TOWARD AN ORGANIZATIONAL ACCOUNTING SYSTEM FOR GOVERNMENT LABORATORIES

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PREFACE

This report is addressed to the need for a more pragmatic basis for evaluating the performance and health of government laboratories. The report proposes the development of an "organizational accounting system" for this purpose. Included in the report are some specific recommendations for developing an organizational accounting system and illustrative "unobtrusive" and "reactive" measures encompassed within an integrative systems framework.

This report is based upon a dissertation on the subject, Organizational Evaluation and the Government Laboratory. The author is indebted to the Naval Weapons Center at China Lake, California and the National Aeronautics and Space Administration for financial support during different phases of the dissertation research effort.

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PART I: INTRODUCTION

> It is easy to establish organizations; it is not too hard to get some work out of them; but it is exceedingly difficult to assure that organizations so established operate at high levels of efficiency and, above all, effectively carry out the purposes which called them into being.[1]

Orientation

The subject addressed in this paper is the assessment of a particular type of complex organization, the government laboratory. In recent years a considerable growth has taken place in the amount of funds expended for research and development both in the private sector and in government. Concomitantly, increased concern has been expressed about the health and effectiveness of the government's in-house laboratories. This paper is one response to the growing interest in developing new methods for evaluating these laboratories; it contains a discussion of a rationale and methodology for an "organizational accounting system" containing a set of "measures" which should serve to lower the degree of subjectivity required in the assessment process.

Background

This paper is based upon the author's doctoral dissertation, Organizational Evaluation and the Government Laboratory. The need for more functional methods of organizational evaluation provided the impetus for that dissertation.

1. Philip Selznick, et. al. The Adaptation of Complex Organizations to Changing Demands, A Report to the Office of Science, Director of Defense Research and Engineering (Washington, D.C.: Smithsonian Institution, 1959), p.1.

In the process of carrying out the research for the dissertation an attempt was made to explore and describe how managers concerned with research and development organizations are handling their responsibilities for assessing organizational effectiveness. An empirical effort was undertaken because the literature concerned with organizational evaluation is deficient in descriptive materials. As a second facet of the dissertation, an effort was made to capitalize upon the knowledge acquired from the empirical effort by developing an approach to organizational evaluation consistent with the research findings. This report draws principally from the latter facet of the study.

The Naval Weapons Center (NWC) at China Lake, California served as the focal organization for the dissertation research. A conceptual scheme derived from the literature on role theory was employed, and data were collected from thirty NWC project managers and thirty-eight managers from project sponsoring organizations within the Naval Systems Commands in Washington D.C. No systematic discussion of the dissertation research findings is attempted in this report; however, they underlie the "organizational accounting system" which will be described below.

Organization of Remainder of Paper

This paper is divided into four additional parts. Part II indicates the need underlying the recommendation that organizational accounting systems be developed and maintained for purposes of evaluating government laboratories. Part III identifies a set of "design parameters." These design parameters are principal considerations to be weighed in establishing the nature and content of an organizational accounting system. Part IV

sets forth a "model" organizational accounting system. It provides a discussion of "unobtrusive" and "reactive" measures that would be included and suggests an integrative "systems framework". Substantial illustrative materials are provided to concretize the discussion in part IV. Finally, concluding observations are offered in Part V.

PART II. THE NEED FOR MORE FUNCTIONAL METHODS OF EVALUATION

This section of the report attempts to explicate the need for improved means of evaluating government laboratories. Initially, three central approaches to organizational evaluation which one encounters in the literature are noted and briefly described. Then, some of the problems encountered when one attempts to apply existing approaches are discussed. Finally, some of the implications of evaluative practives presently employed in the milieu of government laboratories are considered.

Central Approaches[1]

There is a wealth of material which pertains with varying degrees of directness to the "criterion problem."[2] Much of this literature clusters around what might be described as goal oriented, employee oriented and systems oriented evaluative approaches.

Goal oriented approaches might be characterized as focusing upon organizations per se and their performance. These approaches give particular attention to organizational outputs within a time space from the near past to the present and employ effectiveness as a criterion; i.e., the degree

1. A reasonably thorough bibliographic review of literature on organizational evaluation is contained in Chapter II of my dissertation which was cited above.

2. The search for a satisfactory basis for evaluating organizations is at times referred to as the "criterion problem" in the literature on organization theory.

of accomplishment of organizational goals.

Employee oriented evaluative approaches differ from the above in that they focus upon the satisfaction of employees as individuals and are particularly concerned with the status of employee morale, loyalty etc. within a present-near-future time space.

System oriented approaches differ from those mentioned above in degree rather than kind. Organizational "health" is the criterion of this approach and its advocates typically conceive organizations as open systems and emphasize such organizational processes as problem solving, adaptation and growth.

These three central approaches are summarized in the figure below.

