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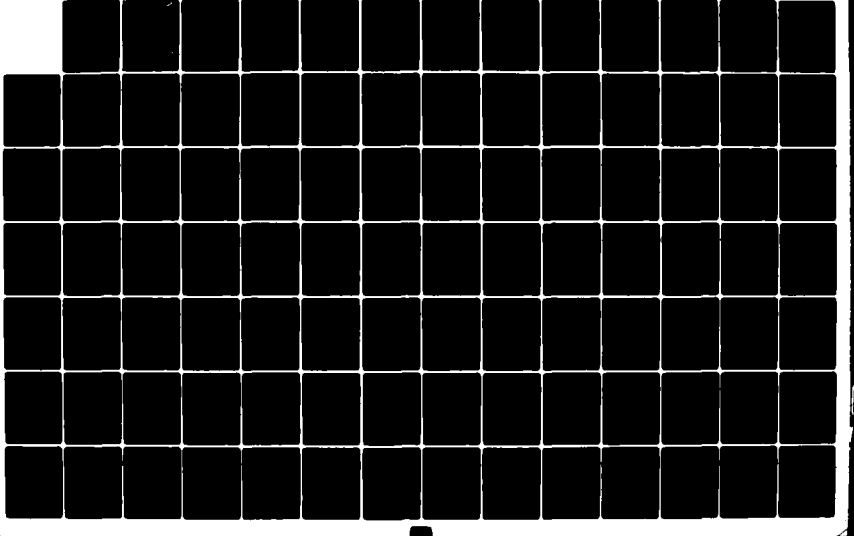

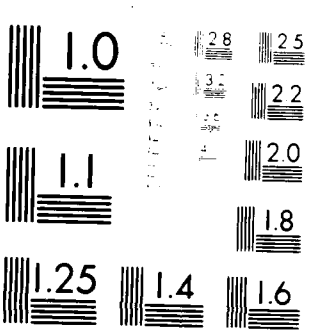
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DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY (ATC)

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

PERCEPTIONS OF A METHODOLOGY FOR THE DEVELOPMENT OF PRODUCTIVITY INDICATORS

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LSSR 69-82

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The need for improving the ability to measure productivity is well documented in the literature. The U.S.A.F. Human Resources Laboratory established a contract with the Maryland Center for Productivity and Quality of Working Life to provide a means of productivity measures improvement. The Maryland Center then conducted a field test of the MCM in twenty-one Air Force units at ten bases.

This thesis is a follow-on study to determine field test participants perception of the MCM output usefulness. The primary research assumption is that support for the MCM and its measures is dependent upon its perceived usefulness by the users. A questionnaire was developed and sent by the authors to the MCM field test participants. The responses were tabulated and analyzed through descriptive statistics. The participants perceived a slight degree of usefulness for the MCM and its measures. It was concluded by the authors that the MCM could provide base level managers with custom productivity indicators. Recommendations were made to increase MCM acceptance by top and middle managers.

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PERCEPTIONS OF A METHODOLOGY FOR THE DEVELOPMENT OF PRODUCTIVITY INDICATORS

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degrees of Master of Science in Engineering Management

and Master of Science in Logistics Management

By

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Captain Richard C. Howell

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has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

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(Captain Richard C. Howell)

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT
(Lieutenant John D. Van Sickle)

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CHAPTER I

INTRODUCTION

Overview

The United States economy is in the worst state of affairs since the Great Depression. Unemployment is increasing to near record height and productivity growth rate is decreasing to near record lows (42:1). United States industry is plagued with inefficiency, aging and expensive to maintain plants and factories. Over one-third of U.S. workers recently surveyed claimed their skills and abilities are not adequately utilized by their jobs (35:6). It is predicted that the United States, once the world's industrial leader, will fall well behind its trading partners in terms of industrial might and economic wealth by the end of the decade (35:6). The prime challenger to U.S. industrial dominance is a country whose economic and industrial bases were shattered by war, Japan. Japan's rapid rise to industrial prominence can best be explained by the following statement:

> Perhaps the greatest catalyst for Japan's remarkable economic achievements has been its near obsession with finding new ways to increase personal and group productivity. Indeed, the Japanese people come very close to worshipping productivity [1:39].

If the U.S. is to deal with the hard issues of its declining industrial leadership it must concentrate as do the Japanese,

on improving productivity in all areas of both the public and private sectors.

Maintaining industrial leadership is important. However, one of the most urgent reasons for improving the U.S. productivity posture is the heightened demand for monetary and material resources. This increase in demand has come at a time of limited resource availability forcing organizations to become more efficient and effective in their resource usage. This phenomenon has hit all sectors of the U.S. economy but has been most 'acutely' felt by the public segments. A statement from the 1973 annual report of the National Commission on Productivity summarizes the public sector's condition:

> Public resources are squeezed between expanding public demands for services and the rising cost of meeting those needs, on the one hand, and a growing resistance on the part of the public to provide more resources through higher taxes on the other. One answer to the dilemma is improved productivity [38:5].

The Department of Defense is the largest and most costly of all the public organizations. Departments within the DOD are filled with old, expensively maintained equipment and facilities. It must however meet an ever-increasing high-technology threat environment on a politically sensitive and limited budget. Because of its size and cost of operations this dilemma has become the subject of much discussion and

research. Increasing the productivity of the DOD has become one of the highest priorities established by the Secretary of Defense. It is his stated desire to give the taxpayers the maximum return possible for the money spent on the DOD.

> "Both by some old-fashioned belt-tightening and by the application of innovative managerial techniques, we can, I am convinced, effect significant savings in our defense program [40:16]."

The Secretary of Defense has placed his concern into action. Under the direction of the Assistant Secretary of Defense, Mr. Frank C. Carlucci, a set of thirty-two improvement actions have been developed and implemented. Although aimed primarily at acquisition improvement, these initiatives are broad scoped and strike at productivity improvement issues within all areas of the DOD.

The current administration has made productivity improvement a key issue. But how will agencies within the Defense Department know if they are or are not improving productivity? The obvious answer is the initiation of some measurement systems. The private sector has developed a very strong productivity measurement system based on profit and economic standings in the market. However, as the federal sector (including the Department of Defense) does not produce for profit nor does it compete in the private sector markets, it is not feasible

to measure federal productivity in the same manner as that of the private sector.

In the past, due to lack of information on government productivity change, it has been assumed that there was zero productivity change, or that there was a specific rate of productivity increase for the federal government. Neither of these assumptions leads to an acceptable indicator of actual changes in federal productivity. Therefore, existing measures have been limited to the private sector (21:14).

Before 1971, there were only a few isolated efforts by federal agencies to measure the productivity of an entire federal organization or even of a selected organizational component. One such endeavor was in 1962 when the United States Bureau of the Budget made a landmark effort to explore the feasibility of productivity measurement in five government organizations. It demonstrated that productivity measures could be prepared for the organizations considered and concluded that valid measures could also be developed for many other government activities. Later, a joint inter-agency team was formed which surveyed the existing measurement systems. The team concluded that the systems available could probably generate sufficient data for the development of federal

productivity indexes. The team also recommended the formation of a joint federal productivity measurement task force. After its formation the task force (in 1972), collected data for 1967 through 1971 from 114 organizational units in 17 agencies, representing about 55% of the federal civilian workforce. Since that time, data collection has expanded in the number of organizations included and refined methodological procedures used to construct productivity indexes (22:13-20).

As can be seen from the preceding paragraph, the federal government is greatly interested in developing accurate measures of government productivity. One reason for this concern was brought out in a May 13, 1972, Business Week article (34:160) which stated . . .

> the potential long term slowdown in U.S. productivity resulting from the shift to a service economy could be worsened if government productivity fails to keep pace with the private sector.

Another point brought out in the same article (34:162) quotes Nestor Terleckyi (National Planning Association Economist) as saying:

> Whereas a corporation's sales and credit suffer if it is inefficient, the feedback to government managers is slower and less specific. Hence, it is essential that they have the information to make good productivity choices.

Such information can only be obtained through accurate and timely productivity measurement systems. This quote is of particular significance in the case of DOD organizations

in that they are constantly required to commit federal resources with no effective means of productivity measurement yet available to them.

Spurred on by the ever increasing enthusiasm of government officials for improvement in federal productivity, the Department of Defense (DOD) established the DOD Productivity Program with the issuance of DOD Directive 5010.31 and DOD Instruction 5010.34. DOD Directive 5010.31 establishes the policy of focusing management attention on the achievement of maximum defense outputs within available resource levels by . . . "seeking and exploiting opportunities for improved methods of operation in consonance with the defense preparedness mission [36:1]." The Directive further states that, "Productivity measurement, enhancement and evaluation will be an integral element of resource management . . . [36:1]." The Directive prescribes a labor-oriented mode, but allows for total product or unit cost measures if available (36:2).

The second DOD Instruction, 5010.34, states that DOD organizations must operate both efficiently and effectively (37:1), and goes on to establish the Productivity Program. It further directed all DOD components to establish their own productivity programs along the following guidelines:

> - Maximum use of existing resource management systems . . . in productivity measurement and evaluation

> - Development and appropriate use of productivity evaluation indicators which represent true measures of the primary workload or mission for each function
>
> - Productivity measurement and evaluation . . . [37:2-3].

In enclosure (3) of this Directive, the Office of Management and Budget (OMB) directs, via memorandum of 9 July 1973,

> . . . (1) The establishment of a permanent system for measuring and evaluating productivity in the federal sector, and (2) The preparation of an annual federal productivity report [37:1, Encl. 3].

There is an established need to improve productivity. Agencies within the Department of Defense have been directed to form productivity programs. The development of productivity measurement systems is a central issue of these programs. Harry P. Hatry of the Urban Institute summarizes the issue:

> Productivity measurements permit governments to identify problem areas and as corrective actions are taken to detect the extent to which improvements have occurred [15:28].

Without good productivity measures, DOD agencies have little hope of defining current levels of productivity, nor can estimates of improvement or regression be made. Without productivity measures there is no way of determining the success or failure of management productivity improvement efforts.

Within the Department of the Air Force, the Air Force Human Resources Laboratory (AFHRL) has been assigned the

duty of investigating the complexities of developing productivity measurement systems. The AFHRL has established a contract with the Maryland Center for Productivity and Quality of Working Life, the purpose of which is ". . . make available to researchers and managers means of measuring efficiency and effectiveness dimensions of productivity for Air Force work centers [35:1]."

There are five objectives of the Maryland Center's investigation (1):

1. To review and define productivity criteria
2. To evaluate and classify efficiency and effectiveness measures
3. To identify major classes of variables which impact productivity
4. To develop a conceptual framework for productivity research
5. To conduct a field test of the method for generating organizational productivity criteria.

A four fold technical approach was used to accomplish the contract requirements (1):

1. Review and synthesize relevant research
2. Conduct extensive field interviews of government and civilian agencies with responsibility for research evaluation and/or measurement of productivity

3. Develop a conceptual framework of productivity and those factors having maximum relevance to enhancing productivity
4. Conduct a field test of the methods at 8 to 15 Air Force sites across three function(al) areas (weather, administration, and maintenance).

The contract, at the time of this writing, is essentially complete. It appears that some progress has been made in the establishment of new productivity criteria and the improvement of existing measurement systems. However, little effort has been directed towards the determination of the relative utility of the contract outputs and their impact on Air Force personnel.

Problem Statement

The contract between the Maryland Center and the Human Resources Laboratory has generated a methodology (to be called herein, the Maryland Center Methodology (MCM)) for producing productivity indicators within Air Force organizations. The field test of the MCM developed many productivity indicators across the test organizations. It is not known if these newly developed indicators are an improvement to those which may have existed previously. Neither is it known if the MCM and its products are considered by the field test participants to be of sufficient value to warrant further test and evaluation.

Justification

Productivity improvement is needed within all agencies of the Department of Defense. It can not be achieved without some form of measurement system. Any effort directed towards improvement or establishment of good measurement systems is therefore justifiable.

It is the contention of the authors of the MCM and these researchers that a good productivity measure must be valid, reliable and useful (35:26-82). If the measure is not perceived by the end user as having these qualities, it ceases to be a good measure. The measure will fall into disrepute, to be discounted or completely ignored. Obviously, a criterion in this state cannot contribute to the goals of productivity improvement.

The ultimate aim of this research is to sample user perceptions towards the productivity measurement criteria developed by the Maryland Center Methodology. These perceptions will be analyzed and conclusions drawn as to the ultimate utility of the MCM.

CHAPTER II

LITERATURE REVIEW

Background

The importance of determining the performance of formal organizations has been recognized since the beginning of the industrial revolution. Early factory owners and managers developed and used sets of prescriptive proverbs to measure and improve performance (27:1). Conceptual approaches to organizational performance were developed in the early nineteen hundreds from the management theories of such experienced practitioners as Fayol, Mooney, Alvin, Brown, Sheldon, Barnard, and Urwick (19:174). The scientific approach to management of Frederick Taylor and the union of statistical methodology with the social sciences from the nineteen thirties to the nineteen fifties provided theorists the tools to test and evaluate effectiveness theory. These forces and the increased influence of formal organizations on society have made effectiveness research extremely prolific, popular, and important in recent years (28:1).

Organizational effectiveness literature and research run a continuum of ideology ranging from Frederick Taylor's empirical management to the reflective distillation of experience from the universal management views of Henri Fayol.

The literature is as abundant as it is diverse, with reports, analyses, theories, principles, and proliferations of management guides and handbooks filling the bookshelves (19:174). The fast pace and popularity of the field has resulted in a state of intellectual confusion (9:5; 11:15; 26:229; 29:546; 30:49). This disorder centers about the definitions of performance, and the establishment of criteria to measure it (23:249; 29:50).

