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PROGRAM ANALYSIS REVISITED\*

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Much of the recent decline in both the rate and volume of program budgeting activity in the United States derives from the difficulties organizations encounter in trying to develop the required program analysis capability. Fortunately, in many cases, the very real problems created by the search for objectives and meaningful programs lead some organizations to recognize analysis as an important management activity in and of itself. To establish objectives requires analysis of what the organization wants to accomplish. Developing programs means looking at the activities now carried on, creating possible alternatives and then deciding upon a future course of action in program and program element terms. All of this requires systematic analysis.

The emphasis on objectives in program budgeting literature led many organizations to assume that the proposal contained some kind of electronic "black box" that would develop objectives and programs for achieving them through a new brand of computer magic. In some situations, when experience demonstrated that there was no magic or easy way, and that analysis and hard work were required, the effort was abandoned. In other cases it resulted in recognition of the value of identifying objectives through program memoranda or writing issue papers or some combination of the analytical steps.

This paper examines the experience of a number of organizations in developing an analytical capability.

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### BUILDING AN ANALYTIC CAPABILITY

The primary reason for program budgeting is to provide an improved method for making decisions on the major policy issues an organization faces so that it can better determine the allocation of its limited resources. It does this through the use of analysis with particular emphasis on system analysis.

The activity required is described succinctly and well in Hawaii's second report on program budgeting for that state:

The analytic procedures characteristic of the PPB approach to problem solving can be reduced to the following steps:

1. Identify and quantify if at all possible the real objective, a task fraught with intellectual and practical hazards.
2. Array all of the alternatives for accomplishing the objective, not just the popular and orthodox ones.
3. Compute or estimate the true total costs and the real effectiveness of each of the alternatives.
4. Compare the changes in marginal costs and marginal benefits within and between alternatives for various levels of effectiveness taking care to re-examine the amount of the objective desired and the possibility of more efficient "mixed solutions."
5. Estimate the spill-over effects and the risks and uncertainty associated with each alternative and do "sensitivity analysis" where appropriate to answer the "what if...?" kind of questions.
6. Using an appropriately designed criterion, select a particular alternative, or mix of alternatives, as the recommended solution, again taking special care to note the results of "5" above.

In general, the use of this approach provides a way of looking at problems of economic choice-making (i.e., a viewpoint and an attitude), of identifying essential items of information, and of creating a structure or framework for organizing and comparing these data in a manageable and analytically insightful way.\*

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\* Progress Report on Implementing Act 185, Session Laws of Hawaii 1970, submitted by Hiram K. Kamaka, Director, Department of Budget and Finance, December 21, 1970.

It should be pointed out that the above statement presents an ideal that every organization should strive to achieve. It also should be recognized as one that is rarely, if ever, attained in practice. To do good policy analysis is just a very difficult task.

Although it may come as a surprise to many people, analysis has had only limited application to the problems of government and business. In government it has been applied chiefly to Department of Defense procurement of major new equipment and to natural resources. Decisions on locating new dams and timber management in public forests are examples of the latter. In business it has tended to focus on activities like investment in new plant or major equipment, warehouse location or production scheduling, and for these usually on a one-at-a-time basis.

That the use of analysis in government or business is on a small scale undoubtedly comes as a shock to a society that is: (a) high-technology oriented, (b) able to put a man on the moon, (c) willing and able to introduce the "new math" in its secondary schools, and (d) seeing computer developments that seem to offer "magic" as a substitute for reasoning. But, analysis of reasonable quality outside of the natural and physical subject fields is still a scarce commodity.

#### Reasons for Scarcity

An explanation for this scarcity of reasonably useful analysis in the social sciences is found primarily in the difference in phenomenology in these subject areas as compared to that in the natural and physical sciences. Secondly, it results from a combination of: quite late development in the application of quantitative techniques to social and economic problems;\* applying quantitative methods with a preoccupation for imaginary and hypothetical problems rather than with attention to observable reality; and a

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\* Although there are isolated examples of analytical studies prior to the mid-1960s, a substantial amount of work in these fields is a very recent development.

concern with methods that are brighter and shinier rather than with those that promise better performance.\*

This criticism of analysis in the social sciences, business, and government is undertaken to identify two problems that come to the fore in attempts to develop program budgeting as a new management decision-making process for an organization. The first is the lack of demand for good analysis on the part of the managers. The second is difficulty in supplying good analysis when it is requested.