Pivotal Elements	Approaches: Goal Oriented	Employee Oriented	System Oriented
Evaluative Dimension	Performance	Satisfaction	Health
Unit of Analysis	Organization	Individual	System
Systemic Function	Output	Maintenance	Process
Time Space	Present - Near Past	Present - Near Future	Present - Distant Future
Evaluative Criteria	Effectiveness etc.	Morale, Loyalty, etc.	Adaptability Growth, etc.

Fig. 1.---Central Evaluative Tendencies

Problems with Existing Literature

There is no shortage of literature suggesting how organizations ought to be assessed; however, there is reason to doubt that managers in complex organizations are employing this "conventional wisdom". Additionally, organization theorists themselves are dissatisfied with existing criteria and methods for assessing organizations. Some of the reasons why this is so are discussed in this section.

Many of the significant contributors to the literature on the "criterion problem" are also its principal critics. Frequently, prior to offering their own views as to what is necessary to resolve the problem of developing satisfactory means for evaluating organizations, these individuals take note of the deficiencies in the existing literature. For example, Katz and Kahn have pointed out,

> There is no lack of material on organizational success. The literature is studded with references to efficiency, productivity, absence, turnover and profitability -- all of these offered implicitly or explicitly, separately or in combination, as definitions of organizational effectiveness. Most of what has been written on the meaning of these criteria and on their interrelatedness, however, is judgmental and open to question. What is worse, it is filled with advice that seems sagacious but is tautological and contradictory.[1]

Other authors such as Seashore feel that present models of organizational effectiveness are too simplistic. Seashore states:

> Historically, much of the work so far has rested upon a simple dichotomous conception of organizational effectiveness: assessment variables are often viewed as belonging to two classes, some representing work performance and others representing satisfaction or morale. The difficulty

1. Daniel Katz and Robert Kahn, The Social Psychology of Organizations (New York: John Wiley and Sons, 1 57), p. 149.

> with this view, aside from its being too simple to be helpful in resolving many issues, arises from uncertainty about the relationship between the two classes. Some hold that there is an inevitable conflict between the requirements of formal organizations and the basic human needs such that the two classes of evaluative variables are incompatible; others hold that high satisfaction is ordinarily a necessary condition for achievement of high work performance. The weight of evidence suggests that neither of these views is adequate and that some more complex image of organization effectiveness is needed.[1]

Some additional shortcomings that are identifiable in the literature on organizational evaluation are presented in summary form below.

---Frequently, erroneous "simplifying" assumptions are made concerning organizational goals; for example:

1). That organizations have a single paramount goal or a small number of compatible ones.
2). That organizations rationally pursue their ends.
3). That agreement exists as to what the goals of the organization are.
4). That organizational goals can be specified in operational terms so data can be obtained on the degree of organizational goal attainment which has been experienced.

---The tendency to treat organizations as though they are all the same. Much of the literature on organizational effectiveness is based on the model of the factory; there is a real question as to whether the resulting analyses are even modestly transferrable.

---There is a shortage of literature which treats effectiveness or health explicitly, in operational terms.

---There is a virtual lack of descriptive materials on the evaluative practices actually being employed by managers of complex organizations.

These deficiencies suggest that organization theorists must make a more meaningful contribution in the area of organizational evaluation. To date, the majority of the contributions have been quite abstract. Conceptual

1. Stanley, E. Seashore, Assessing Organizational Performance With Behavioral Measurements, (Ann Arbor, Michigan: The Foundation For Research on Human Behavior, 1964), p. 72.

frameworks which "ideally" or "in principle" are applicable to a wide range of organizations are basic to the building of generalizable theories for organizations. Nonetheless, theorists also could make a meaningful contribution to organizational practice by formulating conceptual frameworks in operational terms and then testing them through application in particular organizations. A more pragmatic approach to this problem seems necessary.

Evaluative Practices

Realities of organizational life in the milieu of government laboratories are such that systematic organizational evaluations are conducted infrequently if at all. Management personnel in the laboratories and at the headquarters level have numerous demands on their time emanating from other facets of their work, and these preclude their devoting much time to orderly analyses of laboratory health and performance. In some instances an annual laboratory review is made by a panel of experts who take time out from their normal duties to spend a brief time reading or listening to reports and then offer their experienced judgements as to the laboratory's status. In addition, there are occasional ad hoc evaluations; however, both of these approaches produce an evaluation at a particular point in time rather than a multi-purpose evaluative data base available for use by managers throughout the organization.

Despite the fact that they can devote little if any time to evaluation activities, managers, of necessity, are judging the performance and health of laboratories and are willing to and do differentiate between them in terms of their capacity to perform. To the extent research focused upon a single government laboratory is generalizable, it appears that managers "simplify" their responsibilities for evaluations by relying upon the limited data that

became available to them through normal work processes and direct personal experiences with laboratory personnel, reports, etc. It also appears that substantial differences exist in the laboratory "role" definitions: held by managers at various levels in agencies; that is, in the expectations that are held for laboratory attributes and behaviors.

