

Dimensions of Rationality and PPBS*

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The concept of rationality provides a link between the structure of PPBS and administrative behavior. Many implications of PPBS for administrative programs can be elaborated through an analysis of the dimensions of rationality. This chapter examines how the structure of PPBS can be translated into that of organization. Once a PPBS structure is translated into the structure of organizational behavior, it becomes possible to study further some implications of PPBS through organizational concepts and theory. This chapter does not attempt to examine a relationship between PPBS and any particular organization.

A. ELEMENTS OF RATIONALITY

Basically, PPBS as a rational calculus involves three elements: environment, agent, and technology. The agent is the one who attempts to employ the system and for whom PPBS is prescribed. He is the decision maker. The environment and technology are those of the agent. The requirements of PPBS such as explicit goals and objectives are concerned with the problems of identifying and categorizing the environment of the agent in some meaningful way so that the agent can act in an appropriate manner. Programming, program structure, and program alternatives of PPBS calculus are concerned with the problems of technology of the agent.

PPBS as a prescribed design seems to be based on the following scheme of explanation:⁽¹⁾

An agent is faced with an environment, type S,

He is a rational agent,

In an environment of type S, any rational agent will do T.

Therefore, the agent does (or will do) T.

This is transformed into:

* This is a second installment in a series of excerpts from an unpublished Ph. D. dissertation titled, *An Analysis of Planning-Programming-Budgeting System: Norms of Rationality and Administrative Programs in Government*, submitted to the University of Pennsylvania (1969), Ch. III.

(1) Adapted from Carl G. Hempel, *Aspects of Scientific Explanation, and Other Essays in the Philosophy of Science* (New York: The Free Press, 1965), p. 47.

An agent must know that he is faced with an environment, type S,
He should be a rational agent,
In an environment of type S, any rational agent will do T,
Therefore, the agent will do T.

“T” here is technology, which should be most efficient and effective. It is assumed that an agent lives in an environment, and his selection of a technology depends on his knowledge of the environment and available technologies. It is further assumed that the more rational the agent, the greater his effort to understand both environment and technology. Since an interpretation of the environment and choice of technology are the prerogative of the agent, there logically can be no objective determination of either.

What remains, then, is the prescription that the agent should be rational. Faced with the impropriety of defining someone's objectives and technology, norms of PPBS and its calculus require that the agent should be rational and offer the “rational techniques” of rational man. The conceptual difficulty of such a scheme is enormous and it almost leads to a tautology: a rational agent is one who does things rationally.

Let us return to the problem of examining what is involved in the prescription of PPBS. In a general sense, rationality of action is the product of the following inter-acting elements: (1) an agent, (2) an end, a future state of affairs toward which in the mind of the agent the process of action is aimed, (3) a set of conditions, aspects of the situation over which the agent has no control, and (4) a set of means, aspects of the situation over which the agent does have control⁽²⁾.

Variance in rationality thus comes from many sources. First is the disposition of the agent. As long as the agent tries to select means to achieve an end, he is rational. Secondly, the more explicit and empirical the ends, the more rational. And, thirdly, the greater the knowledge of means, the more rational the behavior of the agent. We will examine how each source of variance in rational behavior is treated in PPBS and how these sources can be related to organizational concepts.

B. THE AGENT

The first element of rational behavior relates to the disposition of the agent. Under the norms prescribed by PPBS, an evaluation of rational disposition is made on the criteria of efficiency and economy, effectiveness, coordination and comprehensiveness. Objectivity in the

(2) Kingsley Davis, *Human Society* (New York: The McMillan Co., 1948), pp. 121-132.

determination of relationships between objectives and programs is essential⁽³⁾. As long as an agent strives to select means based on these criteria, he may be said to have a rational disposition. The process by which such a disposition is acquired is outside the scope of this paper. The point being stressed is that PPBS prescribes a maximum rational disposition for the agent and is based on the assumption that each agent will present a rational disposition. If every agent is always rational, then there is no variance among the individuals. In other words, if, through a process of normative or other learning experience, every individual becomes equally rational, then variance in rational behavior will stem from such remaining elements as the situation and knowledge of technology.