Managers Do Not Seek Analytical Studies. Analysis related to the decisions managers must make is not sought for a simple reason: They have no occasion to want such assistance unless there is a crisis which threatens their control. There is a tendency to think of the manager as Marvin Bower of McKinsey & Co. describes him. That is as "an artist in the broadest sense: a creative allocator of resources, an orchestrator of diverse technical disciplines..."\*\* They rarely fit this ideal. Another essay in the same book points out something closer to the real situation which is that "...most chief executives do not want a strong, independent group of directors...The majority of chief executives looks for a rubber-stamp board." That is, they do not want to be appraised or be held accountable.

This second quote comes close to the writer's own concept which is that:

- I. Managers strive to maximize their own autonomy.
- II. Managers do their thing.
- III. Managers tend to ignore past mistakes.
- IV. Managers have little tolerance for uncertainty.

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\*The writer kicked off a major discussion of this problem in "Mathematics: Logic, Quantity and Method," The Review of Economics and Statistics, November 1954. Paul A. Samuelson MC'd a discussion by Professors L. R. Klein, J. S. Duesenberry, J. S. Chipman, J. Tinbergen, D. G. Champernowne, Robert Solow, Robert Dorfman, T. C. Koopmans, Samuelson himself, and the editor, Seymour Harris. That discussion continued in The Review for several issues and spilled over into other learned society journals. As retiring president of The American Economic Association, Wassily Leontieff probably has revived the discussion in his "Theoretical Assumptions and Nonobserved Facts," American Economic Review, March 1971.

\*\*Arts of Top Management, edited by Roland Mann, McGraw-Hill, 1971

They have no obvious reason to want to change the existing system which is the one that brought them to success. If one is led to assume that this applies only to government, let him look at the 1970 history of management by the members of the New York Stock Exchange, LTV, or Penn Central. Ford Motor under Old Henry was another and striking example. One reason for this is that, in the absence of a crisis or threat to his leadership, the manager has little or no incentive for self-examination.

Difficulties in Supplying Good Analyses. When analysis is requested, it is not easy to respond for a number of reasons. These include the difficulties in applying methodology developed in the natural and physical sciences on the basis of stable phenomena to the constantly changing and volatile activities of business, governments and people that are the subject matter of social sciences. At present we lack both basic data and special methodology in these areas. What we have now is only a very limited start on filling these needs.

These lacks create serious problems for both would-be teachers and students. As a result, teaching the use of quantitative methods is relatively new even in Economics which is the granddaddy of the social science efforts.

Out of a bibliography of ninety items which Prest and Turvey did in their excellent survey of cost-benefit analysis, only three items were cited as published prior to 1950.\* Although the survey did not attempt to assure completeness, it is nonetheless a good index of the amount of quantitative work done in economics prior to that year. To be sure, a count for the years through 1960 would have increased the number of citations but only to ten.

With not many courses and only a few students (until very recently) it follows that the supply of available analysts is small. Since the number of professionally qualified individuals is small and the available methodology and data are of limited usefulness, it is very difficult to supply a large number of reasonable-quality analytical studies.

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\*Prest, A.R., and R. Turvey, "Cost Benefit Analysis: A Survey," The Economic Journal, December 1965, Vol. 15, No. 300, pp 683-735.

This is not intended to denigrate analysis or to raise the voice of despair about gaining real benefits to the decisionmaking process through analytical methods. Other methods like intuition or established practice have real problems, too.

Analysis of various kinds can and should be applied at the different levels of managerial decisionmaking from:

1. Day-to-day operations,
2. Short-run changes over the next 6 to 18 months, to
3. Long-range plans for determining where the organization wants to be and what it should be doing 2, 5, 10 or more years from now.

As we step up the ladder of managerial decisions, the problems to be solved are less clear or precise at each level. In day-to-day operations the questions are the relatively straightforward ones of efficiency translated into production schedules, mailroom procedures, individual workloads and the like. Over a longer period measured in months, there is some opportunity to deal with more complicated problems of efficiency in terms of inventory control, changes in activities performed or ways of doing them, putting more emphasis on one kind of equipment and less on another. In short, minor shifts in emphasis and direction of a flow of activities already well in motion.

