IDENTIFYING THE FACTORS THAT CONTRIBUTE TO THE EFFECTIVENESS OF THE PRODUCTIVITY MEASUREMENT AND ENHANCEMENT SYSTEM (ProMES)

A Dissertation

by

JOSÉ HERNÁN DAVID

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2003

Major Subject: Psychology

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ABSTRACT

Identifying the Factors that Contribute to the Effectiveness of the Productivity Measurement and Enhancement System (ProMES). (August 2003)

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The Productivity Measurement and Enhancement System (ProMES) is a human resource intervention that provides feedback to members of an organizational unit via a measurement system constructed by the unit personnel. The unit constructs the system by defining their objectives, identifying productivity indicators for each objective, and developing utility curves or contingencies for each indicator, specifying the overall and relative value to the organization of different performance levels on each indicator. Over the years, it has produced very positive results upon implementation. However, there has been great variability in the effectiveness of ProMES. This study attempted to identify the factors that contributed to this variability. Three major factors were proposed to influence the success of the intervention: feedback quality, the degree to which units prioritized their actions on the feedback, and the organizational social context. Additionally, the individual effects of the components of the organizational social context factor were analyzed; these components included the degree of employee participation in the intervention, unit attitudes towards productivity improvement, organizational support for the intervention, and organizational stability. Three productivity indices were used as

dependent variables: the unit *d*-score (the difference between feedback productivity and baseline productivity divided by the pooled standard deviation), the rate of productivity change over the first third of the feedback stage, and the degree to which units were able to sustain prior productivity improvements over the last two thirds of the feedback stage. The degree of match with the original ProMES methodology was proposed as a moderator in the relationship between the three major factors and the criteria, and the degree of feedback interpretation training given to the unit was proposed as a moderator between the units' action on feedback and the criteria. Drawing on a database of 74 units from different industries and countries, scales were constructed to operationalize the factors. Results from multiple regression analyses indicated that favorable attitudes towards productivity improvement were associated with faster productivity improvements. Additionally, feedback quality and the action taken on feedback significantly predicted greater and faster productivity improvements. The implications for human resource professionals and researchers in industrial/organizational psychology are discussed.

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Le dedico esta obra al pueblo de Honduras, mi tierra natal, con la esperanza de que su productividad propere hoy y siempre. Que los ideales de grandeza de Francisco Morazán no queden en el olvido, y que la hermandad, honradez, y humildad prevalezcan en los corazones catrachos.

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I would like to thank God, first and foremost, for having guided me through a critical stage of my life to successful completion.

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I also need to thank the members of my dissertation committee, Stephanie Payne, Mindy Bergman, and Adrienne Colella. I believe I chose very wisely when I asked each to form part of the committee because they were extremely helpful, insightful, and flexible throughout the different stages of the dissertation. Their comments have significantly improved the quality of the work before you.

I would also like to thank my fellow doctoral students at A&M for providing me with a rich, innovative, and critical environment in which to study I/O psychology.

Last but not least, I could not have done this without the support of my family. My immediate family and my in-laws have been my staunchest supporters throughout these years. Most importantly, thank you to my wife Karen and my daughter Sonia for providing me with the love, motivation, and inspiration to forge ahead. Thank you for all your work, sacrifice, and understanding. You were both the means and the end to this journey. I love you both.

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INTRODUCTION

> In the late 1990s, the annual productivity growth rate picked up to an average of 2.5% from less than 1.5% on average during the previous 20 years. But economists are still trying to understand what was behind it.
>
> - J. Hillsenrath

> "With the growth of productivity well maintained and inflation pressures largely absent, the foundation for economic expansion has been laid," [U.S. Federal Reserve Board chairman Alan Greenspan] concluded.
>
> - A. Vekshin

> [Productivity is] important because in the end, how much is produced by each person employed translates pretty directly into the wealth of the country. The difference between 1.5 and 2.5 percent productivity growth is the difference between the standard of living doubling in one generation or two generations. It has huge implications.
>
> - P. McGinn

Productivity is a concept that has profound importance in our lives. The statements above reflect the focus given to productivity and productivity improvement in the United States. Productivity can have major effects at the national, industry, and individual level (Pritchard, 1992). At the national level, productivity growth accounts for large proportions of the growth in a nation's gross national product (GNP), and can help to reduce inflation (Kendrick, 1984). Alan Greenspan's quote referenced above underscores the importance of productivity growth to the nation's economic expansion. At the firm and industry level, increases in productivity can create more competition,

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This dissertation follows the style and format of the *Journal of Applied Psychology*.

which can lead to industry and firm growth (Pritchard, 1992). At the individual level, productivity growth can lead to improvements in the quality of life, increased leisure time, and advancement within an organization (Kendrick, 1984; Pritchard, 1992). McGinn's (2002) quote above reflects the impact that productivity growth can have on a person's standard of living.

The scientific study of productivity dates back to the days of Frederick Taylor and his *Principles of Scientific Management* (1911). However, productivity did not become a cause for major concern in the United States until relatively recently. From the early 1970s up to the middle of the 1990s, the U. S. experienced a substantial decline in productivity growth, while the productivity of other countries increased at a faster rate (Harris, 1994; Muckler, 1982). Although productivity growth in the U.S. has had a minor increase over the last 6 years (Hillsenrath, 2002), the search for greater improvements in productivity still remains. Moreover, given the interrelatedness of economic markets across the world, it is beneficial for all countries and their competitors to experience productivity growth (Harris, 1994). Productivity has now become a global concern. However, as evidenced by Hillsenrath's (2002) quote at the beginning of this piece, the determinants of productivity growth are still unknown in many cases.

A report of the White House Conference on Productivity (1984) proposed four factors that determine productivity and urged action on them for productivity growth. The factors are capital formation, government policies, private-sector management initiatives, and the use of human resources. Mahoney (1988) stated that the last two

factors, private-sector management initiatives and the use of human resources, could definitely benefit from the psychological study of productivity. Reliable and valid methods of productivity measurement and improvement can give organizations the competitive advantage to become leaders in their respective markets. However, although productivity improvement is highly desirable in most cases, the type and effectiveness of the mechanisms that can lead to improvement can vary widely.

RESEARCH OBJECTIVES

This study will focus on a specific approach to productivity improvement, the Productivity Measurement and Enhancement System or ProMES (Pritchard, 1990, 1995; Pritchard, Holling, Lammers, & Clark, 2002; Pritchard, Jones, Roth, Stuebing, & Ekeberg, 1988, 1989;). Although ProMES has been shown to be an intervention that has positive effects on productivity (Pritchard, Paquin, DeCuir, McCormick, & Bly, 2002a), there is a great deal of variability in its results. This study will attempt to identify some of the causes for this large variability. Specifically, this study will undertake a search for specific organizational and process factors that could lead to productivity improvement in ProMES. The specific and joint contribution of these factors will then be analyzed in relation to different criteria of ProMES effectiveness. However, before these factors can be identified, the literature on productivity research, ProMES, and the theory behind ProMES will be reviewed.

PRODUCTIVITY DEFINED

The different definitions and perspectives from which productivity can be viewed have provided a body of literature that is complex and often confusing. Tuttle (1983, 1981) proposed five definitions of productivity from different academic disciplines. The *economic* perspective presents probably the most salient definition of productivity, which is analogous to an efficiency index: the ratio of outputs over inputs in units of real physical volume (Pritchard, 1992). The *accounting* perspective focuses on financial efficiency measures based on profits and sales (Tuttle, 1981). The *industrial engineering* perspective focuses on the efficiency of the system process. The *managerial* approach views productivity in the broadest terms, as the set of organizational components that lead to effective and efficient organizational functioning. Finally, the *behavioral* approach (Pritchard, 1992) places emphasis on the aspects of productivity that the individual can control, working under the assumption that behavioral change will lead to productivity change. Although there are many different indices and perspectives on productivity, it is important to note that the choice of index is determined by the purpose for which it will be used (Mahoney, 1988).

In the context of this definitional quagmire, Mahoney (1988) also points out the need to differentiate between *total-factor productivity* and *partial-factor productivity*. Total-factor productivity refers to the efficiency of a process as a whole, i.e., the transformation of all inputs into outputs. In contrast, partial-factor productivity refers to

the outputs attributable to a single input factor (e.g., labor outputs and inputs; Mahoney, 1988).

Although the majority of the approaches outlined above place an emphasis on efficiency, productivity has also been defined in terms of effectiveness, the ratio of outputs in relation to standards or expectations (Mahoney, 1988; Pritchard, 1992). A comprehensive conceptualization of productivity should include both efficiency and effectiveness. To that end, this study will define productivity as "*how well a system uses its resources to achieve its goals*" (Pritchard, 1992, p. 455). This definition will be applied in this study to view productivity mostly from a behavioral perspective. With this conceptual backdrop, a detailed description of ProMES and the theory behind it will now be provided.

THE PRODUCTIVITY MEASUREMENT AND ENHANCEMENT SYSTEM

ProMES is an intervention that relies on feedback to let personnel know their levels of performance; this knowledge then serves as a tool that leads to more efficient and effective ways of performing tasks (Pritchard, 1990). The system is developed and agreed upon by both employees and management, and provides an overall index of productivity. This section will begin by presenting some of the research on work motivation that serves as the conceptual foundation for ProMES, and will then transition to describe the implementation of the intervention in more detail.

Work Motivation and ProMES

Motivational Force = Acts → Products → Evaluations → Outcomes → Need Satisfaction

Figure 1. Motivational components in NPI theory.

ProMES has its theoretical foundations within a theory of behavior in organizations proposed by Naylor, Pritchard, and Ilgen (1980) and often referred to as NPI Theory. This theory synthesizes a number of variables that contribute to individuals' behavior in organizations. NPI Theory includes a theory of motivation that attempts to explain how people distribute effort across tasks. It proposes a motivational sequence or chain composed of the following elements: acts, products, evaluations, outcomes, and need satisfaction. Figure 1 presents the elements of the motivational chain.

Individuals or teams perform task behaviors, or *acts*. Acts can be described as the "doing" of something, such as typing, talking, or operating a drill. Acts then combine to form *products*, the end result of task behaviors. For example, drilling (an Act) produces holes or openings (Products). Products are then subject to *evaluations* from supervisors, management, the self, and others. Evaluations determine whether the amount or quality of the product is at a desirable or undesirable level. *Outcomes* are then given on the basis of these evaluations. Outcomes can be intrinsic or extrinsic and be given by the self or others. Examples include pay, punishments, bonuses, feelings of accomplishment, and praise. Outcomes then impact the individual's *need satisfaction*. Needs are relatively permanent preferences for different outcomes such as safety, self-esteem (Maslow, 1954), growth, relatedness (Alderfer, 1972), achievement, or power (McClelland, 1953), among

others. Whenever these needs are met, need satisfaction in the form of positive affect results (Pritchard & Ramstad, 2002; Pritchard et al., 2002). These components dictate an individual's *motivational force*. Motivational force is the degree to which an individual perceives that changes in effort expended on different acts will result in changes in anticipated need satisfaction (Pritchard & Ramstad, 2002; Pritchard et al., 2002).

NPI Theory then describes contingencies between each element (see Figure 2). Contingencies are relationships that establish how changes in one of the motivational components produce different levels of the ensuing component. For example, by perceiving how different amounts of effort placed into acts yield different amounts of products, personnel develop perceptions of *act-to-product contingencies*. If you work hard at sawing, nailing, and painting pieces of wood, you can build a chair. Sawing, nailing, and painting are acts and the chair is the product of those acts. If the amount of effort devoted to these acts increases or decreases, there is a change in the number and/or quality of the chairs produced. The function relating the change in products caused by the change of effort in acts is the *act-to-product contingency*. This relationship is similar to the expectancy component of expectancy theory (Vroom, 1964). In a similar way, establishing a relationship of how evaluations vary according to production (products) forms *product-to-evaluation contingencies*. In turn, the link between the evaluations of products and intrinsic and extrinsic rewards received develops into the *evaluation-to-outcome contingencies*. Finally, the relationship between outcomes and the affect anticipated or experienced from the outcomes forms *outcome-to-need satisfaction*

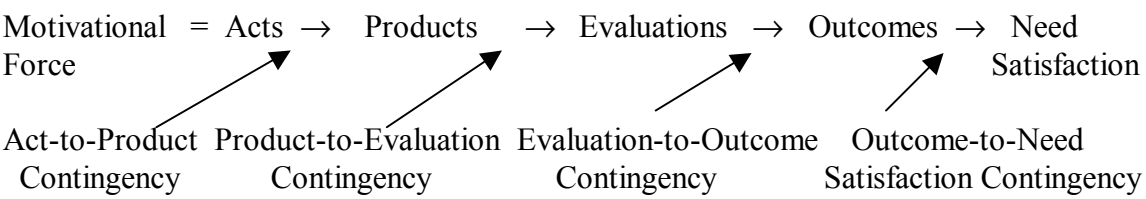

Figure 2. NPI motivational theory.

contingencies. This contingency is akin to the valence component of expectancy theory (Vroom, 1964). The fact that each element in the chain is interconnected makes it possible to combine all these contingencies into a relationship which defines how applying effort to acts leads to expected affect, i.e., need satisfaction. This is also called the utility of acts in Naylor et al. (1980).

Many of the implications pertinent to productivity in NPI Theory were used to create the Productivity Measurement and Enhancement System. Some of these NPI implications include the importance of having valid measures of productivity and the specification of how different levels of products are valued by the organization. Another implication from NPI translated into ProMES is the importance clarifying to personnel how evaluations of performance are made and the way in which these evaluations provide desired outcomes. All of these implications are incorporated in the steps required to implement ProMES. The Implementation of ProMES

ProMES is implemented by a group of people referred to as the design team, which consists of supervisors and members of the unit where the system will be implemented, upper management, and one or two facilitators who are familiar with the

ProMES process. The design team, typically consisting of 5-8 people, identifies the objectives of their target unit. Once the objectives of the target unit are defined, the design team tries to develop measures for quantifying how these objectives are being met. In ProMES, these measures are called *indicators*. Indicators are quantifiable measures describing how well products are being generated. After indicators are defined, the design team develops contingencies for each indicator. These contingencies are graphic functions designed to capture the relationship between different levels of outputs (products) and the amount of benefit to the organization. The contingencies identify the amount of benefit to the organization and this benefit is operationalized by a point system that yields what is termed an effectiveness score. The contingencies are developed by going through a series of steps that result in a graphic function for each of the indicators.

Once these contingencies are finished, the feedback system can be implemented. After a period of collecting baseline data, feedback reports detailing the target unit's indicator scores and the associated effectiveness score on each indicator are given on a regular basis. An overall effectiveness score for each feedback period is also computed. Meetings are held to discuss feedback reports, explain the information provided by them, and identify ways to improve on the indicators.

Referring back to the different perspectives from which productivity can be studied, ProMES is embedded within a behavioral approach to productivity. It provides a measure of partial-factor productivity (Guzzo, 1998; Mahoney, 1988) in that it focuses on things personnel can do to improve productivity and not on the impact of the

technology. However, it does include all aspects of the work being done and its impact on other measures of firm performance can in principle be assessed (Ramstad, Pritchard, & Bly, 2002). Moreover, ProMES can be applied for different purposes, such as strategic planning (Clark, 1999), measuring corporate social performance (Swift & Pritchard, 2002), performance appraisal, and training evaluation. In general, ProMES has proven to be a very successful intervention. A study compiling data from 55 ProMES projects found an average *d*-score of 1.42 (Pritchard et al., 2002) when comparing average productivity increases from baseline to feedback, which surpasses the standards described by Cohen (1977) for a large effect size. However, there is considerable variability in the effects of ProMES in different projects. Of the 55 projects mentioned above, the d-score varies from –2.5 to +5.3. At the same time, the conditions and characteristics encountered in each one of these projects were very different. The impetus for this study will thus be to understand the reasons for this great variability in results. In order to examine the causes of this variability, an analysis of the optimal characteristics of productivity measurement interventions must be undertaken.

