A THEORETICAL AND EMPIRICAL EXAMINATION OF THE EFFECTS OF FEEDBACK AND ORGANIZATIONAL STRUCTURE ON MOTIVATION AND PERFORMANCE

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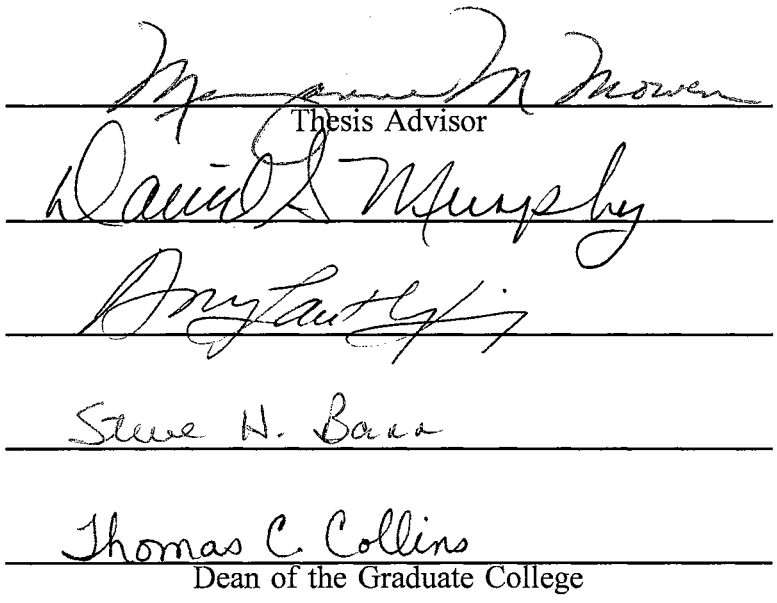

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CHAPTER I

INTRODUCTION

1.1 Overview

Deming (1982) refers to quality as the key to renewed competitiveness in American business. Others suggest that, in order to better assist the company in its quest for quality, support functions like accounting must improve their own quality of service (Bailes, Kleinsorge, and White 1992, Hall and Jackson 1992). Improving quality in support services means motivating support workers to exert maximal effort to achieve high quality. It also requires them to suggest improvements to processes so that quality is easier to achieve. Providing feedback is an important part of this process of quality improvement.

This study examines how different types of feedback can be used to motivate improvements in quality *within* accounting. To accomplish this, a theoretical model called the Selective Attention Model (SAM) is developed. The SAM describes the cognitive process through which feedback influences performance. The SAM recognizes the importance of both attention and goal setting in determining the feedback's influence on both motivation and performance. Organizational structure is described as an important source of goals against which the feedback is compared. The model is used to

develop hypotheses about the effect of feedback type and organizational structure on motivation and performance of accounting workers.

The hypotheses are tested using a laboratory simulation of a management accounting task. The use of a laboratory study allows for more thorough testing of the hypothesized relationships and the underlying cognitive processes that make up the SAM. In the experiment, subjects evaluate job cost information and enter it into a computerized cost accounting system. The system has three sub-systems--a materials requisition entry sub-system, a time ticket entry sub-system, and an overhead entry sub-system--as well as a job cost sheet printing routine.

Two different organizational structures are studied. In the functional structure, subjects perform materials requisition entry, one of three tasks necessary to produce job cost sheets. They know nothing about the other two tasks--time ticket entry and overhead entry--and they never see the job cost sheets which are the output of their work. In the cross-functional structure, subjects perform all three tasks. In addition, they are shown the job cost sheets and are given an explanation of the importance of each task in producing the job cost sheets. Hypotheses suggest that individuals in the cross-functional structure will outperform those in the functional structure because they experience greater task significance, task identity, task variety and autonomy.

Feedback type is defined in terms of its focus. The three types of feedback studied are person-level (which focuses on individual performance), process-level (which focuses on efficiency of whole processes) or organization-level (which focuses on customers' perceptions of the outputs of the process). Feedback type and organizational

structure are hypothesized to interact such that person-level feedback will be superior in the functional structure while process-level feedback will result in in superior performance in the cross-functional structure.