If one combines the above (differing expectations and exposure through direct personal experience) with the inevitable differences in personal and organizational self interests of managers at varying levels in an agency, one can readily surmise that there is considerable "relativity" of both "facts" and "values" in the normal processes of laboratory evaluation.

Differences in "values" and the concomitant subjective quality of organizational evaluations seem inescapable. However, the limited nature of the "factual" data base available to managers for their evaluative judgments appears to be a fundamental shortcoming which can be addressed. This constitutes the "need" toward which the remainder of this paper directed.

PART III. DESIGN PARAMETERS FOR AN ORGANIZATIONAL ACCOUNTING SYSTEM

It is apparent that in developing an evaluative approach considerable care should be given to ensuring that it will be consistent with managerial needs and organizational realities. Our objective in this section is to identify and provide a discussion of some of the significant parameters which should be taken into account in the design of an approach to organizational evaluation. Design parameters which will be discussed below include the following: acceptability, subjectivity, multiple utility, administrative simplicity, precision, comprehensiveness, continuity and specificity.

Acceptability

One of the critical parameters for any workable approach to organizational evaluation is a pragmatic one, its acceptability to evaluators. It is desirable to design into an approach the basis for its achieving a substantial degree of face validity in the eyes of the potential user. An awareness of some of the factors which are perceived to be important to effective laboratory performance by these evaluators coupled with a working knowledge of terms and concepts germane to the evaluation process which have meaning for them should prove helpful in this respect. Data of this nature can be obtained from persons who make laboratory evaluations by probing their thinking on such matters as perceived determinants of successful laboratory performance, the degree of importance attached to various laboratory roles, behaviors and attributes, and evaluative criteria and data presently in use in the laboratory's milieu.

Subjectivity

As noted in part II of this report, subjectivity is present in the evaluation practices of managers for a number of reasons. It is apparent that development of a data base on laboratory performance and health will not by itself produce an organizational evaluation. Availability of an organizational data base may produce an improvement in the quality of evaluative judgments, but it will not supplant the necessity for subjective judgment. Evaluators ultimately will be required to synthesize the contents of an organizational data base with additional information inputs and value considerations. To be of value the data base must be interpreted by knowledgeable persons as to its meaning in relation to organizational goals, previous experience, etc.

This lack of automaticity in the organizational evaluation process has important implications for the design of an evaluative data base. Careful consideration must be given to the set of evaluators for whom the information base is being developed to ensure that their informational needs are being addressed. As noted below, this is particularly true if the data are to be made available to both headquarters and laboratory level managers.

Multiple Utility

The multi-purpose character of an organizational data base cannot be overlooked in its design. Too narrow a conception of the potential utility of an organizational data base should be avoided. Organizational evaluation is an important managerial function in and of itself, but it is not isolable from other managerial needs for data related to organizational conditions. Awareness of these managerial needs provides additional

guidance as to the form and content of the data base. These needs include: data which permit managers to exert control and take corrective actions; data for use in the organizations planning and policy setting processes; and data for use in the political processes of the organization.

A related design consideration concerns who is to make use of the organizational data base. Are the data being assembled and analyzed for use by laboratory managers, headquarters personnel, or both? If the data are to be made available to persons at the headquarters level, the manner in which they are to be employed becomes crucial. If the data are to be used as a basis for criticism, further inquiries and managerial interventions, one would expect little enthusiasm at the laboratory level for developing and maintaining a quality data base. Conversely, if laboratory personnel are convinced that the data are for labortory level managers only or that they will be used in a positive manner by headquarters personnel, they are more likely to cooperate in the development and updating of an accurate set of data. These perceptions of personnel at the laboratory level are likely to determine whether the organizational data base is viewed as just another management report or as a significant management tool worthy of use and improvement.

Administrative Simplicity

Another basic parameter to be considered in designing an evaluative approach is its administrative simplicity as gauged by the amount of effort required of the evaluators and those who must administer the data collection systems and assemble and analyze the evaluative data. Factors such as amounts of time required and costs involved in both the initial and subsequent

applications of the approach are important design dimensions. The designer must confront the inevitable trade-offs between what would be ideal and what seems feasible. Approaches which presume the establishment of new record keeping systems or rely upon the administration of lengthy questionnaires which require considerable time to complete and are time-consuming to analyze are unlikely to succeed.

Precision

Related to administrative simplicity as a design parameter is the degree of precision to be sought in the data base. Data which are precise and elegant are clearly desirable, but organizational realities may dictate that one settle for something less in order that timely inputs can be made to management. At times it may be necessary to use data from existing rather than ideal sources, proximate rather than direct measures, and qualitative rather than quantitative data. This is particularly so while an organizational data base is being established; opportunities for gradually making the data base more precise will exist during each successive update iteration.

Comprehensiveness

Another design parameter is the degree of comprehensiveness to be sought in constructing the evaluative data base. In reviewing the literature on organizational evaluation one of the things which is striking is that many of the theorists who contribute to this literature largely emphasize those variables which their particular conceptual approach best explains. In constructing the evaluative approach being suggested here it seems appropriate to seek information pertinent to each of three evaluative dimensions; namely, performance, satisfaction and health. In short, the

approach should seek to be as inclusive as possible consistent with the parameter of administrative simplicity.