A major reason for the confusion in the field comes from the parochial views that many theorists and researchers hold concerning performance. Many of these individuals attempt to define effectiveness in terms of a single criterion, such as productivity, efficiency, or effectiveness (30:48-63). Another cause for the existing dilemma arises from the complexity and vagueness of the concept itself. Analysts often oversimplify the various criteria of performance measurement (30:48-63). In fact, the concept of performance measurement is intangible and depends on who is doing the analysis and to which school of management theory the analyst subscribes. Indeed, there are almost as many attempts to classify and apply a cognitive taxonomy to performance as there are writers, theorists, and researchers (19:174; 26:249). In thinking about performance - theorists and researchers construct their own individual models which are usually multi-dimensional, multi-faceted and dynamic concepts. John P. Campbell states:

> Perhaps a better way to think of organizational effectiveness [what we call performance] is as an underlying construct which has no direct operational definition, but which constitutes a model or theory of what organizational effectiveness is [35:13].

Theories and models of organizational performance are as diverse as their authors. Campbell and other researchers of performance describe two general themes to the differing explanations of organizational performance (3:73; 4:31; 20:13). These are the goal-centered and natural systems approach.

The Goal-Centered Approach

The goal model is the oldest and most common evaluation model, with many variations on its central theme. This theme makes the assumption that organizations establish and seek rational objectives. These objectives or goals can be identified and the organizations' goal achievement can be assessed as an effectiveness measure, assuming that the goals are apropos (8:31).

The basic model (32:323) grew from the machine theory of organizational dynamics. The conceptual basis for this approach comes from the traditional economic model of man and is consistent with the industrial engineering perspective and much of modern microeconomic analysis of organizational behavior. Operationally applied by Taylor, in conjunction with Max Weber's concept of bureaucracy, the machine theory implied that organizational effectiveness

could be equated with the extent to which the organization attained a set of objectives (32:323).

From the goal-centered approach the Cost/Benefit Analysis and Management by Objectives Programs were derived. Cost Benefit Analysis measures alternative courses of action towards an objective in economic terms. Management by Objectives measures specific, well defined, quantifiable successes and failures of an organization (17:563).

The Systems Approach

An increasingly popular approach is the systems model. The central idea of the systems perspective is that the demands placed upon the organization are so extremely dynamic and complex that it is not possible to define a small number of objectives as performance measures (26:243). Instead, internal and external environmental interactions of the organization are operationally defined and measured as to their contributions to the overall organizational effectiveness (26:242,243).

While the origins of goal theory lie in the fields of engineering and economics, the roots of the systems model are in biology and physics (32:324). Most of what is called the "general system theory", with its emphasis on parallel functions in the hierarchical levels of different systems, is traced to Von Bertalanffy's system theory. Von Bertalanffy's formulation was an extension of the

eighteenth and nineteenth centuries' search for a common dimension in science and culture. The model formulation coincided with the humanistic approach to organizational management as explored by Mayo and Follett. It was popularized by Chester Barnard. This induced organizational theorists to look at organizations as being complex multi-dimensional entities rather than goal-seeking machinery.

The Contingency Theory, Likert Instrument of Social Response (ISR) Model, and Organizational Development Model are deeply founded in the systems perspective. The Contingency Theory premise is that internal and external situations, events, factors, "contingencies", etc. determine an organization's structure and multi-variate nature, thus determining the organization's performance (9:10). The Likert ISR Model's basic defining variable of an effective system is that the individual's participation in decisions that affect them make the organization better equipped to achieve its objectives (10:33). The Organizational Development concept treats an organization's personnel as a resource and seeks to measure individual job perception, self-actualization, communication, and other such characteristics as measures of effectiveness (8:33).

The Problem of Definition

There are essentially three terms which performance researchers attempt to define. These are productivity,

efficiency and effectiveness. Definitions of these vary greatly and may or may not be dependent upon the particular approach of the theorist. Theorists and researchers simply cannot agree on how to define the concept of performance (29:51). Thus, a central issue in organizational performance is the difficulty of conceptual definition of these terms (26:230).

Productivity

Productivity has been defined as efficiency or effectiveness or both. It is a term widely used but often misunderstood. A natural place to begin the quest for understanding productivity is the dictionary. Webster's New Collegiate Dictionary defines it as:

> 1: The quality or state of being productive; 2: Rate of production especially of food by fixation of solar energy by producer organisms [39:918].

The term productive is defined as:

> 1: Having the quality or power of producing especially in abundance . . .; 2: Effective in bringing about . . .; 3a: Yielding or furnishing results, benefits, or profits; 3b: Yielding or devoted to the satisfaction of wants or the creation of utilities . . . [39:918].

Apparently, Webster is no more certain of the meaning than most and does little more than express the confusion surrounding the exact nature of productivity. He is by no means alone in his confusion, as there are a multitude

of meanings bestowed upon the term, even among researchers in the field of production and productivity.

At this point it may be helpful to relate some of the numerous definitions of productivity used in the current literature.

C. Jackson Grayson, Jr. (1972):

> Productivity is a combination of men, machines, and management methods. So, total productivity includes the effects of labor and capital, plus management know-how and innovations [13:31].

Herbert Heaton (1977):

> Productivity is a process, not a thing, except in terms of low-level, short-time-span methods with low-level, short-time-span goals [16:15].

Harry P. Hatry (1978):

> Productivity is most often defined as the ratio of output to input for a particular activity [15:28].

Paul Mali (1978):

> Productivity is the measure of how well resources are brought together in organizations and utilized for accomplishing a set of results. Productivity is reaching the highest level of performance with the least expenditure of resources [20:6].
>
> Productivity is a combination of effectiveness and efficiency [20:7].
>
> (Productivity is) . . . a managed process that identifies productivity and relates all the events and activities necessary to accomplish productivity objectives [20:45].

William T. Stewart (1978):

> (Productivity is the) . . . ratio of performance toward organizational objectives to the totality of input parameters [31:34].

Department of Defense Directive Number 5010.31:

> Productivity. The ratio of goods produced or services rendered (outputs) to resources expended (inputs) [36:Encl. 2].

As can be seen, the ways of defining the term appear to be endless. Practically all agree to the extent that productivity is related to inputs versus outputs of the organization, and most agree the outputs must be goal (objective or mission) oriented. However, there is little agreement on the relationships of the terms productivity, efficiency and effectiveness. As a result, there is no hard and fast agreement on a definition. It would appear that the problem has changed very little over the past few years, as summarized by Burkhead and Hennigan in their 1978 article in Public Administration Review:

> A review of the expanding literature indicates that productivity is characterized as related to or defined by the following terms: efficiency, effectiveness, cost savings, program evaluation, work measurement, employee incentives, management effectiveness, input-output analysis, work standards, and the political/social environment. It is measured at various levels of organizational performance by a wide variety of techniques. Productivity improvement . . . is obviously a virtue worth pursuing. But, sometimes it becomes an empty phrase that embraces almost any "change for the better" in a . . . program [6:34].

In light of this information, we can conclude by saying that

what we mean by "productivity" is dependent on the situation under consideration and the level of evaluation. For the purposes of this research, we shall define productivity as the ratio of output to input with goals considered. We will include both effectiveness and efficiency.

Efficiency and Effectiveness

Efficiency has been defined in several ways. Becker and Neuhauser define efficiency as "the ratio of outputs (returns, benefits) to inputs (costs, efforts) [5:20]." Paul E. Mott defines efficiency as " . . . achievement of the greatest output for the least input [23:17]." Efficiency has been used as part of a sum of two elements to describe performance. As Peter Drucker phrased it: "Efficiency is concerned with doing things right. Effectiveness is doing the right things [26:230]." Chester Barnard views the two terms from a different perspective. Shoderbek, Shoderbek and Kefalals quote Barnard's views:

> Activities of an individual in an organization aimed at achieving ends sought by the organization he defined as effective, while the behavior of an individual in an organization directed to the satisfaction of personal goals he considered efficient [26:230-231].

The terms efficiency and effectiveness are usually held as separate and distinct ideas (12:110). Effectiveness has been described by Paul E. Mott as follows:

> We define organizational effectiveness as the ability of an organization to mobilize its centers of power for action, production and adaptability [23:17].

Effectiveness has been defined in terms of goal attainment. The organization either succeeds or fails to achieve a predetermined objective (8:33; 12:109). Yuctman and Seashore declare an organization effective if it manages to maintain an inflow of essential resources from its environment (41:879). Another common meaning of effectiveness is adaptation, and it can be seen as a conceptual combination of survival and goal attainment. An organization adapts to change and therefore survives. An organization is adaptive to the extent that it can adjust its throughput to meet its objectives.

The Problem of Measurement

Early attempts to measure productivity focused on the numbers of items produced per unit of input. As will be seen, until recently little improvement has been made.

The remainder of this section will present a summary of several proposed methods of measuring productivity and some of the problems encountered. The material will be discussed in a chronological sequence in an effort to trace the progress that has or has not been made.

In 1971, Armstrong and Dougherty developed a set of 14 criteria for use in developing output measures at the Air Force Wing/Base level (3:98). They stated, however, that the criteria were not "sufficiently inclusive for use at the responsibility center level . . ., [3:129]" (defined

as the squadron level) (3:148). They tested their criteria by using them to develop an output measure for 12 Air Training Command hospitals, using data from 1970 Cost Center Performance Reports (3:108). After submitting the measure to both linear and parabolic regression analysis models, it was concluded to be an effective output measure for the hospital responsibility center analyzed (3:130). The implication is, of course, that these criteria could be used in any Air Force Wing/Base responsibility level for developing useful output measures.

In 1972, Nestor E. Terleckyi, the National Planning Association's Director of Goals Accounting Studies, stated in an article in the Defense Management Journal that when measuring productivity: " . . . the choice of appropriate concepts depends on the purpose of the measurement [33:25]." He went on to say: "The degree to which productivity change is beneficial is dependent on the fundamental objectives of the agency under consideration [33:26]." In essence, he is explaining the differences in measuring and defining productivity by saying that they are dependent on the situation under consideration; or put another way, the contingencies determine the measurement and definition.

That same year, Jerome A. Mark, Assistant Commissioner of the Bureau of Labor Statistics, proposed that measuring productivity as output (goods and services) per unit of labor would reflect the joint effects of many other factors: technology, scale of production, management skills, and others

(21:12). However, he later explains (as have numerous others) that because most government services/goods are not priced and sold to the public, it is very difficult to develop specific price measures for them (21:14). This point was reemphasized in an editorial in the May 13, 1972 issue of Business Week as follows:

> Statisticians have long maintained that there is no way to measure the productivity of government workers because their principal products . . . are intangible and defy quantification [34:160].

Also in 1972, Drummond and Pratt utilized the 14 criteria established by Armstrong and Dougherty (3:98) to develop output measures for the standard Air Force base supply organization cost centers, and concluded that the criteria, properly used, make possible the production of " . . . feasible output measures that can be used by managers to enhance the efficiency of their organization [10:100]." One problem uncovered by their research was that, when used for analysis of alternatives, the measures must be used with great care as they do not always include all costs (10:100).

An article in the November 1974 Monthly Labor Review identified one productivity measure utilized by the Federal government as " . . . output per man-year indexes" that express

> . . . the joint effect of a variety of interrelated influences such as changes in technology, substitution of one factor for another, utilization of capacity, skill levels and efforts of the work force, and managerial and organizational skills on the use of the factor in the generation of output [22:14].

It was described as the weighted average of the productivity changes of the organizations included in the sample. The products of each organization measured were combined by multiplying the quantity of each product produced per year by the man-years required to produce one unit of output in the base year (22:14-15). Although logical, it is often impractical to use due to the difficulty in defining and quantifying many government outputs. Some significant problems were brought out. One was that the measure did not consider shifts in quality of output or in types of outputs (22:16-17). The problem of long-term products (i.e., long production times) was identified as due to difficulty in assigning their tasks to a specific period (e.g., construction of a ship). Related to this problem is that of accounting for manpower allocations when personnel are working on more than one project. Similarly, there is the problem of separating contracted products from those of the government employees (22:16-17).

In their analysis of current productivity measurements in the public sector, Searle and Waite brought out yet another significant obstacle to estimating accurate productivity indexes. They discovered that measuring the same task from two different viewpoints (finished product per manhour versus individual output per manhour) skewed the outcome. As an example: If a man hammers $\underline{x}$ nails per hour (individual output/manhour) and new technology is developed that will allow a wall to be erected with one-half the nails,

the number of walls (finished product) per manhour is doubled, but the individual output/manhour (number of nails hammered per manhour) has not changed (25:339).

In 1974, Arnold and Fink conducted research to develop a set of objectives for a Base Civil Engineering (BCE) organization. Their efforts culminated in the development of a model of BCE organizational objectives beginning with the overall objective to "Provide required real property facilities to support the base mission at least cost [4:50]." This was followed by 39 sub-objectives and numerous performance indicators for each aspect of the BCE organization. They also indicated a suggested frequency of use for the indicators (4:49-53). Although the research did not provide a method of measurement, it does recognize the need for such tools and provides some useful indicators for further research.

A 1976 study by Hanley and Smith of USAF Civil Engineering Workforce Productivity found that valid productivity ratios were not possible unless the inputs (labor in particular) were measured against standard estimates (14:77-78).

Productivity in Service Organizations, a 1977 publication by Herbert Heaton, provides some interesting viewpoints on measuring productivity which are, to some degree, applicable to Air Force organizations. He points out that the recipient of services/goods must be a partner in the production process in service organizations (16:13). Heaton feels productivity measurement should take into account the fact that the production of goods and services by service organizations is for

people. Therefore, he developed a measurement method whereby four operating criteria are considered. These are: input; processing; output or follow-up; and timing and coordination. Each function is rated as to its perceived effectiveness and efficiency, and given a rating of between zero and one by the manager. The individual ratings are then multiplied to get gross organizational productivity. Gross productivity is then reduced by the percentage of customers that were, in some way, made worse off than before. This then represents the net organizational productivity index (16:45-46). The method, although useful, still depends on the development of accurate output measures.