When individual variance is reduced to zero, PPBS becomes an agent-free system. This is the logical extreme of the system, and it is in this context that some proponents of PPBS can speak of an organization-free system⁽⁴⁾. This assertion makes a very strong assumption. Yet, it does not mean that an agent is unnecessary or unimportant; it only means that the agents make no difference for the results of calculation. If all the agents behave like thermostats, then there will be no great variations in the individuals. Each agent will read variations in the environment like every other agent and will set motion appropriate technology under his control.

One of the key controversies concerning the rationale and feasibility of PPBS calculus stems from varying outlooks and some misconceptions about such variation-free agents, i. e., completely rational agents. The logical conclusion that there can be rational agents is interpreted by some scholars as a replacement or displacement of the decision maker. This interpretation is not justified. What PPBS is assuming is that if individual variance of the agent is reduced to zero through attainment of complete rationality, the only sources of variance in rationality that remain will be the environment and the technology.

The agent-freeness of PPBS is an assumption which highlights other elements of PPBS. If the concern of some commentators is the variability in the dispositions of the agent, this variability can be handled within the explanatory scheme of rational behavior. That is, we can study what individual variance will produce by way of differences in the manner of reading the environment and selecting technology. On the other hand, if their fundamental concern is

(3) See, Section A, Chapter II, above.

(4) John C. Parker, Fels Institute of Local and State Government, University of Pennsylvania, and a principal developer of an educational PPBS holds the view that PPBS is "organization-free."

with the impossibility of displacing the decision-making agent, PPBS has never assumed such: it only assumes a zero variance of the agent such that whoever acts as the agent, there will be no difference. As stated above, this is an assumption, which is necessary to simplify the prescriptions of PPBS. Otherwise, the PPBS prescriptions become too complicated. Moreover, any application of PPBS is a matter to be decided by the agent himself. No agent is likely to admit that he has a lesser degree of rational disposition.

What implications are derived from this definition of rational behavior and related assumption of complete rational disposition of the agent? It means that the greater the degree of uncertainty in the environment and technology, the lesser the degree of rational behavior even if the agent is completely rational.

This kind of problem has long been treated in public administration, and it is necessary to examine how certain organizational propositions can provide an interpretation of the limiting factors of rational behavior. At this point, it must be made clear that an agent-free system is not an agent-less system. The agent in this instance is the participant of the system. In this sense, PPBS is a participant-oriented system. This is differentiated from other system definitions which are observer-oriented systems. PPBS always recognizes at least one participant. Without a participant, there is no PPBS. Trivial? No. Since this point is often obscured in PPBS discussions, it is possible to confuse PPBS with its associated modes of analysis which are observer oriented. The agent is the participant of the system for which he sets goals and objectives, identifies and evaluates the programs, and sets the resource levels of the programs. An observer-analyst can help the participant-agent to do the job, but cannot completely displace him. If an analyst replaces an existing decision maker, the analyst himself becomes the agent. The problem of the relationship between the decision maker and his advisor is not unique to PPBS. History is replete with examples in which decision makers such as kings and princes were influenced by their chief advisors. One of the PPBS-specific features is that such advisors will be "modern" analysts instead of astrologers or priests.

Additional complications are introduced when the number of participants increase⁽⁵⁾. The greater the number of participants, the more difficult and complicated the process of PPBS in its phase of dealing with objectives. An ideal of PPBS is to have a one-man like decision-making body, possessing all aspects of rational disposition. If a group of men act like one man with a maximum rational disposition, then there will be no need to take into account group phenomena in the prescriptions of PPBS calculus. Since PPBS does not deal with groups,

(5) C. West Churchman, *The Systems Approach* (New York: Delacorte Press, 1968), p. 76.

it assumes either a single agent or well coordinated decision-making body. Traditionally, rational approaches to organization theory have been dealing with the problem of creating such a one-man like body out of a group.

This rational approach is also challenged by some students of public administration. They argue that PPBS has a tendency towards centralization⁽⁶⁾. Such a criticism is, in effect, directed at bureaucratic organization, because bureaucracy is also based on such an approach. Yet, the one-man assumption is not necessarily a prescription for centralization. Because the "one-man" may be a group with members sharing power and influence in formulating objectives. PPBS fundamentally views the decision-making body as one unit for the purpose of defining objectives and formulating programs, be it an individual or a group. In systems terminology, this body is a management sub-system. Such a conception does not depart very much from the conventional legal fiction of a corporate person.