CRITERIA FOR SUCCESSFUL PRODUCTIVITY MEASUREMENT

Guzzo (1988) notes that most productivity measures in I/O psychology are measures of partial-factor productivity. However, in spite of the multiple definitions and perspectives from which productivity can be viewed, there are certain key design criteria for successful productivity measurement. Although the criteria that will now be discussed focus on the behavioral approach to productivity measurement, they are also applicable to

other perspectives of productivity. These criteria will be reviewed at two levels: the measure level (i.e., the specific indicators that compose the measurement system) and the system level (i.e., the productivity measurement system as a whole).

Researchers of organizational productivity (Kendrick, 1984; Mahoney, 1988; Pritchard, 1992; Sink & Smith, 1994; Tuttle, 1981) provide several guidelines for the measures, indicators, or indices that will compose a productivity measurement system. Individual measures should be sensitive to any changes in the levels of productivity across time (Sink & Smith, 1994). The measures should also be comparable across time, i.e., one should be able to make meaningful longitudinal comparisons from one time period to the next (Tuttle, 1981). Productivity indices should capture their differential importance to the overall productivity of the individual or unit. Measures should also be able to capture any nonlinearity in the relationship between different levels of performance and the contribution that is made to the organization (Pritchard, 1992). An example of nonlinearities would be a vineyard where producing wine beyond a certain point may not bring any additional value, and can even be counterproductive because it will create excess stock and ultimately drive the price of the wine down.

Productivity indices should capture both the unit's effectiveness and its efficiency (Pritchard, 1992). From a practical perspective, the measures should be as cost-effective as possible; they should make use of existing sources of data insofar as these are reliable and valid. Additionally, the value to the organization provided by the measurement should meet or exceed the cost of the measurement. Productivity measures should be

valid and also be perceived as valid by organizational members in order to gain increased acceptance (Tuttle, 1981). The validity of the measures involves a series of characteristics: the measure should be fair (Tuttle, 1981), under the unit's control (Pritchard et al., 1989; Sink & Smith, 1994), relevant to the work being done (Sink & Smith, 1994), unbiased (Tuttle, 1981), and reliable (i.e., verifiable by multiple methods or evaluators; Sink & Smith, 1994). Related to the validity of the measures is their understandability; indicators of productivity should be intelligible to the people who must take action on the measurement (Kendrick, 1984). Finally, productivity indices should span the range of productivity levels that could be achieved by the person or unit (Sink & Smith, 1994).

At the level of the productivity measurement system, there are additional essential characteristics to successful measurement. An important characteristic that is often implicit in the literature is the fact that the results of the measurement need to be made available to organizational members. Knowledge of results/feedback data can then serve to motivate and cue workers to specific aspects of their performance (Kluger & DeNisi, 1996; Mahoney, 1988; Nadler, 1979) that can lead to productivity improvements. The measurement system should be comprehensive (Tuttle, 1981). It should include all relevant aspects of the individual or group's performance in relation to the organization's objectives, and in turn assess all the relevant inputs being used to deliver a good or service. This is usually achieved by having multiple subindices of productivity as components of the measurement system (Pritchard, 1992). Another criterion related to

the comprehensiveness of the system is the presence of an overall index of productivity. The overall index allows the subindices to be captured by a single figure on a common metric (Campbell & Campbell, 1988), which can then be used to gauge improvements or decrements in productivity across time. This overall index also allows a better evaluation of the effects of an organizational intervention on productivity (Pritchard, 1992). The overall index should be comparable across units and organizations (Kendrick, 1984). Organizations seeking to implement successful productivity measurement systems should also ensure that the measurement system is aligned with other Human Resource Management (HRM) practices in place. Part of this alignment involves the ability to both aggregate and make comparisons of productivity indices across several units within the organization (Pritchard, 1992). Greater alignment between the productivity measurement system and other HRM practices in place produces what Huselid (1995) describes as internal fit, and as internal fit improves, so should firm performance (e.g., sales, market value, profits; Huselid, 1995). Finally, the productivity measurement system should contribute to the organization's external fit, i.e., the degree to which its HRM practices are aligned with its strategic objectives (Huselid, 1995). If the measurement system can quantify the progress towards the organization's goals, it can be that much more successful.

Criteria for Successful Productivity Measurement in ProMES

ProMES successfully meets most of the aforementioned criteria, both at the measure level and at the system level. At the measure level, ProMES effectiveness scores

provide a common metric that is comparable across time and can be made comparable across different units. To achieve comparability across units, overall effectiveness scores for individual units can be transformed to a percentage of their maximum potential overall effectiveness score. This percentage of maximum allows units with different numbers of indicators and potential overall effectiveness scores to be compared. Additionally, ProMES has the capability for including measures of both effectiveness and efficiency; although ProMES is geared primarily towards the measurement of a unit's effectiveness, the design team can certainly include measures of efficiency to give greater perspective to their effectiveness scores.

The differential importance of indicators is achieved in the contingency-building process by assigning a larger slope, and thus a greater number of possible points, to more important indicators, and any nonlinearities between performance and value to the organization are captured by the detailed graphing of contingency functions. Additionally, the graphing of the unit's minimum and maximum performance in the contingencies ensures that the entire range of performance on an indicator is captured.

The inclusion of the unit personnel in the construction of the measurement system also contributes to several other criteria. The indicators are typically relevant and understandable because the employees, as subject matter experts, are selecting them Moreover, measures are typically perceived as fair and under personnel's control. This is because the development of the measurement system makes units accountable for their productivity. Because management will be evaluating their productivity scores, units try

to select indicators that are under their control in order for them to have the greatest impact on productivity scores in the future. There is additional accountability because management has to give approval of the final measurement system. Units therefore select indicators that are fair evaluations of their productivity, and that are also perceived as fair by management as they evaluate the final measurement system, instead of including meaningless measures of their performance that would give inaccurate measures of the unit. Finally, the existing literature on ProMES (Pritchard, 1990) orients facilitators to ensure that indicators are sensitive to changes in performance, cost-effective, and capture both efficiency and effectiveness.

ProMES also meets most of the criteria suggested at the system level. The presentation of feedback to the unit personnel, especially the inclusion of the overall effectiveness score, allows them to have knowledge of their productivity levels and take action to make improvements. The individual indicator and overall unit effectiveness scores also provide a tool for upper management to diagnose the productivity of one or more units. Based on these effectiveness scores, they can develop strategic plans to improve the organization's functioning through improved internal fit with other HRM practices. Finally, the construction and review of the system at different levels of the organization ensures that it is comprehensive enough to include all of the unit's functions and all of the interactions and inputs that impact the unit's output and productivity.

Pritchard (1992) makes a comparison of several different approaches and interventions for measuring productivity. Most of the interventions described by

Pritchard are lacking in the design criteria that he lists. However, ProMES meets all of those criteria, as well as some others that have been described above. However, given that all of these characteristics are always present in ProMES implementations, the search for the factors that account for the large variation in results must focus on the specific components that surround the development of ProMES.

FACTORS THAT CONTRIBUTE TO ProMES EFFECTIVENESS

We now turn to the specific factors in a ProMES intervention that could be related to its success. Regardless of the perspective taken, the study of productivity is by no means simple. Within a systems theory framework (Katz & Kahn, 1978), equifinality refers to a system's ability to reach the same final state from a number of different initial conditions and through a variety of paths. Hackman (1984) argues that it is pointless to develop theories and interventions that attribute productivity improvement to unitary causes. Equifinality allows us to view the management of organizational productivity as involving the creation of multiple conditions that support high productivity; thus, the best way to improve productivity might be to alter several factors at once, creating a large number of favorable conditions to maximize productivity improvement (Hackman, 1984).

ProMES tries to create what Hackman (1984) calls a "critical mass" of favorable conditions for productivity enhancement by using a number of factors that contribute to productivity changes. However, there are two sets of factors that might explain the most variance. The first set of factors pertains to organizational characteristics that foster productivity measurement and improvement. These include employee participation,

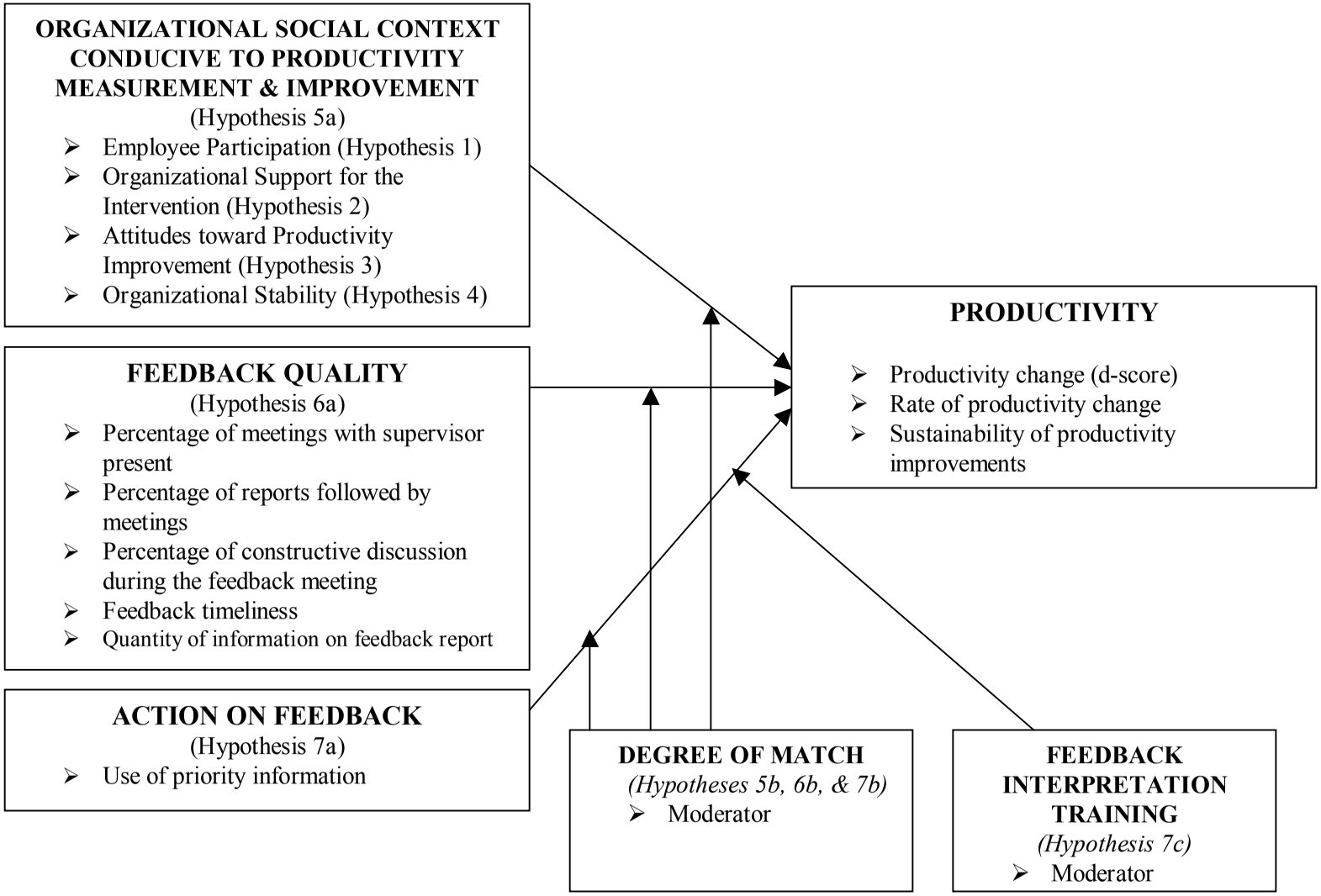

Figure 3. Factors that affect the effectiveness of ProMES.

organizational support, positive attitudes towards productivity measurement and improvement, and organizational stability. The second set of factors relate to the changes that are brought about by the implementation of the intervention. These include the quality of feedback and the action that is taken on feedback. These factors are presented graphically in Figure 3. Figure 3 also presents the operationalizations of productivity that will be used in this study, and two moderating variables that will affect the relationships between the predictors and the criteria. The hypotheses proposed in the following pages assume that the predictors will influence all three productivity criteria. The next section will describe each of these predictors, review evidence for its importance, and present the specific hypotheses for each variable.

Organizational Social Context Conducive to Productivity Measurement and Improvement

The upper left box in Figure 3 presents a number of variables related to the organization's social context. ProMES interventions will have greater effects to the degree there is a social context that is conducive to productivity measurement and improvement. The term "organizational social context" will henceforth be used because the concepts of organizational culture and climate are closely related and the distinction that has been made in the literature in the past may not be warranted (Denison, 1995). There are several factors in the social context that could contribute to productivity improvement, as evidenced by the different models proposed in the literature (Gaither, 1980; Kopelman, 1986; Lawler, 1986; Mali, 1978; Weinstein, 1990). However, in ProMES, there is a series of factors that contribute directly to this social context.

Employee Participation. Wagner (1994) describes participation as a process in which influence is shared among individuals who are hierarchically unequal. Dachler and Wilpert (1978) presented a model containing several defining dimensions within participatory social systems. These dimensions will be used to provide a framework for justifying the importance of participation in ProMES and to identify salient variables that affect the nature of participative systems.

Importance of Participation. Two orientations of participatory systems described by Dachler and Wilpert (1978) reflect the nature of ProMES: socialistic theory and orientation to productivity and efficiency. One of the central tenets in socialistic theory is workers' potential to become economically liberated by participating actively and creatively in the production process in an effort to ultimately control it (Vanek, 1975). ProMES achieves this by building a measurement system from the bottom of the organization up, in effect giving units ownership of their evaluation standards and measures (Pritchard, 1990). Although some may see socialistic views as extreme, the message that this perspective brings across is clear: participation allows workers to have more control over their work.

Dachler and Wilpert's productivity and efficiency orientation views participation as a method to understand individuals' capabilities and maximize efficiency and effectiveness. Participation may effectively accomplish this to the extent that: 1) the issues that participation addresses are relevant to task accomplishment; 2) workers get accurate information about their organizational context that they can use to increase

performance and maximize outcomes; and 3) successful performance is under the workers' control (Dachler & Wilpert, 1978).

These two orientations thus indicate that participation is vital because it gives employees more control over their work and allows them to do their job more efficiently and effectively.

Determinants of Participation. Dachler and Wilpert propose that contextual characteristics will also decide the effect that participation will have on an organizational unit. In the context of ProMES, these contextual characteristics will arise mostly at the level of the organization and the group/unit. At the organizational level, the degree of centralization present in the organization may affect the degree of employee input that can occur during ProMES. Highly centralized organizations could potentially be more controlling of the system that is developed; this influence may be evident by upper management vetoing or altering all or parts of the system, thereby reducing the unit's ownership of it. At the group level, two contextual factors that can affect participatory systems are those of power/influence and leadership (Dachler & Wilpert, 1978), and they are closely interrelated. The participatory nature of ProMES tries to reduce the effects of overly influential organizational members (supervisors or unit personnel) by promoting open discussion and dialectic during design team meetings (Pritchard, 1990). Additionally, the amount of consensus reached by the members of the design team can affect perceptions of input in the process; if there is a small degree of consensus during design team meetings, the unit personnel may perceive the system as being imposed on them by management, decreasing their acceptance of it, and potentially reducing its

effectiveness. All of these contextual variables are thus important determinants of the degree of participation that can occur in a work unit.