Paul Mali presents four methods for measuring productivity in his 1978 book, Improving Total Productivity. First is Measurement Using Productivity Ratios, in which he presents five categories of ratios representing the productivity index. These " . . . can be used within a planned time period or as a reference in some time period to be chosen as a base period." The productivity index is expressed as follows:

$$\text{productivity index} = \frac{\text{productivity, current year}}{\text{productivity, base year}} = \frac{\frac{\text{results, current year}}{\text{resources, current year}}}{\frac{\text{results, base year}}{\text{resources, base year}}} \quad (20:85)$$

The second method is Measurement Using Total Factor Productivity.

> In principle, the total factor productivity is a ratio of output to all inputs required to deliver the output:

$$\text{Total Factor Productivity} = \frac{\text{Output}}{\text{labor + capital + resources + misc.}} \quad (20:91)$$

This method allows for the inclusion of equipment depreciation and other forms of capital. The restriction is that input must be expressed in terms of constant dollars in order to show trends accurately (20:92). The third method of measurement is using Management by Objectives (MBO). MBO provides a "yardstick" to evaluate achievements and progress toward achievements. He identified five steps: (1) identify type of expected output; (2) determine performance factors (quantity of output) required, resources to be used, and required quality; (3) calculate productivity index; (4) formulate objectives based upon those productivity measures; (5) establish a time line (20:95). Fourth, he explains Measurement Using Productivity Checklist Indicators. This method involves the establishment of checklist indicators, by experienced practitioners, that explain what, but not how to perform the tasks required to complete the job. These indicators should specify actions that can measure both performance effectiveness and resource efficiency.

$$\text{productivity index} = \frac{\text{checklist indicators completed}}{\text{total checklist indicators}}$$

(20:99-100)

William T. Stewart, in his 1978 article, "A Yardstick for Measuring Productivity", presents a valuable method of collating organizational productivity indicators into a single productivity index. Since organizations usually

have several "sub-objectives", he uses a utility concept which combines what he calls "surrogate measures" to produce a single indicator of productivity representing "perceived value of efforts resulting in performance toward the perceived objectives [31:34]." The utility concept functions on the basis of assigning a value of zero to the most adverse case of the surrogate measure and a one to the optimal condition, with a continuum from zero to one on the utility scale. The decision-maker can then devise a curve, based upon his perceived utility for that function, for each surrogate measure, with the measure along the horizontal axis and the utility function on the vertical axis. The curve represents the decision-maker's perception of the intrinsic worth at each level of the surrogate measure (31:35).

Using the Keeney model of multiplicative multi-attribute utility function, the various utilities of the surrogate can be consistently combined " . . . to develop a composite utility index which represents overall productivity [31:35]." Since an individual is unlikely to possess the required knowledge to develop a system which is effective and which truly measures organizational productivity, Stewart suggests a participative development approach, the Nominal Group Technique, as developed by Delbecq and Van de Ven in 1968. The technique combines the attributes of both group wisdom and involvement of key personnel

within the organization. This provides a more comprehensive system of measures while the involvement tends to raise personal committment (31:35).

In 1980, Kaneda and Wallett performed a study to develop productivity measures for the design section of a Base Civil Engineering (BCE) organization. Using a survey of BCE design chiefs, base civil engineers and industrial engineers, they were able to compile a list of nine measures considered to be of significant importance by those surveyed (18:64-69). In their research effort, they found the only currently documented inputs were direct labor costs and labor man-hours. They therefore suggest that more comprehensive measures could be developed using such inputs as equipment, facilities, and materials used (18:74-75).

A Productivity Measurement Methodology

Background

The Maryland Center for Productivity and Quality of Worklife under contract from the Air Force Human Relations Laboratory (AFHRL) examined the current organizational performance literature and concluded the following (35:76-79):

1. The definition of productivity . . . should incorporate the concepts of both efficiency and effectiveness.
2. An organizational productivity measurement scheme

should include multiple measures of both efficiency and effectiveness.

3. A set of efficiency and effectiveness measures should have (as) many as possible of the following characteristics: . . . Completeness . . . Comparability . . . Input coverage . . . Compatibility with existing input sources . . . Cost effectiveness . . . Consistent across organizations . . . Acceptable to organization members . . .
4. Individual measures in a set of productivity measures are most useful if they possess the following features: . . . Validity . . . Uniqueness . . . Understandability . . . Controllability . . . Reliability . . .
5. For most Air Force applications, . . . efficiency measures which employ outputs expressed in physical units and inputs expressed as dollar costs are most useful.
6. Efficiency and effectiveness measures should be developed for the key facets of mission performance.
7. Measurement activities in Air Force organizations should make use of a measurement coordinator.

The Maryland Center researchers distilled these conclusions into 5 implications for the Air Force productivity measurement systems. These implications are as follows:

1. Employees need to participate in the measurement process.

2. Management should decide what areas of performance should be measured.
3. Existing data should be used.
4. A measurement coordinator is required.
5. Productivity measures should be useful for research purposes (35:80-82).

The Maryland Center Methodology (MCM)

From these implications, a five phase procedure was developed by the Maryland Center researchers for the development of productivity measurement criteria. These phases are as follows:

Phase I - Background: A "measurement coordinator" is selected from outside the target organization as an unbiased facilitator for the MCM. It is during this first phase that the facilitator familiarizes him/herself with the target organization and its functions, internal and external impacts, lines of communication and authority, and other important descriptive aspects through meetings with both line and staff management. The end result of this phase is a systems model of the target organization and its interactions, and the understanding required to enable the facilitator to discuss the workings of the organization with its members (35:84-86).

Phase II - Definition of Key Results Areas (KRAs): The "management group" (referred to as Group A) is formed consisting of the top two levels of the target organization's

management. After the group is oriented to the purpose of the methodology and the systems model of the organization; a structured group process is carried out to generate KRAs. The KRAs are discussed one by one to insure group understanding of each, and displayed for the entire group to see. A vote is then taken by ballot and the results posted. The KRAs selected are examined before the group and the variations in voting results are discussed. During discussion, the suggested KRAs may be revised, deleted or combined as dictated by the group. Another vote is then taken and results are discussed as above. Normally the second vote results in a significant differentiation between the proposed KRAs. The final list is then developed based on a (pre-established) weighting system (35:86-90).

Phase III - Definition of Productivity Indices and Data Sources: Group B is established consisting of individuals drawn from the second level of management along with their immediate subordinates. Once they have been briefed on the purpose and the methodology, the KRAs are identified and explained. Group B is then asked to generate indicators for each of the KRAs in the same manner as was done in Phase II. The end result is a list of KRAs, each with a set of indicators (35:90-91). Group C is then established consisting of members drawn from both Groups A and B. Using a discussion mode, Group C reviews the products generated by Groups A and B, and redefines any items needing clarification

or further definition. Group C then identifies existing sources of data for each indicator (35:90-93).

Phase IV - Generalization of the Indicators (Optional): Phase IV is only required if the indicators developed are to be part of a common set of indicators to be used across organizations within a functional area. Basically, Phase IV requires repeating Phases I, II and III in other organizations until a repeating set of indicators is obtained which can be consistently applied across the organizations (35:93-96).

Phase V - Implementation: This phase includes the gathering of real data and computing productivity indices for management (35:96).

Conclusions

In the 1972 Public Administrative Review Symposium on Government Productivity, Edward K. Hamilton stated: "The public is now assailed by more irrelevant facts, half-facts, and non-facts on this subject than on any issue in public affairs [24:785]." While there is some truth to Mr. Hamilton's statement, it is evident that the government is genuinely concerned about the issue of productivity and is promoting efforts to better define and measure public sector productivity through organizations/initiatives such as the Air Force Institute of Technology and the Department of Defense Productivity Program.

The research thus far has been approached from many directions and at various levels of the organization. Burkhead and Henning, in their 1978 article, "Productivity Analysis: A Search for Definition and Order", suggest that the bulk of the research efforts in the area of productivity measurement and improvement studies can be placed in one of five categories: (1) activity - output measurement; (2) employee-incentive approaches; (3) organizational behavior; (4) productivity bargaining; and (5) technology transfer (6:11).

While research has developed numerous potentially useful productivity measurement methods for the U.S. Air Force, there are several basic problems which must be overcome before they can be effectively applied. Kaneda and Wallett point out four key requirements in this respect:

1. Organizational goals must be defined.
2. Output must be quantifiable.
3. Inputs must be quantifiable.
4. The time period to be measured must be specified. (18:11)

Other important considerations to be dealt with include the concept that productivity and its measurement are processes to be carried out over time; that the method to be used is dependent upon the contingencies within the subject organization(s); that the measures developed must be used with great care so as not to distort the situation; that shifts in

products and product quality must be considered; and that long-term products must be subdivided so their measures will reflect the productiveness during the period of accomplishment. These, although not all-inclusive, represent the bulk of the hurdles yet to be taken in the search for effective productivity measurement in U.S. Air Force organizations.

The problem of defining productivity is, without a doubt, the most significant task yet to be accomplished. However, in light of the varied approaches taken in the research thus far, it is easy to understand why each effort has expressed it in a different way. There does appear to be general agreement on the basics, but the specifics of the definitions still vary with respect to the approach being taken.

The task before those who would attempt to solve the productivity measurement problem is best summarized in these statements by D. Scott Sink:

> What is needed is not a standard of set measurements created by experts and imposed by organizations, but rather a method by which groups can create productivity measurement systems suited to their own inevitably special circumstances [27:3].

> Successful productivity measurement systems are concerned with how to measure and who decides what to measure as well as with what is measured [27:3].

The MCM attempts to put into practice the concerns of D. Scott Sink. The method does generate measurement criteria

from a group process and subjects them to that organization's management review. It is unknown whether these criteria are useful, or even better than what previously existed. Such questions are the basis of this research.

Research Objectives

The primary objective of this research is to determine if the MCM, as developed, is useful in a military setting. This will be accomplished by:

1. Determining if indicators developed by the MCM are perceived by the users to more accurately reflect organizational productivity than previously used means of productivity measurement;
2. Determining if the perceived usefulness of the indicators developed varies significantly by level of management, years of federal service, time in career field, rank/grade and number of people supervised;
3. Determining how those surveyed perceive productivity;
4. Determining if the administration of the MCM, in and of itself, is perceived by those surveyed to be of any intrinsic value to the organization, and by;
5. Determining if management actually uses or plans to use the indicators developed.

Research Questions

For the purposes of this study, one primary research question will be answered along with the analysis of two secondary research questions.

Primary Research Question

I. Do the participants of the Maryland Center Methodology field test perceive its results as potentially useful.
   a) Do supervisory personnel support the use of the MCM developed indicators?
   b) Do the field test organizations use or intend to use the MCM generated products?
   c) Are the indicators developed by the MCM test organizations perceived by them as useful?
   d) Do the participants of the MCM perceive that the MCM generated measures are accurate and do/will perform well?

Secondary Considerations

I. How do the participants of the Maryland Center's Methodology perceive productivity.
   a) Do the MCM participants perceive the same definitions of productivity, efficiency and effectiveness as those given by the MCM facilitator?
   b) Do participants perceive a need to monitor and measure productivity?

II. How do the participants perceive the Maryland Center's Methodology itself.

a) How do they perceive the structure, processes and mechanics of the MCM?

b) Do they perceive that the MCM has value other than indicator generation?

CHAPTER III

METHODOLOGY

Research Setting

Since this study focused on the objectives of an existing Department of Defense contract, i.e., the development of the Maryland Center Methodology (MCM), it was necessary that the authors initially develop a first-hand knowledge of the Maryland Center procedure. This was accomplished via personal interviews with the MCM developers and by participation in an early field test.

Twenty-one independent organizations from ten Air Force installations participated in the MCM field tests (see Appendix A). The organizations involved were of three functional types: Base Administration; Field Maintenance Squadron (FMS), propulsion branch; and Base Weather Detachment. Selection of the sites to be used was a joint AFHRL and Maryland Center effort and was accomplished by evaluating all CONUS sites against two criteria: the absence of "special" functions co-located with it (e.g., MAJCOM headquarters, numbered Air Force headquarters, Air Division headquarters, etc.); and assigned manpower strength. Each of the sites selected was required to be of sufficient and comparable size. Using random selection with replacement, eleven sites were selected from those sites satisfying both criteria. Ten

sites were used for field testing and one (Andrews AFB, MD) for a pilot study.

Each of the selected organizations participated in the MCM field test. In each instance, a researcher from the Maryland Center acted as facilitator (or measurement coordinator) for the MCM. Subsequently, the commander of each organization was briefed on the results and instructed to use the indicators as he/she saw fit.

A questionnaire was developed by the authors to measure the perceptions of participants to the MCM; its presentation; benefits and outputs (see Appendix B).

Sample

The sample for the survey consisted of all military and civilian personnel who participated in the field test. This included personnel ranging from upper management to first line workers in each of the twenty-one organizations involved.

Research Design

The research is a one-shot case study (6:6). It is realized by the authors that this design is less desirable than many others for research purposes. However, due to the fact that the MCM was already being field tested before the initiation of this effort and the time constraints imposed, it was the best alternative. Even with its drawbacks, the

authors feel some significant insights have been gained by using this design approach.

Data Collection Plan

A questionnaire was selected as the primary means of data collection. This reduced the possibility of the data being affected by many of the confounding variables associated with personal interviews, while insuring anonymity for the respondents. Because the contract was still in progress, the questionnaire was coordinated with both AFHRL and the Maryland Center. Their suggestions for questionnaire improvement were incorporated as determined to be appropriate by the thesis committee. The Maryland Center then distributed the questionnaires. The package included a cover letter (see Appendix C) explaining the purpose of the questionnaire and requesting the manager to distribute it to all individuals in his/her organization who had participated in the MCM. Responses, however, were strictly voluntary. Computer scan forms were provided to record responses. These and responses to open-ended questions were then returned to the researchers via pre-labeled return envelopes.