In PPBS, nothing precludes congress or another legislative body from acting as the agent for the purpose of PPBS. Some observers inconsistently contend that greater control by the congress does not constitute centralization, while greater control by the president or his subordinates are considered to be centralization. An increase in controlling power should not be viewed as a restriction of power or freedom of someone else; it is the increase in the agent's ability to comprehend the environment and technology. At any rate, if PPBS is operated by the executive branch of the government, then, to that extent, it is decentralized system from the viewpoint of the governmental system as a whole. But, it still is one-man oriented system for the level at which objectives are set or interpreted for the purpose of PPBS. As in the current practices of Federal PPBS, the central agent can be the individual agencies and departments which are required to define their objectives and identify programs. This is not a departure from the existing legal fiction. What is new is a reorientation of the agents toward explicitly identifying objectives and programs for better planning, programming, and budgeting of their activities.

Despite the numerous levels of the public superstructure where objectives are grouped into abstract higher goals, a PPBS process really starts from the point where an agent is explicitly recognized as the one who defines objectives and identifies programs. The agent has been defined as a participant of the system and he is supposed to act like a single man of complete

(6) Victor A. Thompson, "The Program Focus Challenge," paper presented for the meetings of the American Society for Public Administration held in Boston, March 27-30, 1968, p.4.

rational disposition. The problem of creating well coordinated group behavior has been the concern of rational organization theory. The problem of creating rational group behavior need not be discussed here, being well covered in the literature of organization theory. Furthermore, PPBS assumes that there is such a rational group. The remaining discussion will consider problems of variable environment and technology. Limiting the problems to technology and environment, it will be assumed for the moment that the agents have zero variance in their dispositions. (Implications of this assumption have been elaborated above.)

In this section, we have also disposed of motivational problems of the agent by attributing to PPBS the assumption of a completely rational agent. There remains the cognitive problems of the agent. Such cognitive limits will be examined in relation to technology and environment.

C. TECHNOLOGY

In a broader sense, the specification of PPBS concerning programs, programming, and program alternatives are tied to the problems of technology. Technology is concerned with a set of means, that is, aspects of situation over which the agent has control. This set of means is determined by the agent's objectives and his beliefs about cause and effect relationships. As long as a set of means or a series of activities achieve objectives, they are technically rational.

An agent can evaluate the technical rationality of his program by two criteria: instrumental and economic. Instrumental criterion determines whether his activities will in fact produce the objectives. "The instrumentally perfect technology is one which inevitably achieves such results."⁽⁷⁾ This is what is called the problem of effectiveness. The economic criterion determines whether an objective is achieved with minimum cost; this criterion is related to the efficiency test. An instrumental question, or problem of effectiveness, takes priority over the question of economy because "the cost of doing something can be considered only after we know that something can be done."⁽⁸⁾

Technology is one of three important variables in understanding and designing PPBS. The varieties of technologies can be examined on many dimensions including the types and certainty of cause and effect relationships. Particularly in governmental organizations where many varieties of activities are carried out, types of technology seem to be important in PPBS design, because a different type of technology requires different steps in planning and programming. However,

(7) James D. Thompson, *Organizations in Action: Social Science Bases of Administrative Theory* (New York: McGraw-Hill, 1967), p. 14.

(8) *Ibid.*, p. 15.

this discussion does not consider a typology of technology, because it can be handled within a more general framework. The framework of this discussion will be constructed along the dimension of certainty and uncertainty of beliefs about cause and effect relationships. Along this scale, technology will be evaluated as to its more or less perfect instrumentality.

Certainty in cause and effect relationships increases when the variables considered by the agent are removed further from external influences. On the other hand, uncertainty in cause and effect relationships will increase with an increase in external influences over the variables. Thus, technical perfection is more nearly possible when the agent has control over the elements involved. The programming aspect of PPBS is the process of identifying such technical cores in which cause and effect relationships are relatively certain. The result of programming is expressed in the program structure, forming a hierarchy or series of activities. Higher level program categories present less certainty concerning cause and effect relationships because they contain more elements and are subject to broader environmental influences. Conversely, lower level program categories provide greater certainty in cause and effect relationships.