Wagner (1994) conducted a meta-analytic review of the influence of the different types of participation on job performance and reported that, on average, participation had a significant but small effect size ($.15 \leq \underline{r} \leq .25$). Based on these results, and the conceptual background provided earlier, it is expected that employee input and participation should contribute to the effectiveness of ProMES. The following hypothesis is thus formulated:

Hypothesis 1: There will be a positive relationship between employee participation and productivity improvements.

Organizational Support for the Intervention. Human resource interventions are often received unenthusiastically by organizational members. This is due in part to HR managers jumping on bandwagons for the hottest new trends or practices. Workers are thus subject to a number of interventions for only a few months that are never adopted permanently as procedures. Thus, organizational support for HR interventions should aid both the survival of the intervention and its effectiveness. Support must begin from the highest level of management possible (Kendrick, 1984). If the upper management of an organization views an intervention as valuable, they will invest in it and support it as much as possible. If lower-level managers and supervisors view an intervention as valuable, they will be interested in implementing it in their departments and will make time to do so. Finally, if the workers see an intervention as valuable, they will willingly take part in it and contribute to its success. Therefore, at a conceptual level, the greater

the support for an intervention at all levels of the organization, the greater the likelihood it will succeed.

The literature seems to support the notion that greater management support for an organizational intervention leads to better results. Miedema and Thierry (1995) provide an anecdotal account of the importance of management support to the successful implementation of ProMES. Chi (1997) found that management support significantly predicted the usage of a computer-mediated communication (CMC) system. Henry (1983) found that upper management support for first-level managers undergoing performance appraisal training resulted in better subordinate evaluations of the first-level managers' performance appraisal skills. Managers who received training but no upper management support resulted in the lowest evaluations. Montgomery (1989) found that management support was the variable that accounted for the greatest variance in group and program effectiveness during the implementation of Quality Circles in an organization. Although the literature on worker support of organizational interventions is scant, there is some anecdotal evidence from practitioners whose HR interventions had little or no effect due to lack of employee support (P. Ramstad, personal communication, April 15, 2002). Given this evidence, the following hypothesis is formulated:

Hypothesis 2: There will be a positive relationship between organizational support for ProMES and productivity improvements.

Attitudes Toward Productivity Improvement. The social psychology literature provides us with research examining the degree to which attitudes guide behaviors. Ajzen's (1991) theory of planned behavior proposes that attitudes towards a behavior and

subjective norms contribute to a person's behavioral intentions, which in turn lead to the occurrence of that behavior. The results from this body of research indicate that attitudes and intentions are good predictors of behavior. Meta-analyses on the topic have estimated the average correlation between attitudes and behaviors at .38 (Kraus, 1995), .61 (Callahan, 1997), and .79 (Kim & Hunter, 1993). Additionally, Kim & Hunter (1993) found the mean correlation between attitudes and behavioral intentions to be r = .87, and the mean correlation between behavioral intentions and behaviors to be r = .82. These results provide solid evidence that attitudes and behavioral intentions are good predictors of behaviors.

The literature on the attitude-behavior relationship in organizational settings provides similar results. Attitudes have been demonstrated to be significant predictors of intentions to use informational technology (IT) data in a production environment (Gallion, 2000) and managers' intentions to benchmark (Hill, Mann, & Wearing, 1996). Additionally, attitudes can significantly predict behaviors such as turnover (Werbel, 1985), customer satisfaction (Schmit & Allscheid, 1995), the employment of people with disabilities (Lewis, 1995), sustainable agriculture practices (Petrzelka, Korsching, & Malia, 1996), decision-making in the context of a new technology (Venkatesh, Morris, & Ackerman, 2000), and the decision to implement a performance appraisal system (Langan-Fox, Waycott, Morizzi, & McDonald, 1998).

Kendrick (1984) notes the need to take the pulse of an organization before engaging in methods of productivity improvement. This includes assessing workers' attitudes and the quality of the relationships between different organizational

constituencies. In the context of this study, it is expected that positive attitudes towards productivity improvement will help create a social context that facilitates interventions such as ProMES. Positive attitudes towards productivity improvement should predict intentions to engage in behaviors that improve productivity, according to the theory of reasoned action (Ajzen, 1991). When complemented with the productivity-enhancing features of ProMES, positive attitudes towards productivity improvement should lead to the formation of intentions to engage in behaviors that will increase productivity. For example, when positive attitudes towards productivity exist, feedback meetings should be more effective vehicles to identify and adopt productivity-enhancing behaviors. The intention to engage in these behaviors could even become explicit through formal or informal goal-setting. Therefore, the degree to which the unit engages in productivity-enhancing behaviors will be related to workers' attitudes towards productivity improvement.

Hypothesis 3: There will be a positive relationship between attitudes towards productivity improvement and productivity improvements.

Organizational Stability. The final factor that could contribute to an organization's social context for productivity improvement is the stability in the organization. Miedema and Thierry (1995) describe stability as a crucial factor when considering the implementation of ProMES. Denison (2002) proposes a model of organizational culture where consistency, adaptability, mission, and involvement contribute to organizational culture. In Denison's model, consistency is analogous to stability, and refers to the degree to which there is agreement, shared core values, coordination, and integration

among organizational members. Additionally, there can be contextual factors, such as technological and environmental changes (Venkatesh et al., 2000; Wiley & Hause, 2002), and interpersonal/personnel factors, such as turnover, that may introduce instability within an organization.

In the context of NPI Theory, organizations that are more stable can facilitate the motivation process in a way that maximizes productivity improvement. First, organizations that are more consistent in their values and messages will have less conflicting demands from multiple constituencies (Naylor et al., 1980; Denison, 2002), allowing a stronger and clearer relationship between products and evaluations (i.e., the product-evaluation contingency). In addition, fewer changes in an organization's technology will create act-to-product contingencies that are more stable across time, yielding a similarity in products that allows for better longitudinal measurement. Finally, fewer environmental and personnel changes will result in more stable acts, products, and evaluations. For example, environmental changes, such as the passage of stricter pollution laws, can lead to changes in acts (e.g., reducing environmental contamination during production), products (e.g., reduced pollution levels), or evaluations (e.g., perceptions of environmental-friendliness and compliance with the law by stakeholders). Personnel changes in the form of turnover could lead to changes in acts (e.g., "I need to explain things more thoroughly to Patrick, the new guy"), products (e.g., a new CEO pushing for more products/services), evaluations (e.g., a new supervisor who expects higher standards of performance from the unit), and outcomes (e.g., the introduction of a different compensation system by a new HR manager). The instability brought about by

changes in personnel and in the environment can have a direct impact on work processes and the contingencies proposed by NPI Theory.

Another factor that will affect organizational stability is the trust among personnel. Groups and organizations in which there is less trust among members might be associated with social contexts that are less stable, which could significantly hinder their productivity. Glover (2000) reported that US Air Force captains displayed lower levels of trust and breaches in their psychological contracts after going through a reduction in force (i.e., downsizing). Webb (1997) described how perceptions of medical teams' success were significantly lower when there was little trust between the physicians and hospital administrators. It could be argued that low levels of trust in an organization can contribute to an unstable environment that is not conducive to productivity improvement. Taking all of the aforementioned factors into account, the following hypothesis is proposed:

Hypothesis 4: There will be a positive relationship between organizational stability and productivity improvement.

Composite Measure of Organizational Social Context Conducive to Productivity Measurement and Improvement. This study has presented arguments for the four components of organizational social context presented in Figure 3. Employee participation, attitudes towards productivity measurement and improvement, organizational support, and organizational stability are the factors believed to contribute most directly to creating a social context that is conducive to productivity measurement and improvement in ProMES. These four variables have each been studied as dimensions

of climate in previous literature (Day & Bedeian, 1991; Minor, 1999). The question remains as to whether the social context in an organization can contribute to organizational productivity. A study by Witt (1985) attempted to address this issue by determining the effects that an organizational climate for productivity had on organizational productivity. Witt proposed that organizational climate for productivity is composed of two factors: reward contingencies and task characteristics. Reward contingencies captured both formal and informal rewards, whereas the task characteristics factor was comprised of task freedom, skill adequacy, task goals, task clarity, and task cooperation. Witt found that better organizational climates for productivity successfully predicted decreases in actual turnover and better perceptions of organizational productivity. Although there was no significant relationship to output criteria, organizational climate for productivity did predict other measures of productivity. Based on the contribution of the Witt study, as well as the literature supporting each facet of social context being proposed here, this study will attempt to create a composite variable to operationalize the social context for productivity measurement and improvement. This composite will be formed from the four variables discussed above and shown in the upper left box in Figure 3 and will be used to study its effects on productivity. The following hypothesis is proposed:

Hypothesis 5a: There will be a positive relationship between organizational social context and productivity improvements.

Degree of Match

Pritchard et al. (2002a) have documented that stronger results are found in ProMES projects that closely follow the original ProMES methodology. They found that projects closely matching the original methodology have effect sizes that are 10 times larger than projects with significant deviations in methodology. Given this finding, this study will perform moderation analyses between the principal predictor variables (i.e., organizational social context, feedback quality, action on feedback) and the criteria by using each ProMES project's degree of match with the original ProMES methodology as a moderator variable.

Hypothesis 5b: The relationship between organizational social context and productivity improvement will be moderated by the degree of similarity with the original ProMES methodology, such that cases with more similarity will show a stronger relationship.

Feedback Quality

The next major predictor in Figure 3 is feedback quality. One of the key components in ProMES is the feedback that the personnel receive on a periodical basis. This feedback is the foundation of any productivity improvements. The effects of feedback have been documented by Kluger and DeNisi (1996). These authors meta-analyzed the literature on feedback interventions and found an overall effect size of d = .41. However, there was also large variability in the results of feedback interventions; about one third of the articles in the study reported decreases in performance after feedback interventions. Kluger and DeNisi proposed a Feedback Intervention Theory

(FIT) to account for this large variability. Although FIT makes no explicit mention of the quality of the feedback, other authors have shed light on the effects of feedback quality. Ilgen and Moore (1987) reported that the quantity and quality of feedback affect both the quantity and quality of performance. Additionally, Hey, Pietruschka, Bungard, & Joens, (2000) indicated that the quantity and quality of feedback has a positive effect on the performance self-regulating work groups. Chan, Wei, and Siau (1997) also found that improving feedback quality increased computer science students' accuracy and speed. This would indicate that feedback quality is of vital importance to productivity improvement.

In ProMES, feedback quality may determine the effects that the intervention has on productivity. Larson, Glynn, Fleenor, and Scontrino (1986) argue for a multivariate approach to the quality of feedback, rather than a univariate approach focusing on specific dimensions of feedback quality. Certain elements of feedback will be especially important in the context of ProMES. The timeliness of the feedback will be essential for the unit to be able to assess their performance immediately and react to it rapidly. The literature supports the notion that greater lags between performance and feedback may limit potential gains from receiving such feedback (Borillo, 1996; Larson et al., 1986; Reid & Parsons, 1996). Additionally, different types of feedback will allow units to receive several perspectives on their productivity (e.g., subindices, overall index, percentage of maximum attainable, changes over time, graphic depictions). It will also allow the personnel to do more with the feedback, such as analyzing trends during certain times of the year, setting priorities for improvement, and setting goals.

The opportunities to discuss the feedback are also important for a quality feedback system. One way to improve the quality of feedback is by having formal feedback meetings, which is the principal feedback delivery mechanism that is used in ProMES. These meetings will be more effective when there is a greater degree of constructive discussion about the feedback and how to improve on specific areas, as opposed to discussion where the unit searches for excuses or takes a non-constructive focus (Paquin, 1997). In total, the more these criteria are present in the feedback, the greater the effect that ProMES should have on productivity.

Hypothesis 6a: There will be a positive relationship between the quality of ProMES feedback and productivity improvements.

Hypothesis 6b: The relationship between quality of ProMES feedback and productivity improvement will be moderated by the degree of similarity with the original ProMES methodology, such that cases with more similarity will show a stronger relationship.

Action on Feedback

The third major predictor in Figure 3 is Action on Feedback. Although feedback can be a useful tool to increase productivity, improvements will not occur unless effective action is taken on this feedback. Feedback can dictate the types of strategies units can take to alter their behaviors at work and improve their productivity. Changes in task strategies thus become important in determining the degree of action that is taken on ProMES feedback. In the goal-setting literature, task strategies have been shown to

mediate the relationship between a goal-setting intervention and performance (Mitchell & Silver, 1990; Weldon, Jehn, & Pradhan, 1991).

Evidence also suggests that ProMES feedback allows units to prioritize the improvements in effectiveness that will yield higher increases in productivity (Pritchard et al., 2002b). Pritchard et al. developed a way to quantitatively identify the extent to which ProMES units were prioritizing improvements on indicators based on ProMES feedback; this method will be explained more fully in the Method section. The data from Pritchard et al. (2002b) suggest that the degree to which units use this priority information more effectively will be associated with indicator level improvements that successfully improve unit productivity.

Hypothesis 7a: There will be a positive relationship between the action taken on feedback and productivity improvements.

Hypothesis 7b: The relationship between action on feedback and productivity improvements will be moderated by the degree of similarity with the original ProMES methodology, such that cases with more similarity will show a stronger relationship.

However, any action that is taken on the feedback will be influenced by the degree to which the unit knows how to interpret the feedback. Chan et al. (1997) found that providing error messages that were more easily interpretable significantly increased computer science students' performance. In the case of ProMES, more extensive training should allow the unit to understand the feedback more clearly, and thus act on it more effectively. This indicates the potential for an interaction effect to occur, where units that

are better trained on the interpretation of the feedback will be able to take more effective action on the feedback.

Hypothesis 7c: Feedback interpretation training will moderate the relationship between the action taken on feedback and productivity improvements.

METHOD

THE ProMES DATABASE

Over the last 20 years, a large database of ProMES projects has been developed (Pritchard et al., 2002). It contains data from 74 ProMES interventions from a variety of industries in 8 different countries. The ProMES facilitators, the people in charge of implementing the intervention, collected data for each project. Most of the data are at the group or unit level. The sample of jobs is diverse, including photocopier repair technicians, university professors, police officers, and circuit board manufacturers. The types of organizations are equally diverse, ranging from the military to educational settings. This database served to provide the predictor and criterion data to be used in this study, as will be described below.

To collect data on ProMES projects, a questionnaire was developed to assess factors that might influence the success of a ProMES intervention (Paquin, 1997). This questionnaire was developed by reviewing the I/O psychology literature, analyzing project descriptions, interviewing ProMES researchers in the US and Europe, and brainstorming on the part of the members of the research team. The result was a long and comprehensive questionnaire that is completed by the facilitator and/or project director. It asks for data on over 200 different variables as well as a list of the objectives, indicators, contingencies, indicator and effectiveness data. To obtain data on projects completed before the questionnaire's development, research assistants completed the questionnaire based on the literature available on each project. A copy of the complete instrument can be found on the ProMES web site (http://www.tamu.edu/promes/meta.htm).

MODEL AND VARIABLES

Model

The model presented in Figure 3 was tested empirically. In order to do this, the ProMES database provided the measures of each of the variables. Items that are representative of each independent variable were combined to form composite scores for each ProMES project. Given that some of these items may be on different measurement scales, rescaling was done when appropriate to form composite scores. The process for doing this is discussed below. These composite scores were then used to test the hypotheses. All the items in each scale and their response options are presented in Appendix A.

Predictors

Organizational Social Context. There were four scale scores for the organizational social context factor: Employee Participation, Organizational Support, Attitudes towards Productivity Improvement, and Organizational Stability.