Continuity

Many of the evaluations of government laboratories with which this writer has become familiar have been of an ad hoc nature and tend to emphasize differing facets of laboratory performance and health from one occasion to the next. Doubtlessly, there has been and will be considerable value in such inquiries; however, the approach being suggested in this paper calls for development of a cumulative data base.

A design parameter is that the evaluative approach be consistent with a conception of organizational evaluation as a continuous iterative process. Underlying this parameter is an assumption that much can be gained from instilling continuity into the evaluation process through the use of periodically updated data or indices which permit trend analysis. It seems unlikely that an optimal evaluation approach can be conceived and developed in a single, discrete effort. While attempting to design in continuity, one would expect that it also will be necessary to modify and improve upon the evaluative data base at each iteration.

Specificity

Finally in designing the evaluative data base potential methods of analysis must be considered. One obvious basis for analysis is to employ periodically collected data to compare a laboratory with itself over time. For this purpose descriptive data which are unique to the laboratory are quite useful. However, the importance of data which are more generalizable should not be ignored. Most laboratories are sufficiently similar

in structure and function to at least a few other governmental and contract laboratories that some value would be obtained from measures and data which could be used in comparative analyses between organizations.

PART IV - AN ORGANIZATIONAL ACCOUNTING SYSTEM

Our purpose in this section is to outline an evaluative approach which is consistent with the above mentioned design parameters. The essence of the approach which is elaborated below is a methodology for developing and arraying a set of data which can be used by managers who are reasonably familiar with the organization to be assessed; that is, an "organizational accounting system." The approach does not seek to produce an effectiveness score or grade for an organization; however, it is intended that the descriptive data included in the evaluative base enable managers to make informed judgments of an organization's performance and health.

Methodologically this approach involves the use of data derived from a combination of unobtrusive and reactive measures and arrayed within a systems framework.[1] The methodological aspects of the approach are discussed in some detail below; illustrative tables are included.

Unobtrusive Measures

Webb et.al. have written a stimulating book on this topic which illustrates the potential of informational resources which exist in one's environment for the construction of unobtrusive or nonreactive measures. These

1. Unobtrusive or nonreactive measures are based on research data which are not obtained by interview or questionnaire and, as a result, are not subject to the "reactive effect" of measurements which directly involve respondents. Reactive or obtrusive measures are those which do rely upon interview and questionnaire data. For a thorough discussion of these concepts see: Eugene J. Webb, et.al. Unobtrusive Measures: Nonreactive Research in the Social Sciences (Chicago: Rand McNally & Co., 1966).

authors begin their book with the following observation on the state of social science research.

> Today the dominant mass of social science research is based upon interviews and questionnaires. We lament this overdependence upon a single, fallible method. Interviews and questionnaires intrude as a foreign element into the social setting they would describe, they create as well as measure attitudes, they elicit atypical roles and responses, they are limited to those who are accessible and will cooperate, and the responses obtained are produced in part by dimensions of individual differences irrelevant to the topic at hand.
>
> <u>But the principal objection is that they are used alone.</u>[1]

In setting forth their argument in favor of the use of unobtrusive measures to supplement reactive research techniques these authors provide numerous examples of nonreactive measures which have been reported in the literature. Two such examples are cited below to illustrate the nature of these measures.

> The floor tiles around the hatching-chick exhibit at Chicago's Museum of Science and Industry must be replaced every six weeks. Tiles in other parts of the museum need not be replaced for years. The selective erosion of tiles, indexed by the replacement rate, is a measure of the relative popularity of exhibits.
>
> Library withdrawals were used to demonstrate the effect of the introduction of television into a community. Fiction titles dropped, nonfiction titles were unaffected.[2]

A number of examples of research which has made use of nonreactive measures constructed from government records also are cited in this book. The following quote is illustrative:

> A particularly interesting and novel use of data comes from the study of city water pressure as it relates to television viewing. For some time after the advent of television, there were anecdotal remarks about a new periodicity in water pressure levels - a periodicity linked to the beginning and end of programs. As the television show ended, so the reports ran, a city's water pressure dropped, as drinks were obtained

1. Webb, 1
2. Ibid., p. 2.

> and toilets flushed. A graphic display of this hypothesis was provided by Mobley (1963), who published a chart showing the water pressure for the city of Chicago on January 1, 1963. This was the day of a particularly tense Rose Bowl football game, and the chart shows a vacillating plateau until the time the game ended, when the pressure level plummets downward.[1]

Unobtrusive measures described in the book which are most relevant in terms of this effort to develop a data base for organizational evaluation purposes are those based on archival data. Of particular interest are organizational records and files from which data can be abstracted and normalized for purposes of trend analysis.