Twenty questionnaires were sent to each Base Administration and FMS propulsion branch, and ten to each Weather Detachment which had participated in the MCM field test. Of the 350 questionnaires sent out, 136 were returned, of which 15 were unanswered. Eleven of those remaining were

unusable due to non-conformance with instructions, leaving 110 usuable questionnaires.

Assumptions

The primary assumption of this research is that unless those who will be required to use and/or be evaluated by a measurement system feel it is valid and useful, they will not support it.

A secondary assumption of both this research and the MCM is that before major improvements can be made in organizational productivity, the concept itself must be understood, and methods developed for its measurement (32:6).

Other significant assumptions of both this research and the MCM are:

1. Working supervisors and experienced journeymen are capable of providing important insights as to how their work and their organization should be evaluated;

2. Worker participation in measurement development will increase its accpetance;

3. Measurement is not an end in itself, but is a means to productivity improvement.

Operational Definitions

The following are taken from the MCM (32:30-73) and are presented to insure understanding of the terms and concepts as discussed in this study.

Productivity: The volume of resources used to produce products and services (efficiency) and the extent to which these products and services conform to acceptable standards of mission performance (effectiveness). Thus, Productivity = Efficiency + Effectiveness.

Efficiency*: The degree to which a product or service is produced without waste. For the purpose of the MCM and this research, it is considered to be measurable in these ways:

a) Efficiency = $\frac{\text{Outputs}}{\text{Inputs}}$, or the ratio of outputs to inputs.

b) Performance Efficiency = $\frac{\text{Standard Level}}{\text{Actual Level}}$, or the ratio of the standard level of performance to the actual.

c) Utilization Efficiency = $\frac{\text{Actual Utilization}}{\text{Available Utilization}}$, or the ratio of actual utilization to the potential utilization.

Effectiveness*: The degree to which the desired results are gained in the production of products or services. The MCM describes the four basic dimensions of this term as:

a) Degree of Goal Achievement; measured in terms of the ratio of actual goal achievement to the standard achievements, etc.;

b) Degree of Quality Attained; measured by defining key quality deviations from the standards of acceptable performance;

c) Degree and Nature of External Impacts; measured by assessing the direct and indirect impact of the outputs on other organizations, the organization's responsiveness to customers/users, and the impact on customer/user attitudes;

d) Degree and Nature of Internal Impacts; meaning the degree to which the organization's capability for future production is enhanced or impaired, and measured by one of three integrated approaches:

*Not specifically defined by MCM

Total Performance Management (National Center for Productivity and Quality of Working Life, 1978); Behavioral-Economic Measurement (Herrick, 1975; Macy & Mirvis, 1976); and a Navy system for evaluating the performance of production foremen.

Key Results Areas (KRAs): The results that individuals in an organization are paid to achieve. This same concept might be called organizational objectives by others. In an Air Force organization, KRAs represent a way to break the unit's mission statement into categories that describe the organization's principal intended accomplishments.

Structured Group Process (Nominal Group Technique): Process in which participants suggest KRAs and/or indicators on slips of paper and then participate in group discussions of those suggested. Following the discussion, secret ballot voting is performed followed by a group analysis of the voting results. The voting and analysis procedure is repeated until there is significant agreement (32).

The following definitions are defined by the authors for the purposes of this research:

MCM: The procedure developed by the Maryland Center for the U.S. Air Force Human Resources Laboratory under DOD contract #AFHRL-TR-81-9 to generate measures of productivity in Air Force organizations.

Participants: All personnel that formed groups A, B, and/or C, as defined in the Literature Review of this research, to include management of the target organizations.

Facilitator (Measurement Coordinator): Individuals from outside the target organization responsible for ensuring that the procedures of the MCM are adequately followed.

Variables Considered

Independent Variable: The Maryland Center Methodology

Dependent Variables:

1. Perceptions of criterion development
   a) Usefulness of KRAs
   b) Accuracy of KRAs
   c) Usefulness of indicators
   d) Accuracy of indicators
2. Use of developed criteria
   a) Current use of new indicators
3. Perceptions of the methodology
   a) Intrinsic value

Secondary Considerations

1. Perceived importance of productivity measurement
2. Perceived definition of productivity
3. Use of group techniques
4. Use of voting system
5. Role of facilitator

Instrument

A seven point Likert Scale was the response option for most of the questions. This scale was chosen because historically, the Likert Scale has been used to evaluate perceptions and it provides an easily understood response mode.

The questionnaire was divided into five sections:

1. Demographic information

2. Perceived importance of productivity measures and definition of productivity

3. Perceptions of the MCM

4. & 5. Perceptions of criterion development and usefulness of criteria developed

The demographic information in Section 1 was requested for two reasons: first, to accurately describe the sample to which the questionnaire was given; and secondly, to provide information for possible cross-sectional analysis. Sections 2 through 5 were the vehicle for providing information on the dependent variables of concern in this study.

The affective measures were developed by the authors and not taken from previous instruments. The measures were not subjected to tests of reliability or validity, nor was the instrument subjected to a pilot test prior to implementation. The instrument was, however, subject to consensual validation by Headquarters USAF and the Maryland Center prior to release.

Statistical Procedures

The Statistical Package for the Social Sciences (SPSS) computer program was used to analyze the data. The SPSS program computed frequencies, mean, median, mode and cross-tabulated desired variables. The missing values options were utilized to account for missing question responses.

The data was examined for significantly large or small proportionality at the extreme ends of the Likert response

scale. The data was separated into three groups; percent responses in 1 and 2; percent responses in 3, 4, and 5; and percent responses in 6 and 7. The percentages in the extreme response modes 1 and 2, 6 and 7 were subjected to a two tailed test of significance for proportions. The following formulae was used to calculate the upper and lower limits at a 95% confidence level.

$$p' \pm 2 \frac{pq}{n}$$

where: p = probability of success: 2/7 = .2857
q = probability of failure: 1 - .2857 = .71428
n = sample size (as per each question) (see Appendix D)

All data originating from the Likert scaled questions were subjected to this examination. Appendix D provides the data for these questions separated into the above groups.

CHAPTER IV

RESULTS/DISCUSSION

Sample Characteristics

The 110 respondents were separated into five demographic groups: organization, years of service, management level, number of personnel supervised and level of participation in the MCM. "Organization" consists of three categories: Field Maintenance Squadron (FMS), Weather and Base Administration (Admin) corresponding to the Air Force units that participated in the Maryland Center Methodology. "Years of service" was broken into six categories covering from one to eight or more years of federal service. "Management level" was divided into three levels: Top, Middle and Supervisory; with an additional open-ended response category. The "number of people supervised" variable contained seven categories ranging from zero to fifty or more individuals supervised. The "level of participation" describes the amount of work and involvement of a respondent in the MCM.

The respondent breakout by organization demonstrates good proportionality of the number of respondents to the relative size of the organization. The FMS accounted for 41% of the total respondents; Weather 18% and Admin 41%. Seventy-five percent of the sample group were senior personnel with more than eight years of federal service. Sixty-eight percent of the participants considered themselves top and

middle management, and 21% considered themselves first line supervisors. Fifty-one percent stated they supervised between five and fifty people; 25% between one and four and 17% had no supervisory responsibilities at all. Forty-four percent of the survey group participated in all levels of the MCM. Table I presents the number of respondents in each category of demographic variable.

Table I

Number of Respondents by Demographic Variable

	Number of Respondents*	Years of Service					Level of Management				Level of Participation					No. People Supervised						
		2) 1-1.99 years	3) 2-2.99 years	4) 3-3.99 years	5) 4-7.99 years	6) 8 yrs or more	1) Top Management	2) Middle Mgmt.	3) 1st Line Sup.	4) Workers/Others	1) Develop KRAs	2) Critique KRAs	3) Develop Indicators	4) All the Above	5) KRAs & Indicators	1) 0	2) 1 to 5	3) 5 to 10	4) 10 to 20	5) 20 to 30	6) 30 to 50	7) 50 or more
1) EMS	45	1	3	5	6	30	3	15	13	19	4	1	9	21	6	6	8	5	2	3	4	16
2) Admin	45	2	6	1	3	31	5	21	10	8	1	4	10	18	12	8	15	13	3	3	3	0
3) Weather	20	4	3	1	1	12	5	6	0	5	1	1	5	11	1	5	1	2	2	0	0	10
2) 1-1.99 years	1						0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0
3) 2-2.99 years	7						0	1	0	5	0	1	4	0	0	5	1	0	1	0	0	0
4) 3-3.99 years	9						3	1	1	4	0	1	4	1	1	5	1	0	0	1	0	2
5) 4-7.99 years	10						0	4	2	4	0	0	3	4	1	3	4	0	0	0	0	0
6) 8 yrs or more	83						14	39	20	8	3	4	13	37	17	6	20	19	16	8	3	7
1) Top Management	17										5	0	1	7	4	0	2	0	1	4	5	5
2) Middle Mgmt.	45										1	3	2	24	8	2	13	10	12	4	1	5
3) 1st Line Sup.	23										3	2	6	9	3	0	8	8	4	1	1	1
4) Workers/Others	22										1	1	10	6	3	16	4	1	1	0	0	0
1) Develop KRAs	10															1	1	1	1	1	2	1
2) Critique KRAs	6															1	4	1	0	0	0	0
3) Develop Indicators	24															11	6	3	3	0	1	0
4) All the Above	47															4	11	8	12	7	1	4
5) KRAs & Indicators	19															2	4	7	1	1	3	1

*As some of the MCM participants failed to indicate responses to various questions, the total number of respondents in each demographic variable may not equal 110.

Perceived Usefulness of the MCM Results

The primary question that this study attempted to answer is "Do the respondents perceive the results of the Maryland Center's Methodology to be useful?" In order to

answer this question, four sub-areas were addressed. These were: supervisory support of the MCM indicators, actual use of the indicators within the organization, the participants' perceived usefulness of the MCM indicators, and accuracy and performance of the MCM indicators. Questions 25-29, 36-38 and 42-53 address these issues.

Supervisory Support

Question 25 dealt with the issue of supervisory support of the MCM indicators. The authors feel that this issue is helpful to the notion of MCM product usefulness on two counts. First, it indicates acceptance or rejection by legitimate authority within the organization. Secondly, the attitude taken by supervisory personnel (regardless of level) does influence those who work beneath them.

The mean response for this question was 4.2, on the seven-point Likert Scale. Approximately seventeen percent of the participants strongly to moderately disagree (1,2), sixty-one percent slightly disagree to slightly agree (3,4,5) and twenty-two percent moderately to strongly agree. Fourteen percent of the total number of respondents strongly disagreed that their supervisors supported the MCM results. On examination one-third of this group came from the lesser experienced non-supervisory members with three to four years of federal service.

The data indicates that the respondents were essentially neutral toward this issue. (Neutral is defined here by the

authors as not having a statistically significant percent of the responses in agreement or disagreement with the issue. The authors will use this definition throughout the results.) This represents an unwillingness on the part of the participants to agree or disagree on a particular issue addressed by a question. There are many reasons for this occurrence. Some possibilities are apathy, question clarity, respondent knowledge of the issue and attitudinal difference.

It is interesting to note the dichotomy of categories which strongly disagree. One segment is the workers, the other is management itself. Inference cannot be made as to any possible relationship between these two. However, in combination (workers and managers) the dichotomy represents a substantial minority who perceive that their superiors do not support the MCM indicators. There is insufficient data to derive a specific explanation for this occurrence. Reasons for the perception may range from the design of the MCM to implementation of new indicators (or lack of) by superiors. The point to be made is that support from the organization's managerial echelons is extremely important for any new program, i.e., the MCM.

Indicator Use

Question 45 asked respondents to what degree they used productivity indicators prior to their participation in the MCM. The mean response to this question was 3.86. Twenty-nine percent responded very low to moderately low degree

(1,2), 13.7% responded slightly low to slightly high degree (3,4,5) and 26.9% responded moderately high to very high degree. The participants were neutral with respect to prior productivity usage. Of note was that 25% of the participants responded "to a very low degree" ((1) on the seven-point Likert scale). This group could not be demographically isolated. This may be due to questionnaire insensitivity, small sample size or research design.

Two noticeable trends were found with respect to prior use when the data were compared across the five demographic variables:

1. When evaluated by organization, Admin had a mean response of 3.0, FMS was 4.27 and Weather was 4.9. This could imply that the Admin groups used productivity indicators less than the FMS and Weather organizations prior to the implementation of the MCM. The finding is not unexpected. A criterion used in selecting the Admin function for field testing was its previous low use and lack of good productivity indices.

2. A trend was found within the demographic variables "years in federal/military service" and "number of subordinates supervised". As the categories of "years in service" increased and the "number of subordinates supervised" increased, the degree of prior indicator use also increased. This

finding has a logical explanation. The participants with more service time and large supervisory responsibilities would have had more exposure to the practical use of productivity indices.

Questions 26, 46 and 50 ask the participants about their current and projected use of the MCM indicators. Question 26 addressed perceived current/planned use of the MCM indicators. Question 46 addresses the same issue using the terms "to what degree have/will you (use the new indicators)." The mean response for Question 26 was 4.0. Fourteen and one-half percent responded strongly disagree, moderately disagree (1,2), 73.7% responded slightly disagree to slightly agree (3,4,5) and 11.9% responded moderately agree to strongly agree (6,7). The mean response for Question 46 was 3.9. Twenty-one and eight-tenths percent responded strongly disagree, moderately disagree (1,2), 60% responded slightly disagree to slightly agree (3,4,5) and 18.2% responded moderately agree, strongly agree (6,7). The participants are neutral with respect to these questions.