The Employee Participation scale was composed of 7 items measuring the degree of centralization in the unit and the organization, the supervisor's influence in the design team meetings, the amount of consensus reached on major issues, the proportion of the target unit actively involved in system construction, and the degree of change that the unit's objectives and indicators underwent after management review. Table 1 presents the items that composed the Employee Participation scale. It is important to note that these items not only represent actual participation levels in the unit, but also conditions that facilitate or hinder participation and/or its effects on the unit. Items 5 through 7

Table 1

Items Composing the Employee Participation Scale.

Employee Participation
1. To what extent was the structure of the target unit centralized? ___ 5. Highly centralized. Virtually all decision-making authority rested with the supervisor of the target group. ___ 4. ___ 3. Neither. Some important decisions were made by the supervisor and some important decisions were made by target unit personnel. ___ 2. ___ 1. Highly decentralized. All target unit personnel had a say in making virtually all important decisions.
2. To what extent was the structure of the local organization centralized? ___ 5. Highly centralized. Virtually all decision-making authority rested with upper management. ___ 4. ___ 3. Neither. Some important decisions were made by the upper management and some important decisions were made by personnel at lower levels of the local organization. ___ 2. ___ 1. Highly decentralized. All personnel had a say in making virtually all important decisions.
3. What was the amount of influence the supervisor(s) had on the content of the completed system? ___ 5. System development was dominated by the supervisor(s). ___ 4. The supervisor(s) had more influence than the average person in the group. ___ 3. The supervisor(s) had about the same influence as the average person in the group. ___ 2. The supervisor(s) had less influence than the average person in the group. ___ 1. The supervisor(s) had no influence on the content of the completed system.
4. What was the degree of consensus reached on the major issues? ___ 5. Complete agreement was reached on all major issues ___ 4. Clear consensus was reached on all major issues ___ 3. Clear consensus was reached on most major issues, but not all ___ 2. Clear consensus was reached on some major issues, but not most of them ___ 1. Clear consensus was reached on only a few major issues
5. What percent of the target unit personnel in the design team were actively involved in design team meetings?
6. What percentage of the objectives were substantially changed to obtain formal management approval?
7. What percentage of the indicators were substantially changed to obtain formal approval?
8. What percent of target unit personnel were part of the design team? _____

Note. Items in italics were omitted from the final scale after reliability analyses.

were converted to a 5-point scale to place them on an equivalent metric as the first four items. The rescaling was done by taking the range of possible values and dividing it into 5 equal intervals. Values that fell into the first interval were coded as 1, those that fell into the second interval were coded as 2, and so on. For example, in items 5 through 7 in the Employee Participation scale, the range of possible values was between 0 % and 100 %, so there were five 20-point intervals in that range. Values between 0-20 percent were coded as 1, values between 21-40 % were coded as 2, and so on until all values up to 100% were accounted for. Items were coded so that higher scores reflected a greater degree of employee participation or potential for participation; this resulted in items 1, 2, 3, 6, and 7 being reverse scored. Items were reverse scored by substituting the 1-5 coding scheme for a 5-1 coding scheme. Mean imputation was used to circumvent the problem of non-equivalent composite scores in cases with missing data. The mean score for the item was substituted in cases where the datum on that item was missing.

The Organizational Project Support scale was composed of items measuring the support for the intervention offered by supervisors and managers. Table 2 lists the specific items used for this scale. All items employ a 5-point Likert scale format in which higher scores reflected a greater degree of organizational support. Mean imputation was used to circumvent the problem of non-equivalent composite scores in cases with missing data. The mean score for the item was substituted in cases where the datum on that item was missing.

Table 2

Items Composing the Organizational Project Support Scale.

Organizational Project Support
1. Highest organization level where the ProMES project was supported ___ 5. Top management: parent. The highest levels of the parent organization's management directly supported the project. ___ 4. Top management: local. The highest levels of the local organization's management directly supported the project, but not the top level of the parent organization. ___ 3. Middle management: local. Middle management of the local organization directly supported the project, but not top management. ___ 2. Lower level management: local. Lower level management of the local organization directly supported the project, but not middle or top management. ___ 1. Supervisors only. The project was supported at the supervisory level but not by any levels of management.
2. At the start of the project (i.e., when the design team started meeting), to what extent did management support the project? ___ 5. High. Management was willing to invest as many resources and support as needed to insure the success of the project, and helped the project whenever help was needed. ___ 4. ___ 3. Moderate. Management was willing to invest some resources and support in the project, and was helpful in some instances and not in others. ___ 2. ___ 1. Low. Management was unwilling to invest any resources and support in the project, and was uncooperative with people involved with the project.
3. Once the project was under way, to what extent did management continue to support the project? ___ 5. High. Management continued to be willing to invest as many resources and support as needed to insure the success of the project, and helped the project whenever help was needed. ___ 4. ___ 3. Moderate. Management continued to be willing to invest some resources and support in the project, and was helpful in some instances and not in others. ___ 2. ___ 1. Low. Management became unwilling to invest any significant resources and support in the project, and was not helpful when needed.

Table 2 (Continued).

4. At the start of the project (i.e., when the design team started meeting), to what extent did supervisors of the units support the project? ___ 5. High. Supervisors were willing to invest as many resources and support as needed to insure the success of the project, and helped the project whenever help was needed. ___ 4. ___ 3. Moderate. Supervisors were willing to invest some resources and support in the project, and were helpful in some instances and not in others. ___ 2. ___ 1. Low. Supervisors were unwilling to invest any resources and support in the project, and were uncooperative with people involved with the project.
5. Once the project was under way, to what extent did supervisors support the project? ___ 5. High. Supervisors were willing to invest as many resources and support as needed to insure the success of the project, and helped the project whenever help was needed. ___ 4. ___ 3. Moderate. Supervisors were willing to invest some resources and support in the project, and were helpful in some instances and not in others. ___ 2. ___ 1. Low. Supervisors were unwilling to invest any resources and support in the project, and were uncooperative with people involved with the project.

The Attitudes towards Productivity Improvement scale was composed of 13 items measuring the initial and subsequent attitudes towards productivity in the unit's different constituencies. Table 3 lists the specific items used for this scale. All items employed a Likert scale format, where responses are given on every line item on a scale of 1 to 5. Items were coded so that higher scores reflected more positive attitudes towards productivity improvement. Mean imputation was used to replace missing data on specific items.

Table 3

Items Composing the Attitudes Toward Productivity Improvement Scale.

Attitudes Toward Productivity Improvement
Rate each of the attitudes below using the scale below: 1. Strong disagreement 2. Moderate disagreement 3. Neutral 4. Moderate agreement 5. Strong agreement
1. How did management feel about productivity? ____ Productivity improvement is important. ____ Productivity improvement is not easy. ____ Productivity improvement is a long-term effort, not something that can be done quickly. ____ Organizational performance is heavily dependent on personnel behavior. ____ Quantitative measurement is important. ____ For a program to be good, it must be invented here.
2. How did the personnel in the target unit feel about productivity? ____ Productivity improvement is important. ____ Productivity improvement is not easy. ____ Productivity improvement is a long-term effort, not something that can be done quickly. ____ Organizational performance is heavily dependent on personnel behavior. ____ Quantitative measurement is important. ____ For a program to be good, it must be invented here.
3. Constituencies value of productivity improvement. There are a number of influential constituencies in any organization such as the target unit personnel, supervision, management, works councils, unions, professional organizations, etc. To what extent did the influential constituencies believe productivity improvement was valuable? _____ 5. All constituencies felt productivity improvement was highly valuable _____ 4. All constituencies felt productivity improvement was somewhat valuable _____ 3. One constituency did not feel productivity improvement was valuable _____ 2. More than one constituency did not feel productivity improvement was valuable _____ 1. More than two constituencies did not feel productivity improvement was valuable

Finally, the Organizational Stability scale consisted of six items measuring unit and management turnover, the degree to which there were serious problems before ProMES started, and the degree of trust between the unit and management. Table 4 presents the specific items used in the Organizational Stability scale. Because Items 1 through 3 were percentage scores, the procedure used in the Employee Participation scale was used to convert these items into a 5-point interval format. The rescaling was done by taking the range of possible values and dividing it into 5 equal intervals. Values that fell into the first interval were coded as 1, those that fell into the second interval were coded as 2, and so on. This procedure converted items 1 through 3 to a metric equivalent to that of the other three items. All items were coded so that higher scores reflected greater organizational stability; items 1 through 4 were thus reverse-scored by changing them from a 1-5 scale to a 5-1 scale. Mean imputation was once again used to replace missing data on specific items.

Table 4

Items Composing the Organizational Stability Scale.

Organizational Stability
1. What was the average percentage of the target unit personnel annual turnover during the project?
2. What percentage of turnover in management positions occurred at the local organization from the start of the project until six months after the start of feedback?
3. From the start of the project to six months after the start of feedback, what percent of managers important to initially approving the ProMES project have left the organization or gone to new positions in the organization in areas unrelated to where the ProMES work is being done?
4. To what extent were there serious problems in the target unit at the start of the project? Examples would include serious conflicts within the group or with the group and management, major organization problems, serious management problems, etc. ___ 5. There were many serious problems ___ 4. ___ 3. There were some moderately serious problems ___ 2. ___ 1. There were no meaningful problems
5. Degree of trust the target unit has in management ___ 5. Very much. Members of the target unit felt that management would never take advantage of them. ___ 4. ___ 3. Moderate. Members of the target unit trusted management would be supportive in most situations but felt they would take advantage of them occasionally. ___ 2. ___ 1. Very little. Target unit members felt that management would take advantage of them at every opportunity.
6. Degree of trust management had in the members of the target unit. ___ 5. Very much. Management felt that the target unit would never take advantage of them. ___ 4. ___ 3. Moderate. Management felt that the target unit would be supportive in most situations but felt that they would take advantage of them occasionally. ___ 2. ___ 1. Very little. Management felt that the target unit would take advantage of them at every opportunity.

Table 4 (Continued).

7. Stability of the local organization's external environment throughout the course of the project. External environment would include external customer demands, competitors, regulations, the nature of the market, etc. _____ *5. Highly stable. The external environment did not change in meaningful ways during the course of the project.* _____ *4.* _____ *3. Moderately stable. Some important features of the external environment changed, but many were quite stable during the course of the project.* _____ *2.* _____ *1. Highly unstable. Most important features of the external environment changed during the course of the project.*
8. Degree of stability of the technology in the target unit throughout the course of the project. ___ *5. The technology did not change in any meaningful way during the project.* ___ *4.* ___ *3. There were minor changes in technology during the project.* ___ *2.* ___ *1. There were major changes in technology during the project*
9. How complex were the demands on this target unit? ___ *5. Highly complex. The target unit was on the complex end of most of the complexity factors listed above.* ___ *4.* ___ *3. Moderately complex. The target unit was in the middle of most of the complexity factors listed above.* ___ *2.* ___ *1. Not complex. The target unit was on the simple end of most of the complexity factors listed above.*

Note. Items in italics were omitted from the final scale after reliability analyses.

Feedback Quality. The Feedback Quality scale consisted of items that measure the percentage of reports followed by feedback meetings, the percentage of feedback meetings attended by supervisors, and the nature of the discussion in the feedback meetings. Table 5 presents the items that composed the Feedback Quality scale. Items 3 and 4 were formed by taking the sum of the percentages of meeting time spent on

positive discussion (i.e., constructive performance feedback, constructive attempts to identify problem causes, constructive attempts to develop improvement strategies, constructive discussion about future goals, and other positive discussion). All items in this scale underwent the procedure used in the Employee Participation scale to convert percentage scores to a 5-point scale. Mean imputation was used to replace missing data.

Formation of Composite Scores. The items in each scale were summed to create composite scores. All subscales and the Organizational Social Context scale underwent an internal consistency reliability analysis (i.e., computation of coefficient alpha). Three items in the Organizational Stability Scale and two items in the Feedback Quality Scale were excluded from the calculation of the composite (see Tables 4 and 5) because their item-total correlations reduced the reliability of the scales. Coefficient alphas for each of the scales are presented in the Results section. Additionally, as depicted in Figure 3, all of the items that composed each of the scales used to test Hypotheses 1 through 4 were summed to create an Organizational Social Context composite score to test Hypothesis 5. Although a confirmatory factory analysis would be the appropriate technique to warrant the combination of these items into a scale and subscales, the number of parameters to be estimated in the model was greater than the degrees of freedom provided by the sample size, thus preventing the use of this technique.

Table 5

Items Composing the Feedback Quality Scale.

Feedback Quality
1. What percentage of feedback meetings were conducted with the supervisor present?
2. What percentage of feedback reports was followed by a meeting to discuss the feedback
3. During initial feedback meetings what percent of the meeting time was characterized by the following behaviors. (These should sum to equal 100%):
_____ Constructive feedback about performance.
_____ Constructive attempts to identify problem causes.
_____ Constructive attempts to develop improvement strategies.
_____ Constructive discussions about future goals.
_____ Irrelevant discussion.
_____ Blaming and searching for excuses.
_____ Other positive discussion. Explain:
_____ Other negative discussion. Explain:
4. After experience with feedback meetings what percent of the meeting time was characterized by the following behaviors. (These should sum to equal 100%):
_____ Constructive feedback about performance.
_____ Constructive attempts to identify problem causes.
_____ Constructive attempts to develop improvement strategies.
_____ Constructive discussions about future goals.
_____ Irrelevant discussion.
_____ Blaming and searching for excuses.
_____ Other positive discussion. Explain:
_____ Other negative discussion. Explain:
5. What was the average amount of elapsed time (in days) between the end of a measurement period and the personnel receiving the feedback report?

Table 5 (Continued).

6. Please check all of the items below which were included in the feedback report.
_____ *A list of products and indicators.*
_____ *The level of each indicator for the period.*
_____ *The effectiveness value for each indicator.*
_____ *The overall effectiveness score.*
_____ *Effectiveness data on products (i.e. the sum of the effectiveness scores for the*
_____ *Percent of maximum score(s):*
_____ *Percent of maximum was provided for the overall score.*
_____ *Percent of maximum scores were provided for products but not for individual*
_____ *Percent of maximum scores were provided for all indicators.*
_____ *Historical data; data on past feedback periods.*
_____ *The amount of change between the previous period(s) and the current data.*
_____ *Priority data; data showing the amount of change in effectiveness with changes in the*
_____ *Graphic representation of effectiveness or percent of maximum.*
_____ *Graphic representation of changes in overall effectiveness or percent of maximum over*
_____ *Other.*

Note. Items in italics were omitted from the final scale after reliability analyses.

Action on Feedback. The Action on Feedback score was composed of a measure of the degree to which units use ProMES feedback to prioritize improvements on the indicators that will yield the greatest effectiveness gains. This index requires some explanation. It was mentioned earlier that ProMES contingencies capture nonlinearities in the translation of how indicator levels reflect different gains to the organization. This can best be explained with an example. Figure 4 shows two example contingencies. The first represents the effectiveness values for different levels of an indicator, a consultant's billable hours. The second contingency represents these values for another indicator, number of associates trained. Given the nonlinearities in these two contingencies, the

gain in effectiveness that can occur in each indicator can vary depending on the unit's performance (i.e., the point on the contingency function) during a given time period. Productivity improvements can be maximized to the degree that units focus and improve on indicators that have the greatest potential gains in effectiveness at each time period.

To operationalize the degree to which units focus on indicators that will bring the greatest gains, the technique described in the following example was used. The two contingencies in Figure 4 were split into 5 equal parts along their x-axis (i.e., the range of performance on the indicator). A potential gain score was computed by determining the increase in the indicator's effectiveness score if the unit were to improve by one fifth (20%) on their performance at Time X+1. The actual gain in effectiveness points from Time X to Time X+1 was then computed. In Scenario 1 in Figure 4, the unit's billable hours are 30 and associates trained are 2 at Time 1. Therefore, the potential gain at Time 2 if the unit were to increase by 20% on both would be +67 points for an increase of 5 billable hours and +5 points for an increase of 1 Associate trained.