In their discussion of the hidden potential of existing records these authors note the value of constructing index numbers as an alternative to the employment of experimental designs in acquiring data for comparison purposes. They point out that transformation of raw data into index numbers provides an improved basis for comparisons even though such numbers may fall short of some ideal in terms of their interpretability.[2]

A number of the features of unobtrusive measures make them very attractive for purposes of laboratory evaluation. The fact that they seem to be based on "harder" data than can be acquired from reactive techniques should make them more acceptable to managers who have been trained in the sciences and engineering. Clearly, nonreactive measures are consistent with the design parameter of administrative simplicity, and they are a source of diagnostic information which managers can use to identify and assess changes in their organization's performance, character, complexion and methods of operation. Finally, these measures make it possible to go back several years in an organi-

1. Ibid., pp. 73-74.
2. Ibid., p. 7.

zation's history and extract data which enable comparisons to be drawn with prior years' experience. It is for these reasons that the evaluative approach being suggested in this Chapter calls for developing a data base with a combination of reactive and unobtrusive measures.

Numerous unobtrusive measures pertinent to the health and performance of the laboratory at China Lake were developed as a byproduct of this author's dissertation research. Several are described in the discussion which follows, and others are included for illustration purposes in Table 8 which appears later in this Chapter. Our intent here is to illuminate this particular method of acquiring evaluative data, not the results.

One of the concerns of managers in government laboratories is that their organizations may evolve into contract management rather than science and engineering institutions. Management's need for data which will enable them to detect and monitor any movement in this direction can be employed as an example to demonstrate the value of unobtrusive measures in organizational evaluation processes. Several measures relating to this managerial concern were developed for the laboratory at China Lake.

One measure was developed from records maintained by that laboratory's Supply Department. Direct Support Stock Units (DSSU'S) are serviced by Supply Department personnel. These DSSU's basically are mini-shop stores which contain small electronic components and hardware items; they are widely scattered throughout the organization being located at sites which are convenient to in-house technical personnel. Supply Department records indicate the number of DSSU'S which are "active" and those which are receiving"curtailed

service" at particular points in time. Active units are serviced twice a week; curtailed service units are those which are serviced irregularly in response to customer requests. Trend data on the number of active and curtailed service DSSU'S were used as one unobtrusive measure of in-house technical activity.

A related measure was developed from records maintained by the China Lake's Engineering Department. These records provided data on the quantity of "sketch" numbers (SK's) which had been issued to the organization's Technical Departments. The data had been kept for a period of years and could be exploited with a minimum of effort. SK's are the initial engineering drawings which are produced as a result of in-house design and development efforts; they constitute a fairly direct reflection of the amount of development effort which is taking place in the organization. Use of these data in portraying trends over an eight year time span provided a second "barometer" of in-house activity.

Examples of other unobtrusive measures developed for the NWC organization which were partinent to the managerial concern under discussion include:

1) Trend data on the number of contract administrators employed by the organization, and the number of man-hours devoted to training programs on contract administration for in-house personnel;

2) Normalized data on the number of patents and publications per one hundred professional employees; and

3) A chart depicting the yearly ratios between dollar commitments for in-house labor and project and total funds expended by the organization.

In the section which follows a framework for a data base which includes these unobtrusive measures is described.

Systems Framework

The utility of some conceptual framework for arraying information acquired for an evaluative data base was self-evident. It seemed likely that a macro level systems framework would be suitable. A variety of systems models are available in the literature; but one which seemed tailor-made for our purposes was found in the book, Social Indicators.[1] This book articulates a rationale for the development of a new social accounting structure to provide the government with a data base for its decision-making responsibilities for the health and performance of the social system. Many of the concepts contained in Social Indicators are transferable from the societal level to the level of organizational systems. In fact, examples of the application of his ideas to the organizational level are provided in the contribution by Gross.[2]

In his essay Gross addressed himself to the question of how one can best appraise the state of a nation and recommends use of a social system model in developing a framework for social system accounting. He identifies system structure and performance as two multidimensional elements which can be used as a framework for a set of social indicators. In describing his model he states,

> The elements of system structure deal with the internal relations among the system's parts, the elements of system performance with the acquiring of inputs and their transformation into outputs. Both involve relations with the external environment. This model, or any part thereof, may be flexibly applied to describe the unique characteristics of any country whatsoever, no matter what the level of industrial development or the type of political regime.[3]

1. Raymond A. Bauer (ed.), Social Indicators (Cambridge, Mass.: The MIT Press, 1966).

2. Bertram M. Gross, "The State of the Nation: Social System Accounting," Social Indicators, ed. by Raymond A. Bauer (Cambridge, Mass.: The MIT Press, 1966), pp. 154-271.

3. Ibid., 155.

Gross portrays his system model graphically as indicated below in Figure 8.[1] He uses the term, transformations, to refer to the changing of inputs into outputs.

