assumed that the enemy will not change as a result of program decisions; yet, it also cannot be assumed that he will be omniscient and make changes that perfectly negate any advancements that the program promises.

A form of personal reaction uncertainty also exists in many nondefense programs. For example, the reaction of the individuals in the work force to "guaranteed income" is highly uncertain. One advantage of the nondefense programs is that much of this uncertainty can be reduced to risk by experimentation, while experimentation with enemy reactions can be expensive both in resources consumed and in political costs.

Environmental, technological, and personal reaction

uncertainty affect both costs and effectiveness. This means that outputs of analysis cannot be considered as perfectly finite or absolute.

Handling Uncertainty and Risk

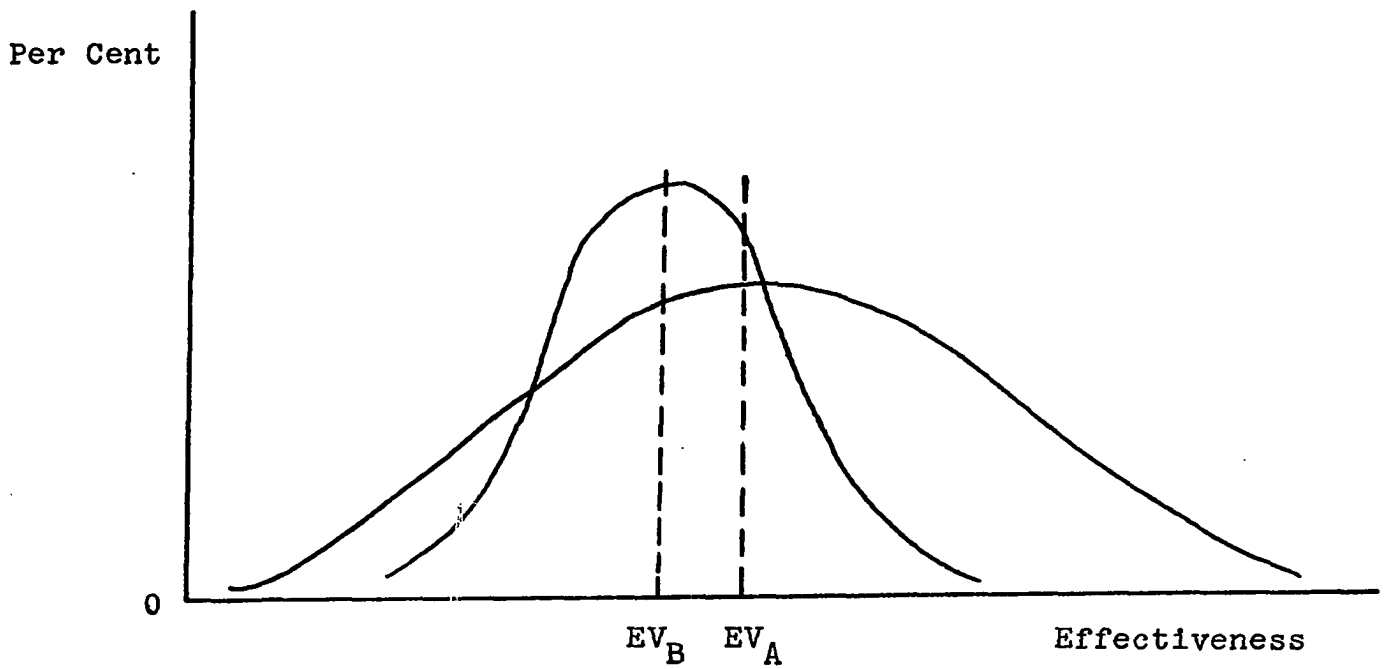
The most sweeping generalization about uncertainty and risk in systems analysis is that they cannot be ignored. Some writers advocate an approach to uncertainty and risk of calculating an expected value and maximizing this. The use of such an approach is subject to the following criticisms:

1. It is assumed that a valid probability distribution is known for all chance variables. While this is true for risk, it is incorrect for uncertainty. To calculate an expected value when uncertainty exists, one must either ignore the uncertainty or arbitrarily weight each possible state of uncertainty with a probability. Either of these could lead to grossly misleading results.
2. Even where only risk exists, the use of an expected value as a sole criterion is questionable. This presumes that the decision-maker is indifferent to the range of values. This presumption is seldom true. Consider the case shown in Figure 10. Here the decision-maker may want to choose alternative B with a lower expected value because of its smaller variation.

Two other methods of handling uncertainty (used particularly in calculating benefit/cost ratios in the natural

FIGURE 10

PROBABILITY DISTRIBUTIONS OF EFFECTIVENESS OF
TWO HYPOTHETICAL ALTERNATIVES



EV - Expected Value of Effectiveness

resource areas) are shortening the time horizon and/or raising the discount rate used in the evaluation. These methods are questionable. When one adjusts the discount rate and/or shortens the time horizon to compensate for uncertainty, the uncertainty is treated implicitly and not explicitly. The effects of uncertainty are then hidden from the decision-maker.[1]

One of the major techniques used to treat uncertainty is sensitivity analysis.[2] In sensitivity analysis planning parameters are allowed to vary over a relevant range, and the effect on costs and effectiveness is noted. The result of sensitivity analysis is a set of sensitivity curves. A group of typical sensitivity curves is shown in Figure 11. The major considerations in the interpretation of sensitivity curves are the slope and the shape of the curve. In Figure 11, curve A indicates that the cost or effectiveness is relatively insensitive to the characteristic being varied. By contrast the characteristic shown by curve B is very sensitive. Curve C illustrates the case where cost and effectiveness is sensitive in the lower range but insensitive in the higher range. Curve D indicates a characteristic which

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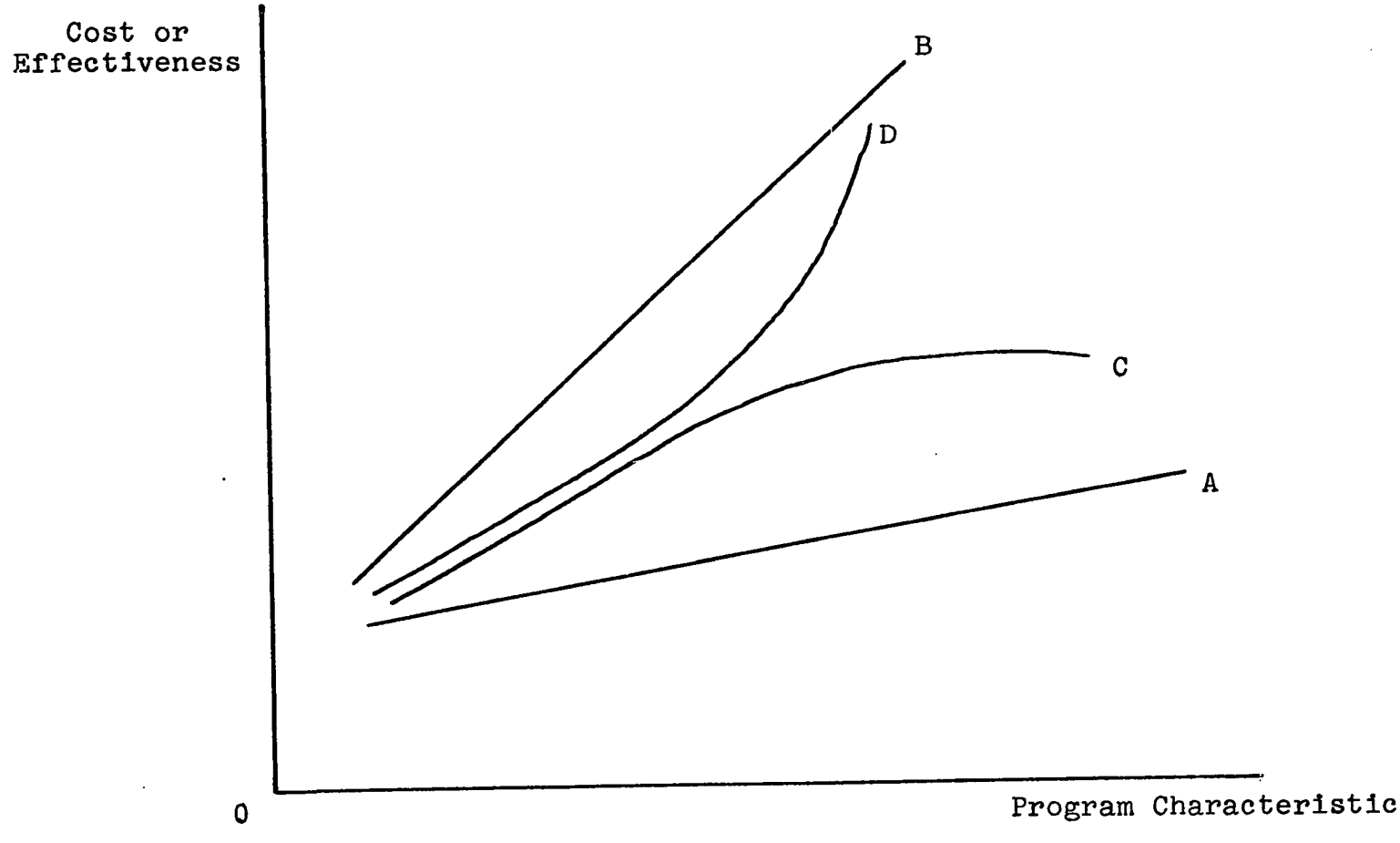
[1]The use of an increased discount rate to handle risk or uncertainty can also have the opposite reaction to the one desired. This is discussed in Appendix A-6.

[2]In its common usage, "sensitivity analysis" is used to treat uncertainty associated with planning factors. The treatment of uncertainty from environmental and technological factors and personal reactions will be termed "contingency analysis."

FIGURE 11

ILLUSTRATIVE SENSITIVITY CURVES



is sensitive in the lower range and acutely sensitive in the higher range.

For illustrative purposes the above curves have been constructed with a single line. In most practical situations the sensitivity curves would appear more like Figure 12. On this curve the effectiveness or cost for each system characteristic is not calculated only at a finite point, but statistical uncertainties in cost and performance calculations are recognized and a range of possible values presented. This range of values is most important when the range varies with the characteristic (as is the case in Figure 12).

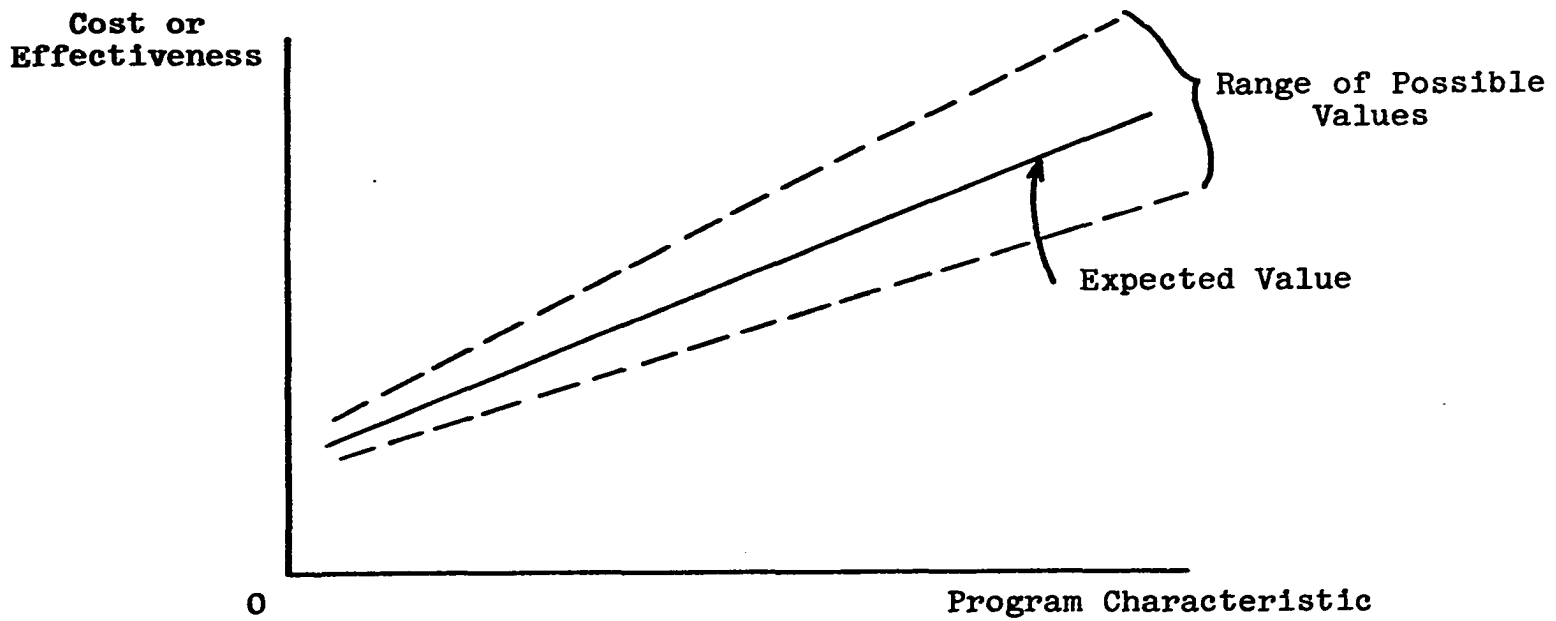
There are cases where the program characteristic involved does not lend itself to quantification on a numerical scale. Sensitivity analysis is still possible using qualitative descriptions of the characteristic. In the Department of Defense it is common to use three estimates -- optimistic, pessimistic, and most likely -- and to determine a statistical range of possible values for each of these.

Another technique used in systems analysis to treat uncertainty is contingency analysis. Here the analyst answers the important "what if" questions. Different environmental, technological, and personal reaction contingencies are postulated, and alternatives are evaluated for each of them.

Also uncertainty can be explicitly handled by subjecting an alternative to a fortiori analysis. In this case,

FIGURE 12

SENSITIVITY CURVE WITH RISK ADDED



the question is asked of every possible contingency and program characteristic -- what is the worst that can happen from the point of view of the preferred alternative? All uncertainties are resolved in favor of this worst possible case, and the alternative which appears to be preferred is compared to other alternatives in this state. Obviously if the preferred alternative retains its edge or even remains close in costs and effectiveness to other alternatives in these circumstances, this is a powerful argument for its adoption.

Effect of Uncertainty Analysis on Decisions

The purpose of uncertainty analysis is the same as all other parts of systems analysis -- to provide information to the decision-maker for a better-informed decision. It has already been noted that a decision-maker might choose an alternative with a smaller expected pay-off because of the greater certainty of a minimum level of results. The decision-maker may also wish to compromise cost or effectiveness in one circumstance or contingency to ensure a minimum (maximum) level of effectiveness (cost) in another circumstance or contingency.

Perhaps the greatest contribution of uncertainty analysis is its effect on the design of alternatives. One of the primary purposes of systems analysis is to try to find "better" ways of accomplishing objectives. One of the characteristics of these "better" ways is the insensitivity of

their costs and effectiveness to different contingencies and uncertainties. Often this insensitivity is attained by "hedging" (using a mix of alternatives) to ensure a higher degree of capability across the entire range of possible circumstances. Another form of "hedging" occurs when the knowledge of uncertainty keeps the decision-maker from making a firm decision. In order to reduce uncertainty it is decided to gather more knowledge about the system, its environment, future technology, and possible personal reactions. Another beneficial result of uncertainty analysis is to highlight the specific areas where increased knowledge would be beneficial. Areas where costs or effectiveness are uncertain can be subjected to a higher level of experimentation and research to reduce the range of variability.

The fact that the explicit treatment of uncertainty by systems analysis allows a better-informed decision does not imply that the decision-maker's task is simplified. Actually, the requirement for decision may be complicated because the decision-maker must explicitly face uncertainty that he was unaware of before systems analysis. The choice between alternatives A, B, and C in Figure 13a is difficult enough. This difficulty is compounded by noting the envelope of possible outcomes of alternatives as shown in Figure 13b.

One practical caution should be expressed in regard to the treatment of uncertainty in systems analysis. It is no more possible to treat in analytic detail each possible contingency or each possible performance characteristic than

FIGURE 13

EFFECT OF UNCERTAINTY ON DECISION-MAKER'S CHOICES

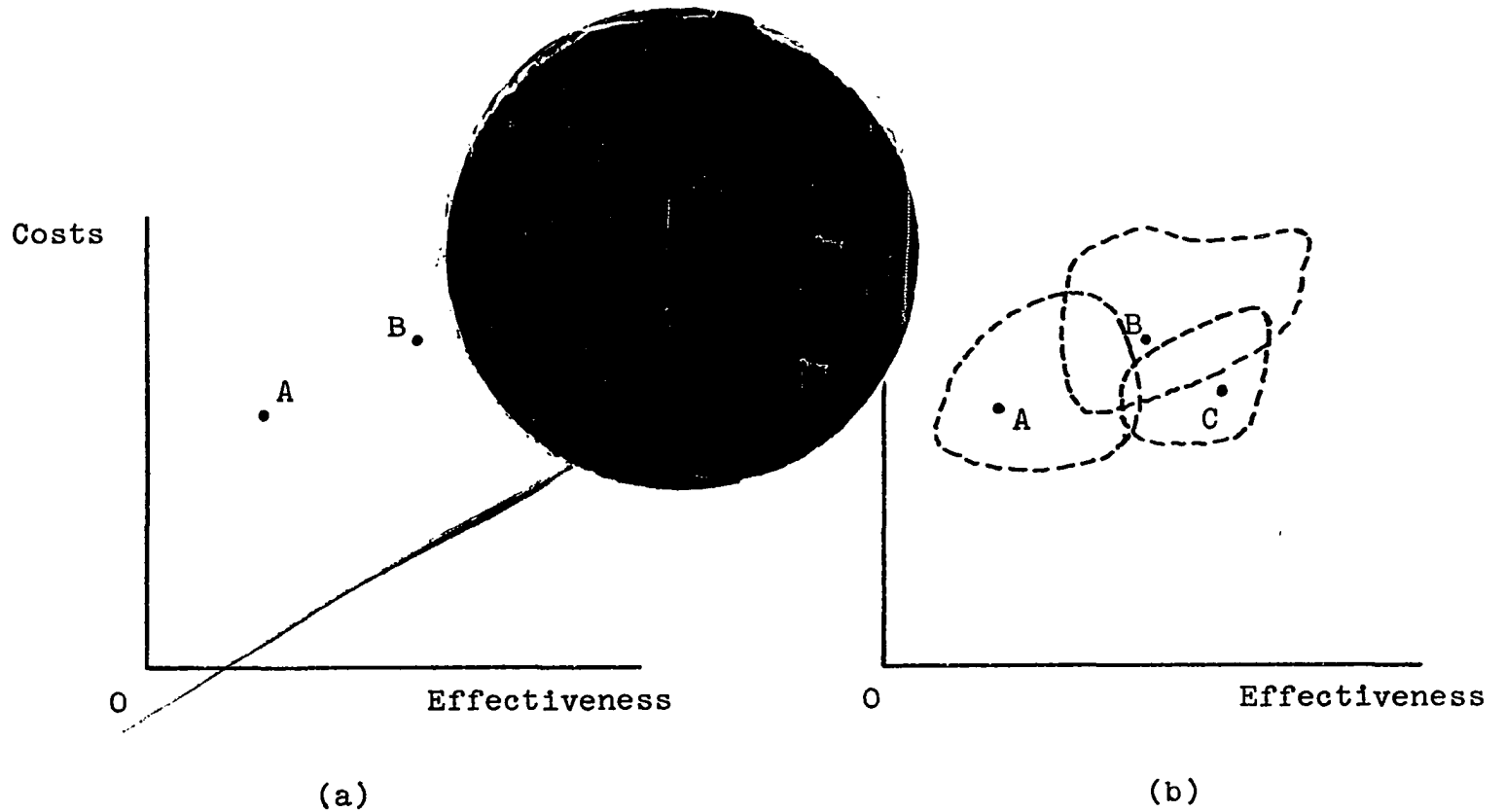
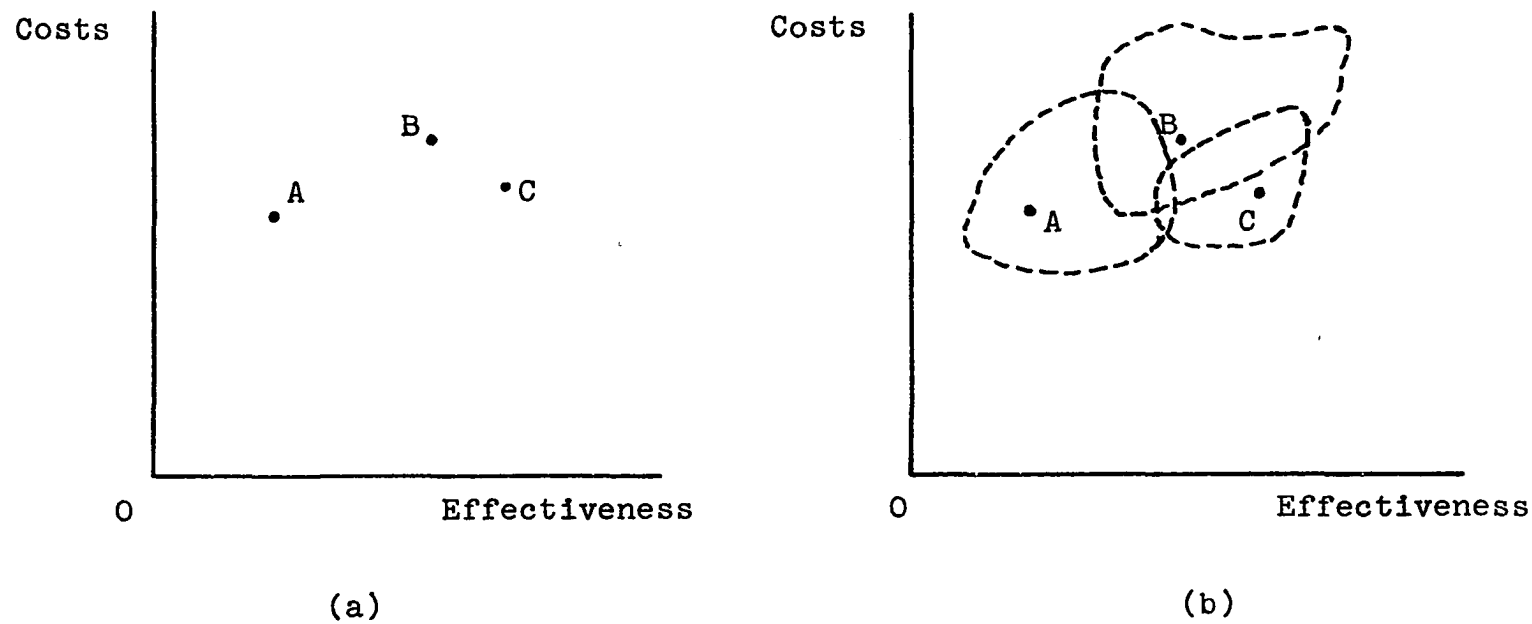


FIGURE 13

EFFECT OF UNCERTAINTY ON DECISION-MAKER'S CHOICES



it is to investigate every alternative possible or to include all variables in the model. Some preliminary screening of states and parameters to be subjected to sensitivity and contingency analysis must take place. It is important that this screening be performed openly and as empirically as possible to ensure that the most significant features are investigated. Even without total inclusiveness, the explicit treatment of uncertainty by systems analysis remains one of its primary strengths as a decision aid.