All ProMES units can derive their potential gain on a 20% interval (or any size) by studying their contingencies; however, there were units in which potential gain was included as part of the ProMES feedback.

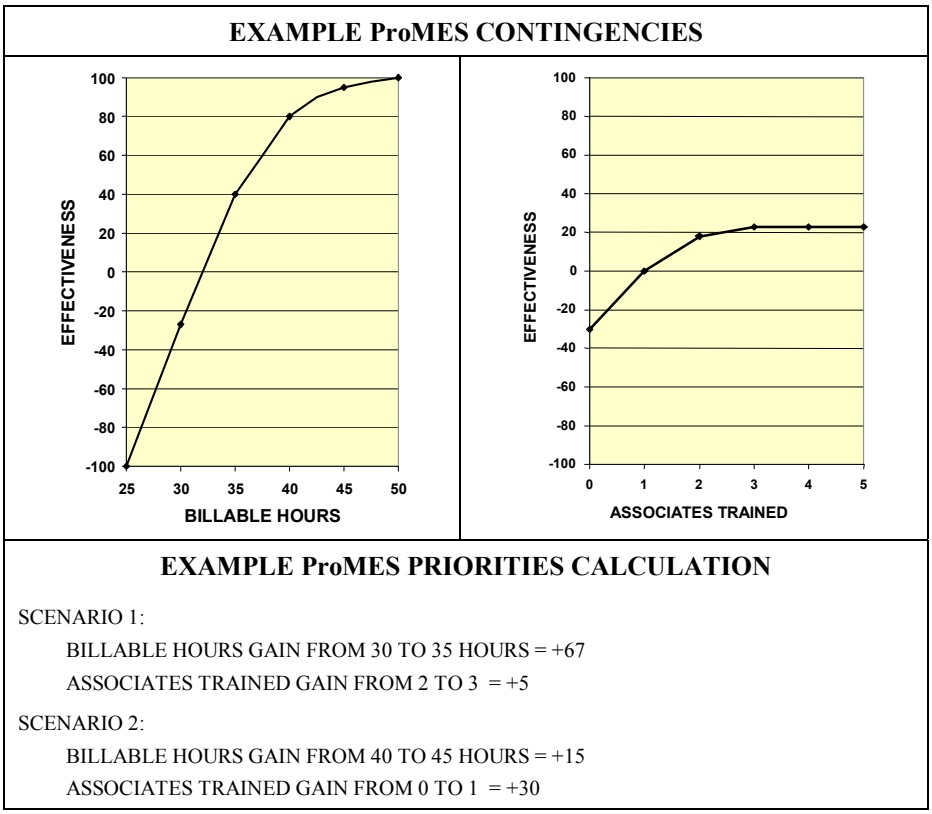

Figure 4. Examples of ProMES Contingencies and ProMES Priority Information.

To determine whether the units are truly optimizing their effectiveness gains, a correlation was computed between the potential effectiveness gains at Time 1 and the actual gains occurring at Time 2. In Scenario 1, if the unit achieved the increase to 35 billable hours but remained constant on the number of associates trained, they would have focused on the indicator that had the greatest potential for effectiveness gain. Employing this focus on all of their indicators would produce a high correlation between their potential gain and their actual gain. If the unit had employed other strategies (e.g.,

focusing on increasing the number of associates trained to 3, but remaining constant on the number of hours billed), the correlation between their potential gain and their actual gain would have been much lower.

There is one pair of potential gain – actual gain values per indicator for each period when ProMES feedback is given. These values were used to calculate a correlation during feedback between potential and actual gain across all of the unit's indicators. Each unit's correlation coefficient served as the Action on Feedback score. In order for this index to be computed, each unit needed to have the following data: inflection points for each indicator's contingency, indicator raw scores and their respective effectiveness scores for each feedback period, and effectiveness scores for at least 3 feedback periods. Indicators with non-monotonic contingencies were excluded from the analyses. To compute the use of priority information score for a given unit, the correlation between potential gain and actual gain across all indicators was computed across all of the unit's feedback periods. This produced a single correlation reflecting the degree to which the unit used priority information. This correlation coefficient was the figure that represented the Action on Feedback score.

Criteria

As shown in Figure 3, there were 3 productivity scores that were used as dependent variables.

d-score. To create an overall index of a unit's productivity, the ProMES intervention sums the effectiveness scores on all indicators for each measurement period to create an overall effectiveness score. This overall score is part of the regular ProMES feedback

report. Overall effectiveness scores were used to calculate a d-score (Hunter, Schmidt, & Jackson, 1982). This was done for each unit by calculating the difference between the mean overall effectiveness score for the Baseline and the Feedback periods and dividing this difference by the pooled standard deviation. The d-score is a valuable metric because it allows the compilation of the body of ProMES results through meta-analysis and it provides a common metric to evaluate the effectiveness of each project, regardless of the number of indicators or points in each system.

Rate of Productivity Change. The second criterion was an index of the rate of change in productivity. This index attempted to capture how quickly productivity improved. In order for this index to be meaningful, only projects with a minimum of 3 feedback periods were considered. For each project, all the baseline and feedback effectiveness scores were standardized by taking the mean of all the baseline and feedback scores, calculating the standard deviation of these scores, and expressing each score as a standard score. Standardization allows for the comparison of projects that have different maximum effectiveness scores due to different numbers of indicators. For example, a project may employ twenty indicators to measure performance, while another may only use ten. It is more likely that the first project will have a higher effectiveness score simply because the higher number of indicators allows for a higher maximum effectiveness score. However, in reality, both projects may be performing at an equal proportion of maximum effectiveness. Standardization thus provides a metric that allowed for comparisons to be made across projects.

After standardizing the effectiveness scores, the slope of the line of the baseline effectiveness mean and the first third of the feedback effectiveness scores was calculated for each project. This variable required a minimum of 3 feedback periods for the unit to be included in the computation; this resulted in the exclusion of 6 of the 62 units with productivity data. This slope was calculated by using the number of measurement periods during this first third of feedback as the x-coordinates and the overall effectiveness score standardized within each unit as the y-coordinates. The measurement period that was used in this calculation was one month, which was the measurement period in 81% of the units (n=60) used in the analyses. Two projects employed a biweekly measurement period, and these projects' feedback effectiveness scores were averaged to form the equivalent of a monthly measurement. All other units employed measurement periods (e.g., 15 weeks) that made comparisons to units using the monthly measurement period difficult, and were thus excluded from the computation of this index. This slope provided a measure of the magnitude and the direction of the change in effectiveness from baseline to the first third of the feedback periods. Therefore, the slope was used to operationalize the rate of change in effectiveness. Steeper slopes (larger numbers) indicated a larger increase in effectiveness from baseline through the first third of feedback, and also indicated how quickly the increase in performance took place during that first third of feedback.

Sustainability in Productivity Improvement. Although it is interesting to see if there is an increase in productivity once ProMES feedback begins, it is also important to know whether any increases in performance are maintained over time. To determine whether

productivity gains in ProMES were maintained, a sustainability variable was created according to 2 decision rules: the unit needed to have at least 6 periods of feedback and the d-score from baseline to the first third of feedback needed to be at least .3, indicating that there had been some productivity improvement; these criteria resulted in the exclusion of 34 of the 62 units with productivity data. Thirteen units were excluded because they had less than 6 feedback periods, seven were excluded because of d-scores lower than .3, and 14 were excluded for failing to meet both requirements. For the units that met these criteria, the slope of the line of standardized overall effectiveness scores for the last two thirds of feedback was computed. This slope coefficient operationalized the sustainability variable.

Moderators

The two moderator variables used in this study were measured with the items displayed in Table 6. To test Hypotheses 5b, 6b, and 7b, the degree of match variable was operationalized via a single item (shown in the upper part of Table 6). To test Hypothesis 7c, the three items in the lower part of Table 6 were aggregated to form the Feedback Interpretation Training score.

Table 6

Moderator Variables.

Degree of Match
Overall, how closely did the development and implementation of the system in this setting match the process outlined in the 1990 ProMES book? _____ 5. Very closely. That process was followed as closely as possible. _____ 4. Closely. That process was followed with only minor changes. _____ 3. Moderately. A few meaningful changes were made. _____ 2. Not closely. Several substantial changes were made. _____ 1. Very differently. Many substantial changes were made.
Feedback Interpretation Training
1. What type of training did members of the target unit receive to help them read and interpret the data in the feedback report? ___ 5. The system was explained in great detail to the target unit and they were given examples of feedback data and how they would be used. (Use this response if the entire unit was on the design team.) ___ 4. ___ 3. The system and how it worked was explained to the entire unit in a meeting or other formal way. ___ 2. ___ 1. No formal training was done other than the design team informally explaining the system to their peers.
2. What type of training did supervisors receive to help them read and interpret the data in the feedback report? ___ 5. The system was explained in great detail to the supervisors and they were given examples of feedback data and how they would be used. (Use this response if the entire unit was on the design team.) ___ 4. ___ 3. The system and how it worked was explained to the supervisors in a meeting or other formal way. ___ 2. ___ 1. No formal training was done other than design team informally explaining the system to their supervisors.
3. What type of training did management receive to help them read and interpret the data in the feedback report? ___ 5. The system was explained in great detail to management and they were given examples of feedback data and how they would be used. ___ 4. ___ 3. The system and how it worked was explained to management in a meeting or other formal way. ___ 2. ___ 1. No formal training was done other than design team members informally explaining the system to management.

RESULTS

DESCRIPTIVE STATISTICS AND ZERO-ORDER CORRELATIONS

Table 7 presents the descriptive statistics and intercorrelations for the variables of interest to this study. The sample used to compute correlations with the dependent variables differed from the sample used to compute predictor intercorrelations because not all units had complete productivity data. Coefficient alpha for most of the scales was acceptable (ranging from .75 to .88). The one exception was the Employee Participation scale, with an $\alpha = .52$. The potential for measurement or specification error using this scale is a concern, and results should be interpreted with caution. The significant intercorrelations among the subscales composing the Organizational Social Context scale (Employee Participation, Organizational Project Support, Attitudes towards Productivity Improvement, and Organizational Stability) provide support for the aggregation of these scales into the broader composite. This aggregation is further supported by a coefficient alpha of .88 for the Organizational Social Context scale. The mean for the Action on Feedback variable presented in Table 7 is actually the zero-order correlation between the potential effectiveness gain and the actual effectiveness for each indicator across all units and feedback periods. The table indicates that, in general, units made the largest effectiveness gains in the indicators that had the most potential for improvement ($r = .16$, $p < .01$, $N = 4094$). However, the magnitude of the correlation was small.

Table 7

Means, Standard Deviations, and Intercorrelations among Study Variables.

Variable	*M*	*SD*	*k*	1	2	3	4	5	6	7	8	9	10	11	12
1. Employee Participation	25.98	2.43	7	(.52)											
2. Organizational Project Support	21.47	3.04	5	.23*	(.82)										
3. Attitudes Towards Organizational Productivity	48.88	6.35	13	.36**	.47**	(.81)									
4. Organizational Stability	23.54	3.65	6	.45**	.52**	.63**	(.82)								
5. Organizational Social Context	119.86	12.24	31	.58**	.69**	.89**	.84**	(.88)							
6. Feedback Quality	15.71	2.80	4	.03	-.11	.13	.06	.07	(.75)						
7. Action on Feedback[a]	.16*	-	-	-.41*	-.23	-.30	-.39*	-.38*	.25	-					
8. Degree of Match	4.26	.90	1	.01	-.01	.23*	.22*	.18	.42**	.38*	-				
9. Feedback Interpretation Training	10.11	1.20	3	-.11	.25*	.16	-.02	.12	.06	-.03	.02	(.50)			
10. *d*-score [b]	1.14	1.71	-	-.16	-.31	-.13	-.19	-.23	.32**	.41* [a]	.40**	-.04	-		
11. Rate of change [c]	.15	.77	-	.14	-10	.31*	.17	.20	.33**	.33* [a]	.47**	-.11	.48**	-	
12. Sustainability [d]	-.02	.21	-	-.34	-.29	-.16	-.05	-.23	-.39	.01 [a]	.16	-.14	.00	-.04	-

Note. $N = 74$ unless otherwise noted. Coefficient alpha for each scale is presented along the diagonal in parentheses. k = number of items in scale.
* $p < .05$ (one-tailed) ** $p < .01$ (one-tailed)
[a] N <= 30 for marked correlations
[b] N = 62 for the correlations in row 8.
[c] N = 56 for the correlations in row 9.
[d] N = 28 for the correlations in row 10.

Although all the Social Context variables were significantly intercorrelated, the correlations were low enough to indicate that each variable brought unique variance (all *r*s < .65). However, Attitudes and Organizational Stability correlated more highly with the Social Context composite (*r*s > .8) than Employee Participation and Organizational Support. Social Context and Feedback Quality were largely independent of each other, r =.07. In regards to the criteria, the *d*-scores and the rate of change index were highly related ($r = .48$, $p < .01$), but the sustainability index was unrelated to the other two criteria.

Hypotheses 1 through 4 tested the components of the Organizational Social Context factor: Employee Participation, Organizational Support for the Intervention, Attitudes towards Productivity Improvement, and Organizational Stability. Statistical significance testing for all the hypotheses in this study was conducted at an $\alpha = .05$ significance level. Hypothesis 1, which proposed the positive relationship between employee participation and productivity improvement, was not supported in the zero-order correlations. There was no support for Hypothesis 2 either, which suggested a positive relationship between organizational support for the intervention and productivity improvement. The zero-order correlations showed some support for Hypothesis 3, the positive association between attitudes and productivity improvement; although the correlations of attitudes with *d*-scores ($r = -.13$) and sustainability ($r = -.16$) were not significant, the correlation with the rate of change index was positive and significant ($r = .31$, $p < .05$). This indicated that units with more positive attitudes towards productivity improvement also made faster productivity improvements over the first third of feedback.

Hypothesis 4, which predicted a positive association between organizational stability and productivity improvement, was not supported. Hypothesis 5 was tested by taking the composite of the scales used to test Hypotheses 1-4 to form the Organizational Social Context composite. Although a positive association was predicted between Social Context and productivity improvement, results indicated that there was no significant relationship. There was strong support for Hypothesis 6, the positive association between feedback quality and productivity improvement. Feedback quality was positively correlated with *d*-scores ($r = .32$, $p < .01$) and the rate of change index ($r = .33$, $p < .01$), but it was also negatively correlated with sustainability ($r = -.39$, $p < .05$). This indicated that units that received higher quality feedback had larger productivity improvements after the onset of ProMES feedback and also achieved those improvements more rapidly. However, these units were also unable to sustain the productivity improvements achieved during the first third of feedback. There was also strong support for Hypothesis 7, which proposed the positive correlation between action on feedback and productivity improvement. Action on feedback was significantly correlated with *d*-scores ($r = .41$, $p < .05$) and the rate of change index ($r = .33$, $p < .05$), indicating that units that made improvements on the indicators that would bring them the greatest effectiveness score gains also achieved larger and faster productivity improvements.

REGRESSION ANALYSES

To get a more comprehensive, multivariate understanding of the relationships in the data, multiple regression analysis was used to formally test Hypotheses 1 through 7. To test the hypotheses relating the components of Social Context (Hypotheses 1 through

4), analyses were performed regressing each of the three productivity criteria on Employee Participation, Organizational Project Support, Attitudes towards Organizational Productivity, and Organizational Stability simultaneously. Table 8 presents the results of this first set of regression analyses.