Attention, goal setting and motivation are all measured using multi-item, self-reported scales. Attention is also measured by the amount of time the individual looks at the feedback. Performance is measured in terms of the subject's error rate on the data entry task and the number of process improvement recommendations made by the subject.

Six individual difference factors which have been shown by past research to influence individuals' reactions to feedback are also measured and controlled for. These variables are locus of control, task interest, ability, experience, productivity, and sign of feedback.

The results of the experiment indicate support for parts of the SAM relating attention, goal setting and motivation. Therefore, future research should more thoroughly examine the model and its applicability in this and other situations where feedback is important. Regarding the hypotheses, a weak effect for organizational structure is detected. This effect is in the opposite direction suggested by the hypotheses. That is, the functional structure subjects outperformed the cross-functional structure subjects. Further evaluation reveals that time limitations in the cross-functional structure may have resulted in the experimental manipulation having a different effect on subjects than was intended. Future research should examine whether this effect persists in situations where workers are either new to a job or where time pressure is high.

The study also reveals that, contrary to expectations, no interaction between feedback type and organizational structure was present. In fact, feedback, as manipulated in the study, had no effect on motivation or performance. These findings imply modifications to the SAM requiring that feedback be useful for either cuing or learning to influence motivation and performance. Future research should examine these implications.

1.2 Motivation for the Study

1.2.1 Feedback

The first variable examined by this study is the type of quality feedback provided. Feedback can be defined as any cue that conveys some degree of information about past behavior (Ilgen, Fisher and Taylor 1979). This study provides three unique contributions to the feedback literature:

1) It isolates the purpose, or intended *use*, of the feedback being provided to the subjects in the study.
2) It studies a characteristic of feedback, its type or focus, that has received little attention in past research looking at motivational effects.
3) It develops a theoretical model that specifically addresses the cognitive process through which characteristics of feedback will influence motivation and performance.

Each of these contributions will be discussed briefly below.

The Uses of Feedback--Past research on feedback has been fragmented and often confounds feedback with other variables (Ilgen, Fisher and Taylor 1979). Correcting this problem requires carefully isolating the characteristics of feedback being studied. It also requires researchers to more clearly identify how the feedback is being used in the situation being examined. This study accomplishes this second goal by focusing on the use of feedback for *motivational* purposes.

According to Vroom (1964), feedback can be used in three different ways:

1) Cuing--Feedback during performance of a task helps the individual to guide his/her performance.

2) Learning--Feedback provided between trials on a task helps the individual isolate performance problems and take the necessary steps to improve.

3) Motivation--Research has found that feedback improves performance, even in a simple task where learning is not as important. This is true even when the feedback is provided after performance, thus eliminating its cuing properties (see Vroom, 1964, p. 239 for a discussion).

All of these three uses of feedback are important. However, this study chooses to isolate the motivational use of feedback because of the importance of motivation for quality improvement. Total quality management strategies (TQM) focus on participative problem solving and management/worker cooperation for continuous, company-wide improvement rather than on centralized decision-making (Hunt 1992, Talley 1991). TQM requires operational employees to participate by suggesting improvements in processes and products (Turney 1993, Hunt 1992). It also requires worker commitment

to detect and fix quality problems immediately (Young and Selto 1993). In short, TQM requires workers to be internally *motivated* to do things that may not be rewarded directly (Mourlton, Oakley and Kremer 1993, Juran 1993).

Feedback Type--Making decisions about the type of feedback to provide is an important function of accountants. Past research in psychology and organizational behavior has shown that some characteristics of feedback do influence individuals' responses to the feedback (Ilgen, Fisher and Taylor 1979, Luckett and Eggleton 1991). However, the focus has been on factors such as the sign, timing and frequency of the message (Ilgen, Fisher and Taylor 1979) rather than its actual content or type, which is the subject of study in this paper.

A More Specific Model of Feedback and Motivation--Existing theories of motivation address only the presence or absence of feedback, not its characteristics or type (Ilgen, Fisher and Taylor 1979). To adequately study the effects of feedback type, a theoretical framework that describes the cognitive process through which feedback influences motivation and performance is needed. The Selective Attention Model (SAM) developed in this study provides this framework.