Sources: The following were the primary sources used in developing this appendix:

1. Systems Analysis and Policy Planning: Applications in Defense, ed. by E. S. Quade and W. I. Boucher.

2. Analysis for Military Decisions, ed. by E. S. Quade.

3. F. S. Pardee, The Financial Portion of a Management Information System.

4. Charles J. Hitch, An Appreciation of Systems Analysis.

APPENDIX A-6

DISCOUNT RATES IN SYSTEMS ANALYSIS

The area of systems analysis and cost-benefit analysis that has received the greatest academic attention has been the handling of time in the calculation of net benefits and costs. The time element is critical since resources are not necessarily expended and benefits are not necessarily received at one specific time. For example, if a dam is constructed there is a large initial investment cost; there are continuing operational costs; and benefits (flood control, recreation, hydroelectric power, etc.) continue to accrue for the life of the dam. Since money itself has a time value (i.e., one dollar consumed today is worth more than a dollar comsumed one year from today), the valuation method used in benefit-cost analysis must include some form of discounting of future benefits and costs. In this regard, cost-benefit analysis is similar to investment analysis in industry.[1]

Different Discount Rates Proposed

Proposed discount rates can be classified into four general schools. These are:

1. Using the rate of return of capital in private industry.[2]

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[1]Robert N. Anthony, Management Accounting, pp. 626-32.

[2]Jacob A. Stockfisch, "The Interest Rate Applicable to Government Investment Projects," Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 187-201.

2. Using a social cost rate which uses a weighted average of source of funds by financing, i.e., one rate for funds accumulated by taxing, and another for funds accumulated by borrowing.[1]

3. Using a social cost rate which considers the ultimate source of the funds in determining a weighted average. Funds from consumers (even if collected by taxation) are weighted at the long-term government bond rate, and funds from industry are weighted by the pretax return on capital rate. All funds which would be otherwise unemployed are weighted at 0 per cent.[2]

4. Using the rate of interest on borrowed government funds. Senate Document 97 giving the Congressional guidance on the discount rate for water resource projects states that discount rates

> . . . shall be based on the average rate of interest payable by the Treasury on interest-bearing marketable securities of the United States outstanding at the end of the fiscal year preceding such computation, which upon original issue, had terms to maturity of 15 years or more.[3]

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[1]Aaron Wildavsky, "The Political Economy of Efficiency: Cost-Benefit Analysis, Systems Analysis and Program Budgeting," Public Administration Review, XXVI (December, 1966), 292-310.

[2]William J. Baumol, "On the Appropriate Discount Rate for Public Projects," The Analysis and Evaluation of Public Expenditures: The PPB System, U. S., Congress, Joint Economic Committee, Vol. I, 1969, pp. 489-503.

[3]Elmer B. Staats, "Survey of Use by Federal Agencies of the Discounting Technique in Evaluating Public Programs," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, p. 217.

It is not surprising that these diverse methods of calculating appropriate discount rates achieve diverse results. The range of rates runs from 3.2 per cent for long-term bonds to 15 per cent for industrial return on capital. The social costs methods indicate discount rates from 5 to 10 per cent. The ambiguity of what discount rate to use is not limited to governmental projects. In business, various figures are used, and the most common figure is determined by a subjective statement by management.[1]

The use of discount rates in the government varies by as much as the theoretical arguments vary. Actual rates used range from 3 per cent by the Office of Economic Opportunity on Job Corps programs to 12 per cent by the Department of Interior on energy and mineral development programs, where exploitation is a private function. Most civilian agencies (Tennessee Valley Authority, General Services Administration, Department of Agriculture, and Department of Transportation) use a 4.2 to 5 per cent.[2] The current guidelines for discounting on a government-wide basis are contained in Bureau of the Budget Circular No. A-94, which requires that discounting be done at a rate no lower than the current rate of yield on

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[1]Anthony, Management Accounting, p. 633.

[2]Staats, "Survey of Discounting Technique," Program Budgeting and Benefit-Cost Analysis, ed. by Hinrichs and Taylor, pp. 222-24.

government bonds.[1] Individual agencies also have specific guidance on the discount rate to be used. For example, the Department of Defense requires a 10 per cent rate.[2]

While there is considerable conflict over the specific rate which should be used for discounting costs and benefits of public projects, the economics profession generally agrees that the 3.2 per cent which is the coupon rate of interest on long-term bonds is too low. From this point of common agreement, theories to use rates from 5 to 15 per cent are advanced.

Effect of Different Discount Rates

One of the ways of noting the effect of the use of different discount rates is to see how approved projects would be affected by rate changes. One study considered Corps of Engineers projects. By varying the discount rates, the percentage of projects which would have unfavorable benefit-cost ratios were:

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[1]U. S., Congress, Joint Economic Committee, Economic Analysis and the Efficiency of Government, Hearings, before the Subcommittee on Economy in the Government, 1969, p. 705. There are two distinctions between this rate and the rate directed by Senate Document 97. BOB Bulletin A-94 includes all government bonds and not just those with an original term of maturity of fifteen years or more. These latter bonds normally have a statutory limit to their rate of interest. Also the BOB direction is for current yield -- not the coupon yield of the bonds. Generally the BOB direction will result in higher discount rates than will Senate Document 97.

[2]U. S., Department of Defense, Economic Analysis of Proposed Department of Defense Investments, DOD Instruction 7041.3, (February 26, 1969), p. 6.

Discount Rate	Percentage Unfavorable
2-5/8	0 per cent
4	9 per cent
6	64 per cent
8	80 per cent[1]

This study assumes that proper benefits and costs have been considered and that the estimates of their magnitude are correct.

One of the more interesting approaches to the use of a discount rate is taken by Charles J. Hitch and Roland N. McKean. They recommend that a "rough average" of the rate of return in the private economy be used (about 6 to 8 per cent). But the significant point that they make is that the uncertainties of costs' and benefits' estimation are so large that it is unnecessary to insist on absolute precision for discount rates.[2]

One of the disturbing practices in the use of discount rates within the Federal Government has been the tendency of some activities to try to account for uncertainties and risks by raising the discount rate. As noted in Appendix A-5 this practice obscures, rather than illuminates, the effect of uncertainty on a proposed alternative. In the case where only costs are calculated in dollar terms and benefits are calculated in some other units, this procedure can also be totally misleading. Consider the example where two

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[1]Wildavsky, "Political Economy of Efficiency," p. 297.

[2]Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age, pp. 213-14.

alternatives, each with identical cost streams of $100,000 per year for 20 years, are under consideration. If Alternative A is considered an average risk and the agency policy of discount rates is to use 8 per cent per year, the present value of the costs would be $981,815. If Alternative B has a relatively high element of risk and a 10 per cent discount rate were used to reflect this higher degree of risk, the present value of the costs would be $851,356. If all else were equal, the tendency would be to select Alternative B with its lower cost -- a decision which is contrary to "common sense."

Recommendation for Use of Discount Rate

While it is improper to use the discount rate to account for uncertainties in the analysis, it is proper to consider the discount rate as one of the uncertain elements of analysis. A rate of 6 to 10 per cent should be used in initial calculations, and the effect of different discount rates on costs (and benefits, if appropriate) should be explicitly considered.

APPENDIX A-7

BENEFIT/COST RATIOS AS OBJECTIVES IN SYSTEMS ANALYSIS

There is a tendency by some practitioners of systems analysis to use the maximum benefit/cost ratio as an objective in cost-effectiveness analysis. This practice does not conform to economic optimization. To illustrate the possible divergence between the economic optimization and maximum benefit/cost ratios as objective functions, consider the highly simplified example where all benefits can be accurately measured on a dollar scale; the area which is in question is one that can be achieved by only one alternative which can vary in size (or rate of output); and the benefits vary linearly with the rate of output. This is shown in Figure 14.

If a vector, OY, is defined that extends from the origin to the cost for any given rate of output, R_i, and β_i is defined as the angle between OY and the horizontal axis of the graph, it can be proven that the benefit/cost ratio equals $\frac{\tan \alpha}{\tan \beta}$.

Proof: For R_i:

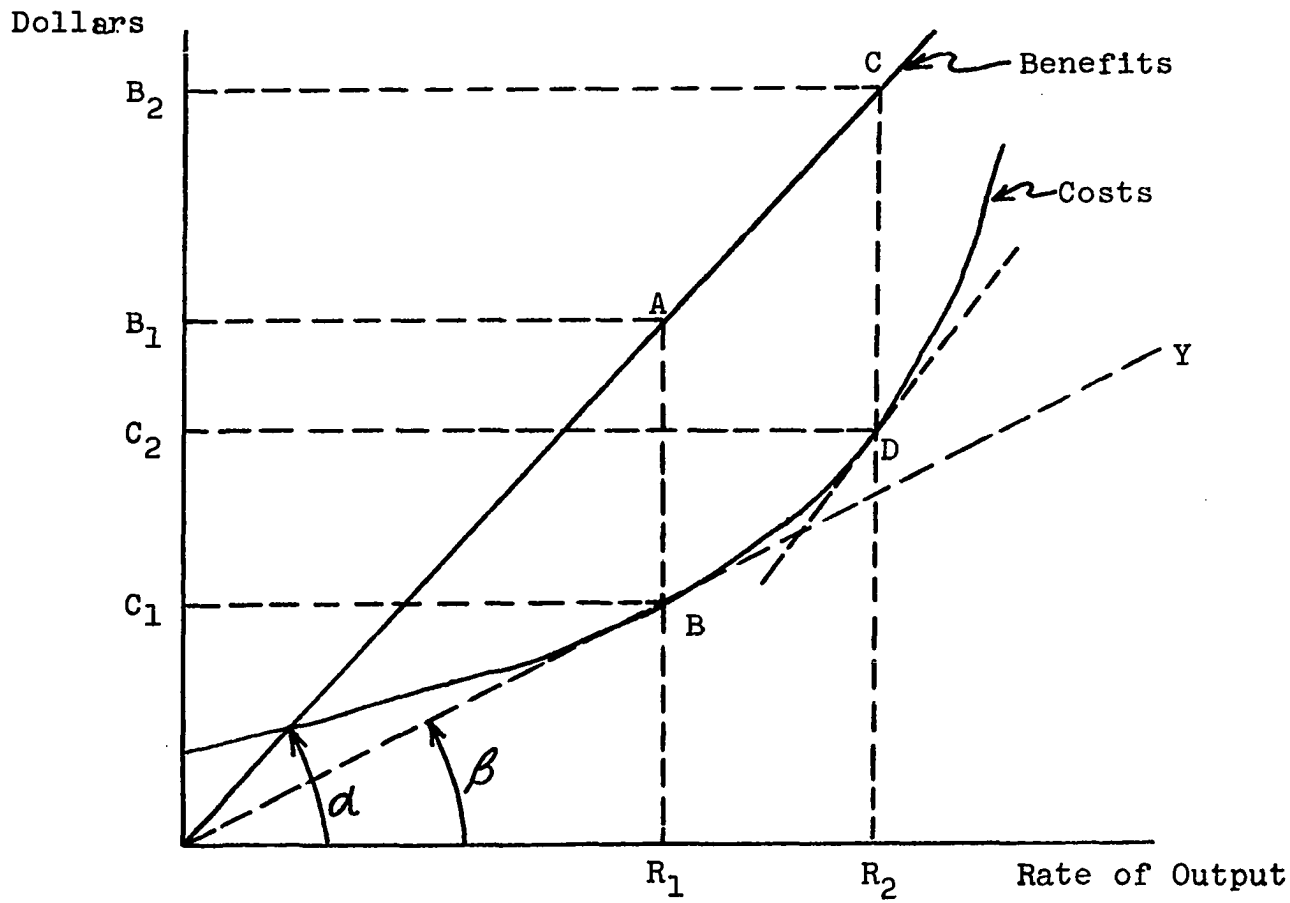
1. Benefit/Cost Ratio = $\frac{OB_i}{OC_i}$ (Definition)

2. $OB_i = R_iA$ (Construction)

   $OC_i = R_iB$

FIGURE 14

BENEFIT AND COST FOR HYPOTHETICAL PROGRAM



3. $\tan \alpha = \frac{R_1A}{OR_1}$ (Definition)

$\tan \beta = \frac{R_1B}{OR_1}$

4. $\frac{\tan \alpha}{\tan \beta} = \frac{R_1A}{R_1B}$ (Division)

5. Benefit/Cost Ratio = $\frac{\tan \alpha}{\tan \beta}$ (Substitution)

From Figure 14, it is obvious that the benefit/cost ratio is maximized at R_1 where OY is tangent to the cost curve. By contrast, net benefits (total benefits minus cost) are maximized by R_2 (where the slope of the cost curve is equal to the slope of the benefit curve -- or where marginal cost equals marginal benefits).

It can then be seen that the benefit/cost ratio, while a powerful tool, has definite limitations for use as a criterion in analysis. Generally it should be used as a criterion only when the cost of the project is strictly defined and not allowed to vary. The benefit/cost ratio is not an adequate criterion for cost-effectiveness analysis or for any form of selection from various alternatives.

APPENDIX A-8

TWO QUALITATIVE TECHNIQUES OF SYSTEMS ANALYSIS

Because much of the apprehension toward the use of systems analysis is based on the premise that it deals strictly with quantitative material, this discussion of two qualitatively oriented techniques of systems analysis is presented. These two techniques are called the Delphi technique and scenario writing.

Delphi Technique

The Delphi technique was devised as a method to add structure to the elicitation of opinions from experts. Its goal is to make the use of expert opinion subject to some of the safeguards of objectivity found in science.

Delphi is based on the premise that while "two heads are better than one" in working on a problem because they have more information, they also have more "misinformation." The gathering of experts together in a committee is as likely to accent the misinformation as it is to accent the valid information. This is because the "ritual" followed in a committee meeting might influence decisions as much as the knowledge and preference of the individuals involved.

Specifically, there are four major drawbacks to the use of committees in eliciting expert opinions:

1. One individual is likely to dominate decisions because of his personal bearing, his ability to communicate verbally,

or his professional reputation. This dominance may be disproportionate to the individual's knowledge in the particular field of interest.

2. A considerable amount of "noise" exists in the communication within the committee. The use of emotional and ambiguous words means that the message spoken by one individual is not always the same as the message received by others.

3. There is high group pressure for conformity. This is often counterbalanced by the reluctance of individuals to change their publically stated position.

4. The reasoning process used by the committee in reaching a decision or conclusion is often obscured.

The Delphi technique is relatively simple in concept. The "expert" participants remain anonymous. In "Round One" they are queried by written questionnaires about their opinion on a particular subject. "Round Two" gives the participant a summary of views held by others (without identification of the individuals involved); asks the expert to reconsider his opinion; and asks him to note the factors and considerations that he believes are relevant to the opinion he reaches. This "cybernetic" process is continued until convergence of opinions is obtained or unreconcilable differences are noted.

The process can be refined by using a number of more specific questions on a subject area designed to bring out

the reasoning behind the over-all judgment. The participants can also be allowed to request additional factual data that they feel would allow a better judgment. (This data is given to all participants and not just the one who requested it.)

The experience to date in the use of the Delphi technique indicates that convergence on a single answer, or two readily identifiable schools of thought, is relatively rapid (normally no more than three "Rounds"). It also indicates that the process is more conducive to independent thought and considered opinion than is normal in a committee process. One experiment successfully contrasted the Delphi technique to committees by using questions whose answers could be checked for accuracy (e.g., What was the suicide rate for females in the United States in 1950?). It was found that the Delphi technique gave more accurate answers than did the committees.

The Delphi technique has also been used to:

1. Determine the viewpoint of a Soviet planner on the number of weapons necessary and the "targeting" of these weapons to reduce the munitions capability of the United States by a specified percentage;[1]

2. Predict the political conditions of the world in twenty-five to fifty years;

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[1]The cross-section of experts which can be used is evident in the seven-man panel used in this case. There were four economists, one physical-vulnerability specialist, one systems analyst, and one electronics engineer.

3. Allocate a hypothetical budget for a university;
4. Allocate a hypothetical budget for law enforcement; and
5. Predict the operating environment of a specific company in twenty years. (This was used as a basis for allocating the company's research budget.)

All of these were "successful" to the degree that convergence was achieved and the reasons for the positions held were crystallized.

The use of the Delphi technique is not without its disadvantages. First, the process is cumbersome and places a heavy burden on the individuals who are using the technique. Second, the process is relatively slow in that considerable time is required between "Rounds" for processing information, gathering additional data, etc. Finally, results of the process can be biased by the selection of the panel members, the design of the questions, and the methods of providing feedback. Even with these shortcomings, the use of the Delphi technique promises to have an ever-increasing application in the analysis of major problems.

Scenarios

Scenario writing has long been a part of most military systems analyses. The purpose of writing a scenario is usually to describe the environmental conditions under which a weapon system must operate in a future time frame.

The scenario contains a proposed step-by-step sequence of actions, stated as explicitly as possible, that connects

the present environmental state with the one that is projected for the future. The advantage of using this technique is that the reasoning behind the projection is open and explicit.

Scenarios have been modified in two basic manners. One of these is to develop "alternative futures," where the assumptions that cause changes in the step-by-step projection of the future environment are altered so that the result is not one projection of future conditions but a set of different possible future conditions. This is particularly valuable in contingency analysis.

Scenarios have also been used to derive the worst possible case for future conditions. This worst possible case does not require a high degree of credibility but only a degree of possibility. This projection of the future has been used for a fortiori analysis.

Summary

Both scenario writing and the Delphi technique have been used in systems analysis to deal with problems which are highly qualitative. Logic, supplemented with these techniques, is the principal tool for the consideration of non-quantifiable aspects of systems analysis.

Sources: The following sources were used to develop the material in this appendix:

a) Delphi Technique:

Norman Dalkey and Olaf Helmer, "An Experimental Application of the Delphi Method to the Use of Experts," Management Science, IX (April, 1963), 458-67.

Bernice B. Brown, Delphi Process: A Methodology for the Elicitation of Opinions of Experts.

Olaf Helmer, Systematic Use of Experts' Opinions.

Norman C. Dalkey, The Delphi Method: An Experimental Study of Group Opinion.

b) Scenarios:

Seyom Brown, "Scenarios in Systems Analysis," Systems Analysis and Policy Planning: Applications in Defense, ed. by E. S. Quade and W. I. Boucher, pp. 298-310.

APPENDIX A-9

PPBS, PERFORMANCE, AND TRADITIONAL BUDGETS IN INDUSTRY

The use of budgets as managerial tools is highly developed in the industrial sector. For this reason it is illuminating to view the three types of budgets from industry's point of view.

Traditional Budget

Industry often has a budget that corresponds closely to the traditional budget of the government. Items of expenditure are broken into the objects to be purchased such as material, supplies, investment items, salaries. These budgets are used for two basic purposes. First, the budget is used as a control device for objects that subordinate managers buy. Second, the budget is used to facilitate personnel recruitment planning and centralized purchasing planning.

A manager in industry who felt that this input-oriented budget was the only budget required would be considered totally irrational. It is difficult to conceive of the president of a company receiving detailed information on the cost of salaries, materials, supplies, and equipment through his budgetary system and absolutely nothing about which products were profitable or even about whether the firm as a whole was operating at a profit.