The overall *F* test was significant only for the regression equation predicting the rate of change index, F (4, 51) = 2.76, p = .04, explaining 18% of the variance in the rate of productivity change. However, only the regression coefficient for Attitudes towards Productivity Improvement (β = .41, t = 2.44, p = .02) was significant. These results displayed some support for Hypothesis 3, which predicted a relationship between attitudes and productivity improvement. Holding all other factors constant, an increase of .41 standard deviations in the Attitudes scale is expected to result in a one standard deviation increase in productivity per time period. However, results ran contrary to Hypothesis 2, which predicted a positive association between organizational support and productivity improvement. Holding all other factors constant, one would expect an increase of .34 standard deviations in the Organizational Project Support scale to result in a one standard deviation decrease in productivity per time period. Similar results were found when regressing the *d*-scores (β = -.34, t = -2.02, p = .04) and the sustainability index (β = -.36, t = -1.64, p = .12) on Organizational Support.

Table 8

Summary of Ordinary Least Squares Regressions for Organizational Social Context Components.

Criterion	Predictor	B	SE B	β
d-score	Employee Participation	-.08	.10	-.11
	Organizational Project Support	-.17	.08	-.30
	Attitudes	.02	.05	.06
	Organizational Stability	-.01	.08	-.14
	F (4, 57) = 1.72			
	R^2= .11			
Rate of Productivity Change	Employee Participation	.01	.05	.03
	Organizational Project Support	-.09	.04	-.34
	Attitudes	.05	.02	.41*
	Organizational Stability	.01	.04	.07
	F (4, 51) = 2.76 *			
	R^2 = .18			
Productivity Sustainability	Employee Participation	-.03	.02	-.39
	Organizational Project Support	-.02	.02	-.36
	Attitudes	-.00	.01	-.08
	Organizational Stability	.02	.02	.36
	F (4, 23) = 1.76			
	R^2 = .23			

* $p < .05$

In sum, this first set of regression analyses provided no support for Hypothesis 1, the positive association between employee participation and productivity improvements. Given that the construct validity of the Employee Participation scale was questionable,

additional correlation analyses were performed using only the items in the scale that directly measured employee participation (Items 5 and 8 in Table 1), but these provided no significant correlations with any of the criteria. Results were opposite to the relationship proposed by Hypothesis 2, the positive association between organizational support for productivity-enhancing interventions and productivity improvements. There was some support for Hypothesis 3, the positive association between organizational members' attitudes towards productivity improvement and actual productivity improvements. Finally, there was no support for Hypothesis 4, the positive association between organizational stability and productivity improvements.

To test the effects of the major factors proposed in Figure 3 on productivity improvement, analyses were performed regressing each of the productivity criteria on Organizational Social Context, Feedback Quality, and Action on Feedback. Action on Feedback was tested in a separate univariate regression analysis because the data available for this variable only accounted for 50% of the cases available to test the hypotheses concerning organizational social context and feedback quality.

Table 9 presents the results of the ordinary least squares regression analyses used to test the effects of organizational social context and feedback quality. Hypothesis 5a proposed a positive relationship between organizational social context and productivity improvement, and Hypothesis 6a proposed a positive relationship between feedback quality and productivity improvement. The overall F test was significant for the regression equation predicting the d-score, F (2, 59) = 5.96, $p < .01$, explaining 17% of

Table 9

Summary of Ordinary Least Squares Regressions for Organizational Social Context and Feedback Quality.

Criterion	Predictor	B	SE B	β
d-score	Organizational Social Context	-.04	.02	-.25
	Feedback Quality	.21	.07	.34**
	F (2, 59) = 5.96 **			
	R^2= .17			
Rate of Productivity Change	Organizational Social Context	.01	.01	.18
	Feedback Quality	.09	.04	.32*
	F (2, 53) = 4.45 *			
	R^2 = .14			
Productivity Sustainability	Organizational Social Context	-.00	.00	-.20
	Feedback Quality	-.03	.01	-.37
	F (2, 25) = 2.92			
	R^2 = .19			

* $p < .05$ ** $p < .01$

the variance in *d*-scores. The regression predicting the rate of change index was also significant, F (2, 53) = 4.45, p = .02, explaining 14% of the variance in the rate of productivity change. An examination of the regression coefficients showed that there was no support for Hypothesis 5a. There were no significant, positive regression coefficients for the organizational social context variable in any of the regression equations. However, the results in Table 8 indicate support for Hypothesis 6a; the regression coefficients predicting the *d*-score (β= .34, $p < .01$) and the rate of change index (β= .32,

$p < .05$) were both positive and significant. Holding all other factors constant, we would expect an increase of .34 standard deviations in the Feedback Quality scale to result in a one standard deviation increase in *d*-score. Similarly, an increase of .32 standard deviations in the Feedback Quality scale is predicted to result in a one standard deviation increase in productivity per time period. Despite these results, the regression coefficient predicting the sustainability index was significant but negative ($\beta = -.37$, $p < .05$), contrary to the relationship posited in the hypothesis.

To test Hypotheses 5b and 6b, hierarchical regression analyses were performed to allow the test for moderators via interaction terms entered at the second step of the equation. Following the recommendations of Jaccard, Turrisi, and Wan (1990), both predictors and criteria were standardized, and cross-products were formed from the standardized scores to perform moderation analyses. This prevents the statistical software packages from erroneously computing the interaction regression coefficient as b_3z_{12}, instead of $b_3z_1z_2$. In situations where this procedure is performed, the unstandardized regression coefficients should be interpreted because they are equivalent to standardized coefficients (Jaccard et al., 1990).

Table 10 presents the results of the hierarchical regression analyses using the three productivity criteria. Hypothesis 5b proposed a moderating effect of degree of match on the relationship between organizational social context and productivity improvement. An analysis of the interaction terms composed by organizational social context and degree of match at the second step of the hierarchical regression tested for the moderation. The only significant interaction occurred when predicting *d*-scores ($\beta = -.27$, $t = -2.20$, $p =$

Table 10

Hierarchical Regression Analyses of Productivity Indices on Organizational Social Context, Feedback Quality, and Degree of Match.

Criterion and Step	β		R^2	ΔR^2
	At step	Final		
d-score				
1. Organizational Social Context	-.31	-.21		
Feedback Quality	.18	.25		
Degree of Match	.38**	.33*	.28**	.28**
F (3, 54) = 7.10**				
2. Organizational Social Context x Degree of Match	-.27*	-.27*		
Feedback Quality x Degree Of Match	.11	.11	.35**	.07
F (5, 52) = 5.59**				
Rate of Productivity Change				
1. Organizational Social Context	.12	.15		
Feedback Quality	.17	.06		
Degree of Match	.37**	.37*	.26**	.26**
F (3, 49) = 5.60**				
2. Organizational Social Context x Degree of Match	-.11	-.11		
Feedback Quality x Degree Of Match	-.15	-.15	.29**	.03
F (5, 47) = 3.79**				
Productivity Sustainability				
1. Organizational Social Context	-.26	-.31		
Feedback Quality	-.52	-.41		
Degree of Match	.42*	.43*	.31*	.31*
F (3, 25) = 3.75*				
2. Organizational Social Context x Degree of Match	.16	.16		
Feedback Quality x Degree Of Match	.14	.14	.36	.05
F (5, 23) = 2.53				

* $p < .05$ ** $p < .01$

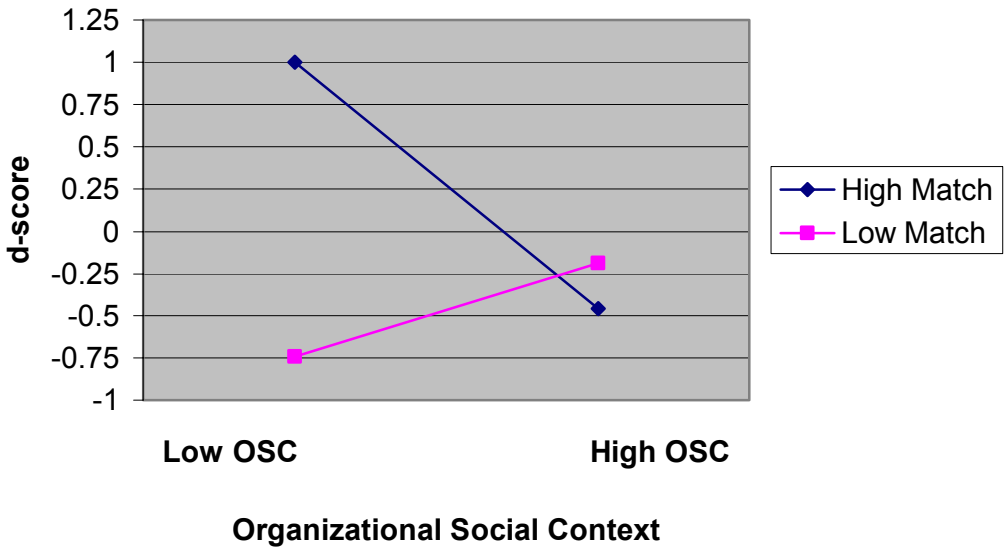

Figure 5. Significant interaction between organizational social context and degree of match on unit *d*-score.

.03). This interaction is displayed in Figure 5. The moderating effect of degree of match is opposite to that proposed by Hypothesis 5b, which stated that the positive relationship between organizational social context and productivity improvements would be enhanced by a greater match with the original ProMES methodology. As evidenced in Figure 5, units that implemented ProMES with close similarity to the original process displayed a strong negative correlation between organizational social context and the *d*-score.

An analysis of the interaction terms at the second step of the hierarchical regression was also used to test Hypothesis 6b, which proposed that degree of match would serve as a moderator between feedback quality and productivity improvement.

There were no significant results for the interaction terms composed by feedback quality and degree of match in the hierarchical regression analyses, lending no support for Hypothesis 6b.

Hypothesis 7a proposed a positive relationship between the action that units took on feedback and productivity improvements. Hypothesis 7a was tested in a separate regression equation with action on feedback as the sole predictor because the data available for this variable only accounted for 50% of the cases available to test Hypotheses 5a and 6a. Results of these analyses are presented in Table 11. The overall *F* test was significant for the regression equation predicting the *d*-score, $F\ (1, 28) = 5.59$, $p = .03$, explaining 17% of the variance. The regression predicting the rate of change index explained 11% of the variance in the rate of change index but results only approximated statistical significance, $F\ (1, 27) = 3.26$, $p = .08$. Overall, these results provide support

Table 11

Summary of Ordinary Least Squares Regressions for Action on Feedback Variable.

Criterion	B	SE B	β	*F*	R^2
d-score	1.67	.71	.41*	5.59 *	.17*
Rate of Productivity Change	.61	.34	.33	3.26	.11
Productivity Sustainability	.00	.13	.01	.00	.01

* $p < .05$

for Hypothesis 7a.

Hierarchical regression analysis was once again used to test for the moderating relationships proposed in Hypotheses 7b and 7c; results of these analyses are displayed in Table 12. Hypothesis 7b proposed a stronger relationship between action on feedback and productivity improvement in units that implemented ProMES with greater similarity to the original methodology. The interaction term composed by the product of the Action on Feedback and Degree of Match variables approached statistical significance when predicting *d*-scores ($\beta = .45$, $t = 1.82$, $p = .08$) and was significant when predicting sustainability in productivity improvements ($\beta = .82$, $t = 2.54$, $p = .03$). A graphical representation of these interactions is presented in Figures 6 and 7. In Figure 6, the interaction effect obtained when predicting *d*-scores displays a trend supporting Hypothesis 7b, where there are larger *d*-scores in units that had both a closer degree of match with the ProMES methodology as well as more effective action taken upon receiving ProMES feedback. However, the significant interaction obtained when predicting sustainability displayed results that provided little support for Hypothesis 7b (see Figure 7). Units with low Action on Feedback scores sustained their productivity levels more effectively in situations where there was low degree of match. But in situations where there was high degree of match, units with high Action on Feedback scores sustained their productivity improvements less effectively than units with a high degree of match with ProMES methodology. In sum, the hierarchical regression analyses provided little support for Hypothesis 7b.

Table 12

Hierarchical Regression Analyses of Productivity Indices on Action on Feedback, Degree of Match and Feedback Interpretation Training.

Criterion and Step	β		R^2	ΔR^2
	At step	Final		
d-score				
1. Action on Feedback	.31	.10		
FB Interpretation Training	-.04	-.14		
Degree of Match	.31	.38*	.25	-
F (3, 27) = 2.92				
2. Action on Feedback x Degree of Match	.45	.45		
Action on Feedback x FB Interpretation Training	-.32	-.32	.37	.12
F (5, 25) = 2.98*				
Rate of Productivity Change				
1. Action on Feedback	.19	.17		
FB Interpretation Training	-.12	-.10		
Degree of Match	.41*	.43*	.27	-
F (3, 26) = 3.14*				
2. Action on Feedback x Degree of Match	.02	.02		
Action on Feedback x FB Interpretation Training	.03	.03	.27	.00
F (5, 24) = 1.74				
Productivity Sustainability				
1. Action on Feedback	-.03	-.59		
FB Interpretation Training	-.14	.06		
Degree of Match	.17	.47	.05	
F (3, 15) = .25				
2. Action on Feedback x Degree of Match	.83*	.83*		
Action on Feedback x FB Interpretation Training	.35	.35	.41	.36*
F (5, 13) = 1.82				

* $p < .05$

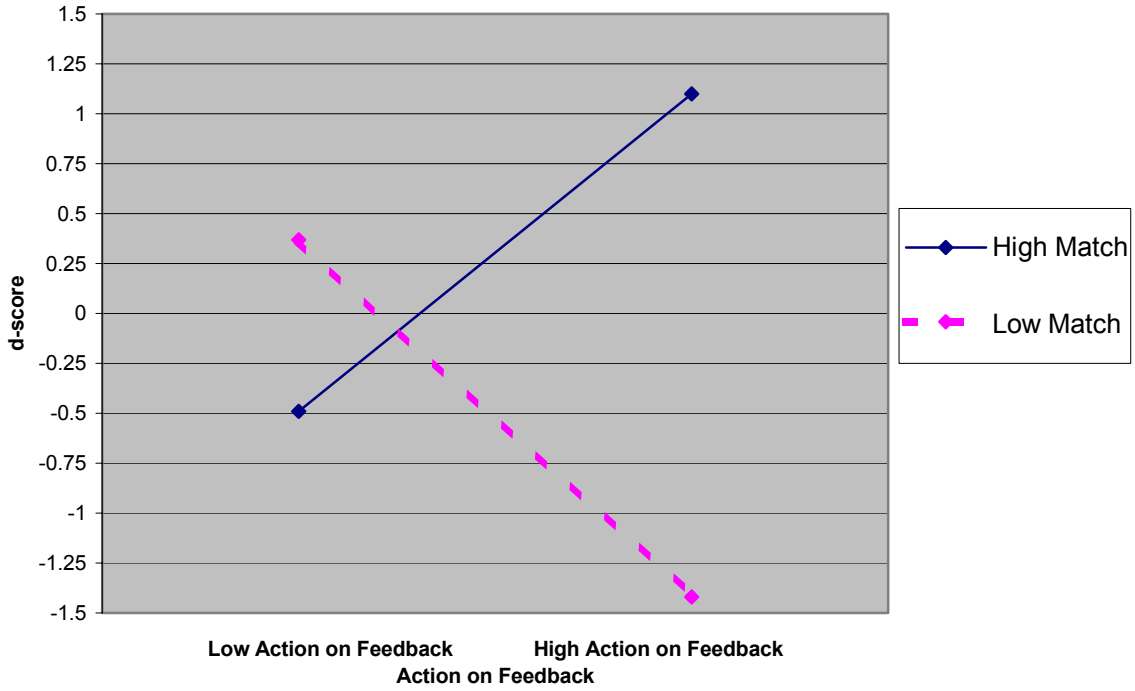

Figure 6. Interaction between action on feedback and degree of match when predicting *d*-scores.