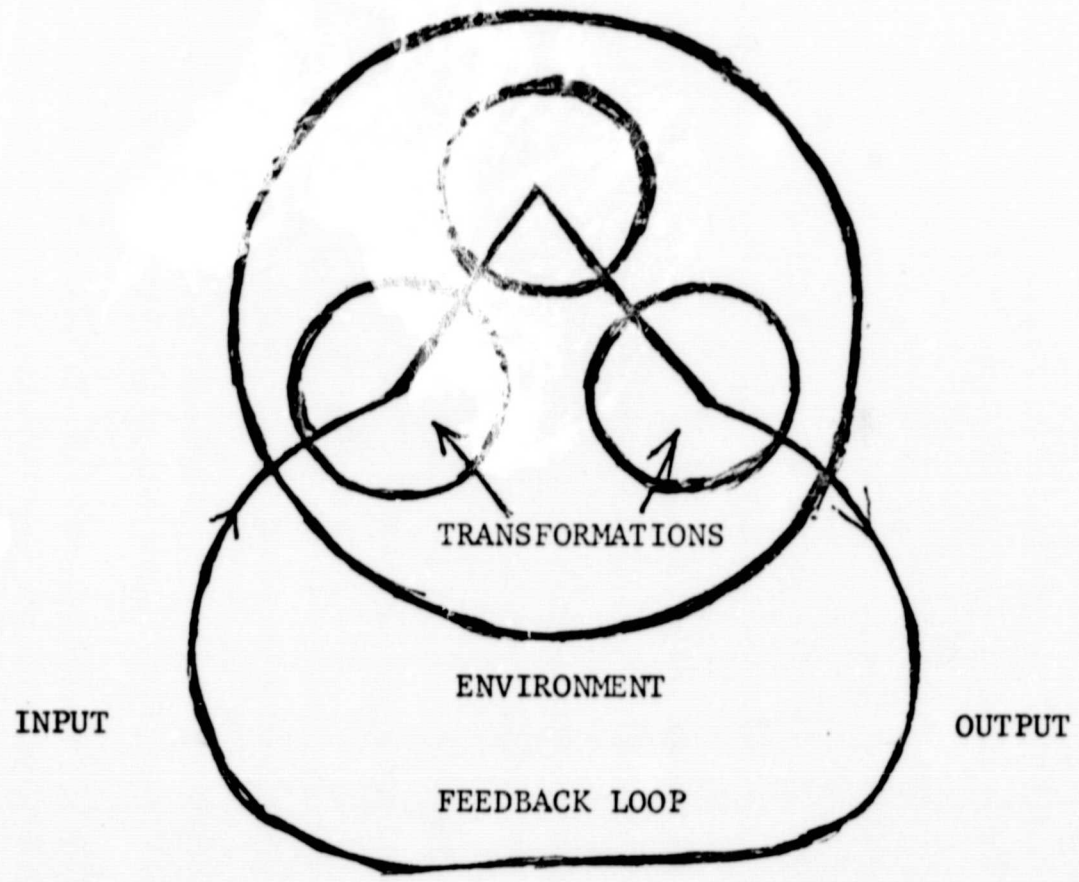

Figure 2 -- General System Model

Gross goes on to elaborate on the elements involved in system structure and performance. For system structure his model includes the following: people, nonhuman resources, sub-systems, internal relations, external relations, values, guidance system, and from preindustrialism to postindustrialism. For system performance his model includes: satisfying interests, producing output, investing in the system, using inputs efficiently, acquiring resources, observing codes, behaving rationally and industrializing and postindustrializing. In Table 1 which follows a flexible application of the above elements is made in ordering an illustrative set of unobtrusive and reactive measures.

1. Ibid., 182.

TABLE 1.--Illustrative unobtrusive and reactive measures related to laboratory health and performance

Elements	Nature of Element	Measures	Type of Measure
1. Inputs			
People			
Number	Structural	Employment Trends by Technical and Support Departments	Unobtrusive
	"	Employment Trends - Professional, Per Annum and Per Diem personnel	"
	"	Employment Trends by Occupational Group	"
Characteristics	"	Educational Level of Workforce (Trends)	"
	"	Grade Level Profile of Workforce (Trends)	"
	"	Age Level Profile of Workforce (Trends)	"
	"	Experience Profile of Supervisory and Non-Supervisory Personnel	"
Acquisition	Performance	Index of Recruitment Success	"
Non-Human Resources			
Physical Assets	Structural	Amount Expended on Facilities by Year (Normalized)	"
Monetary Assets	"	Status of Revolving Fund by Year	"
	"	Sources of RDT&E Funds by Year (Percentages)	"
Goods	"	Amount Expended on Technical Equipment by Year (Normalized)	"
Technical Tasks	"	Number of Technical Task Assignments in Process by Year	"
	"	Number of Technical Task Assignments per 100 Professionals by Year	"

TABLE 1.--Continued

Elements	Nature of Element	Measures	Type of Measure
II. Transformation Processes			
Use of Supporting Services	Performance	Member Satisfaction with Supporting Services	Reactive
	"	Utilization Rate for Library Reference Service	Unobtrusive
	"	Utilization Rate for Computerized Info. Searches	"
	"	Trend Data on Library Items Loaned	"
	"	Number of "Active" and "Curtailed Service" Direct Support Stock Units per Year*	"
Investment in People	"	Data on Rates of Participation in Employee Development Programs	"
	"	Employee Satisfaction with Opportunities for Professional Growth	Reactive
In-House vs. Contractor Effort	"	Dollar Commitments for In-House Labor as a Percentage of Total Funds and Project Funds by Year	Unobtrusive
	"	Number of Stubs Processed for Procurements over and under $25,000 by Year	"
	"	Total Dollars Expended on Procurements over and under $25,000 by Year	"

*Direct Support Stock Units and SK Numbers are discussed in the narrative portion of this paper in the section relating to Unobtrusive Measures.