Performance Budget

One of the principal budgeting tools used in industry is that of the performance or responsibility budget. This budget sets forth the plans for operation in terms of the individual responsible organizations. In connection with responsibility budgeting, cost accounting is normally applied. Under this concept the organization is divided into a number of responsibility centers (or profit centers). For each of these centers the outputs and inputs are measured and the profit for that individual center is calculated.

This measurement of profit for each autonomous center in the company is analogous to the performance budgeting of the government. Many of the problems faced in the two are similar. One of these problems is determining the unit of output. In industry no problem exists when the profit center produces only one homogeneous product. However, when the products produced are not homogeneous, a method of weighting these into equivalent units, or the use of standard hours and costs, is normally followed. In industry the problem also exists where it is impossible to impute a direct monetary value to the output of a specific unit. Industry often solves this by using standard work-load units without trying to determine the specific profit of the responsibility center. Finally, some responsibility centers have outputs that cannot even be quantified, much less assigned a dollar value. In this case expenses are charged to the responsibility center,

and no quantitative measurement of output is attempted.

In most of the "responsibility centers" in the governmental sector the problem of measuring output is like that in industry where no direct "profit" can be calculated. The application of standard costs to the "responsibility center" to compare outputs and inputs is still possible where the outputs are quantifiable.

The purpose of this responsibility budgeting system is largely one of control. The various levels of management are interested in the efficiency with which the responsibility centers are operating. The control aspect is implemented by the use of periodic performance reports which compare the work actually being accomplished (outputs) to the resources consumed (inputs) and both of these to the budget (or plan) formulated. Armed with this knowledge, the manager is able to make corrections as necessary in the ongoing operation of the firm.

Managers in private industry find that the use of a cost-accounting system with responsibility centers does not in itself furnish sufficient information for budgeting purposes. It is difficult to imagine a company's president being concerned solely with the performance of subunits of his organization and not with the total profitability of the company and the profitability of different products and lines of products. It is conceivable that all of the various departments of a firm (fabrication, assembly, etc.) operate

efficiently without the total firm making a profit.

PPBS

The concept of the Planning-Programming-Budgeting System is one that is very common in industry. In fact the normal method of constructing a budget in private industry closely corresponds to the "idealized" PPB system. The first step in budgeting in industry is to determine the probable sales of different products and translate this into a budgeted income statement to determine the projected profitability of the firm. After this requirements are placed on the various responsibility centers for their budgets, and finally the personnel, materials, supply, and investment budgets are generated.

The determination of which products to sell (and in what numbers) during the next year can be directly compared to the program decisions required by the government under PPBS. The use of a budgeted income statement to determine profits is equivalent to the use of benefit-cost analysis in the government to determine if a program is worth while. The task facing governmental organizations is much more complex for three reasons:

1. The final output of most government programs cannot be measured in dollars, and the yardstick of profit does not furnish an easy measure of the worth of a program. The final determination of a program's worth is often a totally subjective judgment which balances outputs and costs.

2. The translation of inputs into program terms is difficult in governmental activities. Industry also has this same problem to some degree. It is difficult to gauge the effects of an expanded customer-service department on the income statement, just as it is difficult to gauge the effect of an expanded personnel office on the quality of outputs of a given governmental activity. The major difference between industry and the government in this case is that the complexity of the government makes such situations more common. In these cases budgeting for the responsibility center, in both industry and the government, cannot be accomplished by a direct translation of product (or program) requirements. Instead, budgeting is accomplished by negotiation between subordinates and supervisors in the chain of command within relatively well-defined financial limits.

3. The outputs of the government are not reduceable to a single unit which can be compared in the framework of a single income statement. The equivalent situation can be imagined in industry if each line of product were purchased with a different, inconvertible monetary unit and the financial solvency of the company depended on its profitability in each monetary unit. It is inconceivable that the firm would then refuse to measure income to costs and expenses for each line of product. The industrial budgeting cycle would then be the same, except product decisions would be made on the basis of several income statements instead of one aggregate statement.

Industrial firms have begun to adopt some specific aspects of PPBS from the Federal Government. Some firms have begun to view their outputs in general product classes defined by the service given to the customers and projecting the revenue and costs associated with these product classes over a period of years. Under this concept a program structure for a firm would look like Table 23. Firms have found that this longer range use of budgets gives advantages in planning for changes in product lines and mixes of products within a given product line.

Summary

Private industry uses all three types of budgets in their managerial efforts -- the traditional budget for operational control, the performance budget for managerial control, and the budgeted income statement for product/program decisions at the first of the budget cycle. Industry does not feel that there is more than one "budget." Rather, three views of "the budget" are used to perform different tasks. The government, through PPBS, has adopted the premise from industry that program decisions must be made before performance and object of expenditure budgets are formulated. Industry, in turn, has adopted the need to structure budgets by grouping their products in light of the customer's view of the service they give and projecting this budget over an extended period of time.

TABLE 23

ILLUSTRATIVE PROGRAM STRUCTURE FORMAT
FOR PRIVATE FIRMS

	Years				
	1	2	3	4	5
Product Area 1:					
Product X					
Revenue					
Costs					
Salaries					
Materials					
Investment					
Other					
Net Profit					
Product Y					
.					
.					
Product Area 2:					
.					
.					

Source: L. A. Dougherty, Developing Corporate Strategy Through Planning, Programming, Budgeting.

Source: The discussion about the use of budget in industry was adapted from Robert N. Anthony, Management Accounting.

APPENDIX A-10

COMPARISON OF TRADITIONAL AND PROGRAM BUDGETS IN THE EDUCATION SEGMENT OF THE DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

The Department of Health, Education and Welfare has developed a highly sophisticated program structure in the Education area. Essentially the structure is a four-dimensional matrix that is based on the following broad categories:

1. The basic goal to be pursued;
2. The target group (by social conditions) to be reached;
3. The general method used by the program; and
4. The target group (by educational category) to be reached.

This breakout allows decision-makers to retrieve a variety of information in a number of aggregate forms. Examples of the information possible would include identification of all of the money being expended for:

1. Developing basic skills;
2. Improving the education of the economically and socially disadvantaged;
3. Expanding institutional facilities; or
4. Giving aid to secondary-level students.

By contrast, the traditional appropriations categories for the Office of Education in the Department of Health, Education and Welfare contain 18 major appropriation categories, 86 minor appropriation categories, and 164

appropriation subcategories. Most of these are object-oriented and are historically and legislatively titled. The amount of meaningful data which can be derived from this breakout is meager.

In addition to the format advantage, the Education portion of the Department of Health, Education and Welfare includes some of the funds spent in other agencies for educational activities. Some of these include:

1. From the Office of Economic Opportunity: Educational Research Activities and Follow-Thru Program;
2. From the Department of Housing and Urban Development: College Housing Loan Program;
3. From the Department of Commerce: Educational portions of Appalachian Regional Development;
4. From the National Science Foundation: Educational Research Activities;
5. From the Department of Defense: Civil Defense Adult Education Activities, School Shelter Advisory Service.

Program Structure

Level	Categories
First	Major Category: Education
Second	Educational Goals: Development of Basic Skills Development of Vocational and Occupational Skills Development of Advanced Academic and Professional Skills Library and Community Development General Research (non-allocable research) General Support (OE salaries and expenses) not allocable to above categories

Level	Categories
Third	Program Objectives: Improving the Education of the General Population Improving the Education of the Economically and Socially Disadvantaged Improving the Education of the Physically and Mentally Handicapped Improving International Education Other
Fourth	Program Character: Supplementing Institutional Resources (general operations, services, materials) Expanding Institutional Facilities (equipment and major construction) Increasing Opportunity for Higher Education (student aid) Improving the Supply of Educational Personnel (recruitment, training) Developing and Introducing Innovation (research, development, demonstration) Collecting and Disseminating Information (statistics, information, dissemination, evaluation) Other (general program support, unallocable salaries and expenses)
Fifth and Sixth	Educational Level Objective
	Preschool, Elementary, Secondary, and Local Agency Level Preschool Preschool and Elementary Elementary Elementary and Secondary Secondary Elementary and Secondary Vocational Local Educational Agency Development and Training Other Preschool, Elementary, Secondary, and Local Educational Agencies
	State Educational Agency (other than those listed below)

Level	Categories
Fifth and Sixth (cont'd)	
	Post-Secondary and Higher Education Levels
	Post-Secondary Vocational (includes Technical Institutes)
	Post-Secondary Vocational and Junior or Community College
	Junior or Community College
	Other Undergraduate
	Graduate
	Post-Doctoral
	All Higher Education
	Other Advanced Training
	Other Post-Secondary and Higher Education
	State Agencies and Organizations for Higher Education
	State Commissions for Higher Education
	Other Organizations for Higher Education
	Adult, ETV, and General Education Levels
	Adult Basic
	Adult Vocational
	Other Adult
	Educational Television
	Other Adult and General Education
	Library Agencies
	Public Libraries
	State Library Agency
	Library of Congress
	Other Library Agencies
	Research Organizations
	Regional Laboratories
	Policy Research Centers
	Preschool Laboratories
	Other R&D Centers
	ERIC Central
	ERIC Clearinghouse
	Instructional Materials Centers
	Other Academic Research (not listed above)
	Other Research Organizations
	Other Public and Private Agencies (not listed above)

Level	Categories
Fifth and Sixth (cont'd)	
	Other
	Profit-Making Organization
	Foreign Government
	Office of Education (salaries and expenses)
	Other

Traditional Budget Categories

Elementary and Secondary Educational Activities

Educationally Deprived Children

- Local Educational Agencies
- Indians
- Handicapped Children
- Juvenile Delinquents in Institutions
- Dependent and Neglected Children in Institutions
- Migratory Children
- State Administration

Supplementary Educational Centers

Guidance Counseling and Testing

Strengthening State Departments of Education

- Grants to States
- Grants for Special Projects
- State Statistical Services
- State Supervisory Services

Equipment and Minor Remodeling

- Grants to States
- Loans to Non-Profit Private Schools
- State Administration

Library Resources

Other Programs

- Bilingual Education Programs
- Dropout Prevention Programs
- Dissemination of Information

Program Planning and Evaluation

Planning
State and Local Evaluation
Federal Evaluation

Program Support

Program Review
Advisory Committees
Evaluation

School Assistance in Federally Affected Areas

Maintenance and Operations

Payments to Local Educational Agencies
Payments to Other Federal Agencies

Construction

Assistance to Local Educational Agencies
Assistance for School Construction of Federal Properties
Technical Services - Washington
Technical Services - Field

Program Support

Program Review
Advisory Committees
Evaluation

Education Professions Development Activities

State Grants for Recruitment of Education Personnel

Development of Educational Personnel

Encouragement of Educational Careers
Experienced Teacher Fellowships
Prospective Teacher Fellowships
Strengthening Graduate Schools of Education
Elementary and Secondary Institutes and Training Program
Vocational Education Institutes
College Teacher Fellowships
Higher Education Institutes
Higher Education Fellowships

Program Support

Program Review
Advisory Committees
Evaluation

Teacher Corps

Operations and Training

Training Costs
Transportation Costs
Salaries and Benefits
Local Administration

Program Support

Program Review
Advisory Committees
Evaluation

Higher Education Activities

Program Assistance

Strengthening Developing Institutions
Colleges of A&M Bankhead-Jones Act
Undergraduate Television Equipment
Other Undergraduate Instructional Equipment

Construction

Public Community Colleges and Technical Institutes
Other Undergraduate Facilities
Graduate Facilities
Construction Loans
State Administration and Planning
Technical Services - Washington
Technical Services - Field
Major Disaster Areas

Educational Opportunity Grants

Grants to Higher Education Institutes
Encouragement of Educational Talent

Direct Loans (NDEA II)

Contributions to Loan Funds
Loans to Institutions
Teacher Cancellation

Insured Loans

Advances for Reserve Funds
Payments for Interest and Fees
Computer Services

Work-Study Programs

Higher Education Activities Supplemental
Grants for Student Services
Inter-Institution Sharing of Resources

Other Proposed Programs

Improvement of Graduate Schools
Dissemination of Information
Program Planning and Evaluation

Program Support

Program Review
Advisory Committees
Evaluation

Expansion and Improvement of Vocational Education

Vocational Training

Vocational Education Act of 1963
George-Barden Act
Supplementary Acts
Homemaking Education (Proposed New Program)

Insured Loans

Advances for Reserve Funds
Interest Payments

Work-Study

Innovative Occupational Programs (Proposed New Program)

Dissemination of Information (Proposed New Program)

Program Planning and Evaluation (Proposed New Program)

Residential Vocational Schools

Program Support

Program Support
Advisory Committee
Evaluation

Libraries and Community Services

Library Services and Construction Act PL 89-511

Grants for Public Libraries
Interlibrary Cooperation
State Institutional Library Services
Library Services to Physically Handicapped

Construction of Public Libraries

College Library Resources

Acquisition and Cataloging by Library of Congress

Library Training

Librarian Training Grants
Library School Program Development

University Community Service Programs

Grants to States
Special Projects

Adult Basic Education

Grants to States
Special Projects
Teacher Training

Public Service Education

Program Development Grants
Fellowships

Program Support

Program Review
Advisory Committees
Evaluation

Educational Improvement for the Handicapped

Preschool and School Programs

Teacher Education and Recruitment

Teacher Education
Personnel Recruitment and Information
Physical Education and Recreation Therapist Training

Research and Innovative Programs

Research and Demonstration
Regional Resource Centers

Innovative Programs
Physical Education and Recreation Research and Development

Captioned Films and Media Services

Captioned Films
Media Services

Program Support

Program Support
Advisory Committees
Evaluation

Research and Training

Education Labs and R&D Centers

Laboratories
Centers

General Education Research and Demonstrations

General Education Research
Evaluation Studies
National Achievement Study
Demonstration and Development

Categorical Research and Demonstrations

Vocational Education
Foreign Language Education
Educational Media
Library Improvement

Construction and Equipment

Training

Dissemination

Program Support

Program Review
Advisory Committees
Evaluation

Foreign Language Training and Area Programs

Language and Area Programs

Language and Area Centers
Language and Area Fellowships

Foreign Language Training and Area Studies

Program Support

Program Review
Advisory Committees
Evaluation

Educational Research and Training

Research in Foreign Education

Training Research and Study Grants

Higher Education
Elementary and Secondary Education

Office of Education Salaries and Expenses

Executive Direction and Administration

Washington
Field

National Center for Education Statistics

Washington
Field

Elementary and Secondary Education

Washington
Field

Adult Vocation and Library Education

Washington
Field

Higher Education

Washington
Field

Research

Washington
Field

Education of the Handicapped

Washington
Field

Educational Personnel Development

Washington
Field

Institute of International Studies

Washington
Field

Civil Rights Educational Activities

Institutes and Grants

University Institutes for School Personnel
Desegregation Center Institutes for School Personnel
Grants to School Boards
Technical Assistance - Desegregation Centers
Technical Assistance - State Educational Agencies

Technical Services and Administration

Washington
Field

Colleges for Agriculture and Mechanical Arts

Grants to States

Promotion of Vocational Education Act of February 23, 1917

Grants to States

Student Loan Insurance Fund

Higher Education and Vocational Student Loans

Vocational Education Loan Defaults

Higher Education Facilities Loan Fund

HEFA Loan Fund Operating Costs

Commission on Sales of Participations
Interest Expenses on Participation Certificates
Administrative Expenses

HEFA Loan Fund Capital Outlay

Source: U. S., Department of Health, Education and Welfare, Office of Assistant Secretary (Planning and Evaluation), Planning-Programming-Budgeting: Guidance for Program and Financial Plan, (17 April 1968).

APPENDIX B-1

STATEMENT BY THE PRESIDENT TO MEMBERS OF THE CABINET AND HEADS OF AGENCIES ON THE INTRODUCTION OF NEW GOVERNMENT-WIDE PLANNING AND BUDGETING SYSTEM, AUGUST 25, 1965

I have asked you to meet with me this morning to discuss the introduction of a new planning and budgeting system throughout the Government.

The objective of this program is simple: to use the most modern management tools so that the full promise of a finer life can be brought to every American at the least possible cost.

This program is aimed at finding new ways to do new jobs faster, better, less expensively; to insure sounder judgment through more accurate information; to pinpoint those things we ought to do more, and to spotlight those things we ought to do less; to make our decision-making process as up to date as our space-exploring equipment; in short, we want to trade in our surreys for automobiles, our old cannon for new missiles.

Everything I have done in both legislation and the construction of a budget has been guided by my deep concern for the American people -- consistent with wise management of the tax-payer's dollar.

In translating this principle in action, and with the help of an outstanding Congress, we have passed more progressive legislation than in any comparable period in history.

We have been compassionate. We have also been prudent.

But we can and must do better if we are to bring the Great Society closer to all the people.

Good Government demands excellence.

It demands the fullest value for each dollar spent. It demands that we take advantage of the most modern management techniques.

This is what I want to introduce today -- a new planning-programming-budgeting system developed by our top management experts led by Budget Director Charles Schultze. Once in operation, it will enable us to --

(1) Identify our national goals with precision and on a continuing basis.
(2) Choose among those goals the ones that are most urgent.
(3) Search for alternative means of reaching those goals most effectively at the least cost.
(4) Inform ourselves not merely on next year's costs -- but on the second, and third, and subsequent year's costs -- of our programs.

(5) Measure the performance of our programs to insure a dollar's worth of service for each dollar spent.

This system will improve our ability to control our programs and our budgets rather than having them control us. It will operate year round. Studies, goals, program proposals, and reviews will be scheduled throughout the year instead of being crowded into "budget time."

To establish this system and carry out the necessary studies, each of you will need a Central Staff for Program and Policy Planning accountable directly to you. To make this work will take good people, the best you now have and the best you can find.

I intend to have the 1968 budget and later-year programs presented in this new form by next spring.

With these programs will go the first studies produced by your planning and policy staffs.

It is important to remember one thing: no system, no matter how refined, can make decisions for you. You and I have that responsibility in the executive branch. But our judgment is no better than our information. This system will present us with the alternatives and the information on the basis of which we can, together, make better decisions. The people will be the beneficiary.

The Budget Director has already talked to most of you about the need for this new approach. He is now preparing plans for setting it up. He is ready to help you in any way he can.

Within the next several weeks he will send our detailed instructions for incorporating fiscal year 1968 and later-year programs into this system. But to make this new plan a success, he will need your full support. I know that you will give him that support.

Source: Weekly Compilation of Presidential Documents, (Washington: Government Printing Office), August 30, 1965, Vol. I.

APPENDIX B-2

LIST OF AGENCIES WHICH ARE REQUIRED TO IMPLEMENT PPBS

Table 24 shows the agencies which have been required to implement PPBS in accordance with BOB Bulletin 66-3, October 12, 1965; BOB Bulletin 68-2, July 18, 1967; and BOB Bulletin 68-9, April 12, 1968. The agencies which have a formal Planning-Programming-Budgeting System as of May, 1969, are also shown.

Sources:

U. S., Executive Office of the President, Bureau of the Budget, Planning-Programming-Budgeting, BOB Bulletin 66-3, (October 12, 1965).

U. S., Executive Office of the President, Bureau of the Budget, Planning-Programming-Budgeting (PPB), BOB Bulletin 68-2, (July 18, 1967).

U. S., Executive Office of the President, Bureau of the Budget, Planning-Programming-Budgeting (PPB), BOB Bulletin 68-9, (April 12, 1968).

Jack W. Carlson, "The Status and Next Steps for Planning, Programming, and Budgeting," The Analysis and Evaluation of Public Expenditures: The PPB System, U. S., Congress, Joint Economic Committee, Vol. II, 1969, p. 637.

TABLE 24

AGENCIES WITH PPBS

	Required By:			System Implemented
	66-3	68-2	68-9	May,1969
Department of Agriculture	X	X	X	X
Department of Commerce	X	X	X	X
Department of Defense - Military Functions	X	X	X	X
Department of Defense - Corps of Engineers	X	X	X	X
Department of Health, Education and Welfare	X	X	X	X
Department of Housing and Urban Development	X	X	X	X
Department of Interior	X	X	X	X
Department of Justice	X	X	X	X
Department of Labor	X	X	X	X
Post Office Department	X	X	X	X
Department of State (excluding Agency for International Development)	X	X	X	(c)
Treasury Department	X	X	X	X
Agency for International Development	X	X	X	X
Atomic Evergy Commission	X	X	X	X
Central Intelligence Agency	X	X	X	X
Federal Aviation Agency	X			
General Services Administration	X	X	X	X
National Aeronautics and Space Administration	X	X	X	X
National Science Foundation	X	X	X	X
Office of Economic Opportunity	X	X	X	X
Peace Corps	X	X	X	X
United States Information Agency	X	X	X	X
Veterans Administration	X	X	X	X
Department of Transportation		X	X	X
Civil Service Commission		(a)	(b)	X
Federal Communications Commission		(a)	(b)	
Federal Power Commission		(a)	(b)	

	66-3	68-2	68-9	May '69
Federal Trade Commission		(a)	(b)	
Interstate Commerce Commission		(a)		
Securities and Exchange Commission		(a)	(b)	
Small Business Administration		(a)	(b)	X
Tennessee Valley Authority		(a)	(b)	X
Railroad Retirement Board			(b)	

(a) Directed to adopt PPBS by January 1, 1968

(b) Required to adopt only parts of PPBS

(c) PPBS adopted for cultural affairs only

APPENDIX C-1

GUIDE TO THE RESOLUTION OF SOME PROBLEMS IN PROGRAM STRUCTURE DESIGN

The process of program structure design is one that is particularly difficult. No specific rules can be formulated to simplify this task. There are probably as many different acceptable program structures as there are individuals who attempt to design the structure. Most of the problems of design may be resolved by looking at the over-all purpose of the program structure: to identify a cluster of governmental activities that are in closer competition with each other than they are with activities outside of the program so that systems analysis of these activities is facilitated. A number of problems continually arise in the design of program structures. These will be discussed individually.