The core technology alone is not sufficient to attain objectives of the agent⁽⁹⁾. The agent must carry out transactions with the environment, supplying necessary inputs for and dispensing outputs of the technology. In order to attain objectives, an agent or organization must consider not only technological elements but also the problems of interaction with the environment. Rationality in terms of these additional elements can be viewed as organizational rationality or political rationality. Organizational rationality dictates that programs cannot be evaluated solely on the bases of efficiency and effectiveness. In this respect, we accept Wildavsky's view as to the superiority of political rationality. Our conclusion, however, is reached by analysis and definition, not on any ideological grounds.

We can now consider the kinds of environment with which an agent deals.

ENVIRONMENT

Several concepts which differentiate organizational environments seem useful for analysis of the PPBS process. Environments can be differentiated on their degree of relevance to the objectives and activities of the agent. A general environment is the least relevant situation for the agent since it embraces everything in the society. Within the general environment, a task environment is formed for the agent, which is relevant or potentially relevant for the identi-

(9) *Ibid.*, p. 19.

fication of objectives and program formulation. The task environment provides support for, and puts demands upon, the agent; it also evaluates the agent's performance. It is very influential factor in the determination of organizational or agent's objectives. The final and most relevant and immediate environment for the agent is what is called "domain." Domain is defined by types of products and services, and population served⁽¹⁰⁾. Actually, the term "domain" can be substituted for objectives. The establishment of domain cannot be an arbitrary action. The agent's claim to domain or objectives must be recognized by the task environment.

In the introduction of this paper, the issues of democracy and decision makers were briefly examined. In the light of the analysis of environment and organizational domain, it can be stated that these cannot be examined in the design of PPBS. When the PPBS calculus specifies that the agent must identify his objectives, it is saying that he must establish his domain within a given task environment. Such a task environment and general environment, including cultural elements, will determine what kinds of process and values should be taken into account in the determination of objectives or domain. Objectives will be the product of interactions between the agent and the task environment. The agent, under the norms of rationality, may resort to various kinds of maneuvers in dealing with his task environment, including bargaining, negotiation, compromise, contracting, coopting, and coalescing. All of these problem cannot be specified in the PPBS process, but none of them are excluded as a way of reaching the definition of the objectives. Simply, the PPBS process is confined to a more limited scope of problems, assuming that the agent would identify his objectives. The more limited concern of the PPBS process is with the problem of operationalizing these objectives. This is one of several implicit assumptions made by the PPBS process to simplify the presentation of its calculus.

The concept of task environment helps in the elaboration of some of the PPBS processes associated with goal setting or objective definition. The agent is the focus of influence in the task environment; a change in the location of the agent will alter the relationship between the agent and the task environment. This change results in a modified definition of domain or objectives. For example, if a PPBS is introduced in a city where the chief agents have been the department heads, then the change of the location of the agents from departments to the Mayor for the purpose of new PPBS processes would activate a different task environment. The task environment of the Mayor would not be a summation of the task environ-

(10) The terms, "task environment and domain" are adapted from this source, pp. 25-29.

ments of the department heads. Thus, if the Mayor acts as the agent and this is new, then a new organizational domain and emphasis will be defined. However, if PPBS is designed in such a way that existing department heads act as the agents, then no radical alteration will occur in terms of objectives and programs of the organization even after an introduction of formal PPBS. In such cases, there has been little or no change in the relationship between the agent and task environment. Such an example will be presented in the next chapter.

In Chapter II, "goal" was defined as a future state of affairs, and "objectives" as the difference between a present and future state of affairs. Attainment of an objective therefore necessitates a separation of controllable from uncontrollable aspects. Controllable conditions must be distinguished from uncontrollable; this is essential for an identification of technological core of the means which correspond to a set of controllable variables of the agent, while the uncontrollable situation presents constraints and contingencies for the agent.

The task environment of the agent can also be examined on the dimensions of homogeneous-heterogeneous and stable vs. unstable environments. Environment, however, will be examined only on the single dimension of simplicity and complexity. The task environment of agents can range from broad and complex situations to narrower and simpler situations. In fact, this dimension can be placed on a hierarchical structure. Generally, the higher the location of a specific agent in an organizational hierarchy, the more complex the situation; the broader the domain of an agent, the wider and the more complex the task environment. On the other hand, the lower the location of the agent in a hierarchy and the narrower the domain, the narrower and simpler the task environment; the more complex and broader the task environment and domain, the more ambiguous the standard of desirability or objectives; and the simpler and narrower the task environment and domain, the more crystallized the standard of desirability or objectives of the agent. The implications of these relationships are that task domain and task environment can be factorized into simpler and homogeneous elements.