The participants actual use of the MCM indicators was addressed by Question 50*. The question additionally asked the respondents why they were or were not using the indicators. Fifty-eight percent of the respondents indicate they are currently using the new indicators. Approximately half

*(See Appendix B) Question 50 was a seven response, open-ended question, not on the Likert scale.

of this group gave as their reason for use that the newly developed indicators "supplemented existing measures". A notable finding was that all levels of management were split 50/50 on use versus non-use. This finding would appear logical, given the percentage split of the data on the issue of use. However, no other demographic variable shows this split. Perhaps this is an indication of lack of sensitivity within the demographic variables on the questionnaire. This finding could give insight to the implementation of MCM indicators by management. In any case, the data are insufficient to explain the finding.

The survey group was neutral with respect to prior indicator usage and current/future use of the MCM indicators. This fact would tend to indicate that the MCM did not change existing behavior patterns or alter previously held attitudes towards indicator usage. However, participants indicated through Question 50 that 58% of them were using the MCM indicators. This would seen to indicate that the MCM has influenced behavior, at least to the point that the new indicators <u>are</u> being tried.

An answer to the opposing views could lie in the sensitivity of Questions 26 and 46. Of the total responses to these questions, approximately 11 to 14 percent were strongly disagree/very low degree (Likert (1)). The weight on the low ends of the data shifts it to a more negative tone. Question 50 was not affected by the negative scale weight,

as it was a question which required essentially two responses, yes or no, to indicator use. Perhaps the above situation existed due to the differing question types.

Perceived Indicator Usefulness

Questions 27 through 29, 37, 38 through 41, 43 and 53 addressed the issue of the respondents' perceived usefulness of the MCM developed indicators. Question 27 dealt with the perceived worth of the MCM with respect to the indicators. Twenty-eight was concerned with the degree to which the new indicators are understandable. Question 28 was considered here because it is felt by the authors that unless the indicators are understandable, they will not be useful. Question 29 dealt with the ease of use of the indicators. Question 37 dealt with the ability of the new indicators to improve management's "picture" of the organization's productivity. Questions 38 through 41 compared various traits of the new indicators with the old*. Question 43 was concerned with their ability to detect existing or potential trouble areas, and Question 53 addressed the usefulness of the new indicators with respect to the Air Force Productivity Program. The responses to these questions are presented in Table II.

Question 27 asked the respondents whether the results obtained from the MCM were worth the time, effort and energy expended. The mean response was 4.4. As noted in Table II, only 19.1% of the respondents disagreed. The low mean is

*Values are reverse scored.

Table II

Distribution of Item Responses

			% Responding						% at Extreme Ends of Likert Scale		
	11	4.4									
	11	4.									
	11	4.1									
	110	4.4									
*m	110	4.5	4.5	4.5	4.5	27.3	20.1	11.8	17.3	9.0	51.9	29.1
*n	110	4.5	4.1	4.5	10.9	33.6	21.8	13.6	10.9	9.0	66.3	24.5
*o	11	4.7	0.4	2.7	9.2	30.9	19.1	16.4	16.4	9.1	58.2	32.8
*p	110	4.6	9.1	4.5	4.5	28.2	20.0	15.5	18.2	13.6	52.7	33.7
*q	110	4.5	9.2	2.7	0.4	26.4	28.2	23.6	4.5	10.9	61.0	28.1
	76	4.4	11.8	1.3	1.3	40.8	17.1	21.1	6.6	13.1	59.2	27.7

*Values are reverse scored.

explained by the fact that 17.3% of the respondents strongly disagreed. As discussed under the issue of "supervisory support", the management/non-management dichotomy is evident here. However, there is insufficient data to explain this condition. The responses did indicate that a statistically significant percent of the sample population moderately to strongly agreed (6,7); 35.4%, that the results were worthwhile. This represents a substantial minority within the sample.

Question 28 asked the respondents if the MCM indicators are easily understood. The mean response was 4.7, and the responses were neutral, with 53.6% of the respondents unwilling to agree or disagree. This is not necessarily surprising because the question implied that one must have

used the MCM indicators in order to determine to what degree they were understandable. As will be seen in the discussion of Question 50, approximately 42% of the respondents have not used them. This would imply that about the same percentage of respondents would be unwilling to agree or disagree on the issue for lack of a comparison basis. There remains the previously discussed reasons of apathy, question clarity, etc., which could apply.

Question 29 asked the respondents if the MCM indicators were easier to use than previously used indicators. Here again was the implication of use for comparison purposes. The mean response was 4.3, with 70.9% of the sample population unwilling to agree or disagree.

Question 37 asked the respondents if the MCM indicators, if implemented, would provide management with an "improved picture" of actual productivity in their areas. The mean response was 5.4. A majority of the respondents (56%) moderately to strongly agreed (6,7) with this issue. It should be noted that Question 37 did not imply prior use, and did not require a comparison of the MCM indicators with any previously used indicators. This question simply asked the respondent to give his opinion of the MCM indicators based on whatever knowledge of them he possessed, which in many cases would only include that obtained during the period in which they were developed.

Question 38 asked the respondents to compare the usefulness of any previously used indicators with that of the

MCM indicators. The mean response was 4.5, and the responses were in the 3, 4, 5 range on the Likert scale. Again, prior use of the MCM indicators was implied for comparison. It was also implied that the respondent had used indicators prior to the MCM, which may well be false. In either case, the result would probably be the same - a median response for lack of the experience required for the comparison.

Question 39 again asked the respondents to compare the MCM indicators with "previously used" indicators. This time it was to determine the degree to which they are comprehensive. The mean was 4.5 with 66.3% unwilling to indicate a preference as to whether the MCM indicators were more or less comprehensive than those "previously used". The discussion from Question 38 also applied here.

Question 40 required the respondents to indicate whether the "previously used" or the MCM indicators were more acceptable to them. The mean was 4.7 with 58.2% unwilling to agree or disagree (3,4,5). Even though the statistical criteria test did not show significance for the agree (6,7) response, the authors feel this was so close that it warrants mention. The criteria established ($32.9 > X > 19.9$) was only one-tenth of a percent removed from the percent responding agree (6,7), 32.8%. The authors feel this difference is negligible, and the agree response (6,7) should be considered significant. It should also be noted that even though the question requires a comparison of the two types of indicators,

it does not necessarily require prior use of the MCM indicators, only an opinion of the indicators' acceptableness to them.

Question 41 was similar in that it asked for the respondents' opinions of the MCM indicators versus "previously used" indicators meaningfulness. The mean response was 4.6, with 52.7% responding slightly disagree to slightly agree, and a substantial minority (33.7%) in the agree (6,7) response mode.

Question 43 asked the respondents to what degree the MCM indicators are/will be useful in detecting areas of existing or potential trouble. The mean response was 4.5, with 61.0% responding in the slightly disagree to slightly agree (3,4,5) range. This question also implied use of the MCM indicators in order to realize their potential or lack of potential for detecting organizational difficulties, which in many instances was not the case.

Question 53 asked the respondents to what degree the MCM indicators helped their commander comply with the Air Force Productivity Plan. The mean response was 4.4, and the responses were neutral. This was not too unexpected as many of the respondents may not have ever heard of the Plan or know anything about that possible avenue for MCM indicator use.

Participant perceptions of the MCM indicator usefulness, although not directly obtained through any one of the questions discussed above, was better established in view of their combined results. Reviewing these results shows an aggregate

mean response of 4.6 on the Likert scale. There is a significant percent of the sample population responding moderately to strongly agree (6,7) on the issues of: worth of the MCM results (Question 27); ability of the MCM indicators to improve the manager's "picture" of his unit's productivity (Question 37); the MCM indicators degree of acceptability over "previously used" indicators (Question 40); and their degree of meaningfulness over that of "previously used" indicators (Question 41). The respondents were neutral (as defined) on Questions 28, 29, 38, 39, 43 and 53.

An implied previous or current use of the MCM indicators may have been a factor in causing many respondents to select slightly disagree to slightly agree responses (3,4,5) (because they lacked any real experience with them). A related reason might have been that the respondents had not used indicators prior to the MCM (or only slightly) and therefore, had no basis for comparison. They would be likely to select a non-committal response in that case since there were no "non-use" type responses available. There are many possible reasons for this neutrality, not the least of which might be participant apathy, question clarity, and attitudinal indifference.

Perceived Accuracy and Performance of KRAs and Indicators

The participants' perceptions of KRA/indicator accuracy and performance were indicated by their responses to Questions

36, 42, 44, 47, 48, 49, 51 and 52. Questions 36, 42 and 44 dealt with perceived accuracy of the KRAs and indicators. Questions 47, 48 and 49 asked the degree to which the newly developed indicators would assist in determining current needs, future needs and forecasting future organizational capabilities. Questions 51 and 52 dealt with respondents' perceptions of the abilities of the indicators to measure the organization's effectiveness and efficiency. The data for these questions are presented in Table III.

Table III

Perceived Accuracy and Performance

Question	Number of Responses	Mean Response	% Responding 1	2	3	4	5	6	7	% at Extreme Ends of Likert Scale (1+2)	(3+4+5)	(6+7)
36	110	5.2	4.5	0.9	7.3	13.6	20.9	28.2	24.5	5.4	41.8	52.7
42*	110	4.6	3.6	3.6	11.8	30.0	20.0	21.8	9.1	7.2	61.8	30.9
44	110	4.5	9.1	0.9	5.5	28.2	32.7	19.1	4.5	10.0	66.4	23.6
47	110	4.3	10.9	5.5	6.4	28.2	28.2	15.5	5.5	16.4	62.8	21.0
48	110	4.4	10.9	3.6	3.6	32.7	23.6	20.9	4.5	14.5	59.9	25.4
49	110	4.3	10.0	5.5	5.5	30.9	22.7	20.9	4.5	15.5	59.1	25.4
51	77	4.5	10.4	---	---	40.3	26.0	16.9	6.5	10.4	66.3	23.4
52	77	4.5	10.4	1.3	1.3	41.6	15.6	23.4	6.5	11.7	58.5	29.9

*Values are reversed scored.

Responses to Question 36 established the respondent perceptions of the accuracy of the KRAs. The mean response was 5.2 on the Likert scale. A majority of the respondents (52.7%) moderately to strongly agreed that the KRAs did accurately describe the key facets of the organization's mission. Approximately 76% of "top management" (11

respondents) moderately to strongly agreed that the KRAs for their organizations were accurate. Although the small number of respondents in the category made any inference based on this percentage highly questionable, the authors speculated that the reason for the high level of agreement may be because of top management's active role in KRA development.

Accuracy of the MCM indicators was addressed by Questions 42 and 44. The mean responses were 4.6 and 4.5 respectively, with 64% (combined average) of the respondents unwilling to state a preference one way or the other. In both questions and on the issue of indicator accuracy the respondents were neutral.

Two aspects of MCM indicator performance were investigated: the ability to provide managers assistance in determining current and future organizational needs and capabilities; and the ability to measure organizational efficiency and effectiveness. Questions 47, 48 and 49 addressed the first aspect. The participants were neutral on each question. This could imply that the participants did not know to what degree the indicators could perform the specified tasks, or that they were not even aware that the indicators could be used for such purposes. Apathy and/or question clarity were also possible explanations. Questions 51 and 52 addressed the second aspect of MCM indicator performance, efficiency and effectiveness measurement. Again, the respondents were

neutral concerning this aspect. There is a possibility that this may be due to some confusion on the def. tions of the terms efficiency and effectiveness.

The issue of accuracy and performance of the MCM indicators must be considered apart from that of KRA accuracy because they are very different elements of the MCM. The KRAs were developed to focus attention on the essential aspects of the target office tasks, while the indicators were developed to measure the relative facets of task accomplishment. The respondents essentially agreed that the KRAs were accurate, while remaining neutral to the accuracy and performance of the indicators. The neutrality could be due to participant lack of familiarity with the various capabilities associated with measures of productivity.

Summary Discussion of the Perceived Usefulness of the MCM Results

The first aspect of this issue covered was that of the perceived supervisory support for the MCM indicators which was found to be neutral. This might imply that the respondents were unaware or indifferent to their supervisors' indications of support, or that they could not determine if their supervisors' actions were supportive.

The aspect of "indicator use" reveals that productivity indicator use has not changed as a result of the MCM. However, the MCM is considered to have influenced the behavior of the participants in that 58% had voluntarily instituted use of the MCM indicators. The primary way in which they

were used was as a supplement to existing measures. This is not unusual, as any cautious manager would never abandon proven measures in lieu of proof that new ones would do a better job. These findings tend to indicate that managers foresaw enough potential in the indicators to try them out.

A significant percentage of the respondents indicated that participating in the MCM was worthwhile, and the MCM indicators were more acceptable and meaningful than previously used indicators. A majority of the respondents felt that the MCM indicators, if implemented, would provide management with an improved "picture" of their organization's productivity. Although many of the questions on "indicator usefulness" revealed a neutral response, it was felt that this was due in great part to the fact that the questions implied a need to have actual use experience in order to answer them.

Finally, the perceived accuracy and performance of the KRAs and indicators were examined. The KRAs were perceived to be accurate by a majority of the respondents, while the respondents remained non-committal towards the MCM indicators. The authors were only able to speculate that the non-commitment toward the indicators was due to non-familiarity and/or insufficient time to determine indicator accuracy and performance.

There were some notable trends throughout the data on this issue. One trend was that in the responses to many of the questions there existed a substantial group of responses in the "strongly disagree" or "very low degree" (1) response

category. Only in one instance were the authors able to establish a feel for the composition of that group, and even that was uncertain. Another notable fact was that in all but two questions, the 1 and 2 Likert scale responses constituted a significantly small percentage of the sample population (e.g., the responses could not be said to have been interpreted to indicate "disagreement" or "low degree"). It was also found that approximately 75% of the responses to questions pertaining to this issue were found to be neutral. However, the authors feel some of this may be due to instrument error and clarity.