TABLE 1.--Continued

Elements	Nature of Element	Measures	Type of Measure
II. Transformation Processes (Continued)			
In-House Vs. Contractor Effort	Performance	Number of Contract Administrators Employed by Year	Unobtrusive
	"	Trend Data on SK Numbers Issued by Year*	"
Modus Operandi	"	Commitment of Funds for Travel - Normalized by Year	"
	"	Number of Officially Sponsored Meetings and Programs by Year	"
	"	Member Perceptions of Organizational Climate Vis a Vis Task Accomplishment	Reactive
III. Outputs			
Output Mix	Performance	Trend Data on RDT&E Dollar Expenditures by Technical Program Area	Unobtrusive
	"	Trend Data on Man Years of Effort by Technical Program Area	"
	"	Trend Data on Fund Commitments Broken Down by DOD RDT&E Category	"
Quantitative Measures	"	Number of Publications per 100 Professionals	"
	"	Number of Patent Awards per 100 Professionals	"
Qualitative Measures	"	Number of Significant Development Accomplishment Per Year (Listed by Item)	Reactive

*Direct Support Stock Units and SK Numbers are discussed in the narrative portion of this paper in the section relating to Unobtrusive Measures.

TABLE 1.--Continued

Elements	Nature of Element	Measures	Type of Measure
IV. Environmental Considerations			
Internal Relations			
Satisfying Member Interests	Performance	Turnover Rates by Year: Scientists and Engineers; and all Employees	Unobtrusive
	"	Trend Data on Hours of Sickleave Used (Normalized)	"
	"	Hours of Annual and Compensatory Time Forfeited by Year	"
	"	Feedback from Organizational Members on Their Satisfaction	Reactive
Reward System Utilization	"	Disciplinary Actions Taken by Type: Normalized Trend Data	Unobtrusive
	"	Personnel Awards Data by Type: Normalized Trend Data	"
	"	Promotion Rate Data by Year	"
External Relations			
Satisfying Non-Member Interests	"	Feedback from Organizational Members on their Perceptions of Non-Member Satisfaction	Reactive
	"	Feedback Directly From Non-Member Representatives of Counter Organizations - Users, Sponsors, etc.	Reactive

Reactive Measures

The third major element of the evaluative approach being outlined in this Chapter involves employment of reactive measures to complement the unobtrusive data collection methods discussed above. Since organizations are abstractions and are dependent upon the behavior of their participants in order to function, it seems reasonable to include data on participant perceptions in an evaluative data base. Admittedly, such perceptions may be erroneous and there are methodological limitations to reactive research; nonetheless, they are important data because of their behavioral consequences. The statement of Harold J. Leavitt that, ". . . The world as it is perceived is the world that is behaviorally important," is suggestive of their managerial significance.[1]

Our purpose in this final section is to suggest how a reactive instrument for use in organizational evaluations might be constructed.

The general system model depicted in Figure 8 and the structural and performance elements of Gross's social system model are suggestive of reactive data that should be included in an evaluative data base. People represent the fundamental input of an organizational system; how well the internal organizational environment satisfies their interests is an important consideration. Similarly, it is desirable to maintain data on the extent to which non-members of the organization who are a part of its external environment are satisfied with its performance and outputs. Finally, perceptions of organizational participants concerning the transformation processes which the organization employs in task accomplishment should prove useful.

1. Harold J. Leavitt, Managerial Psychology, (2nd ed. revised.; Chicago: University of Chicago Press, 1964). p. 35.

A questionnaire format employed by Stephenson and Gantz to inventory the perceptions of organizational members concerning the climate of their organizations seems well suited for purposes of acquiring the desired reactive data.[1] For each item on their questionnaire they asked respondents to indicate the ideal circumstance and the actual. This permits comparisons between the two and should be helpful in problem identification. It also makes it possible to compare the "actual" responses at differing points in time to discern the nature and direction to changes in perceptions. This questionnaire format is illustrated in some detail below in conjunction with a listing of potential questionnaire items which were compiled from data acquired during the research effort for the author's dissertation.

1. Robert W. Stephenson and Benjamin S. Gantz, "A Problem - Oriented Inventory For Use in Research and Development Organizations," 1967 (Unpublished report available in the files of the Naval Weapons Center).