End-Product Definition

It is generally conceded that intermediate products should normally not be included in a program structure. Some suthors have carried this concept to an extreme position and determined that none of the programs in the Federal Government's program structure should have products that are "consumed" within the Federal Government.[1] This concept of

[1]This is advocated in Samuel M. Greenhouse, "A 'Distributed Output' Concept for the Planning-Programming-Budgeting System," Personnel Administration, XXX (July/August,

end-products assumes that PPBS is a tool to be used only at the Presidential and Congressional level. In practice, PPBS is primarily designed to aid decision-makers in the agencies themselves. This means that the end-products around which the program is structured should be the end-products from the view of the head of the agency.[1]

Even within this general guidance, it might be necessary to design a specific program category that does not represent an end-product because of the over-riding consideration for the program structure to aid analytic efforts. For example, the Airlift and Sealift program category in the Department of Defense does not represent a direct end-product. Instead, it contributes primarily to General Purpose Forces. However, the analysis requirements of "airlift and sealift" make its isolation as a separate program category desirable.

Multi-Purpose Categories

Another practical problem encountered in the design of program structures is that of the placement of categories that contribute to more than one purpose. These categories

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1967), 36-39. This "distributed output concept" means that agencies which perform predominantly supporting functions (such as the General Services Administration) "distribute" or allocate their costs to the agencies receiving the services. The agencies receiving the allocations can then reflect "full costs" in final products that go outside of the Federal Government.

[1]End-products should then be those products or services that are "consumed" outside of the agency -- regardless of whether they are "consumed" by another agency of the Federal Government or "consumed" outside of the government.

are of two general types -- truly multi-purpose categories and support categories.

Many programs in the government naturally serve more than one purpose. It would be misleading to divide these programs and allocate their costs and outputs to various program categories. Generally the best that can be done is to place the program in a category corresponding to its primary purpose. If another purpose is critical it would be permissible to put the program in a second program category as a "non-add" entry. There is no way that a single program structure that shows all interactions between programs could be designed. Only the major interactive, substitutive, and complementary programs can be shown.[1]

The other part of the problem of handling programs that contribute to more than one purpose is support programs. The placement of support activities can be handled in one of three manners -- allocation of the costs to mission program categories; a separate program category; or a combination of these two.

Generally the allocation of support costs to mission program categories is undesirable unless the support costs involved are variable and depend directly on the level of activity in the mission programs. Arbitrary allocations can

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[1]It should be noted that regardless of the placement of individual programs in a program structure, all complementary, substitutive, and interactive programs must be considered during an analytical study.

distort the costs shown in a particular program category and be misleading to decision-makers and analysts.[1]

The simplest way to handle support activities is to accumulate all of them in one separate program category. This practice can be misleading since it could be assumed that the level of support costs is totally independent of the size and nature of the mission programs. This practice will also increase the tendency to have "tip-of-the-iceberg" estimates of costs in the analysis of direct "mission" programs.

Probably the most meaningful program structure is one that combines these two approaches. Support costs that can easily and meaningfully be allocated to mission program categories are allocated, and the residual costs are retained in a separate program category. This must be tempered with the need to maintain a minimum cost of data-gathering in a program structure. The allocation of costs requires the routine generation of data of both the costs in the support area and the size of the allocation parameter in mission

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[1]When support costs are included in a mission program category, they can be allocated to existing program elements, or separate program elements can be designed to absorb the support costs. The decision of which of these to use should again be based on the degree of relationship between the level of the direct mission program elements and the support cost. If this relationship is strong, the costs should be allocated; if not, they should be accumulated in a separate program element.

programs.[1]

One other caution is appropriate in the discussion of the allocation of support costs. The basis for allocation should be logically as well as statistically verifiable.[2] This basis should be stated explicitly and be periodically reverified to ensure that it is still valid.

Multi-Classification

Another practical problem that is involved in the design of a program structure is how to design the structure so that it is capable of providing data for a number of types of questions. Ideally the program structure format should be capable of reorganizing the data contained in it to provide answers to many psssible questions.[3]

The problem of multi-classifications is principally

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[1]Regardless of the general procedure determined to handle support costs, analytic efforts should attempt to determine the total incremental cost involved in a given effort. This will frequently involve the gathering of costs from support program elements or categories for analyses of mission activities.

[2]It is possible to have a high degree of statistical correlation on the size of an element of support cost with a parameter of operating programs that would allow a nonsensical allocation of costs. For example, the total support cost of internal training could be statistically correlated to the total direct appropriations of activities which require this training. Allocation of these costs, on this basis, would be difficult to substantiate logically if these activities had significantly different proportions of their costs devoted to operating and investment purposes.

[3]An example of this type of program structure is in the Department of Health, Education and Welfare (Appendix A-10). Here program data can be aggregated by major objectives, activities, target groups by age, and target groups by social conditions.

one of determining whether a particular grouping or classification is to be included. It is possible to envision an almost infinite number of interesting classifications for data. If a program structure included all of these, the cost of maintaining the information would be unrealistically high. Each classification of data should meet one of two criteria: it should involve a substantial commitment of resources, or it should be of a significant degree of importance to the activities of the agency. If these criteria are not met, the classification should not be included in the program structure.

The expectations about the program structure providing data should be reasonable. No program structure is going to be capable of being a complete data source for all analysis and all decision-making. Instead, the program structure should be expected to provide information on the major questions that must be answered on a recurring basis.

Organizational Congruence

The aspect of design of a program structure that allows the crossing of organizational lines is one that creates a major problem. The tendency is for an organization to want to structure its programs so that the program budget corresponds to the organization -- or conversely, to modify the organization so that it corresponds to the program structure. Neither of these tendencies is desirable.

If the program structure is simply a mirror image of

the existing organizational structure, much of the illuminative power of PPBS is lost. The traditional budget accumulates costs by organizational units. A superimposed program budget that accumulates the same information as the organizational budget is a duplication of effort.

The tendency to try to reorganize an agency to match the program structure should also be resisted. A well-designed program structure may point out organizational weakness that should be corrected, but the fact that the organization does not perfectly match the program structure is not sufficient to determine that a reorganization is necessary. Organizations can be structured by either process, purpose, or a combination of these.[1] The program structure is built solely on the basis of purpose. To reorganize an agency to conform to the program structure would be to forego many of the advantages of a process-oriented organizational structure.[2] By the use of a program structure the advantages of better program decisions and planning can be achieved without the loss of control that would result if the process-oriented organizational structure were abandoned.

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[1]Most organizations do reflect a combination of process-oriented and purpose-oriented organizational structure.

[2]Some of these advantages include: the more economical utilization of professional skills; insurance of a higher quality of technical decisions; insurance of more "professional" development; the cancellation of work-load flucuations; and the attainment of a higher degree of consistency in technical decision. (Harvey Sherman, It All Depends, pp. 34-35.)

Program Descriptions

One way to preclude some defects in the design of a program structure is to use program descriptions. A complete description of each program category, subcategory, and element contained in the structure should be prepared. This description should include an explicit identification of the objectives that the program component is trying to achieve as well as an explicit delineation of the content of each component.

Program descriptions aid in communications about the program structure and its use in analytic efforts. In addition, complete description of the program components helps to ensure consistent treatment of aspects of design throughout the structuring process and during any subsequent modification of the program structure.

Stability of Program Structure

Another problem in the design of a program structure concerns the stability that should be expected in the structure itself. Obviously the structure must remain relatively stable so that long-range planning is possible. However, situations, programs, and objectives change and a program structure that is completely rigid will soon be of limited use for decision purposes.

This conflict is usually resolved by establishing broad program categories that are relatively stable and allow for considerable replacement and realignment of the individual

elements within these categories. This compromise gives a degree of over-all stability and also a degree of flexibility.

Even the over-all program structure must be expected to change over a period of time. Particularly in the early use of PPBS changes and modifications will be required. The desire to retain a stable planning instrument should not inhibit the major modifications necessary, and the first few years of PPBS will probably result in a relatively fluid program structure.

Summary

The design phase of the program structure is one which contains many problems, most of which must be resolved by some form of compromise. The overriding consideration in each decision on the design of the program structure should be its effect on analysis and the decision process.

The design of the program structure of the budget is critical because it begins to give a definite meaning and sense of reality to the Planning-Programming-Budgeting System. There is a danger that this step will be accepted by some as the total substance of PPBS. This tendency should be avoided, and the constant reference to the ultimate purpose of the program structure -- to better structure budgetary information for analytic purposes -- should help counteract this.

Because of the many compromises necessary in the design of the program structure, it is not advisable to devote

an inordinate amount of time during the initial design to the complete refinement of definitions of all aspects of the program structure. It should be recognized that the use of PPBS will suggest necessary revisions to the program structure, and a workable structure will be the product of evolution.

Sources: The material in this Appendix was predominantly adapted from:

(1) Sue A. Haggart, et al., Program Budgeting for School District Planning: Concepts and Applications.

(2) State-Local Finances Project, Developing an Objective-Oriented Governmental Program Structure.

APPENDIX D-1

FACTORS CAUSING RESISTANCE TO PPBS

In the implementing of a Planning-Programming-Budgeting System, one of the first and most important tasks that a manager must undertake is an assessment of sources of resistance to the proposed system. Only after this resistance is identified can the manager take the necessary steps to overcome it and achieve an effective system.

Generally there are three ways that individuals are effected by any change in an organization. These are:

1. Behaviorial effects: Changes in the way the individual performs his work.
2. Psychological effects: Changes in the way the individual relates to his work.
3. Sociological effects: The way in which the established relationships with others are altered.[1]

The implementation of PPBS is so significant that all of these effects are substantial. Generally if an individual perceives these effects as contributing to his sense of importance and personal worth, his reaction to the change is favorable. If the change is perceived as detracting from his sense of importance and personal worth, his reaction to the change is unfavorable and he will resist the implementa-

[1]Arnold S. Judson, A Manager's Guide to Making Changes, pp. 10-14.

tion.[1]

The purpose of this Appendix is to highlight those aspects of PPBS where the perception of individuals will possibly indicate to them that the change is unfavorable. For purposes of discussion these will be divided into aspects that change organizational relationships, those that change the immediate job, those that effect the governmental programs, and miscellaneous effects.

Organizational Relationships

A managerial system change such as the implementation of PPBS always results in a massive change of organizational relationships. As one author, who is an expert in organizational change, commented:

> Change typically involves risk and fear. Any significant change in human organizations involves rearrangement of patterns of power, association, status, skills and values.[2]

Part of the resistance that results from the shifts in organizational relationships obviously occurs because the individuals involved do not know exactly what will change. This fear of the unknown makes these individuals cling to the familiar routines and institutional arrangements that already

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[1] Ibid., p. 34.

[2] Warren G. Bennis, "Theory and Method in Applying Behavioral Science to Planned Organizational Change," The Journal of Applied Behavioral Science, I (October-November-December, 1965), 345.

exist.[1]

However, it is not just the fear of the unknown that causes resistance to PPBS. The implementation of PPBS causes a significant shift in the organizational "power" arrangements within a given agency. The fact that an office of systems analysis will begin to make a direct input into the major decision process constitutes a major shift of power. Resistance to the implementation of PPBS because of this loss of power and authority should be divided into two classes. First, there are the individuals who are in established seats of power of the agency, and the introduction of PPBS will result in an actual decrease in their organizational authority and power. Their resistance to the system is almost inevitable. Second, there are individuals within an agency who perceive the loss of organizational power and authority as the result of the implementation of PPBS when no actual loss will occur. Information which changes their perception can reduce this source of resistance.

Another source of resistance to PPBS is the change in the personal relationships in the agency as a result of operating under the new system. Any change which requires individuals to begin working with a new group of people is likely to be resisted if these new relationships are not

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[1]Robert E. Millward, "PPBS: Problems of Implementation," Journal of the American Institute of Planners, XXXIV (March, 1968), 92.

smooth.[1] The new relationship between line managers and the systems analysts is one that is susceptible to a high degree of conflict. Managers tend to view systems analysts as individuals who are "bogged down" in their special techniques and are not familiar with the operational problems that exist in the agency. The systems analysts, on the other hand, tend to view line management with less than enthusiasm. They see these managers as imprecise and careless in their decision-making techniques.[2] Analysts, when their recommendations are not accepted without modification, intensify this conflict by viewing managers as inept; of lower intelligence; unduly influenced by narrow, parochial interests; and victims of bureaucratic inertia.[3] The potential conflict relationship between line management and the systems analysts can be a source of massive resistance to PPBS.[4]

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[1]Frank J. Jasinski, "Adapting Organizations to New Technology," Harvard Business Review, XXXVII (January-February, 1959), 79-80.

[2]Robert H. Hayes, "Qualitative Insights from Quantitative Methods," Harvard Business Review, XLVII (July-August, 1969), 111.

[3]K. A. Archibald, Three Views of the Expert's Role in Policy-Making: Systems Analysis, Incrementalism and the Clinical Approach.

[4]This conflict is further intensified when the personal characteristics of these two groups are considerably different. An example of this was the "whiz kids" under Secretary McNamara in the Department of Defense. This group was generally young, had little military experience, and was somewhat skeptical of authority. By contrast, the senior military officers were very rank- and experience-oriented. (William P. Snyder, Case Studies in Military Systems Analysis, p. 2.) However, this vast difference between the "whiz kids"

Work Requirements

An organizational change such as the implementation of PPBS in a governmental agency will change many of the requirements of the work itself of line management. Whenever the job task is changed significantly, a number of questions about the change occur to individuals. The perceived answers to these questions will determine the response of the individual to this change. The questions include:

1. "How effective will I be in the new situation?"
2. "What new things will I have to learn? Can I learn them? How difficult will it be for me? How much time will I have to learn these things?"
3. "What will the change mean in terms of how others will regard me? What will be my new status in the eyes of others?"[1]

The aspects of PPBS that would cause unfavorable answers to these questions can be identified.

Maybe the greatest obstacle to acceptance of PPBS by line management is the unfamiliarity of these individuals

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and the military may have contributed to some reduction of resistance due to the lack of perceived threat to job security. Because of the military/civilian split, the senior military personnel did not feel that their immediate job was in danger of being assumed by these "whiz kids." This reduced job threat does not exist in the nonmilitary agencies where both line managers and systems analysts are civilians. (J. B. Benton and A. L. Tenzer, Program Budgeting and Executive Commitment, p. 17.)

[1]Judson, A Manager's Guide to Making Changes, pp. 29-30.

with the techniques and tools of systematic, quantitative analysis. Many managers find themselves threatened when mathematical techniques of any kind are used.[1] These individuals realize that there will be some changes in the types of managers that the Federal Government hires and promotes. They will naturally resent these changes.[2]

A second change in the job of line management that will create resistance to the implementation of PPBS is the need for managers to make their decision criteria explicit and allow systems analysts to use that criteria in their efforts. Managers are normally reluctant to spell out their decision criteria in detail because they feel that this infringes on their authority and causes them to lose their advantages of experience and expertise.[3]

The decision-makers in the Federal Government also resist the application of systems analysis to decisions

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[1]Geoffrey E. Nunn and Lloyd L. Byers, "Quantitative Decision Tools and Management Development Programs," Training and Development Journal, XXI (November, 1967), 9. This appears to be the case in the attitude of Foreign Service Officers. Most of these individuals have a background which is well founded in liberal arts. The use of quantitative concepts and techniques is totally alien to the background. (Henry S. Rowen and Albert P. Williams, Jr., "Policy Analysis in International Affairs," The Analysis and Evaluation of Public Expenditures: The PPB System, U. S., Congress, Joint Economic Committee, Vol. III, 1969, p. 995.)

[2]Robert F. Vandell, "Management Evolution in the Quantitative World," Harvard Business Review, XLVIII (January-February, 1970), 87.

[3]Stuart J. Yuill, "Quantitative Information for Strategic Planning," Naval War College Review, XXIII (November, 1970), 21.

because the aspects stressed during analysis are often different from those that they have historically considered important. Analysis is likely to overlook intangible and unquantifiable factors. Even when these factors, such as organizational continuity, discipline, morale, and esprit de corps, are a part of the analysis it is doubtful that they will be given the same high degree of emphasis that they received in decisions prior to analysis.[1]

Another major difference between the decision-maker's task under PPBS and his "traditional" decision task is the general approach to problems. Managers are comfortable dealing with problems using natural analogs on a highly aggregated basis. They have a fundamental disposition to limit the amount of information received and considered in the decision process.[2] The use of systems analysis demands that more factors and information be considered than would be considered in decisions based on analogs. Systems analysis also demands that the decision at hand be broken

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[1]James R. Schlesinger, "Quantitative Analysis and National Security," World Politics, XV (January, 1963), 312.

[2]Kenneth E. Boulding, "The Ethics of Rational Decision," Management Science, XII (February, 1966), B-167. This limitation of information can be easily seen in the methods of "trimming" a budget under the traditional budget versus those necessary under PPBS. It is much easier to "cut" budgets by imposing arbitrary financial limits than to familiarize oneself with the details necessary to reduce budgets based on functional needs. (U. S., Congress, Senate, Committee on Government Operations, Planning, Programming, Budgeting, Inquiry, of the Subcommittee on National Security and International Operations, 1969, p. 224.)

into its component parts and that judgment be applied piecemeal to each of these component questions. The decision-makers feel that they have less control over the eventual outcome of a decision when applying these piecemeal judgments than they do when applying judgment to the entire problem on the basis of a natural analog.[1]

The aspect of systems analysis that explicitly treats uncertainty also makes decision-makers uncomfortable and increases their resistance to its use. Systems analysis makes the decisions more difficult because the decision-maker becomes aware of uncertainties that he was unaware of, or chose to ignore, in the decisions made without analysis.

Another reason for the resistance of line management to the implementation of PPBS is its perceived effect on the "status" of the individual decision-maker. Decision-makers are often afraid to use the services of a systems analyst for the same reason that they are afraid to consult a computer. There is an implicit feeling that the need to use these outside services is because of a "loss of intuition" by the decision-maker.[2]

Finally, managers will resist the implementation of PPBS because the entire basis for justification of their work

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[1]Clay Thomas Whitehead, Uses and Limitations of Systems Analysis, p. 108.

[2]Gerhard Colm and Luther H. Gulick, Program Planning for National Goals, p. 171, and Yuill, "Quantitative Information for Strategic Planning," p. 126.

is changed. Managers are skilled in performance and activity measures and would rather communicate to higher levels on this basis. They are not as skilled in the determination of objectives and the measurement of benefits.[1] One author overstated this condition by noting that:

> In the past, social action agencies have measured operating "performance" in terms of honesty (no embezzlement), prudence (no profligacy), cost control (not using too many paper clips), and occasionally relatively crude output standards (the number of job placements in a training program). However, under cost-benefit standards, for example, the program manager can be honest, prudent, and thrifty (all no doubt great virtues) and still look like a clod with a shockingly low benefit-cost ratio.[2]

Governmental Programs

The use of PPBS is also perceived by governmental employees as a threat because of its implied reallocation of funds. Since PPBS is a tool to provide for a basis of better allocation of funds, it is reasonable for administrators to question the effect of the use of this system on the programs with which they are concerned. In this regard, PPBS can be perceived in three different manners: It will help achieve an expanded budget; it will have no effect on the

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[1]C. W. Churchman and A. H. Schainblatt, "PPB: How Can It Be Implemented," Public Administration Review, XXIX (March/April, 1969), 185.

[2]Walter Williams, "Developing an Agency Evaluation Strategy for Social Action Programs," Office of Economic Opportunity, December 16, 1968, as cited by Robert A. Levine, "Policy Analysis and Economic Opportunity Programs," Analysis and Evaluation, U. S., Congress, Joint Economic Committee, Vol. III, 1969, pp. 1189-90.

level of the budget; or the budget will be reduced under PPBS.[1]

If an individual perceives PPBS in the first method noted above, it is likely that he will support and actively work for its implementation. If PPBS is perceived in the third method noted above, it is likely that its implementation will be resisted by the employees of the activity.

This resistance to PPBS because of its perceived impact on current programs is not totally irrational. Often a government employee has devoted years of his life to the design and operation of a specific governmental program. He tends to view national needs as completely synonymous with that specific program. Any analysis which fails to support this conception will create tension in the individual.[2] When confronted by a systems analysis that states that the particular program with which an individual decision-maker is closely involved is not the best alternative to achieve

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[1]Some people, such as Lyle E. Crane, School of Natural Resources, University of Michigan, in Ruth P. Mack and Sumner Myers, "Outdoor Recreation," Measuring Benefits of Government Investments, ed. by Robert Dorfman, pp. 110-16, see PPBS and benefit-cost analysis as a way to substantiate demands for more funds. The effective use of PPBS does not guarantee a higher budget, though. In some cases PPBS, implemented effectively, can result in a lower level of appropriations. For example, the Office of Economic Opportunity has one of the more sophisticated program-evaluation efforts in the Federal Government's PPBS. This office still finds it very difficult to receive funds for its programs. (Allen Schick, "From Analysis to Evaluation," The Annals of the American Academy of Political and Social Science, CCCXCIV [March, 1971], 70.)