Since World War II, operations research and related mathematical and logical methods of analysis have been applied successfully to improving efficiency at these first two levels where everyone has a fairly good idea of what "more efficient" means. It is when questions of a third level are involved, like, what does the organization want to be, or what should it be doing--policy issues--that analysis becomes a most difficult task.

As a former counsellor to President Nixon put it:

Tracing the complex and involute interconnections by which inputs produce outputs in a large social system is not the work of amateurs. It is not now done in any area of social policy save in economics,

and there, most economists would insist, it is done imperfectly. It is not done elsewhere because no one really knows how to do it. It is just that most persons who have considered the matter feel it has to be done, and accordingly someone will have to learn how.\*

And program budgeting has put more people to work trying to learn how to do analysis of social systems than any other management effort in history.

#### CASE HISTORIES OF ANALYSIS

A number of varied and different approaches have been taken to deal with the difficulties arising from the current demand for analysis. None of these has provided more than a partial solution. This is not surprising in light of the problems in both the demand and supply sides just discussed. There also are demand and supply effects arising from the timetable used in putting program budgeting into effect. The demand for INSTANT ANALYSIS created by U.S. Bureau of the Budget Bulletin 66-3 which in 1965 launched the new system in most agencies of the federal government outside of the Department of Defense. (DOD had introduced program budgeting in 1961.)

A study made for the Budget Bureau in 1968 concluded: "The dilution of the quantity of analytical professionals who had the required skills caused by the demand for instant analysis in all agencies almost guaranteed that the quality of analysis would suffer."\*\* They also point out, "There seemed to be a sufficient number of analysts' positions authorized...to make the PPB system work by 1968 even though the positions might not be optimally placed." In addition, they found "A scarcity of analytic skill...in most agencies...." and that "One possible explanation for this scarcity...among persons selected for the analysis staffs is that many...transferred into PPB work from

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\* Moynihan, D.P., National Goals Research Staff, Toward Balanced Growth: Quantity with Quality, U.S. Government Printing Office, July 1970, p 7.

\*\* In "Personnel Limitations on Instant Analysis," by Harper, Kramer and Rouse, a chapter in Program Budgeting 1971, a Rand book now in final stages of preparation.

agency occupational categories such as budget analyst, program analyst or management analyst without specific reference to prior quantitative or analytic work."

This problem has also been discussed by Chester Wright, Director, Management Sciences Training Center, U.S. Civil Service Commission. He says,\*

Looking for analysts inside the government...there already existed many so-called analytic positions... Since the last name in PPB is budget, there was a natural inclination to look there.

Since the content of Budget Bulletin 66-3 indicated that there was a certain amount of economics associated with PPB, agencies...tended to look among those staffs (economics) as a recruiting source...There was also the belief...that people...working in various programs for a good many years should know enough about those programs to be able to analyze them.

It is implicit in the essay that few of these people knew enough about either their programs or analysis to meet the requirements. Nor did many of the budget analysts or economists.

Since few of the government's available analysts could fill the need, Wright then addresses the question of the requirements to be filled by an analyst in program budgeting.

A point that cannot be emphasized too much is the fact that PPB analysis is truly interdisciplinary in nature. No single academic discipline has a lock on PPB analysis. No one from any presently existing discipline can be a good PPB analyst unless he has acquired insights and skills from other surrounding disciplines...He should know some economics; by this I mean specifically micro-economics and its application to problems of the public sector.

We are most specifically not talking about the applications of welfare economics. There was an early temptation on the part of some people to equate welfare economics with the analytic endeavors required by PPB. This is simply not the case. In the first place, PPB is not as normative as most of the theory

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\*From "Recruiting and Developing PPB Staff," by Chester Wright, a chapter in Program Budgeting 1971, a Rand book now in final stages of preparation.

under welfare economics tends to be. Additionally, the convoluted mathematical and mechanical computations which seem so alluring to most of the people writing in the welfare field, have no useful application in the real world of political intrusions and data deficiencies.