Hypothesis 7c proposed a moderating effect of feedback interpretation training on the relationship between action on feedback and productivity improvement. The interaction terms composed by the product of action on feedback and feedback interpretation training that were entered in the second step of the hierarchical regression were not significant for any of the criteria. These results suggested no support for Hypothesis 7c.

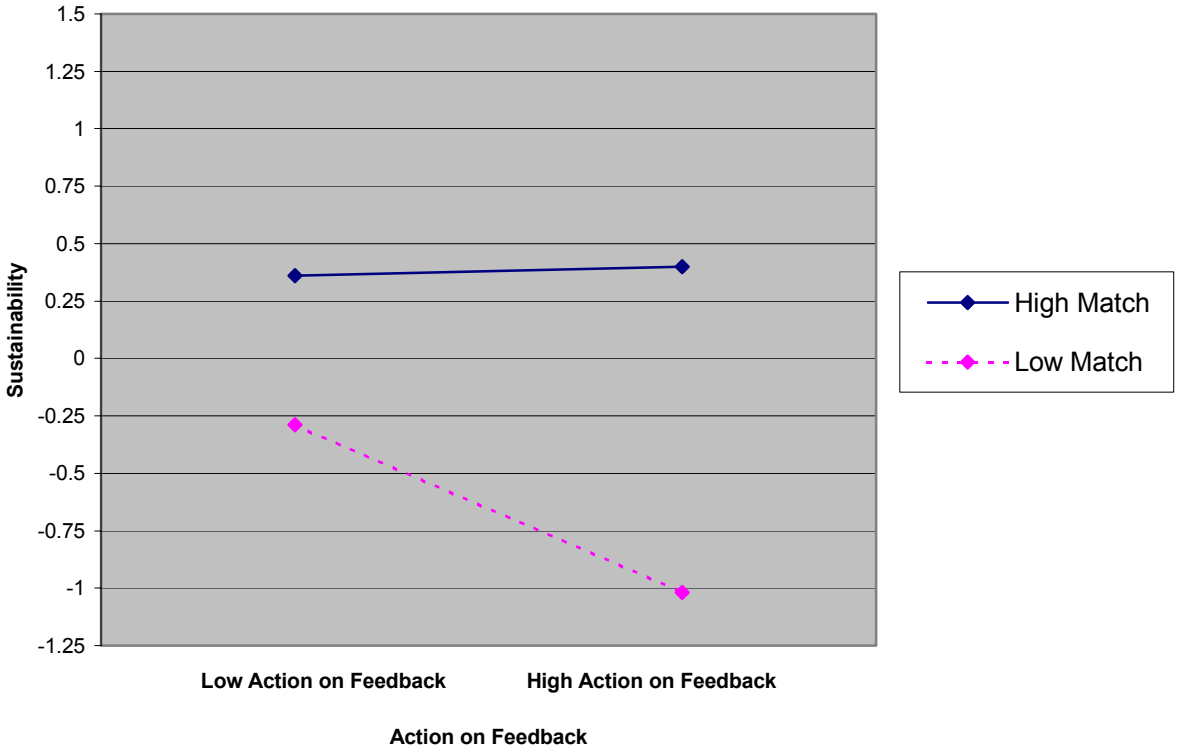

Figure 7. Significant interaction between action on feedback and degree of match when predicting productivity sustainability.

SUMMARY AND CONCLUSION

SUMMARY OF FINDINGS

There was partial support for the hypothesized relationship between attitudes towards productivity improvement and productivity gains. Attitudes significantly predicted faster rates of productivity improvement in ProMES units; however, they did not predict the sustainability of productivity improvements, a finding that further explains the lack of a significant relationship with the *d*-scores. The social psychology literature points to cases where the predictive effects of one-time attitude measures wane over time (Currey, 1999; Davidson & Jaccard, 1979; Kubicka, Csemy, Duplinsky, & Kozeny, 1998). However, in this study, it is difficult to determine the effects that attitudes had on productivity improvement because attitudinal ratings were made by a third party at different times (see Limitations section). A longitudinal assessment of attitudes at different times in the ProMES process might provide a clearer picture of the nature of the attitude-productivity improvement relationship. The tentative hypothesis suggested from these results is that attitudes may be a stronger predictor of behavior (i.e., productivity improvement) during the initial phases of feedback because employees do not have a comprehensive picture or reference point of the behavioral change that will need to take place to improve productivity. In terms of the NPI Motivation Theory, there is an unclear perception of the act-to-product contingency. Therefore, individuals might be more willing to engage in different behaviors and/or reallocate effort across behaviors if they have positive attitudes towards productivity improvement. However, as the nature of the behavioral changes (act-to-product contingencies) that must accompany

productivity improvements becomes clearer, individuals' attitudes and/or behavioral intentions might change, explaining the lack of a significant relationship between attitudes and the overall effect size.

There was strong support for the positive association between feedback quality and productivity improvements. The zero-order correlations presented in Table 7 and the regression analyses in Table 8 pointed to feedback quality as being significantly related to both larger and faster productivity improvements. It is interesting to note that this effect was reduced in the hierarchical regression analyses. The high correlation between feedback quality and the degree of match variable, and the potential multicollinearity caused by these two variables could have led to the reduction in the predictive power of feedback quality. However, the high correlation between these two variables is not surprising because providing high-quality, constructive feedback in a team setting is part of the methodology proposed in Pritchard (1990). Therefore, the effects of feedback quality may be subsumed under the degree of match variable. Including both variables as predictors might have resulted in the unique variance that feedback quality contributed to predicting productivity improvement being obscured. Nonetheless, the analyses *sans* the degree of match variable indicate that feedback quality does contribute to productivity improvements.

The results also indicated support for the relationship between action on feedback and productivity improvements. Although the analyses for this variable were conducted with only a subset of all the units available, the trends displayed in the results indicate that units that prioritized improvements on the indicators that would bring the greatest

effectiveness gains also had the greatest and fastest productivity improvements. This indicates that although feedback quality is an important determinant of productivity improvement, effective use of and action on the feedback also contributes to increases in productivity.

There was little support for the rest of the factors hypothesized to predict productivity improvements in this study. Employee participation, organizational stability, and the organizational social context were found to not have a significant relationship with productivity improvement. In the case of employee participation, the low reliability of the scale used in this study could have contributed to the absence of a significant relationship. So although the results of this study do not point to participation as one of the key factors leading to productivity improvement, anecdotal accounts from other ProMES works (Pritchard et al., 1995) and meta-analysis results (Wagner, 1994) warrant another examination of this relationship with more reliable measures. The effects of organizational stability and the organizational social context on productivity improvement could have been also ameliorated due to measurement issues. Although both scales had acceptable reliabilities, the unidimensionality of the organizational stability scale was somewhat questionable, even though all items included in it were rationally hypothesized to affect stability. In the case of the organizational social context scale, the lack of an adequate sample size prevented a confirmatory factor analysis of the measurement model, which could have pointed to the adequacy or inadequacy of the model fit. In both cases, the use of refined measures and a larger sample size should provide a clearer picture of the nature of these relationships.

Additionally, there was no support for the moderators proposed in this study. Although the moderating effects of the degree of match variable were not in the directions predicted, it consistently displayed strong main effects when predicting productivity improvement. This suggests further examination of what exactly constitutes a high or low degree of match with the ProMES methodology. The current single-item measure posed some limitations in the reliable measurement of the degree of match variable. A more specific identification of the core features that define whether a unit implements ProMES with a close similarity or not might shed light behind the results in this study.

Organizational support for the intervention was found to have an effect opposite to the one predicted; results indicated that higher levels of organizational support resulted in declines in productivity. One of the potential explanations for these results is that the Organizational Project Support scale measured support by managers and supervisors, and not necessarily the unit personnel that would be doing the work. So although there might have been financial, logistical, and leadership support for ProMES, the level of grassroots support "in the trenches" was unknown. This is arguably the population of greatest interest in the measurement of support because it is the unit personnel who are going to be performing the behaviors that will lead to productivity change. An expansion of the Organizational Project Support scale that includes an assessment of the unit's support and is completed by the unit personnel (see Limitations section) would provide more insights into the effect of support on productivity improvement.

CONCLUSIONS

This study attempted to identify factors that contribute to productivity improvement as suggested by Hackman's (1984) call to examine the influences on productivity not in isolation but in the complex tangle they typically work in. The goal would be to have specific prescriptions for managers and practitioners that would allow them to measure and improve productivity more accurately and effectively. Although most of the hypotheses proposed in this study were not supported, there are a few prescriptions that can be handed out.

Attitudes towards productivity improvement seemed to be somewhat effective in predicting productivity improvements. Positive attitudes might have a positive effect specifically during the initial phases of ProMES implementation and might be able to affect intentions and behaviors in ways that contribute to productivity improvement. However, more research is needed before determining the exact mechanisms by which attitudes contribute to productivity improvements.

Feedback quality was found to be a strong contributor to productivity improvements in ProMES. These results provide additional support to aspects of Kluger and DeNisi's (1996) Feedback Intervention Theory. These authors proposed that the effects of feedback interventions on performance are increased by cues that point to both task-learning processes and information regarding erroneous hypotheses. The Feedback Quality scale used in this study captured themes similar to these cues, such as the time spent developing improvement strategies and the time spent identifying problem causes. There is the possibility that productivity improvements occur when units employ the cues

gathered during feedback meetings to identify correct and incorrect task strategies and develop new task strategies. Kluger and DeNisi argue that performance is improved through task learning processes; however, there is also the possibility that the motivational processes are also triggered through improvements in the units' act-to-product contingencies (Naylor et al., 1980). An additional contributor to the quality of the feedback meetings is the degree of time spent discussing future goals. This discussion leads to constructive intention formation, which ultimately increases the likelihood that the unit will engage in productivity-enhancing behaviors. The implications of these results are especially pertinent to people in charge of delivering group and unit-level feedback. The degree to which these feedback providers can guide constructive discussion around performance, task strategies, problem areas, and future goals will dictate the kind of productivity improvements that the unit will be able to achieve.

The final contributor to productivity improvement identified in this study was action on feedback, the degree to which units prioritized their improvements on indicators that would bring them the greatest gains. Feedback can serve a cueing function describing where a unit is on a productivity index relative to where it should be (Nadler, 1979). However, ProMES provides an additional dimension to the feedback by cueing the units to the importance of improving productivity indicators at every measurement period, not only in relation to organizational goals, but also in relation to each other. At that point, it is the unit's responsibility to act on the specific indicators that will bring the greatest gains, and the results of this study indicate that those that do act on those cues also have greater productivity improvements. Thus, there are two principal messages that

can be delivered to practitioners based on the action on feedback variable. The first is that feedback on productivity indices should contain this double-cueing function, providing data relative to organizational goals as well as relative to the rest of the productivity indices that are relevant to the unit.

Nonetheless, a major conclusion from this study is that there needs to be more research on the factors proposed. The rest of the factors proposed in this study should not be discarded that easily, at least until they can be revisited with a different research design and methodology, as is discussed further in the Limitations and Future Research sections.

LIMITATIONS

Although this study contained an international sample of organizational units representing different industries and job types, it was nonetheless a small sample to conduct multivariate hypothesis testing. Although the merits of significance testing have been questioned (Cohen, 1994; Schmidt, 1992; Schmidt, 1996), it still provides a useful method for arriving at closer approximations to population parameters via the rejection of null hypotheses (Cortina & Dunlap, 1997). The small sample provided little power for hypothesis testing (Cohen, 1992) and was a severe hindrance to the use of multivariate statistics that would have allowed for a better specification of measurement and structural models underlying the data (Anderson & Gerbing, 1988). The problems with the small sample size were exacerbated by missing data on both the predictor and criterion sides for many units.

Another limitation inherent in this study is the nature and utilization of the data. This study did not employ direct measures of some of the constructs that were hypothesized to explain the variance in productivity improvement; instead, once hypotheses regarding constructs had been formed, items to operationalize those constructs were searched for in the database. This is partly reflected by the low to moderate levels of internal consistency reliability in the scales. The more important issue, however, is the unidimensionality (or lack thereof) of these scales. Although coefficient alpha was acceptable in most of the scales, it is no indication that the scale is solely measuring the construct of interest (Cortina, 1993). Sample size again played a part in addressing this issue by limiting the use of an exploratory factor analysis that could have provided stable and interpretable solutions.

The nature of the data collection is another issue that tempers any conclusions that can be drawn from this study. As discussed in the Method section, the questionnaire used in this study was typically completed by the people implementing ProMES, and did not involve data collection from individuals who formed part of the work unit or organization. This resulted in the data consisting of third-party accounts of individual and/or group-level attributes and characteristics. Although the long time spent with the units by these ProMES facilitators makes them appropriate respondents to implementation and logistical questions, it is less certain whether it also qualifies them to make inferences on other attributes (e.g., attitudes, levels of support). Additionally, most of these questionnaires were responded to in a post hoc fashion after feedback in the unit had been ongoing for some time, allowing the potential for these delayed ratings to be

less accurate (Heneman & Wexley, 1983) or be subject to social desirability response sets (Moorman & Podsakoff, 1992). Additionally, there is the possibility that knowledge of the unit's results may affect respondents' ratings in the questionnaire (Falk & Bayroff, 1954). Finally, there is a possibility that the raters were an additional source of error variance in the ratings because there were several ProMES facilitators who completed the questionnaire on more than one project. Partitioning out the variance due to raters in a generalizability study (Shavelson, Webb, & Rowley, 1989) may provide closer estimates of the true or universe score for some of these measures.

On conceptual grounds, it is a certainty that the prediction model tested in this study is not fully specified (Cohen , Cohen, West, & Aiken, 2002). There are predictors that went unmeasured and should definitely have an impact on productivity improvement (e.g., organizational and group norms, ability levels). The nomological net must be extended further to provide a more comprehensive explanation of the mechanisms by which productivity improves. Moreover, the degree of criterion relevance of each overall effectiveness score may differ across units or organizations. For example, there might have been units that built their contingencies so that performance improvements they knew were easy to make would be rewarded with high scores. Although there are anecdotal accounts that this "rigging" of the system takes place infrequently (Pritchard, 1990), this is one example of the potential sources of error variance that can factor into the criteria. There is also a question regarding the degree of independence between the *d*-scores and the rate of change index given that the rate of change index is, to a certain extent, a graphical representation of the *d*-score (at least for the first third of feedback).

The high correlation between the two measures also points out the potential for both indices to share common variance. Additional criteria that were not included as part of overall effectiveness scores can help draw more solid conclusions regarding the orthogonality of these two measures.

FUTURE RESEARCH

The need for more research on the factors that influence productivity remains. The challenge for researchers interested in organizational productivity is to continue examining the factors that have brought success to interventions such as ProMES (Pritchard, 1992). In the case of the ProMES methodology itself, there are many areas of research opportunity in the study of the processes, changes, and outcomes that occur during the implementation of the intervention.

The Limitations section should provide much direction for future research. More specifically, there are many opportunities to test the hypotheses proposed in this study with more direct measures of employee participation, organizational support, employee attitudes towards productivity measurement and improvement, and organizational stability. In addition, longitudinal data collection on all of the unit's relevant constituencies (e.g., personnel, supervisors, management, union) should provide more accurate assessments of the influence of these factors at different points in time. There are also several opportunities to study some of the variables proposed in this study through additional methods. For example, a content analysis of the design team and feedback meetings could provide richer data to operationalize these variables.

Future studies can further test the theory of planned behavior (Ajzen, 1991) by measuring the other components of the theory, behavioral intentions and perceived control. The notion of attitude strength (Huff, 2001) and alpha, beta, and gamma changes in attitudes (Thompson & Hunt, 1996) can be added to provide a more comprehensive explanation of the effects of attitudes on productivity across time. Additionally, measurement of attitudinal criteria (e.g., job satisfaction, organizational commitment) might provide greater insights on the effects of productivity-enhancing interventions.