[2]Whitehead, Uses and Limitations, p. 95.

an objective, the individual has no choice but to believe either that something is wrong with the program or that something is wrong with the analysis. Generally he will question the analysis before the program.[1] Because of the danger that analysis will disclose that their favorite program is not effective, it is not surprising that many managers will resist the application of PPBS and systems analysis to that program.[2]

Miscellaneous Sources of Resistance

In addition to these three major classifications of sources of resistance, there are a number of other factors that can create a significant level of opposition to PPBS. Many individuals feel that PPBS implies reorganization because the program structure cuts across the organizational lines.[3] This fear of reorganization gives rise to uncertainties about the new personal and organizational situations which may result.

The manner of implementation of PPBS in the Federal

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[1]Harold A. Hovey, The Planning-Programming-Budgeting Approach to Government Decision-Making, p. 93.

[2]U. S., Congress, Senate, Committee on Government Operations, Planning, Programming, Budgeting, Inquiry, of the Subcommittee on National Security and International Operations, 1969, p. 127. This resistance of personnel to the inroads of PPBS will probably increase to the extent that their immediate job security and promotion potential is related to the success of the individual program in question.

[3]Millward, "PPBS: Problems of Implementation," pp. 92-93.

Government can also increase resistance to the system. A directed, forceful manner of implementation can increase resistance because the individuals feel that their needs are not being considered and they resent the loss of control over their own actions.

Finally, the amount of work generated by the implementation of a Planning-Programming-Budgeting System can lead directly to resistance to the system. The amount of effort of the line management in generating data and providing technical expertise to the system is very large. This active support may be difficult to attain because the ongoing duties of line management are of such a magnitude that they often find it difficult to spend a significant amount of time directly involved with the system.[1] Many managers, particularly at a lower level, only see the costs of the system and do not see the benefits that are accruing at a higher organizational level.[2] The existence of high costs in the absence of perceived benefits will almost inevitably generate resistance to the system.

Summary

The assessment of the sources of resistance noted above gives a number of indications on how opposition to PPBS

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[1]State-Local Finances Project, PPB Pilot Project Reports from the Participating 5 States, 5 Counties and 5 Cities, p. 185.

[2]Churchman and Schainblatt, "PPB: How Can It Be Implemented," p. 185.

can be reduced. Some of these include:

1. Eliminating uncertainty in what organizational relationships will prevail after PPBS.
2. "Lubricating" the new interpersonal relationships that are created as a result of PPBS -- particularly those between line management and the systems analysts.
3. Training that eliminates unfamiliarity with PPBS concepts and techniques.
4. Training so that decision-makers view their programs in a larger perspective and treat analysis which is critical of their program as an aid to decision and design instead of an affront to their experience, intelligence, and status.
5. Ensuring that personnel understand that a program structure which cuts across organizational lines does not mean that a reorganization is either necessary or desirable.
6. Modifying the means of implementation so that personnel perceive the system as something not necessarily "forced" on them.
7. Moderating the cost-benefit perception of individuals by (a) lowering the costs of PPBS by recognizing and allowing for the time required of line management, and (b) ensuring that the lower levels see the benefit of the system.

It would be unrealistic to expect the implementation of PPBS to be accomplished without resistance. In addition to the fact that the use of PPBS has an effect on the power and authority relationships, the nature of the system itself

is a source of conflict that generates opposition. If there were no opposition, it would be doubtful if PPBS was performing the functions for which it was created.[1] This conflict-generating feature of PPBS can be seen in most of the goals of PPBS. Some of these are:

1. PPBS is geared toward change of the organization in an environment that is now oriented toward the status quo.[2]
2. PPBS has a definite function of reallocating funds.
3. One of the major goals of systems analysis ". . . is to question, to challenge and to provoke debate."[3]
4. Finally, the nature of the goals that distinguish PPBS from operating management creates conflict. The long-run goals that are the proper concern of PPBS will conflict on occasion with the short-run goals of operating management.[4]

While the implementation of PPBS can, therefore, be facilitated by the reduction of resistance and conflict, any attempt to totally eliminate resistance to PPBS will defeat the purposes of the system. A viable, operative Planning-

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[1]U. S., Congress, Senate, Committee on Government Operations, Planning, Programming, Budgeting, Inquiry, of the Subcommittee on National Security and International Operations, 1969; p. 134.

[2]Allen Schick, "Introducing PPBS at the State and Local Level," (unpublished paper, Tufts University, n. d.)

[3]Alain C. Enthoven, "Systems Analysis in the Pentagon," speech presented to the Association for Public Program Analysis, Washington, D. C., September 26, 1968.

[4]Benton and Tenzer, Program Budgeting and Executive Commitment, p. 22.

Programming-Budgeting System is intrinsically a generator of conflict and resistance to its use.

APPENDIX D-2

ORGANIZATION AND STAFFING OF PPBS EFFORT

During the implementation of a Planning-Programming-Budgeting System one of the most crucial sets of required decisions concerns the organization and staffing of the PPBS effort. These decisions affect both the eventual operating capability of the system and the degree of resistance that will be met during implementation. Some of the key considerations in this area will be discussed. First, the possibilities of organizing for the implementation effort of PPBS; then, the organization necessary to sustain the PPBS effort after it is implemented; and finally, the staffing requirements of a PPBS effort will be discussed.

Implementing Organization

In implementing PPBS some form of organization is required to perform the following tasks: identifying the agency's major objectives and formulating the program structure; identifying the key issues that should be subjected to analysis in the initial phases of PPBS; determining the processes and procedures to be followed in analytical efforts and data collection; and determining the continuing administrative framework for PPBS.

Generally there are three organizational arrangements that can be used to perform these tasks -- central staff unit; ad hoc, temporary advisory group (composed of members from

the operating activities); or a combination of these. If a decision is made to implement PPBS using a central staff unit, the group that performs the work will normally be the same as the staff agency that will be responsible for the eventual operation of PPBS. The relationship of line management to this staff unit is one of responding to requests for information and data.

This centralized form of implementation has some definite advantages. These are:

1. The agency head could maintain a high degree of control over the work.
2. The program structure would be less influenced by the existing organizational structure.
3. The selection of areas for analysis would not be unduly biased by predispositions of line management.
4. The time required for implementation would be reduced because less negotiation and compromise would be required.
5. The "institutionalization" of PPBS would result since a permanent group would be in existence.

From the point of view of the eventual effective operation of PPBS, this centralized implementing organization structure has some definite disadvantages. The lack of participation of line management can create a high degree of hostility toward PPBS and a reluctance to furnish the information necessary for the design or effective use of the system. The separation of PPBS design from the operating environment

of line management can also reduce the amount of practical realities in the final system.

The use of an ad hoc, temporary advisory group to implement PPBS also has some advantages. Generally these are the reverse of the disadvantages noted for the central staff unit. Each subordinate activity that is represented on the advisory group will feel that it has played a significant part in the design of PPBS and the implementation process will probably be facilitated. This approach has disadvantages in that the central, broad-based view of the organization and its objectives and functions would be lacking.

A compromise to these two approaches includes the use of both a central staff and an ad hoc, temporary committee to implement PPBS. The combination of these two could allow a significant amount of participation by subordinate organizational activities without their parochial interests dominating the system. Within this combination, there is a spectrum of possible organizational relationships. This spectrum can be described by three positions:

1. At one extreme, the temporary group would just be advisory to the central staff. The advisory group could debate ideas and provide a communication chain to the operating activities, but the authority for decision would belong to the central staff.
2. In the middle of the spectrum, the temporary group and

the central staff could be coequal, with disputes and differences being resolved by the head of the agency.

3. At the other extreme, the central staff could be subordinate to the advisory committee and furnish technical advice when requested. Decisions concerning the implementation of PPBS would be made by the advisory group.

The choice of where on this spectrum the individual agency's implementation program will be located depends on the circumstances of the particular agency. If the cost of hostility encountered during implementation and the possibility of an "impractical" system is considered higher than the benefits of a more co-ordinated system, the implementation organization should be constructed in line with the third possible compromise. If the reverse is true, the first compromise would be preferred.

When utilizing a compromise organizational arrangement, it is important that the duties, responsibilities, and authority of each of the participants be defined as completely as possible. If they are not defined in this manner, it is possible for some significant aspect of the implementation of PPBS to be neglected, and the working relationship between the participants could degenerate into a meaningless, wasteful struggle for power.

Regardless of the organizational arrangement used to implement PPBS, it would be a mistake for the head of the agency simply to assign the task and withdraw from the process until the system is implemented. The agency head should be

actively involved in the implementation process since the system is primarily designed to serve him in his decision capacity.

Operating Organization

The form of organization that is chosen for the operation of PPBS will also have an impact on how the system is received by the operational activities. There are some general rules which appear appropriate to the organization of the PPBS effort. These are:

1. The central staff component that is responsible for analysis should have relatively direct access to the decision-maker;[1]
2. The staff should be located at a level high enough that a broad organizational perspective is possible;
3. The staff should be allowed a high degree of freedom in the analysis efforts performed;
4. The staff should have a relative degree of security so that their analyses are not constrained to the "party line";
5. The staff should be isolated from the day-to-day operational problems so that they are able to spend full time on the broader issues for analysis;
6. The staff should not be isolated from line management to

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[1]This is because the staff's function is to provide information that will be used for his decisions. Only if the staff has a high degree of familiarity with the problems the decision-maker faces and the information that he considers important, can this function be effectively performed.

the extent that knowledge of practical operations and systems is lost; and

7. The staff's outputs should be located so that they are directly used in the decision-making process of the agency.

These rules cannot be rigidly followed since they are internally inconsistent. For example, the need for the staff to be isolated from the daily operational problems must be compromised with the need for the staff to be familiar with the operating procedures and systems.

Generally there are three organizational placements that are appropriate for PPBS analytic staffs -- in the Budgeting Office, in the Planning Office, and in a separate activity. The placement of the central analytic staff for PPBS under either budgeting or planning should be done with caution. PPBS is to provide a bridge between planning and budgeting, and if the central staff is placed under either of these it must retain close ties to the other. Generally, the placement of a PPBS staff under the Planning Office will effectively isolate it from the day-to-day operational problems, but this tends to sacrifice operating knowledge and isolate it from the decision process. In the Budgeting Office, the PPBS analytic staff is closely associated with the day-to-day operations of the agency and is a part of the normal decision process, but it could become too involved in the smaller operational problems of the agency to be of much use in planning. A separate office could be a reasonable

compromise between the two if the magnitude of the PPBS effort is sufficient to justify a separate organizational entity.

The proper organizational placement of a central staff for analytic efforts does not resolve all of the organizational questions associated with PPBS. There is a definite danger to having all of the analysis associated with PPBS concentrated in one central group. The operations of this group could control the types of decisions the executive makes, the alternatives he sees, the information he receives, and the criteria that he uses. If all studies initiated are closely controlled by one central staff, the "biases" of that staff could dominate the decision process. The inception of planning efforts also begins at the lower levels of the organization, and the technical data necessary for most analysis exists at that point. As a result, much of analysis can best be performed at these lower levels. For this reason it is almost essential that an analytic capability be established at several lower organizational levels as well as just at the central staff level.

The organizational relationship established between the central analytic staff and the analytic staffs of lower organizational units does a great deal to determine the degree of centralization of authority that results from PPBS. The operating relationship between the central analytic staff and subordinate analytic staffs is established by three criteria:

1. Who identifies the areas requiring analysis?

2. Who performs the analysis itself?

3. Who makes the final decision based on the analysis?

If the central analytic staff selects the areas for analysis, performs the analysis themselves, and refers the product to the agency head for decision, the centralizing impact of PPBS will be very significant. If, on the other hand, the areas for analysis are selected by subordinate activities, analyses are performed at subordinate levels, and subordinate decision-makers are allowed to make decisions with a high threshold value of decision impact, then the use of PPBS will not have a significant impact on the centralization of authority in the agency. The role of the central analytic staff in this latter case is as a reviewing agency for the analyses referred to the agency head for decision. Between these two extremes there are various combinations of analyses initiation, performance, and approval that will have a more, or a less, centralizing impact.[1]

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[1]Contrary to some belief, the use of PPBS in any agency is not neutral in its effect on centralization of authority. PPBS has a natural tendency to create centralization since it crosses organizational lines; forces decisions to the attention of the chief executive; and makes assumptions explicit in the decision process so that higher levels can meaningfully participate in these decisions. Some agency heads such as Secretary McNamara have welcomed PPBS because it afforded a much higher degree of control over their organization. It is also possible for the use of PPBS to allow more decentralized decisions by having a more meaningful delegation of decentralized authority. The input orientation of the traditional budget has led to excessive attention to detail at the top echelons of agencies. PPBS can allow the delegation of objectives and criteria to lower levels and let these lower levels be concerned with implementation.

The amount of centralization that is implicit in the operating procedures established will partially determine the degree of resistance that the implementation of PPBS encounters. The more centralization that is involved, the greater loss of power and authority of subordinate officials and the greater their resistance.

The operating procedures between the central analytic staffs and subordinate activities should be based on an assessment of the benefits that can be derived from higher and lower degrees of centralization. Some of the benefits that must be considered include:

1. Benefits of "centralization":

a. More co-ordination can be achieved and alternatives can be viewed across organizational lines when the analysis is performed at the central level.

b. The agency head has more control over the products of analysis and the decisions of the agency.

c. The achievement of an adequate analytic capability is easier due to the decreased demand for analysts.

2. Advantages of "decentralization":

a. Implementation of PPBS will not be resisted as much.

b. Subordinate activities retain their incentive for inventiveness and adaptation of new alternatives.

c. Conflicting opinions are not suppressed by a monolithic analytic unit.

d. Subordinate officials are trained in the use of

analytic tools for decisions.

e. Operating data necessary for analyses is more readily available.

The operating procedures between the central staff and analytic staffs at subordinate levels also determine the number of people required on the central staff. As stronger staffs are developed at operational levels and more analyses are performed at these levels, there is a requirement for a smaller sized central analytic staff. Other determinants of the size of the staff required at the central level include:

1. The size of the governmental agency involved;
2. The variety and complexity of the agency's operating programs; and
3. The sophistication of analyses desired.

Staffing

The method in which the staffing function is performed is also a determinant of the ease of implementing PPBS. The major staffing requirement under PPBS is to man the central and subordinate analytical staffs. Generally staffing can be performed in one, or a combination, of the following three manners:

1. Hire individuals trained in systems analysis from outside the agency. When this is done the staff is well qualified to apply the techniques necessary, but a major upgrading of knowledge in the organization and its programs is required. Because it is likely that these individuals from outside the

agency will have significantly different personal characteristics (particularly age and experience) than line management, the conflict between the staff specialists and line managers could become more intense.[1]

2. Upgrade the analytic skills of individuals from line activities. These individuals have the advantage of being familiar with the organization and the substance of the programs. Also line managers will not feel that the staff is "unreachable." The major problem of trying to upgrade existing personnel is the amount of time required before an operational analytic capability is achieved.

3. Use consultants from outside the agency. This alternative has the advantage of being quickly implemented because the immediate product of analytic efforts from consultants will probably be more usable than the initial analytic products of an in-house staff. Overreliance on consultant capability, however, can lead to the neglect of development of an adequate internal staff. The results of studies from consultants are difficult to assimilate consistently into the decision process of the agency since they usually encounter a high degree of resistance of line management. In determining the method of staffing of systems analysts, the decision-

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[1]This apparently has been one of the problems in the Federal Government's implementation of PPBS to date. One author noted that the individuals who pioneered PPBS in the Federal Government were technical specialists ". . . with little understanding, less interest and no experience in general management." (Bertram M. Gross, "The New Systems Budgeting," Public Administration Review, XXIX [March/April, 1969], 115.)

maker must weigh the advantages and disadvantages of each of these and try to find an optimum blend of staffing.

Once the decision is made on the general approach to be followed in staffing the analytic office, it is necessary to look for the specific individuals. The required academic background for a systems analyst staff is truly multi-disciplinarian since different disciplines view complex problems in different manners. Successful analysts have come from almost every academic discipline, including Law, History, Psychology, Political Science, Economics, Mathematics, Statistics, Biology, Chemistry, Physics, Engineering, and Business Administration.

Probably more important than the academic background of the analysts selected are their personal characteristics. William B. Ross, Deputy Undersecretary for Policy Analysis and Program Evaluation in the Department of Health, Education and Welfare, stated that he felt that successful analysis involved 10 to 20 per cent technique application and 80 to 90 per cent substantive knowledge.[1] It would appear that the following qualification would be critical in the selection of analysts:

1. A background of public service that helps the analyst identify and formulate problems.

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[1]U. S., Congress, Joint Economic Committee, The Planning-Programming-Budgeting System: Progress and Potentials, Hearings, before the Subcommittee on Economy in Government, 1967, p. 79.

2. A high degree of maturity that allows the analyst to have his analysis subjected to criticism and to accept the limitations of analysis.

3. A high degree of incisiveness and imagination that allows the analyst to get to the heart of problems and formulate better objectives.

4. Some degree of mathematical skill, so that the quantitative techniques that are often used in analysis are not beyond the analyst's level of comprehension.

5. A high degree of resourcefulness and dynamism that will lead the analyst to search out problems for analysis.

6. An ability to express himself capably in both verbal and written communications.

7. A high degree of diplomacy that will facilitate the interpersonal relationships between the analysts and line managers.

Once the individuals have been selected to staff the analytic office, it will be necessary to provide training to upgrade their skills. If the individual has experience in the agency it will probably be necessary to train him in analytical techniques.[1] The academic training that is given is only the start of the necessary indoctrination. The best education for a potential analyst is performing analyses under the supervision of experienced analysts.

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[1]Some of the training programs available for this purpose are discussed in Chapter IX.

Summary

This appendix has addressed some key considerations involved in the organizational and staffing decisions of PPBS. These decisions can be made in such a manner that the internal opposition to PPBS is reduced. For example, the implementation can be left largely to a temporary committee from the operating elements; a small central analytic staff can be established with subordinate responsibility for identifying areas for potential analysis, performing the analysis, and approving analyses with a high threshold value; and the majority of individuals selected for the analytic staffs can come from the operational activities. These decisions that facilitate the implementation of PPBS can be made only at a price -- a more limited, unco-ordinated program structure; loss of individual control of decisions by the agency head; inadequate utilization of limited analytic talent; and an increased amount of time before the analytic efforts are fruitful. These decisions should be made on the basis of the costs and benefits of each possible alternative.

Sources: The discussion in the appendix was largely adopted from the following sources:

1. J. B. Benton and A. L. Tenzer, Program Budgeting and Executive Commitment.

2. James R. Schlesinger, Defense Planning and Budgeting: The Issue of Centralized Control.

3. Operations Research Office, Fields of Knowledge and Operations Research.

4. State-Local Finances Project, Administrative Framework for Establishing Planning-Programming-Budgeting Systems in States, Cities, and Counties: Some Considerations and Suggested Possibilities.

5. State-Local Finances Project, Implementing PPB in State, City, and County.

6. State-Local Finances Project, Staffing and Training for a PPB Syatem in State and Local Governments.

APPENDIX E-1

GUIDELINES FOR THE REVIEW OF SYSTEMS ANALYSIS

The receipt of the product of systems analysis requires a decision on the part of the decision-maker. If a decision-maker takes the results of analyses based on "blind faith" and automatically concurs in their recommendations, this could be the source of large errors. For this reason any systems analysis must be subjected to an extensive review before a decision is made.

The reason for this review of systems analyses should be to make the decision-maker better aware of how the recommendations of the analysis should be treated. If the review of analyses degenerates into an attempt to try to achieve a perfect analysis, it could be dysfunctional. In all probability, no analysis of a major complex problem in the Federal Government will ever achieve "perfection." As noted in Appendix A-4, it is doubtful if any analysis will even be complete because of the time, cost, and data limitations. The decision-maker's review of systems analyses should then concentrate on gaining more knowledge about the analysis itself so that he is aware of the caution with which its recommendations should be treated. Review should not become a contest to determine how many "errors" can be found. If the review of systems analysis is not kept in proper perspective, it is possible that the analysis will be continuously

returned to the analytic group to correct "errors." The net result of this would be that the decision required on the problem would be postponed, at a significantly high cost of inactivity.

This appendix will furnish a glimpse at some of the aspects which should be considered during review of any systems analysis. Some broad general areas to be considered will be discussed, and a list of questions that should be asked of any analysis will be presented.

Decision-makers should be cautioned against the tendency to substitute intensive review of analyses for active participation in the analyses themselves. The review process is limited in the effect that it can have on the analytic effort, while participation in the analysis can greatly enhance the over-all quality of the analysis.

General Areas of Review

There are two general areas which appear to be the major problems in most systems analyses -- biases and lack of substance. These are manifested in so many diverse manners that it is impossible to consider them properly in any given question or set of questions about the analysis. In the review of a systems analysis these should be constantly kept in mind and the degree to which they appear should be identified.

Biases

It is incorrect to assume that a process such as systems analysis which is open, explicit, and attempts to conform to the scientific method is free from the biases that exist in all organizations and individuals. In all endeavors where the elements of judgment and perception are highly active, biases can become a serious source of disorientation.

The fact that there are strong biases toward a common viewpoint in any organization should not be surprising. There are a number of reasons why these biases exist. Some of these are:

1. Individuals tend to follow their interests in the selection of occupations, and as a result the organization is composed largely of people with common interests and goals who reinforce each other's beliefs.
2. All communications received in the organization are a filtered and simplified view of reality that tends to reinforce the biases that exist.
3. The intensity of experience and attention in a given area over a period of time tends to form a block to the consideration of other possible areas.