The Maryland Center Methodology was field tested in an extremely harsh environment, the military. Military organizations are known to be conservative, resistive to change and bureaucratic. They are bastions of tradition - tying their members to the less risky "safe" past. The military's members are skeptical of the new, afraid that it may in some way harm or injure. The MCM was designed for this environment, and this is the environment from which inference should be drawn.

Perception of the MCM

Perception of Structure and Mechanics

It was of interest to these researchers to survey the participants' perceptions of the structure and mechanics of the Maryland Center Methodology in order to determine if the

various aspects were considered beneficial. If not, then this would indicate a need for improvement in that area. The MCM utilizes a group process guided by a facilitator to achieve its outputs. The group mechanics of voting, unsolicited input and KRA formation are the processes which form the MCM product. The questions used to address this issue all measured the extent to which the development of KRAs and indicators benefited its development (Question 30); the facilitator aided in productivity understanding (Question 31); the facilitator aided in development of opinions (Question 32); the facilitator provided the needed guidance (Question 33); the voting process aided in reaching consensus (Question 34); use of KRAs aided in focusing on key aspects of productivity (Question 35); and the degree of subordinate inputs needed (Question 55). The mean responses on the Likert scale were were from 5.25 (slightly agree) to 5.82 (moderately agree). The mode varied from 6.0 (moderately agree) to 7.0 (strongly agree).

There was little variation noted in the mean responses by organization type, although the Base Administration function was an average of 0.34 scale units higher on Questions 30 through 35. Other notable trends were as follows:

(1) Across Questions 30 through 35 and 55, those who had participated only in the development of KRAs had a mean response 1.52 scale units below the overall mean for the

survey group. It was further noted that with but two exceptions 30% of those in the "KRA development only" category responded "strongly disagree" to these seven questions. The authors perceive this to be due to their minimal amount of involvement throughout the process and possibly because of insufficient feedback and/or initial motivation by the facilitator and sources of authority.

(2) Across Questions 30 through 35 and 55, those who supervised 30 or more individuals consistently responded below the mean. Those supervising 30 to 50 personnel responded on the average 0.66 scale units below the overall mean, while those supervising 50 or more averaged 0.94 scale units below the mean. The authors feel this could be, in part, due to the natural tendency on the part of supervisors of large numbers of people to resist participative management (primarily due to the increased difficulties and time lag).

Other than perhaps specific job-related characteristics, there is little information available to explain the high base administration means. However, the authors view this difference as relatively insignificant. The low means from the "30 and above" supervisory category and the "KRA development" category may be related. By design of the MCM, the individuals who were responsible for developing the KRAs were to be upper management. Although the level of management variable revealed no specific tendencies, those in the

upper management levels would typically supervise 30 or more individuals. This would infer (assuming those participating only in the KRA development phase were, in fact, in the "30 or more supervisory category") that, as stated above, the upper managers supervising large numbers of people may not have been provided with sufficient feedback or initial motivation to stimulate their interest and support. Another factor may have been that their busy schedules simply did not allow for sufficient involvement, which could have resulted in dissatisfaction with the entire procedure.

Perception of Intrinsic Value

Survey Questions 20 through 24 were used to determine the perception of the survey group concerning possible intrinsic values of the Maryland Center Methodology. Four values were considered: improvements to the understanding of productivity, impressing upon the participants the need for measuring and tracking organizational productivity, increasing organizational productivity awareness, and improving a unit's ability to use productivity information in decision making. The responses are described in Table IV.

Table IV

Intrinsic Value Perceptions

Question	Number of Responses	Mean Response	% Responding 1	2	3	4	5	6	7	% at Extreme Ends of Likert Scale (1+2)	(3+4+5)	(6+7)
20	110	4.8	11.8	0.9	2.7	19.1	25.5	20.9	19.1	12.7	47.3	40.0
21	110	4.7	11.8	2.7	5.5	20.9	19.1	23.6	16.4	14.5	45.5	40.0
22	110	4.2	12.7	1.8	6.4	32.7	28.2	14.5	3.6	14.5	67.3	18.1
23	110	3.6	24.5	2.7	10.0	33.6	17.3	8.2	3.6	27.2	60.9	11.8
24	110	3.9	18.2	7.3	4.5	27.3	25.5	10.0	7.3	25.5	57.3	17.3

Responses to Question 20 revealed that a significant percent of the respondents moderately to strongly agreed that the MCM improved their understanding of productivity in the organizational context. Question 21 also revealed a significant percent agreeing that the MCM had shown them the need for measuring and tracking productivity within their organization.

The remaining questions (22, 23, 24) received neutral responses, with a significantly small percentage of the sample population agreeing. This would indicate that the respondents do not agree, however, they do not necessarily disagree either. This lack of agreement on the last three questions (22, 23, 24) may be due to the fact that they require judgement by the respondent as to the result throughout the organization. Also, the field test was conducted at the branch level of the organization and, therefore, did not involve the remainder of the organization. This being true, the respondent would have little choice but to select a value within the 3, 4, 5 Likert scale values.

With this hypothesis in mind, it can be stated that the respondents see some "personal" benefit from intrinsic values of the MCM, however, nothing could be said with regard to the benefits received (if any) by the remainder of the organization.

Perceptions of Productivity

Definition

The MCM utilized a facilitator to guide the participants through the various development phases. At the first meeting

of each MCM group, the facilitator defined productivity, efficiency and effectiveness. In addition, the facilitator emphasized the importance of measuring, monitoring, and tracking organizational productivity.

Questions 14, 15 and 16 asked the participants to select the preferred definitions for productivity, efficiency and effectiveness. Fifty-five percent of the respondents preferred the MCM definition of productivity; forty-six percent preferred the MCM definition of effectiveness; and fourteen percent preferred the MCM definition of efficiency (see Table V). It would appear from the low percentage of acceptable responses to the definition of efficiency that this term gave the participants trouble. This may, however, be misleading. The question (No. 15) contained an "all of the above" response which included the MCM definition plus the phrase "doing things right". Forty-one percent of the survey group selected the "all of the above" response. Given this high percentage, the low agreement between the participants and the MCM on the efficiency term was probably due to question phraseology.

Need to Monitor

The sample group's perceived need to monitor and track productivity at the various levels of the organization was gathered by Questions 17, 18 and 19. Question 17 asked respondents about the importance of productivity monitoring at the top levels of management. Question 18 asked about

Table [illegible]

[illegible]

[illegible]	[illegible]	Respondents [illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]
Federal Military Service	1-[illegible] years	1	[illegible]%	0%	0%
	[illegible] years	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible] years	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible] years	[illegible]	[illegible]	[illegible]	[illegible]
	20 years or more	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]
Level of Management	Top Management	[illegible]	[illegible]%	[illegible]%	[illegible]%
	Middle Management	[illegible]	[illegible]	[illegible]	[illegible]
	1st Line Sup.	[illegible]	[illegible]	[illegible]	[illegible]
	Worker	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]*	[illegible]	[illegible]*
MCM Participation	Developed KRAs	10	[illegible]%	0%	[illegible]%
	Critiqued KRAs	[illegible]	[illegible]	0	[illegible]
	Developed Indicators	24	[illegible]	[illegible]	[illegible]
	All of Above	[illegible]	[illegible]	[illegible]	24
	KRAs and Indicators	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]%	[illegible]%	[illegible]%
Number of People Supervised	0	19	10%	[illegible]%	[illegible]%
	1 to 5	[illegible]	[illegible]	[illegible]	11
	5 to 10	20	7	0	8
	10 to 20	18	12	4	[illegible]
	20 to 30	[illegible]	[illegible]	[illegible]	[illegible]
	30 to 50	[illegible]	[illegible]	0	[illegible]
	50 or more	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]*	[illegible]%	[illegible]%

*Totals may vary slightly due to rounding and variations in total responses per question.

monitoring productivity at the lower levels of management and Question 19 asked if improvements to existing measures would assist management. Mean responses on the seven point Likert scale were from 5.6 to 6.4, in the moderately agree range. The mode was 7.0, strongly agree, in all cases.

Demographic comparisons of the sample group across these questions revealed no notable findings. All variable categories displayed about the same response pattern, except those whose MCM participation was only to critique the KRAs. Only 33%

of this group felt that there was any need to monitor productivity at the lower working levels of an organization (Question 18). In addition, this group was low (44%) in the responses given to Question 17, "need to monitor at top management levels" and Question 19, "improvements to existing measures will assist management". This group consisted of six respondents, three middle managers, two supervisors, and one worker. The small number of respondents in this group prevented the authors from drawing any conclusions from their responses.

Most of the Maryland Center Methodology participants define productivity and its components as does the MCM. They perceive a need to track, monitor and improve productivity measures. There was no supporting evidence that the MCM was responsible for these attitudes.

Participant Comments

Survey Question 50 was used to determine whether or not the new indicators were being used and, if so, for what reason. Question 50 also allowed for comments and remarks in general. As a whole, the open comments were negative. This does not imply that the general attitude was, in fact, negative, as only 30% of the survey group offered written comments. Of this group, one comment was positive, ten were considered neutral and nineteen were negative. Demographic breakouts of the comments identify middle managers as providing the bulk of

the comments. Specifically, the majcrity were E7 to E9. The following were representative of the comments received:

Positive: "I do not use the developed indicators because I am a Section Supervisor. I have schedules for what and when work should be done and review the work going out of the section. These schedules will vary when other demands are placed by Branch Chiefs/DA (such as details for my subordinates or additional duties, etc.) -- these things are beyond my control and do not affect my control of the office productivity. This is a tool for the Branch Chiefs and the DA to check productivity of their sections -- allowing for equitable distribution of details and extra duties and the morale of the organization, the indicators would be a valuable tool to the Chief of Administration." (Administration, GS-5, 1st line supervisor).

Neutral: "As a work center shop supervisor, I have seen no new productivity indicators handed down or instated /sic/ at the branch level." (FMA, E5/E6, 1st line supervisor).

"Management has not used the indicators developed as yet." (Administration, GS-6/7, Worker).

Negative: "Very simply, we were under no direction to use the newly developed indicators. That, obviously, left it up to me to impose or not impose upon my unit. I personally did not agree that strongly with the indicators that were developed. I still don't believe that the workers I have assigned here are capable of developing their own indicators of productivity that management should have to live by." (Administration, 03, Top Management).

"Not needed." (FMS, E5/E6, 1st line supervisor).

"Enough indicators are already available in this and other weather units I have been in to indicate the unit's status. To add to or modify the existing ones is therefore not justified. In addition, most of the 'new' indicators are just variations of existing ones." (Weather, 04, Top Management).

"We use the existing methods, QC Report, spare level, UIRs Work Load, this is a proven measure

of effectiveness and efficiency." (FMS, E7/E9, Middle Management).

" . . . It is my general impression that this entire program was a waste of the taxpayer's money. Each and every KRA and indicator that my group brought out over three meetings can be readily found in management books, manuals, and Regs." (FMS, E7/E9, Middle Management).

Limitations of Research

One of the chief problems encountered in this research was the lack of control in administration and collation of the questionnaires. By having a third party administer them, there was no way of knowing whether the appropriate personnel received the questionnaire. Further, these researchers had no knowledge of the number of personnel included in the population. The number of participants was roughly estimated by the Maryland Center.

As such, it was impossible to determine the actual proportion of the relevant population sampled and whether or not those surveyed had, in fact, participated in the field test. It is interesting to note here that more than ten completed questionnaires were deleted from the analysis because they contained comments to the effect that the respondent had never heard of the MCM (i.e., had not participated in the field test). It is possible that the respondents did in fact participate in the MCM and were apathetic to it or did not wish to be bothered by a survey but were told to fill out the questionnaire.

Another impact of not knowing who was included in the population was that participant attrition could not be accounted for. The time span of the field test was approximately eight months during which time each of the 21 participating organizations spent about five days actually involved in the MCM. The time between the field test participation and questionnaire completion, therefore, varied between eight months and one month, depending upon when the field test was actually conducted at the given location. Thus, several groups had recent exposure to the MCM, while others had time to forget the various aspects of the MCM.

While opportunity to implement the indicators was a problem, so was the fact that there was no real requirement or inducement to do so. Even though Headquarters USAF supported the effort and solicited participants' cooperation, there was no requirement to use what had been produced. Any use of the MCM products was strictly voluntary. This, in general, meant there could be no real comparison between existing and new indicators except where indicators were voluntarily implemented. This accounted for 50% of the organizations, and only a small fraction of the indicators developed.

Collection of the questionnaires was handled by USAF mail. This, in itself, may have created a problem. Both of the organizations not responding at all were contacted

by the authors prior to data analysis. Each organization reported that the questionnaires had been returned via USAF mail, yet they were never received.

The small sample size presented another problem. The Maryland Center estimated the number of field test participants to be 350. As stated in Chapter III, only 136 questionnaires were returned, and those were further reduced to a usable number of 110. This represents less than one third of the estimated population. When this sample was divided into the various demographic categories, severe limitations were placed on the explanations which could be made concerning the data due to the small numbers of respondents in each category. It was further noted by the authors that the number of respondents categorized as "workers" was relatively small. This is felt to be, in part, due to attrition and the small number of returns.

Finally, a major problem occurred as a result of the questionnaire format. The last five questions were the result of inputs from external coordinating authorities and were received after the questionnaire was in final form for reproduction. Due to severe time limitations, these questions were added to the end of the questionnaire. The result was placement of the questions following a page left blank for open-ended responses. The outcome of this format was that 33% of the 110 usable responses did not include answers to Questions 51 through 55. This, however, is only speculation on the part of the authors.