There is also the question of the effects feedback quality can provide independent of the degree of match in the implementation. In future studies, instead of reporting the degree of match on a Likert scale, perhaps making a deeper assessment of the specific features from the original methodology that are incorporated into each implementation (e.g., indicator development, contingency building process, feedback quality), possibly in a checklist format, could provide a better measurement of the degree of match and a deeper understanding of which features work and why.

Addressing several of these avenues of research may lead to a broader specification of the nomological net surrounding productivity measurement and improvement. The interrelationships among the different factors making up this network will be of special interest. This study proposed linear relationships between the proposed factors and the criteria. However, identifying potential mediating, moderating, and nonlinear relationships among variables could help establish a more solid foundation towards maximizing productivity in work units. For example, there is a possibility that

the effects of feedback quality on productivity are mediated through the unit's action on feedback. This and other potential relationships may pave the way to more effective and efficient productivity improvements.

The fact remains that ProMES helps improve productivity. This study attempted to identify factors that contributed to its effectiveness. Attitudes towards productivity improvement, feedback quality, and action on feedback stood out among the rest of the factors that were proposed. However, another factor not explored in this was the ProMES implementation process. Although this sounds like a factor that is more optimally examined in an experiment using a control group and pre-post measurements, as was done in Pritchard et al. (1988, 1989), the implementation process introduces the "critical mass" of factors (Hackman, 1984) needed for effective productivity improvement. Some of these factors include: clearer perceptions of unit strategy and goals brought about by the development of ProMES objectives; the expected increase in motivational force brought about by the definition of the unit's product-evaluation contingencies via ProMES contingencies (Pritchard, 1995); role clarity brought about by the differences in the importance of indicators; the establishment of a frame-of-reference in regards to performance standards (Bobko & Colella, 1994) achieved in the definition of the zero point in contingencies; the more accurate depiction of the utility of performance levels through non-linear contingencies; the optimization of existing task strategies or introduction of novel strategies during design and feedback meetings; and the prioritization of improvements on indicators that bring the greatest productivity gains (Pritchard et al., 2002b). Unfortunately, the database used in this study does not contain

measures for these factors. The possibility remains that some of these factors that are part of the ProMES "critical mass" may have a differential impact on productivity improvement. These factors may allow a greater explanation of the variance in results obtained using ProMES.

As a concluding statement, the data collected so far has given us some general ideas on what factors to focus on in understanding the reasons for the success of ProMES. However, other factors such as those discussed above, could potentially be very important to the success of ProMES. Exploring such issues should provide fruitful avenues of research for those interested in studying organizational productivity.

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APPENDIX A

ITEMS USED TO CALCULATE COMPOSITE SCORES

ORGANIZATIONAL SOCIAL CONTEXT

Employee Participation

Centralization: the degree to which decision-making and authority are centralized or delegated. A completely centralized organization is one where all decision-making authority rests in the hands of a single top manager. A completely decentralized organization is one where every employee has a say in making decisions.

1. To what extent was the structure of the target unit centralized?
   - ___ 5. Highly centralized. Virtually all decision-making authority rested with the supervisor of the target group.
   - ___ 4.
   - ___ 3. Neither. Some important decisions were made by the supervisor and some important decisions were made by target unit personnel.
   - ___ 2.
   - ___ 1. Highly decentralized. All target unit personnel had a say in making virtually all important decisions.

2. To what extent was the structure of the local organization centralized?
   - ___ 5. Highly centralized. Virtually all decision-making authority rested with upper management.
   - ___ 4.
   - ___ 3. Neither. Some important decisions were made by the upper management and some important decisions were made by personnel at lower levels of the local organization.
   - ___ 2.
   - ___ 1. Highly decentralized. All personnel had a say in making virtually all important decisions.

3. The amount of influence the supervisor(s) had on the content of the completed system:
   - ___ 5. System development was dominated by the supervisor(s).
   - ___ 4. The supervisor(s) had more influence than the average person in the group.
   - ___ 3. The supervisor(s) had about the same influence as the average person in the group.
   - ___ 2. The supervisor(s) had less influence than the average person in the group.
   - ___ 1. The supervisor(s) had no influence on the content of the completed system.

4. Amount of consensus reached on the major issues:

___ 5. Complete agreement was reached on all major issues

___ 4. Clear consensus was reached on all major issues

___ 3. Clear consensus was reached on most major issues, but not all

___ 2. Clear consensus was reached on some major issues, but not most of them

___ 1. Clear consensus was reached on only a few major issues

5. What percent of the target unit personnel in the design team were actively involved in design team meetings? (Actively involved means they were present, attended carefully to what was happening, clearly understood what was going on, and spoke regularly.) _____%

6. What percentage of the objectives were substantially changed to obtain formal management approval?

7. What percentage of the indicators were substantially changed to obtain formal approval?

Organizational Support

1. Highest organization level where the ProMES project was supported: (Check the highest level.)

___ 5. Top management: parent. The highest levels of the parent organization's management directly supported the project. (If there is no parent organization and the top level of the local organization supported the project, use this rating.)

___ 4. Top management: local. The highest levels of the local organization's management directly supported the project, but not the top level of the parent organization.

___ 3. Middle management: local. Middle management of the local organization directly supported the project, but not top management.

___ 2. Lower level management: local. Lower level management of the local organization directly supported the project, but not middle or top management.

___ 1. Supervisors only. The project was supported at the supervisory level but not by any levels of management.

2. At the start of the project (i.e., when the design team started meeting), to what extent did management support the project? Management support is composed of verbal support to the project directors and the target unit, support with organizational resources such as paid employee time and space to work, and publicly stated support of the project to others in the organization.

___ 5. High. Management was willing to invest as many resources and support as needed to insure the success of the project, and helped the project whenever help was needed.

___ 4.

___ 3. Moderate. Management was willing to invest some resources and support in the project, and was helpful in some instances and not in others.

___ 2.

___ 1. Low. Management was unwilling to invest any resources and support in the project, and was uncooperative with people involved with the project.

3. Once the project was under way, to what extent did management continue to support the project?
   ___ 5. High. Management continued to be willing to invest as many resources and support as needed to insure the success of the project, and helped the project whenever help was needed.
   ___ 4.
   ___ 3. Moderate. Management continued to be willing to invest some resources and support in the project, and was helpful in some instances and not in others.
   ___ 2.
   ___ 1. Low. Management became unwilling to invest any significant resources and support in the project, and was not helpful when needed.

4. At the start of the project (i.e., when the design team started meeting), to what extent did supervisors of the units support the project? Supervisory support is composed of verbal support to the project directors and design team, support with organizational resources such as time and space to do ProMES work, and publicly stated support of the project to others in the organization.
   ___ 5. High. Supervisors were willing to invest as many resources and support as needed to insure the success of the project, and helped the project whenever help was needed.
   ___ 4.
   ___ 3. Moderate. Supervisors were willing to invest some resources and support in the project, and were helpful in some instances and not in others.
   ___ 2.
   ___ 1. Low. Supervisors were unwilling to invest any resources and support in the project, and were uncooperative with people involved with the project.

5. Once the project was under way, to what extent did supervisors support the project?
   ___ 5. High. Supervisors were willing to invest as many resources and support as needed to insure the success of the project, and helped the project whenever help was needed.
   ___ 4.
   ___ 3. Moderate. Supervisors were willing to invest some resources and support in the project, and were helpful in some instances and not in others.
   ___ 2.
   ___ 1. Low. Supervisors were unwilling to invest any resources and support in the project, and were uncooperative with people involved with the project.

6. At the start of the project (i.e. when the design team started meeting), to what extent did the union/works council support the project? (A works council is primarily a European institution which is composed of full-time employees of the organization who represent the union at the work site.) Union/works council support is verbal support to the project directors, cooperation with project personnel, publicly stated support to other union and works council members, and publicly stated support of the project to the design team and others in the organization.
   ___ 5. High. Unions/works councils were willing to support as needed to insure the success of the project, and helped the project whenever help was needed.
   ___ 4.
   ___ 3. Moderate. Unions/works councils were helpful in some instances and not in others.
   ___ 2.
   ___ 1. Low. Unions/works councils were unwilling to support in the project, and were uncooperative with people involved with the project.
   ___ 0. Not applicable. There were no unions/works councils in this setting.

7. Once the project was under way, to what extent did the union/works council support the ProMES project?
   ___ 5. High. Unions/works councils were willing to support as needed to insure the success of the project, and helped the project whenever help was needed.
   ___ 4.
   ___ 3. Moderate. Unions/works councils were helpful in some instances and not in others.
   ___ 2.
   ___ 1. Low. Unions/works councils were unwilling to support in the project, and were uncooperative with people involved with the project.
   ___ 0. Not applicable. There were no unions/works councils in this setting.

Attitudes toward Productivity Improvement

Rate each of the attitudes below using the scale below:

1. Strong disagreement 2. Moderate disagreement 3. Neutral 4. Moderate agreement 5. Strong agreement

1. How did management feel about productivity?
   ____ Productivity improvement is important.
   ____ Productivity improvement is not easy.
   ____ Productivity improvement is a long-term effort, not something that can be done quickly.
   ____ Organizational performance is heavily dependent on personnel behavior.
   ____ Quantitative measurement is important.
   ____ For a program to be good, it must be invented here.

2. How did the personnel in the target unit feel about productivity?
    ____ Productivity improvement is important.
    ____ Productivity improvement is not easy.
    ____ Productivity improvement is a long-term effort, not something that can be done quickly.
    ____ Organizational performance is heavily dependent on personnel behavior.
    ____ Quantitative measurement is important.
    ____ For a program to be good, it must be invented here.

3. Constituencies value of productivity improvement. There are a number of influential constituencies in any organization such as the target unit personnel, supervision, management, works councils, unions, professional organizations, etc. To what extent did the influential constituencies believe productivity improvement was valuable?
    _____ 5. All constituencies felt productivity improvement was highly valuable
    _____ 4. All constituencies felt productivity improvement was somewhat valuable
    _____ 3. One constituency did not feel productivity improvement was valuable
    _____ 2. More than one constituency did not feel productivity improvement was valuable
    _____ 1. More than two constituencies did not feel productivity improvement was valuable

Organizational Stability

1. What was the average percentage of the target unit personnel annual turnover during the project?
   _____ %

2. The stability of the local organization's management.

   a. What percentage of turnover in management positions in the local organization occurred from the start of the project (i.e., since approval was received to do the project with this unit) until the first feedback report was given? ____%

   b. From the start of the project to six months after the start of feedback, what percent of managers important to initially approving the ProMES project have left the organization or gone to new positions in the organization in areas unrelated to where the ProMES work is being done?
   ____ % Managers Unit has not had six months of feedback ___

3. To what extent were there serious problems in the target unit at the start of the project? Examples would include serious conflicts within the group or with the group and management, major organization problems, serious management problems, etc.
   ___ 5. There were many serious problems
   ___ 4.
   ___ 3. There were some moderately serious problems
   ___ 2.
   ___ 1. There were no meaningful problems

Degree of trust between target unit members and management.

4. Degree of trust the target unit has in management
   ___ 5. Very much. Members of the target unit felt that management would never take advantage of them.
   ___ 4.
   ___ 3. Moderate. Members of the target unit trusted management would be supportive in most situations but felt they would take advantage of them occasionally.
   ___ 2.
   ___ 1. Very little. Target unit members felt that management would take advantage of them at every opportunity.

5. Degree of trust management had in the members of the target unit.

___ 5. Very much. Management felt that the target unit would never take advantage of them.

___ 4.

___ 3. Moderate. Management felt that the target unit would be supportive in most situations but felt that they would take advantage of them occasionally.

___ 2.

___ 1. Very little. Management felt that the target unit would take advantage of them at every opportunity.

FEEDBACK QUALITY

1. What was the average amount of elapsed time (in days) between the end of a measurement period and the personnel receiving the feedback report? ___ Days

2. Please check all of the items below which were included in the feedback report. (If something was given to the group as a whole but not to each individual such as putting up a figure showing the changes in effectiveness over time, consider that as part of the feedback report.):

_____ A list of products and indicators.

_____ The level of each indicator for the period.

_____ The effectiveness value for each indicator.

_____ The overall effectiveness score.

_____ Effectiveness data on products (i.e. the sum of the effectiveness scores for the indicators for each product).

Percent of maximum score(s):

_____ Percent of maximum was provided for the overall score.

_____ Percent of maximum scores were provided for products but not for individual indicators.

_____ Percent of maximum scores were provided for all indicators.

_____ Historical data; data on past feedback periods.

_____ The amount of change between the previous period(s) and the current data.

_____ Priority data; data showing the amount of change in effectiveness with changes in the indicators.

_____ Graphic representation of effectiveness or percent of maximum.

_____ Graphic representation of changes in overall effectiveness or percent of maximum over time.

_____ Other.

3. What percentage of feedback reports were followed by a meeting to discuss the feedback report? _____%

How would you describe the content of the feedback meetings at the start of feedback and again after the personnel had experience with feedback meetings?

4. During initial feedback meetings what percent of the meeting time was characterized by the following behaviors. (These should sum to equal 100%):

_____ Constructive feedback about performance.
_____ Constructive attempts to identify problem causes.
_____ Constructive attempts to develop improvement strategies.
_____ Constructive discussions about future goals.
_____ Irrelevant discussion.
_____ Blaming and searching for excuses.
_____ Other positive discussion. Explain:
_____
_____ Other negative discussion. Explain:
_____

5. After experience with feedback meetings what percent of the meeting time was characterized by the following behaviors. (These should sum to equal 100%):

_____ Constructive feedback about performance.
_____ Constructive attempts to identify problem causes.
_____ Constructive attempts to develop improvement strategies.
_____ Constructive discussions about future goals.
_____ Irrelevant discussion.
_____ Blaming and searching for excuses.
_____ Other positive discussion. Explain:
_____
_____ Other negative discussion. Explain:
_____

APPENDIX B

MODERATOR VARIABLES

Degree of Match

Overall, how closely did the development and implementation of the system in this setting match the process outlined in the 1990 ProMES book?

_____ 5. Very closely. That process was followed as closely as possible.
_____ 4. Closely. That process was followed with only minor changes.
_____ 3. Moderately. A few meaningful changes were made.
_____ 2. Not closely. Several substantial changes were made.
_____ 1. Very differently. Many substantial changes were made.

Feedback Interpretation Training

1. What type of training did members of the target unit receive to help them read and interpret the data in the feedback report?
   ___ 5. The system was explained in great detail to the target unit and they were given examples of feedback data and how they would be used. (Use this response if the entire unit was on the design team.)
   ___ 4.
   ___ 3. The system and how it worked was explained to the entire unit in a meeting or other formal way.
   ___ 2.
   ___ 1. No formal training was done other than the design team informally explaining the system to their peers.

2. What type of training did supervisors receive to help them read and interpret the data in the feedback report?
   ___ 5. The system was explained in great detail to the supervisors and they were given examples of feedback data and how they would be used. (Use this response if the entire unit was on the design team.)
   ___ 4.
   ___ 3. The system and how it worked was explained to the supervisors in a meeting or other formal way.
   ___ 2.
   ___ 1. No formal training was done other than design team informally explaining the system to their supervisors.

3. What type of training did management receive to help them read and interpret the data in the feedback report?

___ 5. The system was explained in great detail to management and they were given examples of feedback data and how they would be used.

___ 4.

___ 3. The system and how it worked was explained to management in a meeting or other formal way.

___ 2.

___ 1. No formal training was done other than design team members informally explaining the system to management.

VITA

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