Because of the mutual reinforcement of these areas of early intellectual commitment and symmetry of information and experience, it is little wonder that the biases that exist in a given organization are compounded and gain in strength over time. The preponderance and strength of these

biases make it doubtful if a given organization has the ability even to ask the proper questions about its operations and goals.

These biases that exist in an organization have a definite effect on the performance of analyses. It is unreasonable to expect an analyst to be able to remain free from the social- and communication-generated biases that exist in a given organization. In addition to the sources of bias that exist throughout the organization, the analyst has biases imposed directly on his work. During the evaluations of his analytic efforts and during the interaction with the reviewers of analytic efforts the analyst becomes directly aware of the alternatives, assumptions, ideas, etc. that are contrary to the views and biases of the organizational "party line" and often finds that it is useless, and often damaging to his career, to support these alternatives, etc. As a result analyses tend to be biased to "please" the organization.

The process of analysis itself is a source of another form of bias that operates on the analyst. When the analyst designs a specific alternative himself, he creates a source of commitment to that alternative which can bias his consideration of the other alternatives that are designed by someone else. The analyst also tends to work with the analysis to the extent that he begins to believe that his assumptions and models are more representative of the "real world" than they might possibly be, and as a result he attaches undue

significance to his results and recommendations.

The detection of bias in systems analyses would be relatively simple if this bias was manifested by deliberate attempts to distort the recommendations. However, this is seldom the case. Most of biases reflected in analysis come with the conviction of the analyst and the organization that they are presenting an open, objective study that is free from bias. The identification of these "hidden" biases is extremely difficult.

There are many ways that biases are manifested in systems analyses. Some of these include:

1. The objective is limited so that it conforms closely to the current operation of the organization.
2. The alternatives considered are all consistent with a biased view of reality.
3. The contingencies considered in the analysis are all consistent with the organization's biases.
4. Costs and benefits are restricted to those accruing to only a selected population (e.g., only costs to the specific agency and benefits to their direct clientele are included, and costs to other agencies or the public in general and benefits to groups other than direct clientele are ignored).
5. Optimistic estimates of costs and benefits are presented.

The most obvious way to combat organizational bias in systems analysis is to have the same problem analyzed again by an organization which will have biases operating in an

opposite direction.[1] The major disadvantage of this method is the cost of the duplicate analytic efforts.

A less extreme counter to the existence of bias in systems analysis is to have the completed analysis reviewed by an organization that has biases in the opposite direction. This review, in the role of a "devil's advocate," can isolate areas and alternatives not considered in the orginal analysis.

Another way to reduce the degree of bias that exists in analytic studies is to have the studies performed outside of the activity which has any operational responsibility for the programs involved. There are two major difficulties involved in this practice. First, if the analytic staff communicates properly with the operational personnel they will still tend to be affected by the biases of these individuals. Second, it the analytic staff does not communicate with the operational personnel, the results of the study could be so impractical that they would be virtually useless.

While it is impossible to totally eliminate bias from any systems analysis, the process of analysis itself makes the existence of this bias easier to handle than it is in a

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[1]One case where this was done was a study for a cross-Florida barge canal. The Corps of Engineers (who would perform the work if the project were approved) made a benefit-cost analysis. The result of this analysis was that benefits would be 120 per cent of costs. A consulting firm hired by the railroads in the area (who were understandably opposed to the canal) made a benefit-cost study which showed total benefits of 13 per cent of costs. ("Putting a Dollar Sign on Everything," Business Week, July 16, 1966, p. 128.)

form of decision-making that relies totally on intuition. The attempt to make all assumptions and judgments open and explicit during the analysis aids in the identification of bias. If this bias is identified, the decision-maker can compensate for it in the caution that he applies to the use of the results of the analysis.

Lack of Analytic Substance

The second major problem in many systems analyses is that they often substitute the mechanics of analysis for its substance. Like any other individual, the systems analyst is a product of his background and environment. Because of the necessity of some quantitative knowledge, the field of systems analysis is dominated by the quantitatively oriented disciplines. This background means that many analysts are more comfortable when they are manipulating mathematical tools than when they are trying to come to grasp with the ill-defined, unstructured tasks of problem formulation and definition. Also, the literature on systems analysis is dominated by detailed descriptions of the tools and techniques used in analysis rather than the general approach and orientation of analysis.

The end result of these background and environmental effects is that the analyst's effort is often primarily concerned with the manipulation of quantitative data rather than with actual analysis of the problem. The problem is oversimplified and distorted to fit an existing and convenient

mathematical formula or technique rather than adapting and developing formulas or techniques to fit the real-world problem.

This problem of overemphasizing techniques and neglecting the substance of the problem is manifested in the results of the analysis in many ways. Some of these include:

1. The problem formulation and design of the analysis cannot be explained simply and logically.
2. The results of the analysis tend to be mathematically "clean" and do not reflect uncertainty.[1]
3. The details of computation are emphasized too heavily in the presentation of the results of the analysis.
4. Data is painstakingly refined.[2]
5. All intangible and unquantifiable factors are neglected or arbitrarily forced into a quantitative expression.
6. The criteria used in the problem is limited so that it fits the data and techniques available.
7. Firm, hard recommendations are given.

The easiest way to combat the tendency of systems analysis studies to become disoriented toward the mechanics of the problem and away from its substance is to have meaningful participation by the decision-maker in the performance

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[1]Risk may be identified and extensively treated, but uncertainty that cannot be characterized by probability values is neglected.

[2]The usual presence of uncertainty dominates the probable data error to such an extent that detailed refinement is unnecessary in most analyses.

of the analysis itself. This participation can force the analyst to consider the complexities of the real problem. Also, in the use of the completed product of systems analysis, the decision-maker should make a practice of asking difficult questions and demanding that the completed analysis answer these questions to the best of its ability.

Questions for Review of Analysis

The following questions can be used as guides to the review of a systems analysis effort. Most of these questions are not answerable on an absolute basis but require a subjective evaluation. It is also doubtful if any analysis would be able to satisfy all of the questions. The asking of these questions will give the decision-maker a feeling for the reliance that he should place on the specific recommendations made by the analysis. For purposes of convenience these questions are divided into seven categories -- (a) Objectives, Criteria, and Effectiveness; (b) Assumptions; (c) Alternatives; (d) Models; (e) Cost; (f) Sensitivity Analysis; and (g) Recommendations and Documentation.

These questions are:

A. Objectives, Criteria, and Effectiveness

1. If the objective defined by the analysis is expanded, are more alternatives possible, and is a meaningful comparison of these alternatives possible?

2. Is the objective defined by the problem too broad to allow meaningful comparisons of alternatives?

3. Is the objective defined by the analysis consistent with the problem that requires solution?

4. Are multiple objectives ignored in order to simplify analysis?

5. Was the objective of the analysis redefined during the process of the analysis itself?

6. Is the criteria identified consistent with higher-level objectives?

7. Does the criteria used consider all of the dimensions of a multiple objective?

8. Is the criteria used reasonable (such as maximizing effectiveness for a specified cost or minimizing cost for a specified level of effectiveness) instead of nonsensical (such as minimizing cost and maximizing effectiveness)?

9. Are ratios used as criteria?

   a. If ratios are used, does this mean that the analysis is indifferent to the absolute size of effectiveness or cost?

   b. If ratios are used, are all resources considered in the cost portion of the ratio?

10. Are program-size and performance rates used as the only measures of effectiveness?

11. Is there at least one separate measure of effectiveness for each dimension of a multiple objective?

12. Is it recognized that proximate measures of effectiveness are imperfect indicators of the attainment of objectives?

a. Are the measures of effectiveness adequately defined?

b. Has there been an attempt to consider aspects of the objectives that are not covered by the proximate measures of effectiveness?

c. Is the fact that there are differences between the scales of proximate measures of effectiveness and attainment of objectives recognized?

13. Is time an explicit part of the measures of effectiveness?

14. Are qualitative measures of effectiveness ignored?

15. Are all measures of effectiveness arbitrarily forced into a dollar measurement?

a. Would the results of the analysis be more informative if units of measurement other than dollars were used for some areas of effectiveness?

16. Does it appear that the first measure of effectiveness that was suggested was uncritically accepted so that data manupulation could begin?

B. Assumptions

1. Have the assumptions reduced the problem to the extent that the results are no longer useful?

2. Are there alternative assumptions as reasonable as the assumptions used in the analysis?

a. Were these alternative assumptions checked by sensitivity analysis?

3. Was any element of uncertainty removed by assumption and not checked subsequently by sensitivity analysis?

4. If the validity of an assumption became critical to the analysis, was this assumption re-examined and subjected to rigorous analytical treatment?

5. Are there any assumptions that appear to have been made to make the model easier to manipulate?

6. Is the future environment of the analysis implicitly assumed to be the same as today's environment?

7. Has there been an implicit assumption that what has happened in the past will continue into the future in an uninterrupted trend?

a. What happens to the recommendations if these "historical trend" assumptions are relaxed?

8. Does the use of certain tools of analysis carry hidden assumptions (such as the linearity of specific relationships)?

9. Are there implicit assumptions contained in the attempt to secure quantitative measures of qualitative factors?

C. Alternatives

1. Have all meaningful alternatives been considered?

a. If any alternatives have been excluded from detailed analysis, was this done openly and explicitly, and can this exclusion be verified by the analysis itself?

2. Are the alternatives compared really significant alternatives or just minor variations of each other?

3. Are current programs and capabilities considered among the alternatives?

4. Were the alternatives restricted by adherence to the "party line"?

a. Were any alternatives considered that would have involved administration and operation of the program by another organization?

5. Did the process of analysis itself generate any meaningful alternatives?

6. Are any combinations of alternatives possible that could lead to a major improvement in effectiveness?

7. Are the alternatives considered really feasible in light of the prevailing political, cultural, and policy considerations?

8. Are the alternatives considered adequately described?

D. Models

1. Are all of the key factors of the real world contained in the model?

a. If some key factors are excluded from the model, can this be justified based on insensitivity of results to changes in these factors, etc?

2. Were all major interactions considered in the model?

3. Were spill-over benefits explicitly considered and defined?

4. Is the logic of the model stated clearly and concisely in nonmathematical terms?

5. Is the logical structure of the model intuitively acceptable?

6. Are the cause-and-effect relationships contained in the model intuitively satisfying?

7. Were enough representative situations analyzed to define the parameters and their relationships in the model?

8. Does the model consider political, administrative, legal, and psychological constraints as well as physical limitations?

a. Was the influence of non-quantifiable factors explicitly considered in the model unless it is logically demonstrated that this influence is negligible?

b. Were the various possible personal reactions of major characters in the program (members of the organization, clients, enemies, etc.) considered?

9. How does the model treat the problems associated with implementing the program?

10. Does the model cover the full time span of the operation of the program?

11. Did the incorporation of details take place in the later stages of the analysis (after formulation of the problem, determination of alternatives and key factors, etc.)?

12. In building the model, was the representativeness of the model ever sacrificed to attain a model that was easier to manipulate?

E. Cost

1. Are all costs included, even if they will be incurred outside of the activity involved?

2. Are incremental costs used?

3. How were the opportunity costs of the resources on hand at the start of the program calculated?

4. How is the time value of money considered?

5. Was the total cost (including support cost) over the entire life of the program considered?

a. Are the costs of initial implementation of the program (training, construction, etc.) included?

6. Were nonmonetary costs considered?

7. If dollars are used as the only measure of cost, is this because other measures are unimportant?

a. Would the analysis be more informative if some resources were measured in physical units in addition to dollars?

8. If support costs were allocated to the alternatives, was the basis for allocation valid?

a. If some other "reasonable" basis for allocating costs were used, would the recommendation of the analysis be substantially changed?

9. Are the cost estimates for all of the alternatives made in a comparable manner?

10. Were the cost-estimating relationships extrapolated beyond the capability of the historical data?

a. Was this extrapolation justified by "logic"?

b. Was the additional uncertainty generated by this extrapolation considered?

11. How is the remaining value of assets that will be on hand at the end of a proposed program treated?

12. Have meaningful cost categories been devised?

F. Sensitivity Analyses

1. Does the model distinguish between risk and uncertainty?

2. Was uncertainty neglected while a detailed analysis was made of the more easily defined risk?

a. Was uncertainty ignored by concentrating on the calculation of one "expected" value?

3. Was contingency analysis performed over the full range of possible contingencies?

a. If less than the full range of possible contingencies was used, is there a reasonable explanation for excluding some?

4. Was sensitivity analysis used to investigate the possible technological and performance changes of the system?

5. Was sensitivity analysis used to explore the uncertainties in the parameters of the model itself?

6. Was the sensitivity of the analysis to the key judgments of the analysis explicitly noted?

7. Was the discount rate used to find a present value for cost and monetary benefits subjected to sensitivity analysis?

8. Have uncertainty and sensitivity of costs as well as effectiveness been explicitly considered?

9. Are both the range and rate of sensitivities considered in the analysis?

10. Was the sensitivity analysis used to design better (less sensitive) alternatives?

11. Has a fortiori analysis been used to verify the capability of the preferred alternative?

12. Has uncertainty been implicitly handled by raising the discount rates instead of being explicitly treated?

G. Recommendations and Documentation

1. Is the information presented by the analysis in a meaningful and usable form?

2. Does the study, as a whole, logically support the conclusions and recommendations presented?

3. Do the conclusions reached by the analysis actually answer the key questions of the decision-maker?

4. Are the recommendations made consistent with the uncertainty existing in the analysis?

5. Are the limitations of the analysis, as well as its strengths, stated clearly and explicitly?

6. Are the conclusions and recommendations based on significant differences between alternatives that are not dominated by the uncertainty inherent in the analysis?

7. Were all judgments in the analysis made explicit and not disguised as fact?

8. Are all calculations in the analysis explicitly performed so that they can be duplicated?

9. Is the data used in the analysis (and the sources of that data) explicitly exposed?

10. Does the quantitative data presentation imply a higher degree of precision than is possible due to statistical and real uncertainties?

11. Is there an indication that the analyst performed this analysis in isolation or is there evidence of significant operational participation?

Summary

The information contained in a systems analysis study is of little use to a decision-maker unless he is able to establish the degree of credibility that he can assign to that information and the degree of caution with which the information should be used. This is the purpose of the review of systems analysis studies. It is important that the result of this review be conveyed to the individual (or group of individuals) who performed the analysis. This feedback will enable them to improve future analytic efforts.

Sources: The material in this appendix was largely suggested by:

1. Irving Heymont, et al., Guide for Reviewers of Studies Containing Cost-Effectiveness Analysis.

2. Herbert Kahn and Irwin Mann, Ten Common Pitfalls.

3. E. S. Quade, "Recapitulation," Analysis for Military Decisions, ed. by E. S. Quade, pp. 318-30.

4. E. S. Quade, "Pitfalls and Limitations," Systems Analysis and Policy Planning: Applications in Defense, ed. by E. S. Quade and W. I. Boucher, pp. 345-63.

5. E. S. Quade, "By Way of Summary," Ibid., pp. 418-29.

APPENDIX F-1

CASES

A total of fifty-one cases that are appropriate for training in the area of PPBS in the governmental sector were identified. These cases are classified according to their major application to the specific learning objectives noted in Chapter VIII. Table 25 presents the number of cases applicable to each of the objectives.

The cases that were identified are listed below. They are listed in accordance with the major areas of training and specific learning objectives identified in Chapter VIII. The location of each case and a short description of each case is presented. If the case appears applicable to more than one specific learning objective, the second objective is shown, by number, in the parentheses following the description of the case.

Concepts and Techniques of PPBS

B. 3.c. Understanding of Total Quantification Misconception

MILITARY ASSISTANCE TO FREELAND

William P. Snyder, Case Studies in Military Systems Analysis, PP. 11-46.

This is an illustrative systems analysis of a high-level, complex, and ill-defined problem. There is a high content of qualitative data in the case.

TABLE 25

APPLICABILITY OF TRAINING CASES TO LEARNING OBJECTIVES

Learning Objective	Specific Learning Objective	Number of Applicable Cases
B. 3.c.	Understanding of "Total Quantification" misconception	1
C. 3.	Skill in developing a program structure	4
C. 5.	Skill in designing output indicators	1
D. 3.f.	Skill in modifying sequence of implementation	2
D. 4.	Skill in determining organizational patterns	3
D. 5.	Skill in implementing analytic capability	2
E. 1.	Skill in monitoring operations of PPBS	1
E. 2.	Knowledge of systems analysis techniques and language	29
E. 3.	Skill in selecting problems for analysis	1
E. 4.	Skill in defining problems for analysis	1
E. 9.	Skill in using systems analysis for decisions	6

Design of PPBS

C. 3. Skill in Developing a Program Structure

FEDERAL COMMUNICATIONS COMMISSION

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 72-80.

This case consists of a hypothetical report by the FCC on the proper program structure for the agency. The student is asked to review the report and design a program structure with output indicators. (C. 5.)

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

The Intercollegiate Case Clearing House (Case 13C20)

This case describes in detail the functions of the Department of Transportation in New York. Several bases for developing a program structure are presented. The student is asked to develop the program structure.

POST OFFICE DEPARTMENT

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 48-71.

This case contains a number of Post Office intra-departmental memoranda and the minutes of a meeting on PPBS. Departmental data is presented and the student is asked to select the program structure that is most suitable from the many that are recommended.

U. S. DEPARTMENT OF AGRICULTURE (A)

The Intercollegiate Case Clearinghouse (Case 11C46)

This case discusses the efforts to design a program structure for the Forest Service of the Department of

Agriculture. The student is asked to evaluate the evolution of the program structure and the reaction of managers in the Forest Service to this structure.

C. 5. Skill in Designing Output Indicators

BUREAU OF CENSUS

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 140-150.

This case discusses the Bureau of Census output indicators in the Foreign Trade Program. The difference between performance indicators for control and PPBS output indicators is stressed. (B. 8.)

PEACE CORPS

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 119-39.

This case discusses the Peace Corps' PPBS, its program structure, and the method that it used to develop output indicators. The student is asked to evaluate these output indicators.

Implementation of PPBS

D. 3.f. Skill in Modifying Sequence of Implementation

PPB IN THE CITY OF NEW YORK

The Intercollegiate Case Clearinghouse (Case 13C22)

This case describes, in detail, the implementation of PPBS in New York City. The system was implemented by first trying to achieve an adequate analytic capability before structuring the budget in program terms. The student is asked to evaluate this approach to PPBS.

PPB IN THE CITY OF PHILADELPHIA

The Intercollegiate Case Clearinghouse (Case 13C21)

This case describes, in detail, the implementation of PPBS in Philadelphia. The system was implemented by first developing a program structure and then implementing the analytic tasks. The student is asked to evaluate this approach to PPBS.

D. 4. Skill in Determining Organizational Patterns

MIDLANDIA

The Intercollegiate Case Clearinghouse (Case 13C19)

This case concerns the plan of implementation of PPBS by the hypothetical State of Midlandia. One of the key questions addressed is the placement of the PPB staff in either Planning or Budgeting. The student is asked to make a decision on the organizational placement of the PPB staff and draw up a phased implementation plan. (D. 7.)

OFFICE OF ECONOMIC OPPORTUNITY (B)

The Intercollegiate Case Clearinghouse (Case 12C6)

This case discusses the merits of changing the organizational location of budgeting from Office of Management, Budget and Finance Division to the Office of Research, Plans, Programs and Evaluation because of PPBS. The student is asked to decide if this change is advisable.

U. S. DEPARTMENT OF LABOR

The Intercollegiate Case Clearinghouse (Case 11C45)

This case discusses the organizational evolution of

the Department of Labor from 1948 to 1966. The Department's program structure for PPBS is described. The student is asked to evaluate further proposed organizational changes to make the organization more compatible with the program structure.

D. 5. Skill in Implementing Analytical Capability

THE POST OFFICE

R. Joseph Novogrod, Gladys O. Dimock, and Marshall E. Dimock, Casebook in Public Administration, pp. 249-80.

This case is based on four interviews with staff members of the Post Office Department. The individuals in the interview discuss some of the actions taken during the implementation of PPBS and systems analysis in that department.

U. S. DEPARTMENT OF LABOR (B)

The Intercollegiate Case Clearinghouse (Case 12C38)

This case describes the Department of Labor's efforts to integrate the review and analysis function into PPBS. Interviews and parts of actual reports are used. The student is asked to evaluate the Department's efforts. (E. 1.c.)

Use of PPBS

E. 1. Skill in Monitoring Operations of PPBS

DEPARTMENT OF THE INTERIOR (A)

The Intercollegiate Case Clearinghouse (Case 12C39)

This case discusses the procedures and forms adopted in the Department of the Interior for the development of long-range budgets and the preparation of Program Memoranda.

The student is asked to comment on the adequacy of these procedures.

E. 2. Knowledge of System Analysis Techniques and Language

AGRICULTURE STABILIZATION AND CONSERVATION SERVICE

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 271-80.

This case concerns a program analysis of the peanut agriculture program. A considerable amount of program data is presented. The student is asked to evaluate four alternatives against the present procedure. This case requires the refinement of objectives and development of measures of effectiveness before beginning analysis. (B. 2.b.)

BOMB RACKS FOR THE F-10B

William P. Snyder, Case Studies in Military Systems Analysis, pp. 47-59.