The identification of objectives and the definition of evaluation criteria or indicators, as specified by PPBS, must be interpreted as requiring a process of simplifying and factorizing the task elements so that more concrete standards of desirability can be used in calculation. Under a PPBS, then, a greater effort will be made to segment the task environment and to factorize the domain of the agent in order to devise operational objectives.

E. MODIFIED CONCEPTS OF RATIONALITY AND PPBS STRUCTURE

Rationality has been interpreted in many ways, sometimes as a maximizing principle, and in

other cases, interpreted as a satisficing principle. In addition, some argue for economic rationality, while others contend for political rationality⁽¹¹⁾. These interpretations and contentions stem from different outlook and approach toward problem solving and organization. A key contention of this paper is that all of these aspects can be accommodated in a scheme which combines the two dimensions of technology and environment.

Technology was dimensionalized along the scale of beliefs about cause and effect knowledge, which ranges within the extremes of complete and incomplete knowledge. And, the environmental factors were thought to produce a dimension of standards of desirability, which also ranges within two extremes of crystallized and ambiguous standards. These two variables, using only their extreme values, produce four "boxes", or cases⁽¹²⁾.

FIGURE 1—Types of Rationality

		Assumptions on Cause Effect Relationships	
		Complete	Incomplete
Standards of Desirability	Crystallized	I Economic	II Instrumental
	Ambiguous	III Organizational	IV

The first case is where criteria of evaluation are crystallized and cause and effect knowledge is believed to be complete. The second case has crystallized criteria and incomplete knowledge. The third case has ambiguous criteria and complete knowledge. And, the fourth case has ambiguous criteria of evaluation and incomplete knowledge of cause and effect relationships.⁽¹³⁾

In the first case, it is possible to apply maximizing principles or economic rationality. Since the input-output ratio can be calculated, an efficiency test can be performed. The efficiency test is the strictest of the tests, but is limited in its scope. The efficiency test presents results of calculations which are precise and acceptable to any observer or user of the test.

In the second case, where the criteria of program evaluation are crystallized but the knowledge of cause and effect relationships of the program is incomplete, the test will be instrumental or one of effectiveness. As long as a program is thought to produce desired results, the program is acceptable regardless of knowledge about cause and effect relationship.

(11) Herbert A. Simon, *Administrative Behavior* (2nd ed.: New York: The Free Press, 1957), Chapters IV-V. See, Chapter II of this Paper. Also.

(12) Adapted from J.D. Thompson, *op. cit.*, p. 86.

(13) *Ibid.*

The third and fourth cases cannot be evaluated by either efficiency or instrumental tests. They must be evaluated by other criteria such as historical performance of the agent, the prestige of the agent, or other contributions to the organization or society. In such cases, moreover, it is more likely that the agent will search for desirable objectives and increase the knowledge of cause and effect relationships. This searching process can be represented by the broader concept of systems analysis.

This suggestion is consistent with the evaluation of systems analysis presented in Chapter II. We noted there that systems analysis as a mode of analysis can be used for a problem of broader scope even with less rigorous scale of measurement. If systems analysis can enable the agent to assess even generally what his situations are, then it is no small accomplishment toward rational calculation of objectives and programs. In this case, political rationality would be the dominant principle. Political rationality expresses the fundamental reasons for the existence of a system and its components.

For the present discussion, it is sufficient to establish that different types of assessment will be and can be used for different situations. The situations which PPBS is dealing with are infinite; they vary, and types of assessment must also vary according to situations. This point is crucial since an undifferentiated usage of several modes of analysis creates misconceptions regarding the structure of PPBS, and undue emphasis on the desirability of cost-effectiveness analysis presents some strain in the practice of PPBS.

In sum, this modified concept of rationality clarifies several implications of PPBS for the formulation of administrative programs. Any discussion of the implications of PPBS must recognize the specific type of situation in which it is to be applied.