Questionnaire Format

INSTRUCTIONS: Put "A" for actual and "I" for ideal in the appropriate column. How characteristic is this of your organization?

Not at all Characteristic	A little Characteristic	Moderately Characteristic	Extremely Characteristic	Don't Know

EXAMPLES:

Employees are committed to goals.

		A	I	

Employees have substantial freedom in their work.

			A I	

Questionnaire Items

I. Member Satisfaction

Employees are adequately recognized and respected by management.
Employees enjoy their work.
Employees have a high level of enthusiasm for their work.
Employees exhibit a sense of urgency and importance with respect to their work.
Employees have adequate opportunities for professional growth.
Work assigned to employees is technically challenging.
Employees participate adequately in the organization's policy processes.
Employee accomplishments are suitably rewarded.
Employees feel they are employed in a successful and viable organization.
Employees have substantial freedom in their work.

II. Non-Member Satisfaction

The organization is responsive to the needs of its sponsors.
The judgment and competence of the organization's personnel are recognized and respected by headquarters level personnel.
The organization has the reputation of being an effective laboratory.
The organization is responsive to the needs of the users of its products.

The technical work of the laboratory is regarded as well conceived, planned and conducted.
The products of the organization are regarded to be reliable and effective.

III. Transformation Processes

A. Resources

The organization has highly qualified personnel.
The organization's facilities are adequate.
The support services provided to technical personnel are adequate.
The organization has sufficient personnel to accomplish its workload.
Funds available to the organization are adequate in quantity and sufficiently firm to ensure continuity of effort.
Unfettered funds are available in the organization to support investigations of new ideas.

B. Managerial Climate

The organization evinces a high degree of interest in new ideas.
The organization requires its members to adhere strictly to the chain of command in communications.
Engineers are permitted much latitude in their selection of technical approaches.
Repercussions are minimal if an engineering approach which was well conceived fails.
Employees are encouraged to attend professional meetings, present papers, etc.
Decision making authority is widely dispersed in the organization.
The organization's operating philosophy emphasizes an orientation to the needs of the users of its products.
Project managers have considerable discretion in terms of their authority to make decisions as representatives of the organization.
Interpersonal relations of organizational employees exhibit mutual respect and good communications.
The organization encourages responsiveness to its sponsors.
The organizational employees consider their laboratory to be a competitor to other government laboratories and/or private industry.

C. Personnel Policies and Practices

The organization allows its personnel considerable latitude in terms of their internal mobility to aid them in achieving a good "fit" between their needs and interests and the requirements of their positions.

The organization's recruitment practices adequately infuse "new blood" into the organization.
The organization's promotion practices produce well qualified supervisory personnel.
The organization's promotion practices reward persons whose contributions are primarily technical.

D. Work Practices

Operating practices permit laboratory employees to "keep their fingers dirty" through direct involvement in technical work.
The organization's work practices result in its professional employees assuming considerable responsibility early in their careers.
Operating practices keep employees aware of the environment in which their products must operate; e.g., "knowing how sailors think "
Personnel of the organization are adequately involved in the overall weapons planning process of the Navy.
In conducting their work employees actively seek inputs from the potential users of their products.
The organization promotes diverse projects and interests.
The laboratory has imposed upon itself a number of rules and regulations which hamper the effectiveness of its employees.
Considerable duplication exists among projects being conducted at the laboratory.
The laboratory has sufficient administrative flexibility to respond to urgent problems by establishing new projects.
The majority of the technical projects of the organization have been internally generated.
The organization is able to exercise considerable discretion in terms of whether it will take on or reject task assignments.
The organization's employees are known for their openmindedness to ideas which have been conceived by other organizations.
Considerable emphasis is placed by the organization on the avoidance of technical mistakes.

E. Management Practices

Inspirational leadership is forthcoming from the top management of the organization.
The organization's management has the ability to back and promote its projects.
The organization has an enlightened and understanding top management.
The managerial style of the organization's top management is to provide general but not detailed guidance.

PART V. CONCLUSION

In this paper an attempt has been made to set forth a functional method for the evaluation of government laboratories. The organizational accounting system which has been described represents an approach which would produce a periodically updated data base which would be continuously available to managers for purposes of evaluation. Such a data base clearly would serve to lessen the subjective nature of present laboratory evaluations even though it would not eliminate the necessity for subjective judgment.

The specific "measures" included to illustrate the nature of unobtrusive and reactive measures and the integrative systems framework doubtlessly would not be directly transferable to most government laboratories; nonetheless, they should be suggestive of measures that would be useful. The underlying rationale of the proposed organizational accounting system including the discussion of relevant design parameters should provide the necessary conceptual base for developing a set of measures that would be suitable for a particular laboratory or set of laboratories relatively comparable in terms of scope and function.

Assuming that those concerned with the management of government laboratories agree with the premise that there is a need for improved methods of evaluation, it is submitted that the development and gradual refinement of an organizational accounting system along the lines suggested in this report would produce a pragmatic basis for making evaluative judgments.