This is a case which requires the student to prepare cost-effectiveness analysis where the decision-maker is asked to choose between two competing weapon systems. The situation is relatively simple. A solution guide is presented. Sensitivity analysis and the danger of attaching undue significance to minute differences are illustrated. (B. 2.g.)

BUREAU OF MINES

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 290-99.

This case presents data on the supply and demand of helium through the twenty-first century and proposes a conservation program. The student is asked to make a cost-

benefit analysis of the proposed program.

BUREAU OF NATIONAL CAPITAL AIRPORTS

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 300-10.

This case presents the problem of airport congestion in the Washington, D. C., area. The student is asked to evaluate seven proposals, presented in general terms, and perform a systems analysis study of this problem.

BUREAU OF NATIONAL CAPITAL AIRPORTS (A)

The Intercollegiate Case Clearinghouse (Case 12C66)

This case presents cost and revenue data for Dulles and Washington National Airports. The student is asked to prepare an analysis revising, or retaining, the current fee charges.

DOWNTOWN PARKING AUTHORITY

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 255-57.

This case describes a proposed municipal parking facility. The student is asked to prepare an analysis of the problem.

FEDERAL AVIATION AGENCY

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 234-39.

This case requires an analysis of a proposed replacement of air traffic control receivers in the Federal Aviation Agency. The costs and savings associated with this action are presented, and the student must perform the analysis and make the recommendation.

FEDERAL HOUSING ADMINISTRATION (A)

The Intercollegiate Case Clearinghouse (Case 12C48)

This case describes the mortgage insurance program of FHA. The student is required to make an analysis of the alternatives available for changing maturity and loan/value ratios.

FOREST SERVICE

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 258-70.

This case describes alternatives possible to increase the supply of timber in the year 2000. The student is asked to use these generally defined alternatives and projections of timber growth and demand to prepare a Program Memorandum on forest products.

FOREST SERVICE (A)

The Intercollegiate Case Clearinghouse (Case 11C59)

This case shows the projection of timber supply for the year 2000. The student is asked to prepare a sensitivity analysis on the effect of a changed GNP on the stock of timber. (B. 2.g.)

HOUSING ASSISTANCE PROGRAMS (A)

The Intercollegiate Case Clearinghouse (Case 12C11)

This case presents the details of three housing assistance programs -- Low-Rent Public Housing; Below-Market Interest Rate Program; and Rent Supplement Program. The student is asked to calculate the cost of subsidizing a family of four with low income under each of the programs.

HOUSING ASSISTANCE PROGRAMS (B)

The Intercollegiate Case Clearinghouse (Case 12C12)

This case presents housing and demographic data for a hypothetical city of 200,000. The analysis also uses the data in the HOUSING ASSISTANCE PROGRAMS (A) Case. The student is asked to prepare a ten-year housing plan to eliminate substandard housing in that city.

INTERNAL REVENUE SERVICE (A)

The Intercollegiate Case Clearinghouse (Case 11C8)

This case provided data on the costs and additional revenues from auditing different classes of tax returns. The Student is asked to perform an analysis of the audit procedure using marginal cost and marginal revenues. (B. 2.e.)

INTERNAL REVENUE SERVICE (B)

The Intercollegiate Case Clearinghouse (Case 12C9)

This case concerns the operation of a sample survey to estimate the extent of under-reporting of tax liability. The student is asked to prepare a sampling plan based on opportunity costs. (B. 2.b.)

INTERNAL REVENUE SERVICE (C)

The Intercollegiate Case Clearinghouse (Case 12C10)

This case presents the alternative of computerizing the servicing of tax returns in one IRS District. The student is asked to analyze the costs and effectiveness of the computerized method versus the manual system.

LAND AND FACILITIES DEVELOPMENT ADMINISTRATION (A)

The Intercollegiate Case Clearinghouse (Case 12C63)

This case discusses the point-rating system used in the Department of Housing and Urban Development to assist in selecting water and sewer facilities programs for funding. The student is asked to apply the system to two specific projects and to evaluate the usefulness of the rating system.

MacARTHURS IN EUROPE

William P. Snyder, Case Studies in Military Systems Analysis, pp. 61-84.

This is a relatively complex case involving the comparison of two weapon systems. The student is requested to perform an analysis based on given facts. A solution guide is provided. The need for explicit treatment of uncertainty (best-optimistic-pessimistic estimates are made) and the concept of marginal costs are illustrated. (B. 2.b. and B. 2.g.)

MICHIGAN GUARANTEED STUDENT LOAD PROGRAM

The Intercollegiate Case Clearinghouse (Case 13C29)

This case presents a large amount of data on the characteristics of colleges and college students and state and federal student guaranteed loan programs. The student is asked to perform an analysis to answer the question of whether the guaranteed loan program should be continued and, if so, in what manner.

NUTHATCH NATIONAL FOREST (A)

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 281-86.

This case presents a problem where the alternatives are selling timber from a forest in one of two manners or opening the area to recreation. The student is asked to analyze these alternatives and provide a recommendation.

NUTHATCH NATIONAL FOREST (B)

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 287-89.

This case introduces another dimension to the case above. The alternative of providing intensified management to increase the yields of a deferred timber harvest is added. The student is asked to use discounting techniques to aid in the analysis.

OFFICE OF ECONOMIC OPPORTUNITY

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 311-36.

This case compares three different approaches to calculating benefits of anti-poverty programs. The student is asked to evaluate these approaches. (B. 2.b.)

POST OFFICE DEPARTMENT (B)

The Intercollegiate Case Clearinghouse (Case 11C50)

This case presents data on the money-order operations of the Post Office. Based on the data provided, the student is asked to analyze proposals to increase the fees for these money orders and otherwise modify the money-order fee structure.

POST OFFICE DEPARTMENT (C)

The Intercollegiate Case Clearinghouse (Case 11C51)

This case isolates the problem of the effect of the Post Office closing on Washington's Birthday and Veteran's Day and not closing on regional holidays. The student is asked to prepare an analysis of the various possible holiday operating policies.

POST OFFICE DEPARTMENT (D)

The Intercollegiate Case Clearinghouse (Case 11C52R2)

This case concerns the alternative of offering discounts for mailers who pre-sort first-class mail. Based on the cost data presented, the student is asked to prepare an analysis of this problem.

REFUSE DISPOSAL (A)

The Intercollegiate Case Clearinghouse (Case 13C27)

This case presents quantitative data on the operating parameters of New York City's refuse-disposal activity. The student is asked to calculate when the city will exhaust its landfill.

REFUSE DISPOSAL (B)

The Intercollegiate Case Clearinghouse (Case 13C28)

This case describes four alternatives for future refuse disposal. The student is asked to perform a cost-effectiveness study of these four alternatives which are interdependent and at least one of which contains significant technological uncertainty.

STREET LIGHTS

The Intercollegiate Case Clearinghouse (Case 13C24)

This case presents the data to be used to develop relationships between the adequacy of street lighting and traffic accidents and crime. The student is asked to develop the relationships based on the control data presented and to note the limitations of this data. (E. 9.)

SWIMMING POOLS

The Intercollegiate Case Clearinghouse (Case 13C23)

This is a simple study to determine the best way to provide the opportunity for swimming for residents of a "model neighborhood." The alternatives of constructing three pools, six pools, or busing are presented. The student is to perform an analysis of these three alternatives.

VETERANS ADMINISTRATION

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 229-33.

This case concerns the replacement of a hospital boiler plant. Investment and operational cost data is given for three alternatives. The student is to use a discount rate and perform a cost-effectiveness analysis to select the preferred alternative. Intangible factors also must be considered.

E. 3. Skill in Selecting Problems for Analysis

BUREAU OF RECLAMATION (A)

The Intercollegiate Case Clearinghouse (Case 12C68)

This case involves the adoption of quantitative

staffing guides developed by the Air Force to the personnel support function of the Bureau of Reclamation. The student is asked to comment on the applicability of these guides and how the PPB approach would work in the personnel area.

E. 4. Skill in Defining Problems for Analysis

EMERGENCY AMBULANCE SERVICE (A)

The Intercollegiate Case Clearinghouse (Case 13C25)

This case presents a description of the emergency ambulance service of New York City. The student is asked to define the system and to determine objectives and measures of effectiveness and specific alternatives.

E. 9. Skill in Using Systems Analysis for Decisions

DEPARTMENT OF THE INTERIOR (B)

The Intercollegiate Case Clearinghouse (Case 12C44)

This case presents the problem of allocating limited funds to two incommensurate projects -- helium conservation and research in underground excavation. Information from the Program Memoranda for these projects is presented. The student is asked to use this information in making a decision.

DISEASE CONTROL PROGRAMS

Program Budgeting and Benefit-Cost Analysis, ed. by Harley H. Hinrichs and Graeme M. Taylor, pp. 240-54.

This case presents the results of a program analysis on possible motorcycle accident prevention control programs. The student is asked to review the benefit-cost study and decide if the recommended amount of funding is adequate. The issue of placing a value on human life is raised by the study.

EMERGENCY AMBULANCE SERVICE (B)

The Intercollegiate Case Clearinghouse (Case 13C26)

This case is composed of a complete systems analysis of the emergency ambulance service of New York City. Three alternatives (all ambulances at hospital, a satellite system, and dispersed ambulances) are considered. The student is asked to review the analysis as an aid to decision-making.

NAVY SEARCH AND RESCUE HELICOPTERS

William P. Snyder, Case Studies in Military Systems Analysis, pp. 121-45.

This is a complex case which presents a report of systems analysis on the number and types of helicopter systems for search and rescue missions and their operation procedures. The student is asked to make the decision. This case illustrates many of the problems of incommensurate variables.

THE PANTHERS (A)

U. S. Army Management School, Fort Belvoir, Virginia

This case shows a short cost-effectiveness analysis to study the replacement of 750-pound bombs and 2.75-inch rockets with "Panther" guided missiles. There are some obvious errors (particularly omissions) in the analysis. Discussion questions are used to guide the students in the review of this analysis.

THE PIONEER-FREIGHTER

William P. Snyder, Case Studies in Military Systems Analysis, pp. 85-120.

This case presents a completed cost-effectiveness

study on two competing weapon systems, and the student is asked to make a decision based on this study. This analysis contains some glaring errors, including uncertainty concealed by an assumption.

APPENDIX G-1

PPBS SURVEY INSTRUMENT

The basic data for evaluating existing PPBS training efforts was gathered by a survey. The normal survey package included:

(a). A letter that requested the organization or school to complete the survey. As far as possible, this letter was addressed to specific individuals in the organization or school.

(b). An explanation sheet of the questions contained in the survey questionnaire. This sheet defined the scope of the survey and gave examples of the types of replies that were desired.

(c). The questionnaire itself. The majority of questions in the questionnaire were open-ended. This questionnaire technique was deliberately used so that the replies would not be constrained by the language of the questionnaire.

Two basic forms of questionnaires were used -- one for training efforts and one for educational efforts. The same general information was requested in both, but the phrasing of questions was changed to make them more applicable to the specific institution in question. Copies of a typical letter, a questionnaire explanation, and a questionnaire used for both training and educational activities are attached.

Dear Sir:

The Management Department at this University is surveying the various training programs that are currently being offered in the area of the Planning-Programming-Budgeting System. It appears that a part of your professional military course concerns this system.

While the attached questionnaire is specifically designed for short training efforts instead of longer and broader educational efforts such as your school conducts, it can be adapted to use for the portion of your course that concerns PPBS. I would greatly appreciate your organization completing the survey form and returning it in the stamped envelope which is attached by May 15, 1971, if at all possible.

Sincerely,

PPBS Training Effort Questionnaire Explanation

I. Scope of Study:

The Planning-Programming-Budgeting System (PPBS) that is the subject of this survey is the one that was first implemented in the Department of Defense in 1961 and expanded to most of the agencies of the Federal Government in 1965. The system has been adapted and implemented in many state and local governments since that time. As used in this survey, PPBS includes one or more of the following items:

1) A program structure which is established in terms of objectives or missions of the agency.

2) A multi-year projection of costs and benefits (or outputs) of the programs in the program structure.

3) A system of program decisions based on an analytical comparison of costs and benefits of alternatives through the use of systems analysis (including economic analysis, benefit-cost analysis, and cost-effectiveness analysis).

The primary aim of this survey is to determine the types of training currently available to public managerial personnel in the general area of PPBS. While managerial training is the main emphasis, any specialized training that is provided for budgeting personnel, systems analysts, etc. is of interest to evaluate its possible applicability to managerial training. For the purpose of this survey, short (usually one day or less), general orientation programs are not considered as training.

II. Explanation of Selected Questionnaire Entries:

I. H. 1. Level of Participants: Include the military or civil service grades of participants or a more general description of organizational placement where specific grades are not applicable.

III. PPBS Coverage: Examples of information desired include:

Area: History of PPBS

1. Knowledge by the trainee of the evolution of budget practices (including PPBS) in the Federal Government.

Area: Program Structure

1. Knowledge by the trainee of program structure concept.

2. Ability of the trainee to distinguish between input-oriented traditional budgets and output-oriented traditional budgets.

Area: Analytical Analysis

1. Knowledge by the trainee of the concepts and procedures of systems analysis.

2. Knowledge by the trainee of the general applicability of economic concepts such as marginal cost to governmental programs.

IV. Methods of Instruction:

A. Instructional Techniques: Examples include:

Lecture	3 hours
Structured Discussion	6 hours
Problem	6 hours

B. Training materials: Please list the textbook, cases, etc. used for training purposes. If any of these materials were developed locally, please describe in enough detail that their content can be easily understood.

V. Remarks: Include any remarks which you feel would assist the researcher in understanding the training program. Include as attachments any schedules, lesson outlines, etc. which would provide more visibility.

PPBS TRAINING EFFORT

Date_____

I. Administrative Data:

A. Sponsoring Organization_____

B. Organization Conducting Training_____

C. Course Number and Name_____

D. Number of Direct Training Hours in Training Effort

E. Number of Direct Training Hours Devoted to One or More Aspects of PPBS_____

F. Usual Class Size_____

G. Frequency of Offering_____

H. Participant Information:

1. Level of Participants_____

2. Organizational Responsibility of Participants (Check One)

_____Top Executives (Agency or Department Heads)
_____Line Management
_____Staff Management (Not Directly Associated with PPBS)
_____PPBS Duties
_____Other (Specify)_____

II. General Information:

(Describe in general terms the major aim, or objective, of the training effort and a short course description.)

III. PPBS Coverage:

(Describe the areas of PPBS covered in the course offering and the specific learning objectives in each area)

IV. Methods of Instruction:

A. What specific instructional techniques are used in the PPBS area of the course and how many classroom hours are devoted to each?

B. What texts, cases, or other training materials are used for the PPBS portion of the course?

V. Remarks:

A. Name and telephone number of individual to contact in case of questions

B. Other

Dear Sir:

The Management Department at this University is surveying the educational programs that are currently offered in the area of the Planning-Programming-Budgeting System (PPBS). From a review of your University bulletin the following courses appear to be applicable to the PPBS concept:

If PPBS is a significant part of these course offerings, I would appreciate it if one questionnaire were completed for each course. If there are other courses offered by your department in which PPBS is a significant part, please have the questionnaire reproduced locally and complete one form for each course.

Your cooperation in this study and the return of the forms in the attached envelope before May 15, 1971, will be greatly appreciated.

Sincerely,

PPBS Educational Effort Questionnaire Explanation

I. Scope of Study:

The Planning-Programming-Budgeting System (PPBS) that is the subject of this survey is the one that was first implemented in the Department of Defense in 1961 and expanded to most of the agencies of the Federal Government in 1965. The system has been adapted and implemented in may state and local governments since that time. As used in this survey, PPBS includes one or more of the following items:

1) A program Structure which is established in terms of objectives of missions of the agency.

2) A multi-year projection of costs and benefits (or outputs) of the programs in the program structure.

3) A system of program decisions based on an analytical comparison of costs and benefits of alternatives through the use of systems analysis (including economic analysis, benefit-cost analysis, and cost-effectiveness analysis).

The primary aim of this survey is to determine the extent to which this new managerial innovation in the government has penetrated into the various universities. To be considered in the survey it is not necessary that a course be taught solely on PPBS or that all of the elements of PPBS be included in the course. For example a course which concerns the application of systems analysis in the public sector would be applicable to this survey. Also a course on governmental budgeting which contained a significant block (say 6 classroom hours or more) of instruction on PPBS would be applicable.

II. Explanation of Selected Questionnaire Entries:

I. D. Course Length: Number of semester or quarter hours credit given for the course. Please distinguish between quarter and semester.

III. PPBS Coverage: Examples of information desired include:

Area: History of PPBS

1. Knowledge by the student of the evolution of budget practices (including PPBS) in the Federal Government.

Area: Program Structure

1. Knowledge by the student of program structure concept.

2. Ability of the student to distinguish between input-oriented traditional budgets and output-oriented traditional budgets.

Area: Analytical Analysis

1. Knowledge by the student of the concepts and procedures of systems analysis.

2. Knowledge by the student of the general applicability of economic concepts such as marginal cost to governmental programs.

IV. Methods of Instruction:

A. Instructional Techniques: Examples include:

Lecture	3 hours
Structured Discussion	6 hours
Problem	6 hours

B. Educational materials: Please list the textbook, cases, etc. used for educational purposes. If any of these materials were developed locally, please describe in enough detail that their content can be easily understood.

V. Remarks: Include any remarks which you feel would assist the researcher in understanding the educational program. Include as attachments any schedules, lesson outlines, etc. which would provide more visibility.

PPBS EDUCATIONAL EFFORT

Date_____

I. Administrative Data:

A. Name of School_____

_____

B. Department_____

_____

C. Course Number and Name_____

_____

D. Course Length_____

E. Number of Classroom Hours Devoted to PPBS_____

_____

F. Usual Class Size_____

G. Frequency of Offering_____

H. Participant Level

_____ Graduate

_____ Undergraduate

_____ Both Graduate and Undergraduate

II. General Information:

(Describe in general terms the major aim or objective of the course and a short course description.)

III. PPBS Coverage:

(Describe the areas of PPBS covered in the course offering and the specific learning objectives in each area.)

IV. Methods of Instruction:

A. What specific instructional techniques are used in the PPBS area of the course and how many classroom hours are devoted to each?

B. What texts, cases, or other educational materials are used for the PPBS portion of the course?

V. Remarks:

A. Name and telephone number of individual to contact in case of questions

_____

B. Other

APPENDIX G-2

SURVEY OF PPBS TRAINING EFFORTS IN STATE, COUNTY, AND CITY GOVERNMENTS

In order to better understand the managerial PPBS training effort, state, county, and city units that have conducted some formal PPBS training were surveyed. The purpose of this survey was not to compare the results to the conceptual training model designed for the Federal Government, but to assist in constructing the model. Because of the objective nature of the questionnaire, the same survey form was used for these governmental activities as was used for Federal Government training.

The non-federal governmental bodies selected to participate in the survey were identified by the narrative report of a survey, conducted by the State-Local Finances Project[1], of implementation of PPBS in state and local governments. Only those governmental and private associations that were reported to have conducted training or were planning training were included in the survey population.

Table 26 gives a list of the activities requested to participate in the survey and indicates those who replied to the survey request. Table 27 gives a summary of the number of replies to the survey request. Eighteen of the thirty-five organizations (or about 51 per cent) requested to

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[1] Implementing PPB in State, City, and County, pp. 135-37 and 142-45.

TABLE 26

LIST OF ACTIVITIES CONTACTED IN SURVEY OF NON-FEDERAL TRAINING

Associations:

*Budget Executives Institute, Oakland University
**International City Managers' Association
**National Association of State Budget Officers

States:

Arkansas
California
Connecticut
**Iowa
**Maine
*Maryland
**Michigan
*Mississippi
New Jersey
**New York
*North Carolina
**Oregon
Pennsylvania
Rhode Island
Vermont
*Washington
**West Virginia

Counties:

*Bucks County, Pennsylvania
**Metropolitan Dade County, Florida
**Metropolitan Nashville-Davidson County, Tennessee
*Monroe County, New York
**Omstead County, Minnesota
**Orange County, California
**San Bernardino County, California

TABLE 26--Continued

Cities:

*Beloit, Wisconsin
**Danville, Virginia
Dayton, Ohio
Detroit, Michigan
**New York City, New York
**Philadelphia, Pennsylvania
**Pomona, California
*Tacoma, Washington

*Replied that no training in PPBS was conducted

**Did not reply to survey

TABLE 27

RESPONSES TO SURVEY OF NONFEDERAL TRAINING

	Total Contacted	No Reply	Replied But No Course	Course Data Furnished
Associations	3	2	1	0
States	17	6	4	7
Counties	7	5	2	0
Cities	8	4	2	2
Total	35	17	9	9

participate in the survey replied to the request for information. One-half of these eighteen indicated that no training had been conducted except for very short orientation programs.[1]

Survey Results

In order to present a complete picture of the results of this survey, each of the nine positive replies will be discussed. These are discussed in the approximate order of the depth of the training offered, beginning with the least intensive training.

City of Detroit

Detroit, Michigan, has conducted one training program in the area of PPBS. This course involved fifteen hours of lecture instruction. The course could be classified as a reasonably comprehensive orientation of the PPBS concept, including an introduction to systems analysis.