CHAPTER V

SUMMARY/CONCLUSIONS/RECOMMENDATIONS

Summary of Research

This investigation of the Maryland Center Methodology field test consisted of exploration into three distinct areas:

1. A review of the literature in the field of productivity and productivity measurement.
2. An orientation to the Maryland Center Methodology.
3. A questionnaire survey of the MCM participants.

The literature review included both theoretical and empirical works focusing on both the definition of terms and the results of previous measurement research efforts. The authors reviewed literature on the MCM, contacted its developer in person and by phone, and actually participated in one of the field tests. A questionnaire survey was developed by the authors, subjected to consensual validation by both the Maryland Center and Headquarters USAF and administered to the MCM field test participants. Basic descriptive statistics were then developed from the responses and trends, similarities, contradictions, and novelties were identified.

Summary of Results

Primary Issue

The MCM did not influence the participants to use

productivity indicators more than they had previously used them. The MCM did appear to influence the participants to try the new indicators. There was agreement among the participants that the results of the MCM were worth the time and trouble extended to it. There was agreement that the indicators produced were more acceptable and meaningful than previous indicators. A majority of respondents perceived that the new indicators might give management a better "picture" of organizational productivity. The survey group felt that the KRAs were accurate.

Secondary Issues

There was general agreement that the various mechanics of the MCM were beneficial in the development of useful productivity measurement tools. The participants also feel that the MCM, in and of itself, provides some intrinsic value to the organization, outside of the KRAs and indicators. Specifically, these were the greater understanding of productivity, an understanding of the need to measure productivity and how to better use productivity measures in organizations.

In general, the participants perceived the definitions of productivity and effectiveness as espoused by the MCM facilitators. The definition of efficiency may have caused some confusion. This, however, is believed to be in part due to the question wording. The participants generally agreed that there is a need to monitor productivity at both the upper and lower levels of the organization.

Conclusions

There is some indication that the participants may perceive the results of the Maryland Center Methodology as potentially useful. This was made particularly evident as a majority of the participants indicated they were using the MCM outputs, even though there had been no direction from higher authority requiring their use. There is some evidence that the indicators are perceived as worthwhile and present a good picture of an organization's productivity. It appears that the MCM is capable of providing Air Force managers with a means of developing tailored productivity indicators. It also appears that these indicators could be accepted and used by the majority at all levels of an organization, however, top and middle managers must be more thoroughly convinced of the capabilities of the MCM's outputs.

The participants perceive productivity in much the same way as the MCM. They appear to perceive a need to monitor, track and improve productivity measures. Although there is little evidence to support it, the MCM may have a positive effect on participant attitudes toward productivity.

In general the participants perceive the various procedures of the MCM to be useful in the development of productivity indicators.

It was noted that many of the middle managers (particularly those involved only in the development of the KRAs)

did not perceive of the MCM or its outputs as being as useful as did the majority of the participants. This may be due to their lack of involvement with the MCM.

Recommendations

For the MCM

As seen earlier, there is some degree of usefulness perceived, in general, for the MCM. However, it was also noted that in many instances there existed a substantial group of individuals who strongly disagreed with the various aspects of the MCM and its outputs. These individuals were generally found to be middle and top managers with several years of federal/military service. Because of this and the attitude implied by some middle managers that they had been left out of the picture, these researchers recommend that top and middle managers be better briefed and informed during the implementation of the MCM. Another fact reinforcing this recommendation is that middle managers comprise the bulk of those participating, and are expected to use the outputs in their various units. Unless they are "sold" on the concept, it is unlikely to have much success. This also leads the researchers to suggest that this group should be informed of all aspects of the program, especially the results, in order to instill a feeling of active participation.

Another observation is that the MCM purports that the workers can contribute significant input toward the development

of accurate measures at their level within the organization. However, the percentage of workers actually participating in the MCM was relatively small compared to the percentage of middle managers. It is, therefore, recommended that either more workers be included or this philosophy be evaluated and possibly changed.

One other recommendation that might be considered is instituting a seminar for participating organizations on indicator implementation and tracking techniques necessary to establish a viable productivity management program.

For Future Research

These researchers recommend that future studies be conducted in a pre-test, post-test manner on a refined version of the MCM. This would entail pre-testing a specified test unit (or group of units) as to their perceptions of productivity and its measurement. After execution of the MCM, the participants should be post-tested, after sufficient time has passed, as to their opinions on the same issues and their perceptions of the potential usefulness of the indicators formed. This test may also include perceptions of the refined MCM mechanics. Another post-test would be administered after a specified implementation period (we suggest one year). This test would attempt to extract opinions and facts concerning the actual performance of the indicators developed and used.

It is recognized that this requires a fairly lengthy time span. However, the various tests could be administered as parts of smaller individual research projects. Another point regarding this recommendation is that command emphasis will be required and use of the indicators will have to be mandatory.

Research into the perceptions of middle management and their perceived need to know concerning the various aspects of the MCM might also be instituted as a possible research project.

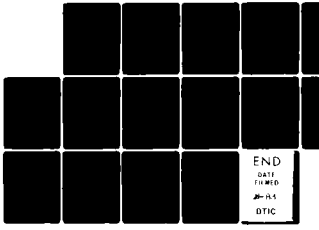
Finally, these researchers suggest a research effort to probe the validity of the philosophy of worker expertise espoused by the MCM. This might be accomplished by using a pre-test, post-test design with both a participative and a control group.

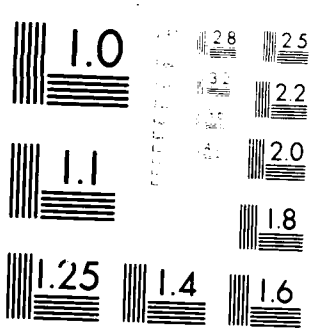
APPENDIX A

ORGANIZATIONS PARTICIPATING IN THE FIELD TEST OF THE MARYLAND CENTER METHODOLOGY

AD-A123 026 PERCEPTIONS OF A METHODOLOGY FOR THE DEVELOPMENT OF PRODUCTIVITY INDICATORS(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. 2/2

UNCLASSIFIED R C HOWELL ET AL. SEP 82 AFIT-LSSR-69-82 F/G 5/9 NL




1.0
2.8
2.5
3.2
2.2
1.1
2.0
1.8
1.25
1.4
1.6

Air Force Base/Org.	FMS	Admin	Weather
Griffis	x	x	x
McChord	x	x	x
Travis	x	x	x
March	x	x	x
Bergstrom	x		
Barksdale		x	x
Luke	x		
Shaw	x		
Laughlin		x	x
Williams		x	x

APPENDIX B

QUESTIONNAIRE

INFORMATIONAL SURVEY

This questionnaire is part of a study being done by the Air Force Institute of Technology in conjunction with the University of Maryland Center for Productivity and Quality of Working Life (MCPQWL) currently under contract with the Air Force Human Resources Laboratory (HRL). In the broadest sense, the goals of this study are to determine the perceptions of those participating personnel toward the Maryland Center Methodology, and their estimates of the value of using the Methodology with other Air Force organizations. This information will be used to help evaluate the possible benefits of the Methodology and changes that might improve it.

If this study is to be helpful, it is important that you answer each question as thoughtfully and frankly as possible. This is not a test; there are no right or wrong answers. The important thing is that you answer the questions the way you see things or the way you feel about them.

All individual responses to questions are completely CONFIDENTIAL. Although none of the questionnaires will be seen by anyone outside the research committee, please do not place your name on the questionnaire so that your confidentiality can be assured.

Completed questionnaires are processed by automated equipment. Computers summarize the responses in statistical form in groups large enough so that individual responses cannot be identified.

PRIVACY ACT STATEMENT

In accordance with paragraph 30, AFR 12-35, the Air Force Privacy Act Program, the following information about this survey is provided:

a. Authority: 10 U.S.C., 8012, Secretary of the Air Force: Power and Duties, Delegation by Compensation E.O. 9397, 22 NOV 43, Numbering System for Federal Accounts Relating to Individual Persons.

b. Principal Purpose: The survey is being conducted to assess perceptions of worth and utility of the Productivity Measurement Methodology currently being developed by the Maryland Center for Productivity and Quality of Working Life under contract to the Air Force Human Resource Laboratory.

c. Routine Uses: Information provided by respondents will be treated confidentially. The averaged data will be used in part to determine the perceived utility of the aforementioned Methodology and to identify its strengths and weaknesses for Air Force wide research and development purposes.

d. Participation: Response to this survey is voluntary. Your cooperation in this effort is appreciated.

INSTRUCTIONS

1. Most questions may be answered by filling in the appropriate spaces on the computer scored response sheet provided. If you do not find a response that exactly fits your case, use the one that is the closest to the way you feel.

2. Please answer all questions in order.

3. Please use a soft pencil (No. 2), and observe carefully these important requirements:

   -Make heavy black marks that fill the box.

   -Erase clearly any answer you wish to change.

   -Make no stray markings of any kind on the response sheet.

   -Do not staple, fold or tear the response sheet.

4. Each question on the answer sheet has ten response choices (numbered 1 through 10). However, the questionnaire items normally only require a response from 1-7; therefore, you will rarely need to fill in choices 8, 9, or 10. Questionnaire items are responded to by marking the appropriate space on the response sheet as in the following example:

Using the scale below (seven descriptive statements which may reflect your opinion), evaluate "Sample Item 1."

SCALE:

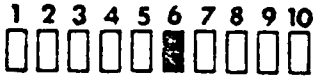
1 = strongly disagree
2 = moderately disagree
3 = slightly disagree
4 = neither agree nor disagree
5 = slightly agree
6 = moderately agree
7 = strongly agree

Sample Item 1:

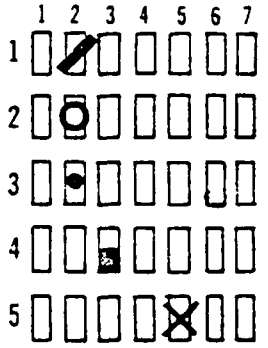
The meaning of the term "Productivity" is unclear to me.

(If you "moderately agree" with Sample Item 1, you would "blacken in" the corresponding number of that statement (moderately agree = 6) on the response sheet for item numbered "Sample Item 1."

RIGHT WAY TO MARK ANSWER SHEET



WRONG WAYS TO MARK ANSWER SHEET



5. A few questions will require written responses. In these cases, please mark "other" on the response sheet and use the space provided to write in your response. If more space is required, please use the reverse side of that page of the survey and reference the statement number.

6. Each section of the survey has short instructions about that section. Please be sure to read them before beginning.

7. When you have completed the survey, please turn in all survey materials to the survey administrator.

SECTION I

Darken the block on the response sheet provided that corresponds to the question number and what you think is the most appropriate answer for each of the following questions:

1. At what base are you currently assigned?

   1. Griffiss AFB
   2. McChord AFB
   3. Travis AFB
   4. March AFB
   5. Barksdale AFB
   6. Williams AFB
   7. Shaw AFB
   8. Luke AFB
   9. Laughlin AFB
   10. Bergstrom AFB

2. In what organization are you currently assigned?

   1. Field Maintenance Squadron
   2. Central Base Administration
   3. Weather Detachment
   4. Other (Mark response sheet and please specify in the margin)
      Specify here

3. Total years federal/military service:

   1. Less than 1 year
   2. More than 1 year, less than 2 years
   3. More than 2 years, less than 3 years
   4. More than 3 years, less than 4 years
   5. More than 4 years, less than 8 years
   6. More than 8 years

4. Total years in present career field:

   1. Less than 1 year
   2. More than 1 year, less than 2 years
   3. More than 2 years, less than 3 years
   4. More than 3 years, less than 4 years
   5. More than 4 years, less than 8 years
   6. More than 8 years

5. Total months on station:

1. Less than 6 months
2. More than 6 months, less than 9 months
3. More than 9 months, less than 12 months
4. More than 12 months, less than 18 months
5. More than 18 months, less than 24 months
6. More than 24 months, less than 36 months
7. More than 36 months

6. What is your present level in the organization?

1. Top Management (e.g., Chief of Administration, Weather Detachment CC, Propulsion Branch Chief)
2. Middle Management (e.g., Administration Branch Chief, Weather Station Chief, Propulsion Section Chief)
3. First Line Supervisor (e.g., Foreman, Shop Chief, etc.)
4. Other (Mark the response sheet and please specify in the margin) Specify here

7. Total months in present position:

1. Less than 1 month
2. More than 1 month, less than 6 months
3. More than 6 months, less than 12 months
4. More than 12 months, less than 18 months
5. More than 18 months, less than 24 months
6. More than 24 months, less than 36 months
7. More than 36 months

8. In what way did you participate in the Maryland Center Methodology?

1. Helped develop Key Result Areas (KRA's)
2. Helped to refine (critique) the KRA's
3. Helped develop indicators for the KRA's
4. All of the above
5. Both 1 and 3 above
6. Other (Mark the response sheet and please specify in the margin) Specify here ——————→

9. If you are in the Civil Service and hold a General Service (GS) pay grade, what is that pay grade?

1. Not applicable
2. GS 1, 2 or 3
3. GS 4
4. GS 5
5. GS 6 or 7
6. GS 8 or 9
7. GS 10 or 11
8. GS 12
9. GS 13
10. GS 14 or higher

10. If you are in the Civil Service and hold a Wage Grade (WG) pay grade, what is that pay grade?

1. Not applicable
2. WG 1, 2, 3 or 4
3. WG 5
4. WG 6
5. WG 7
6. WG 8
7. WG 9
8. WG 10
9. WG 11
10. WG 12 or 13

11. If you are in the Civil Service and hold a Wage Supervisory (WS) pay grade, what is that pay grade?

1. Not applicable
2. WS 4, 5, 6 or 7
3. WS 8
4. WS 9
5. WS 10
6. WS 11
7. WS 12
8. WS 13
9. WS 14
10. WS 15

12. If you are an active duty military member, what is your grade?

1. Not applicable
2. E1 or E2
3. E3 or E4
4. E5 or E6
5. E7, E8 or E9
6. 01 or 02
7. 03
8. 04
9. 05 or higher

13. Number of people you directly and indirectly supervise:

1. 0
2. Less than 5
3. 5 to 10
4. 10 to 20
5. 20 to 30
6. 30 to 50
7. More than 50

SECTION II

Darken the block on the response sheet that corresponds to the question number and what you feel is the most appropriate answer for each of the following questions.