Knowledge that should be possessed by the ideal analyst is in the fields of mathematics and statistics. I do not mean anything very profound in either subject. Some of the more useful tools seem to lie in the field of vectors and matrices, some idea of basic notation, sampling techniques, probability and simulation modeling. He should also be aware of what some of the so-called management sciences derive from the practical application of mathematics. Particularly useful seem to be linear programming, regression analysis and some knowledge of the basic techniques of computer application.

In addition, he must have a practical knowledge of the area in which he is working. He either must have this to start with, or he must gain it. It is not true that analysis can be applied in some sort of pure fashion to an area of public endeavor about which the analyst has no real insight or useful experience.

He must also know something about budgeting; the way that budgets are constructed and the whole process of budget analysis, presentation and approval. He must know something about accounting from the standpoint of information on the handling of accounts and how this information is aggregated and presented to management. He must know something about the management process en toto. He should have some insight into how large-scale enterprises are organized and managed. He does not really need great depth in any of these areas. There is no particular advantage in his being a recognized expert in one or more of these fields, but he must have a rock-hard grasp of the fundamentals in each area if he is to avoid making calamitous mistakes.

Reading the foregoing account of what a good program budgeting analyst should know, makes it clear that the analysis requirement is not easy to fill. That this is the case is set forth again and again in case histories.

Belgium: "...the almost nonexistence in Belgium of analytical capability, adequate statistical information..."

Canada: "Speaking subjectively, mostly for lack of evidence to the contrary, it would appear that the immediate impediment to progress in analysis is the general absence...of junior officers qualified to conduct analysis and senior officers who really want it conducted."

France: "The shortage of qualified analysts must be underlined. The existence of trained analysts, working at the right place, is a prerequisite of success...civil servants often lack analytical capability since most of them have a humanities training which does not include the use of quantitative methods."

Ireland: "...difficulty of securing adequate skilled personnel to do the work involved...limited number of 'trained' personnel available and these persons, themselves, were 'learning by doing.'"

Japan: "The non-defense areas of government have not had a long experience in systematic analysis. The number of young analysts is gradually increasing but the number is still not large enough."

More examples from the cases would only repeat the above citations. Despite continuing complaints about getting analysts or people who can do good analytical work, the situation is not at all a hopeless one. There are a number of cases where the development of just enough capability has made possible better decisions than would have been available in the absence of the capability developed through the program budgeting effort.

New York City's experience is representative. "The staff...has a sprinkling of systems analysts and operations researchers. It is in the main a generalist staff...Despite relatively thin education in quantitative analytic techniques, we find that they learn fast and perform superbly."

"The net result is that the analysis effort under program budgeting has tended to become a wide-ranging management improvement program...It has produced massive changes--a revolution of rising expectations that he (the Mayor) can now demand and often get rational analyses of recommended program actions and of the alternatives!"\*

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\*From "Program Budgeting in the City of New York," by Frederick O'R. Hayes, a chapter in Program Budgeting 1971, a Rand book now in final stages of preparation.

## CONCLUSION

Recruiting and training analysts and building an analytical capability has been the largest single problem in applying program analysis. There have been others, too. Belgian experience in building a program budgeting analysis capability may be useful. The Belgians "attach the greatest importance to the drawing up of the first program structure for a ministry. This involves several months of joint work by the Institute's [non-government] researchers and the chief department administrators. It is necessary to make them [ministry employees] think in terms of goals, concrete objectives and the alternative ways of attaining these, instead of thinking in terms of activities resulting from law and from previous regulations. Drawing up of the program structure helps to make explicit the objectives that are implicitly behind the departments' ongoing activities. It also leads to a regrouping of these activities in a manner that will collect and present information adequately for future political decisions."

Since the need to make people think in terms of goals, concrete objectives and alternative ways of attaining these, rather than in terms of activities resulting from law and existing regulations is too often overlooked or misunderstood, it is worth repeating that statement. It also was the barrier that quickly stopped those who were looking for a "black box" to solve all decision problems.

Obviously these are the first steps in program analysis. The ones involved in applying quantitative methods to imaginary and hypothetical problems that offer little in terms of observable reality may look like program analysis but they are not an acceptable substitute for the genuine article.