City of Dayton

Dayton, Ohio, attempted to develop a PPBS course for managers that was to be taught by the internal staff. This training was conducted from February to July, 1968. A total of twenty hours of instruction was presented. The majority of the course was spent in working on Issue Papers. The city

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[1]Three of the nine had conducted short orientations (less than one day) or had an informal training program. The other six reported no training at all.

itself was not extremely pleased with the results of this training because of the lack of professional trainers.

State of Rhode Island

Rhode Island has conducted one major training program for line management personnel in the state's Health, Welfare, and Education Departments. This course required a total of twenty-two hours (taught once a week for four weeks). The history of PPBS and its concepts and techniques were presented. Considerable attention was paid to the proper selection of problems for systems analysis and the use of analysis for decision purpose. About fifteen hours of this training was devoted to case discussion.[1]

State of Arkansas

Arkansas utilized the U. S. Civil Service Commission's Planning, Programming, and Budgeting Seminar to train some thirty-five top-level executives in line management positions. Because of the high degree of emphasis on the use of analytic techniques, the reaction of the participants to this course was largely negative. The behavior of the managers attending the course was not affected by the instruction provided.

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[1]In addition to this course, a nineteen-hour training program in PPBS for middle-management personnel is planned for the summer of 1971 covering essentially the same material.

State of Connecticut

Connecticut utilized a consultant firm to develop and teach a twenty-eight-hour course in PPBS to members of line management. A one-day orientation was presented to agency heads, and the other four days of training were presented to the middle-management levels. The courses covered the concepts of PPBS, the structuring of programs, the application of systems analysis, and implementation of PPBS. Generally the lecture method of presentation was used for all instruction.

State of Vermont

Vermont has utilized an extensive four-week course in PPBS for its top executives and line managers. The first week of the course is spent in lectures and discussion on the concepts and techniques of PPBS; the methods of developing program structures; the implementation of PPBS (including training and staffing); and the monitoring of the PPB System. The remainder of the course is devoted to the analysis of specific state governmental problems on a task-group basis. The instructors of the seminar meet with the task-group members to guide their analytic work. Final reports are submitted during the last week to the entire group of participants.

State of Pennsylvania

Pennsylvania has developed a sophisticated program of training in the area of PPBS. This training program is based on six courses. The major course from the point of view of managerial personnel was a thirty-hour Planning-Programming-Budgeting Seminar conducted by a consultant firm during December, 1968, and February, 1969. This course covered the history of PPBS, including examples of its application in other governmental activities. The major stress was on the conceptual basis of the Planning-Programming-Budgeting System. Another course in the Pennsylvania program was a one-time offering on Public Expenditure Analysis. A total of forty-eight hours was devoted to this training effort. Quantitative techniques of systems analysis were explained through lecture and an illustrated cost-effectiveness study. Since 1968 a total of 154 employees have been trained in these two managerially oriented courses.

The remaining four courses in PPBS in Pennsylvania are oriented more toward the technicians who operate the PPB System than they are toward the managerial personnel in the state. These courses include:

1. A twelve-hour PPBS Operations course which is given to all those employees who have duties directly involved in the PPB System. This course covers program structures, program plans, program revision requests, program policy guidance, analysis of programs, and budget procedures and instructions.

2. A sixty-hour economic analysis course for analysts in PPBS. This course gives an introduction into economic theory and analytical procedures required by PPBS.

3. A sixty-hour quantitative techniques course for PPBS analysts. The course primarily deals with statistical methods that are required by PPBS.

4. A sixty-hour computer science course that presents basic computer technology to PPBS technicians.

State of California

California has also developed a sophisticated program of training in PPBS. The major element in this training is the development of training teams to perform internal training in each of the departments. From each department one training team, composed of seven members (three line managers, a fiscal officer, a finance budget analyst, a legislative analyst, and a training officer), is provided forty-eight hours of instruction in PPBS. This instruction includes the history of PPBS; the process of systems analysis; and the specific details of the PPB System adopted in California. Since 1969 some 240 individuals have completed this instructor development training.

In addition to this program, an extensive forty-hour course in Program Management is provided to top executives and line managers from the state's departments. This course relates concepts behind the PPB System and discusses managerial use of systems analysis. Scheduling and evaluation

procedures for controlling major programs are also presented. From 1968 through 1970, some 700 executives in the state's agencies have been trained in this course.

The state also has a course that is used for budget personnel in PPBS. This course covers the history and concepts of PPBS, especially as practiced in California, in about thirty hours of intensive training. About 150 personnel have been trained through this course.

State of New Jersey

New Jersey has developed a unique approach to training of managers in connection with the PPB System. The training program is directly related to the stage of participation of the individual department involved in the PPB System of the state. A total of twenty-two-days' training is provided during the first year that an agency of the state uses PPBS. Six more days of instruction are provided during the second year that PPBS is used in the agency. The type of training provided is very extensive. Not only are the concepts and techniques of PPBS presented but a great deal of action training is provided on the implementation of PPBS including staffing, design of program structures, implementing analytic studies, organizing for PPBS, and organizational change in connection with PPBS. The managerial use of analysis, including the identification and definition of issues for analysis and the determination of alternative methods to achieve objectives, is stressed.

Summary

Even though the number of states that replied to the survey and are engaged in an active training program for PPBS is relatively small, one cannot help but be impressed with the magnitude of efforts of at least four of them. These four training programs all have a high degree of emphasis on the training of managerial personnel. Vermont's use of task-force analysis for training, Pennsylvania's use of short courses taught on an extensive basis, California's use of internal departmental instructor teams supplemented with an extensive course in program management, and New Jersey's intensive program of instruction on PPBS that corresponds to the depth of participation of the agency in the system, all represent unique approaches to the complex problem of achieving a massive change in the behavior of managerial personnel in connection with the Planning-Programming-Budgeting System.

APPENDIX G-3

PPBS-RELATED COURSES FOR CIVILIAN AGENCIES OF THE FEDERAL GOVERNMENT[1]

From the material received from the United States Civil Service Commission, the courses applicable to PPBS were identified. Two courses were of direct interest to the study. These were a two-week Planning, Programming, and Budgeting Seminar and a nine-month effort called "Educational Program in Systems Analysis." These are discussed in detail in Chapter IX.

In addition to these two courses, there were a number of courses that were related to specific aspects of PPBS. These included:

1. Two short orientation programs. One is designed for upper-level management and the other for middle management. Because of their short duration, they could not treat any of the learning objectives in the model formulated in Chapter VIII in anything but a summary manner. These programs are:

EXECUTIVE ORIENTATION IN PPB

An introduction to major concepts of PPB including the foundations, documentations, and processes. Principally an informational program with one case problem to demonstrate roles and application of analysis. Primarily for grades GS-14 and above.

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[1]The course descriptions presented in this appendix are quoted from U. S., Civil Service Commission, The Management Services Training Center, The Schedule for January-June, 1971, Washington, D. C., n. d.

Frequency of Offering: Approximately four times a year with 30-40 participants each time
Number of Classroom Hours: 18

GENERAL ORIENTATION IN PROGRAM EVALUATION

A general introduction to objectives and methodology of PPB for middle level personnel. Lecture program aimed at informing participants on the broad aspects involved in PPB.

Frequency of Offering: Approximately six times a year with 30-40 participants each time
Number of Classroom Hours: 12

2. One short course on the history of budgeting. This course would primarily be concerned with specific learning objectives A-1, A-2, and A-3 which relate to the early history of budgeting, the Budgeting and Accounting Act of 1921, and the Hoover Commissions.

THE FEDERAL BUDGET PROCESS

This course is designed to provide an understanding of the budget process. It will be helpful particularly for those working in a professional capacity who are relatively new to the Government. Subject matter includes the function, history, and procedures of the Federal Budget Process.

Frequency of Offering: Approximately twelve times a year with 30-40 participants each time
Number of Classroom Hours: 12

3. Three courses that cover the use of analytical and mathematical techniques in management. These courses would be useful in developing a perceived need for analytic techniques in managers and giving them an acquaintance with the capabilities of systems analysis.

SYSTEMS ANALYSIS FOR GOVERNMENT OPERATIONS

A program designed for managers, staff professionals, administrators, and others who want to better understand and use systematic approaches to the problems of their agencies, or who work with those who are now using systems analysis. The course is intended for GS-13 and above or equivalent.

Frequency of Offering: Approximately ten times a year with 30-40 participants
Number of Classroom Hours: 18

ECONOMICS FOR PUBLIC MANAGERS

A program to provide public managers with an understanding of economic considerations and implications in the decision process. Topics in price theory, determination of demand, cost analysis, economic efficiency, and capital budgeting.

Frequency of offering: Approximately twice a year with 20-25 participants
Number of classroom hours: 30

MANAGEMENT ANALYSIS TECHNIQUES

A course designed to: acquaint management and others feeling a need for the training with tools and techniques of analysis; provide an orientation in the application of analytic tools to management problem-solving; and develop an appreciation for analytic techniques. The program is structured to permit discussion along with an exchange of ideas and information.

Frequency of offering: Approximately four times a year with 20-25 participants
Number of classroom hours: 30

4. Nine courses that are specifically designed to acquaint the trainee with specific techniques of systems analysis rather than the broad appreciation presented in the previous courses.

EXECUTIVE SEMINAR IN DECISION-MAKING TECHNIQUES

A program designed to examine applications of mathematical and statistical techniques in the solution of organizational problems. Participants are presumed to have general and recent knowledge of algebra, finite mathematics, and statistics.

Frequency of offering: Approximately twice a year with 30-40 participants
Number of classroom hours: 18

OPERATIONS RESEARCH ORIENTATION

A program designed to provide a general introduction to the classes of analytic techniques known as Operations Research/ Systems Analysis. The underlying management concepts, basic methodology, and classification and description of techniques and their uses will be covered.

Frequency of offering: Approximately twice a year with 30-40 participants
Number of classroom hours: 18

EXECUTIVE WORKSHOP IN OPERATIONS-RESEARCH TECHNIQUES

A course designed as a techniques-oriented program for executives already familiar with the broad concepts of Operations Research/Systems Analysis. Major techniques covered are: mathematical programming, probability techniques, simulation models, and networking.

Frequency of offering: Approximately twice a year with 30-40 participants
Number of classroom hours: 12

ECONOMIC INVESTMENT ANALYSIS

A course covering the major elements involved in economic investment analysis of Department of Defense projects. Lectures, case studies, and discussion groups cover such topics as: discounted cash flow, cost analysis, treatment of inflation and uncertainty, decision criteria, and preparation and presentation of economic investment analyses. Although cases and examples are drawn from Defense, the principles and techniques are applicable to all government programs using economic analysis. Participation is open to civilian and military personnel in the middle or upper levels of management, administration, or budgeting in government.

Frequency of offering: Approximately eight times a year with 20-25 participants
Number of classroom hours: 24

TECHNIQUES AND METHODS OF OPERATIONS RESEARCH

This program is designed to increase the practical understanding of such basic operations-research techniques as: inventory theory, replacement theory, simulation, cost/benefit analysis, linear and dynamic programming, and game theory.

Frequency of offering: Approximately four times a year with 20-25 participants
Number of classroom hours: 24

COST/BENEFIT WORKSHOP

A course designed to provide instruction in the basics of cost/benefit analysis, with a maximum amount of participation in actual analysis and a minimum amount of philosophy consistent with understanding. Several case exercises take up about half the course workshop. Topics covered include: the setting

for analysis; criteria problems and output measures; problem formulation and systems identification; the process of analysis; model building and use; present value, discounting, and other time problems in analysis; cost and benefit identification and calculation; standards for reviewing analysis; and the economics of public program analysis.

Frequency of offering: Approximately eight times a year with 20-25 participants
Number of classroom hours: 30

DETERMINING PROGRAM COSTS

A course to provide participants with an understanding of the techniques for estimating costs of future programs and the capability to apply these techniques to their own operations. Participants will learn methods for costing and analyzing current and proposed programs through the use of demonstration cases and guided workshops. Subjects include: regression and correlation analysis, time series, improvement curves, and index numbers. Limitations and assumptions within the management context will be highlighted.

Frequency of offering: Approximately four times a year with 20-25 participants
Number of classroom hours: 30

LINEAR PROGRAMMING

A course designed to enable an analyst or program manager to: recognize problems that can be solved by linear programming; understand the ideas of linear programming; formulate problems in the correct form for solution; and obtain solutions to problems, usually through the use of standard computer programs readily available for all government computers. A computer will be used for solving demonstration problems.

Frequency of offering: Approximately twice a year with 20-25 participants
Number of classroom hours: 30

DISCOUNT RATES AND PROCEDURES

A course to instruct managers and program analysts in the proper application of discount rates to projected cost and benefit streams of alternative programs. For purposes of comparison, the anticipated costs and benefits of all major government investments must be reduced to a level of present value through the application of appropriate discount rates. This course will discuss the question of the appropriate rates, explain the concept of present value, and equip participants to derive present value through the use of standard discount tables.

Frequency of offering: Approximately four times a year with 20-25 participants
Number of classroom hours: 6

Attachments:

1. Letter from Roy W. Niemela, Evaluation Division, Office of Management and Budget, February 19, 1971.

2. Letter from Thomas D. Cablk, Management Services Training Center, Bureau of Training, United States Civil Service Commission, February 18, 1971.

C-O-P-Y

February 19, 1971

Major Richard D. Smith
1005 Chautauqua Avenue
Norman, Oklahoma 73069

Dear Major Smith:

Your letter of January 30 to the head of our Resources Systems Branch, Budget Review Division, has been referred to me for reply.

The Office of Management and Budget, previously the Bureau of the Budget, relies on the Civil Service Commission for establishing and operating Government training courses. May I suggest, therefore, that your question about PPB and systems analysis courses can be answered best by the Management Sciences Training Center of the Civil Service Commission here in Washington. Please contact Mr. Chester Wright, Director of the Center, at the address shown on the enclosed card.

I wish you well on your research project.

Sincerely,

(Signed by)

Roy W. Niemela
Evaluation Division

C-O-P-Y

626

C-O-P-Y

February 18, 1971

Richard D. Smith
Major, USAF
1005 Chautauqua Avenue
Norman, Oklahoma 73069

Dear Major Smith:

Your letter of January 30, requesting information on certain training courses, has just arrived on my desk. I hope the delay has not caused you any hardship in your research.

The PPB and Systems Analysis training courses which we provide are shown in two enclosed brochures. In the blue booklet are short courses given here in Washington. Similar courses are given by our Regional Training Centers in various locations around the country. Some of the courses are given entirely by our staff, some are given by contractors, and some are combinations. If it is necessary to distinguish between them, I shall be happy to do so. I have marked the courses most closely connected with PPB and Systems Analysis with a red check mark. Others are related in varying degrees to those subjects.

In addition, we administer a nine-month training program called the "Educational Program in Systems Analysis," described in the brown brochure. It is given by 6 universities.

Per your request, our booklet describing available teaching cases is also enclosed. As a small incidental matter, we changed our scope and name last year, and are now the Management Sciences Training Center.

If you have additional questions, please write to me.

Sincerely yours,

(Signed by)

Thomas D. Cablk
Assistant Director for
Program Analysis
Management Sciences Training
Center
Bureau of Training

C-O-P-Y

APPENDIX G-4

LIST OF DEPARTMENT OF DEFENSE TRAINING ACTIVITIES SURVEYED

I. Professional Military Schools

Air Command and Staff College
Air War College
Armed Forces Staff College
*Army War College
Command and General Staff College
Industrial College of the Armed Forces
Marine Corps Command and Staff College
National War College
*Naval Postgraduate School
School of Systems and Logistics
Squadron Officers' School

II. Technical and Managerial Short Courses

Advanced Cost and Economic Analysis, School of Systems and Logistics, USAF
Advanced Quantitative Methods in Cost Analysis, School of Systems and Logistics, USAF
Basic Quantitative Methods in Cost Analysis, School of Systems and Logistics, USAF
**Budget Officer Course, Air Training Command, USAF
*Defense Management Systems Course, Naval Postgraduate School, USN
Economic Analysis for Decision-making, Army Management Engineering Training Agency, USA
Financial Administration Course, Air Training Command, USAF
Financial Management for Managers, Army Management Engineering Training Agency, USA
Operations Research Appreciation, Army Management Engineering Training Agency, USA
*Operations Research/Systems Analysis Executive Course, Army Management School, USA
Professional Military Controller Course, Air University Institute for Professional Development, USAF
Quantitative Decision-making, Army Management Engineering Training Agency, USA
Top Management Seminar, Army Management Engineering Training Agency, USA

*These offices did not reply to the survey.
**A reply was received to the survey but the course offering was not applicable to this study.

APPENDIX G-5

OTHER PPBS-RELATED COURSES OF THE DEPARTMENT OF DEFENSE

In addition to the Department of Defense's programs of training in PPBS that are discussed in Chapter IX, six short courses that are directly related to the PPBS effort were identified. These courses are not included in Chapter IX because they are primarily designed for technicians for PPBS work. As such, they provide a highly intensive treatment of narrow subjects and are not easily and economically adaptable to managerial PPBS training.

These six courses are:

Economic Analysis for Decision-making

Army Management Engineering Training Agency

This course is designed to give the trainee knowledge in the use of a variety of techniques to evaluate cost impacts of management decisions. Training in concepts of applied decision-making, classification and measurements of cost, time value of money, and basic methods of economic comparisons is provided.

Frequence of offering: 8 times a year with 20 participants

Number of classroom hours: 80

Basic Quantitative Methods in Cost Analysis

School of Systems and Logistics

This course is designed to develop a basic understanding in quantitative techniques used in cost-estimating

and cost analysis. Topics include basic statistics, linear analysis, regression analysis, and variance analysis as applied to cost-estimating.

Frequency of offering: Approximately 3 times a year with 20 participants

Number of classroom hours: 82

Advanced Quantitative Methods in Cost Analysis

School of Systems and Logistics

This course is designed to develop more advanced skills of quantitative techniques in cost-estimating. Topics include multi-variate regression analysis, curilinear regression analysis, and use of time-sharing computers in cost-estimating.

Frequency of offering: Approximately 2 times a year with 18 participants

Number of clsssroom hours: 108

Advanced Cost and Economic Analysis

School of Systems and Logistics

This course provides extensive application of the techniques taught in the two previous courses. Topics include review of the techniques taught in the two earlier courses, sensitivity analysis, and evaluation of existing data base.

Frequency of offering: Approximately 2 times per year with 15 participants

Number of classroom hours: 120

Professional Military Controller Course

Air University Institute for Professional Development

This course is designed to develop the professional

qualifications of a comptroller at departmental and operating levels. A substantial part of this course includes a survey of some of the principles of PPBS as it affects the comptroller of the organization.

Frequency of offering: 3 times a year with 38-40 participants each time

Number of classroom hours devoted to PPBS-related subjects: 77

Financial Administration Course

Air Training Command

This course is designed for mid-level personnel in the comptroller's organization. It presents financial techniques, including a discussion of PPBS from the point of view of its effect on the operations of the comptroller.

Frequency of offering: 4 times a year with 12-16 participants

Number of classroom hours devoted to PPBS-related topics: 78

APPENDIX G-6

COLLEGES AND UNIVERSITIES NOT REPLYING TO SURVEY

School	Department
American University	Government and Public Administration
Arizona State University	Political Science
Ball State University	Political Science
Boise State College	Public Administration
California State College, Hayward	Public Administration
California State College, Los Angeles	Political Science
California State Polytechic College, Kellogg-Voorhis	Political Science
Cleveland State University	Economics
Columbia University	Economics
Cornell	Graduate School of Business and Public Administration
De Pauw	Political Science
Florida A&M University	Political Science
Florida State University	Government
George Washington University	School of Government and Business Administration
Georgia State College	Political Science
Harvard University	Government
Indiana State University	Political Science
Indiana University	Political Science
Louisiana State University	Economics
Michigan State University	Political Science
Moorhead State College	Political Science
North Carolina State University	Political Science Economics
Northwestern University	Political Science
Ohio State University	Public Administration
Pennsylvania State College	Political Science
Princeton University	School of Public and International Affairs
Sonoma State College	Political Science
Southern Illinois University, Carbondale	Government
Stanford University	Graduate School of Business
Syracuse University	Political Science
United States Naval Academy	English, History, and Government
University of California at Los Angeles	Economics
University of California at Riverside	Graduate School of Administration

University of Denver	College of Business Administration
University of Florida	Political Science
University of Georgia	Political Science
University of Hartford	School of Business and Public Administration
University of Iowa	Political Science
University of Maine	Political Science
University of Massachusetts	Economics
University of Michigan	Economics
	Political Science
University of Minnesota	School of Public Affairs
University of Mississippi	Economics and Business Administration
University of Missouri, Columbia	Political Science
University of Missouri, Kansas City	School of Administration
University of Nebraska	Economics
University of North Carolina	Economics
University of Pennsylvania	School of Finance and Commerce
University of Rhode Island	Political Science
University of Utah	Political Science
University of Washington	Economics
Utah State University	Political Science
Washington University	Economics
Wayne State University	Economics
West Virginia University	Political Science

APPENDIX G-7

COLLEGES AND UNIVERSITIES REPLYING WHERE PPBS IS NOT A SIGNIFICANT PART OF CURRENT COURSE OFFERINGS

School	Department
*Brigham Young University	Political Science
Harvard University	Economics
Memphis State University	Political Science
Ohio University	Economics
Princeton University	Economics
University of Chicago	Graduate School of Business
*University of Mississippi	Political Science
University of Missouri, Columbia	Economics

*A course with a substantial offering in PPBS is planned for the near future.

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