14. I would define productivity as:

1. Quantity and quality
2. A ratio of input to output
3. Ratios of efficiency and effectiveness
4. Output per man-hour
5. Efficiency
6. Effectiveness
7. I am unsure of the definition of productivity

15. I would define efficiency as:

1. $\frac{\text{Output}}{\text{Resource input}}$
2. $\frac{\text{Resource utilization}}{\text{Resource availability}}$
3. "Doing things right"
4. All of the above
5. 1 and 2 above
6. Satisfaction of personal goals within the organization
7. I am unsure of the definition of efficiency

16. I would define effectiveness as:

1. "Doing the right things"
2. Quality of output
3. External impacts of outputs on users
4. Internal impacts of outputs on the organization
5. All of the above
6. 1 and 2 above
7. I am unsure of the definition of effectiveness

** Darken the block on the response sheet that corresponds to the question number and what you think is the most appropriate answer for each of the following statements using the scale below.

1 = strongly disagree
2 = moderately disagree
3 = slightly disagree
4 = neither agree nor disagree
5 = slightly agree
6 = moderately agree
7 = strongly agree

17. It is important to monitor organizational productivity at the top management level of my organization (e.g., by the Chief of Administration, the Weather Detachment CC, the Propulsion Branch Chief).

18. It is important to monitor productivity at the lowest working level.

19. Improvements to existing means of tracking productivity (if any) will assist management.

SECTION III

20. Participating in the Maryland Center Methodology improved my understanding of productivity as it applies to my unit.

21. Participating in the Maryland Center Methodology showed me the need for measuring and tracking my organization's productivity.

22. The other members of my unit have gained an improved understanding of the need for productivity measurement.

23. There has been an increase in productivity awareness throughout my organization as a result of participation in the Maryland Center Methodology.

24. Since participating in the Maryland Center Methodology, my unit is/will be better able to use productivity information in making decisions.

1 = strongly disagree
2 = moderately disagree
3 = slightly disagree
4 = neither agree nor disagree
5 = slightly agree
6 = moderately agree
7 = strongly agree

25. My supervisor supports the use of the newly developed productivity indicators.

26. My organization is using/is planning to use the newly developed productivity indicators.

27. The results of the Maryland Center's Methodology were worth the time, effort, and energy expended toward them.

28. The new productivity indicators are easily understood.

29. The newly developed indicators are easier to use than the indicators previously in use, if any.

30. The use of groups in developing Key Result Areas (KRA's) and indicators was beneficial.

31. The group facilitator helped us understand productivity as it applies to the unit.

32. The group facilitator aided me in the full development of my opinions and those of the others.

33. The facilitator provided the needed guidance to assist us in developing realistic KRA's and indicators.

34. The voting process helped us arrive at a group consensus.

35. The use of KRA's helped us focus our attention on the important aspects of productivity in our organization.

1 = strongly disagree
2 = moderately disagree
3 = slightly disagree
4 = neither agree nor disagree
5 = slightly agree
6 = moderately agree
7 = strongly agree

SECTION IV

36. The Key Result Areas (KRA's) accurately described the key facets of the mission the organization is expected to accomplish.

37. The indicators developed, if implemented, would give managers in my organization an improved picture of actual productivity in their areas.

** Using the following scales mark your perceptions toward the indicators developed by the Maryland Center Methodology.

With respect to the indicators we are currently using, the indicators developed by the Maryland Center Methodology are:

38. 1 - - - - 2 - - - - 3 - - - - 4 - - - - 5 - - - - 6 - - - - 7
useful not useful

39. 1 - - - - 2 - - - - 3 - - - - 4 - - - - 5 - - - - 6 - - - - 7
more less
comprehensive comprehensive

40. 1 - - - - 2 - - - - 3 - - - - 4 - - - - 5 - - - - 6 - - - - 7
acceptable unacceptable
to me to me

41. 1 - - - - 2 - - - - 3 - - - - 4 - - - - 5 - - - - 6 - - - - 7
meaningful not meaningful

42. 1 - - - - 2 - - - - 3 - - - - 4 - - - - 5 - - - - 6 - - - - 7
accurately reflecting not reflecting
performance performance

** Use the scale below to evaluate the following questions.

1 = very low degree
2 = moderately low degree
3 = slightly low degree
4 = neither high nor low degree
5 = slightly high degree
6 = moderately high degree
7 = very high degree

43. To what degree do/will the newly developed indicators be useful in detecting areas of existing or potential trouble?

44. To what degree do/will the newly developed indicators reflect the actual productivity of your organization?

45. To what degree did you use productivity indicators prior to this methodology?

46. To what degree have you/will you actually use the new indicators that were developed by the Maryland Center Methodology?

47. To what degree do/will the newly developed indicators assist your organization's managers in determining <u>current</u> organizational needs?

48. To what degree do/will the newly developed indicators assist your organization's managers in forecasting <u>future</u> organizational needs?

49. To what degree do/will the indicators assist in forecasting organizational production capabilities?

50. Do you use the newly developed indicators because: (mark only one response)

1. They are new
2. They are better than previously used measures
3. They supplement existing measures
4. All of the above
5. You have been instructed to use them
6. You do not use them (if not, please give a brief explanation on the sheet provided)
7. Other (mark response sheet and please specify in the margin)

Specify here ——————————→

If you selected response 6 above, please give a brief explanation below of why you do not use them.

SECTION V

** Use the scale below to evaluate the following questions:

1 = very low degree
2 = moderately low degree
3 = slightly lower degree
4 = neither high or low degree
5 = slightly high degree
6 = moderately high degree
7 = very high degree

51. To what degree do the newly developed indicators measure your organization's effectiveness?

52. To what degree do the newly developed indicators measure your organization's efficiency?

53. To what degree do the indicators help the commander comply with the Air Force Productivity Plan?

54. To what degree do the newly developed indicators overlap previous indicators?

55. To what degree should subordinates provide inputs towards development of productivity measurement systems?

APPENDIX C

COVER LETTER

THE MARYLAND CENTER
For Productivity & Quality of Working Life

May 3, 1982

Dear :

As promised, I am enclosing the final results and evaluation surveys from the Maryland Center project. Enclosed are two sets of materials:

- Rating books for KRA's and Indicators, and
- Project Evaluation Questionnaires.

I. You will find three rating booklets entitled, *Assessment of the Similarity of Key Result Areas and Indicators*. One of them is yours to keep and it includes the KRA's and Indicators from your organization and the seven others studied.

Two of these booklets should be completed according to the enclosed instructions and returned to the Maryland Center in the return envelopes provided. As the organization commander, you should complete one and your "next in command" who participated in the study should complete the other one.

II. Project Evaluation Questionnaires are in individual envelopes which are pre-addressed to AFIT/LSB. These contain survey booklets entitled, *Survey of Maryland Center Methodology*. Each person who participated in the project from your organization, including yourself, officers, enlisted, and civilian should receive one of these envelopes. Please encourage them to complete the survey as soon as possible and forward it in the envelope provided via Air Force mail to Captain Howell (AFIT/LSB) Wright-Patterson AFB, Ohio 45433.

Please have both sets of surveys completed and return them to their respective destinations no later than May 14, 1982. If you have questions, call me, Bob Wilkinson or Elizabeth McAbee at (301) 454-6688.

Thank you very much for your cooperation. It has been a pleasure working with you on this project. Bob and I hope that the results you have received are beneficial to your organization.

Cordially yours,

Thomas C. Tuttle, Ph.D.
Director

TCT/ecm

Enclosures

University of Maryland • College Park, Maryland 20742 • (301) 454-6688

APPENDIX D

TABULATED DATA

Question	Number of Responses	Mean Response	% Responding 1	2	3	4	5	6	7	% at Extreme Ends of Likert Scale (1+2)	(3+4+5)	(6+7)
17	110	6.4	0.9	1.8	1.8	2.7	6.4	17.3	69.1	2.7	10.9	86.4
18	110	5.6	5.5	2.7	2.7	10.0	19.1	11.8	48.2	8.2	31.8	60.0
19	110	6.1	0.9	3.6	---	8.2	10.0	25.5	51.8	4.5	18.2	77.3
20	110	4.8	11.8	0.9	2.7	19.1	25.5	20.9	19.1	12.7	47.3	40.0
21	110	4.7	11.8	2.7	5.5	20.9	19.1	23.6	16.4	14.5	45.5	40.0
22	110	4.2	12.7	1.8	6.4	32.7	28.2	14.5	3.6	14.5	67.3	18.1
23	110	3.6	24.5	2.7	10.0	33.6	17.3	8.2	3.6	27.2	60.9	11.8
24	110	3.9	18.2	7.3	4.5	27.3	25.5	10.0	7.3	25.5	57.3	17.3
25	110	4.2	13.6	3.6	1.8	40.0	19.1	14.5	7.3	17.2	60.9	21.8
26	110	4.0	10.9	3.6	5.5	50.9	17.3	6.4	5.5	14.5	73.7	11.9
27	110	4.4	17.3	1.8	6.4	20.9	18.2	21.8	13.6	19.1	45.5	35.4
28	110	4.7	8.2	3.6	3.6	26.4	23.6	20.9	13.6	11.8	53.6	24.5
29	110	4.3	8.2	0.9	4.5	55.5	10.9	10.9	9.1	9.1	70.9	20.0
30	110	5.4	3.6	2.7	2.7	17.3	18.2	29.1	26.4	6.3	38.2	55.5
31	110	5.4	5.5	1.8	15.5	24.5	24.5	29.1	23.6	7.3	64.5	52.7
32	110	5.3	4.5	2.7	4.5	13.6	23.6	27.3	23.6	7.2	41.7	50.9
33	110	5.7	4.5	0.0	0.0	14.5	24.5	23.6	32.7	4.5	39.0	56.3
34	110	5.8	3.6	0.9	0.9	8.2	13.6	38.5	37.3	4.5	22.7	75.8
35	110	5.3	5.5	1.8	0.0	16.4	24.5	25.5	26.4	7.3	40.9	51.9
36	110	5.2	4.5	0.9	7.3	13.6	20.9	28.2	24.5	5.4	41.8	52.7
37	110	5.4	4.5	1.8	0.9	15.5	20.9	34.5	21.8	6.3	37.3	56.3

Question	Number of Responses	Mean Response	% Responding 1	2	3	4	5	6	7	% at Extreme Ends of Likert Scale (1+2)	(3+4+5)	(6+7)
38*	110	4.5	4.5	4.5	4.5	27.3	20.1	11.8	17.3	9.0	51.9	29.1
39*	110	4.5	4.5	4.5	10.9	33.6	21.8	13.6	10.9	9.0	66.3	24.5
40*	110	4.7	6.4	2.7	8.2	30.9	19.1	16.4	16.4	9.1	58.2	32.8
41*	110	4.6	9.1	4.5	4.5	28.2	20.0	15.5	18.2	13.6	52.7	33.7
42*	110	4.6	3.6	3.6	11.8	30.0	20.0	21.8	9.1	7.2	61.8	30.9
43	110	4.5	8.2	2.7	6.4	26.4	28.2	23.6	4.5	10.9	61.0	28.1
44	110	4.5	9.1	0.9	5.5	28.2	32.7	19.1	4.5	10.0	66.4	23.6
45	110	3.9	24.5	4.5	6.4	28.2	9.1	15.1	11.8	29.0	43.7	26.9
46	110	3.9	14.5	7.3	7.3	33.6	19.1	16.4	1.8	21.8	60.0	18.2
47	110	4.3	10.9	5.5	6.4	28.2	28.2	15.5	5.5	16.4	62.8	21.0
48	110	4.4	10.9	3.6	3.6	32.7	23.6	20.9	4.5	14.5	59.9	25.4
49	110	4.3	10.0	5.5	5.5	30.9	22.7	20.9	4.5	15.5	59.1	25.4
51	77	4.5	10.4	---	---	40.3	26.0	16.9	6.5	10.4	66.3	23.4
52	77	4.5	10.4	1.3	1.3	41.6	15.6	23.4	6.5	11.7	58.5	29.9
53	76	4.4	11.8	1.3	1.3	40.8	17.1	21.1	6.6	13.1	59.2	27.7
54	77	4.4	7.8	3.9	3.9	36.4	27.3	11.7	9.1	11.7	67.6	20.8
55	77	5.5	2.6	---	3.9	22.1	14.3	28.6	28.6	2.6	40.3	57.2

*Note: Percentages may not sum to 100% due to rounding error

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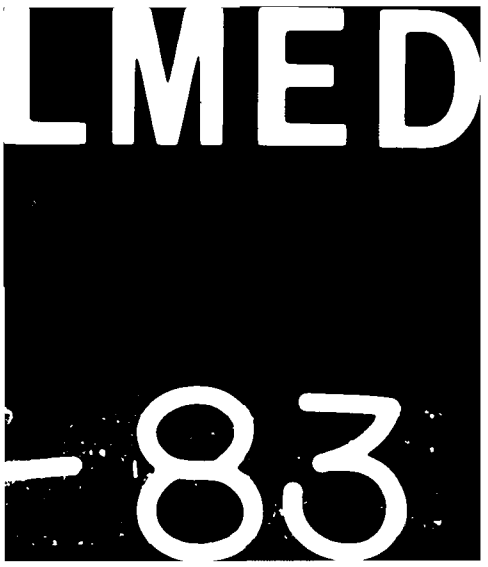
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