Development of the SAM begins with goal setting theory, which provides a partial explanation of why the fit between feedback and the environment is so important. Goal setting research suggests that feedback provides information about progress toward goals, which are the basis for motivated behavior (Locke and Latham 1990, Locke et. al. 1981, Ashford and Cummings 1985). Based on additional research from social

psychology (McArthur 1981, Taylor and Fiske 1978), the model suggests that the degree to which feedback will enhance goal setting is dependent on the attention paid to the feedback and the user's response, which are determined in part by characteristics of the organizational environment. The importance of considering these interactions between feedback and the organizational environment will be discussed further in the next section.

1.2.2 Interactive Effects of Feedback and Organizational Structure

Behavioral accounting researchers are becoming increasingly aware that, for their research to be externally valid, they must consider the interaction between accounting system variables and environmental variables (Gibbons and Jamal 1993, Otley 1980, Birnberg and Shields 1989). That is, they must take a contingency approach. Luckett and Eggleton (1991) further suggest that, ". . . any analyses of the predicted effects of feedback on the responses of individuals must consider the influence of the organizational context (p.373)." In short, the 'fit' between feedback and its environment is vital in determining its effect on motivation and performance. Thus, interactions between feedback and environmental variables are important.

This study focuses on one of many potential variables that may interact with feedback type--organizational structure. The exact nature of the interaction between feedback type and organizational structure is specified in the SAM and will be discussed further in later chapters. However, it is also important to address the direct effect of organizational structure on motivation and performance. The next section further discussed the importance of organizational structure and its effects.

1.2.3 Organizational Structure

Past research provides strong evidence that variables like organizational structure directly influence motivation and performance. In particular, the job characteristics model suggests that organizational structure, through its effect on job characteristics, can affect motivation (Hackman and Oldham 1986).

Other evidence of the importance of organizational structure is found in the quality literature. TQM authors have suggested that companies could change organizational structure to facilitate quality improvement (Scholtes and Hacquebord 1988a, 1988b). Literature describing just-in-time manufacturing advocates cross-functional (cellular) structures rather than traditional, functional (job-shop) structures (Foster and Horngren 1988). Cross-functional structures have also been recommended for support services like accounting (Bailes, Kleinsorge, and White 1992, Hall and Jackson 1992).

Because of the high expense associated with reorganization, it is vital for accounting managers that a change in structure will provide the intended benefits. Therefore, this paper examines the direct as well as interactive effects of a functional versus cross-functional structure on motivation and performance in the accounting department.

1.3 Organization of the Paper

The remainder of this paper is organized as follows. Previous research related to the study is outlined in Chapter 2. In Chapter 3, the selective attention model (SAM) is

described and applied to develop hypotheses about how feedback type and organizational structure interact to affect motivation and performance. In Chapter 4, the laboratory study used to test the hypotheses is described. Chapter 5 outlines the results of the study. The final chapter provides a summary and discusses limitations and opportunities for further research.

CHAPTER II

LITERATURE REVIEW

Very little research exists dealing with the effects of feedback and/or structure variables within the management accounting function. Therefore, previous research applicable to this paper addresses the effect these variables in other settings. With this in mind, the literature will be divided into two categories:

1) Studies dealing with feedback, and

2) Studies addressing organizational structure.

2.1 Feedback Literature

Few past researchers have examined the relationship between feedback content and motivation. Work in accounting dealing with feedback content has focused on the learning and cuing functions of the feedback. This literature, which uses the Brunswik Lens model to describe and evaluate decision making behavior in multiple cue probabilistic learning situations (Luckett and Eggleton 1991), will be reviewed briefly below, mostly to emphasize the difference between it and the current research.

According to the lens model, a judgment situation can be viewed in terms of two sides of a 'lens'. On one side of the lens is the decision maker. On the other is the

environment or criterion being evaluated. The decision maker combines bits of information about the criterion, called cues, viewed through the lens in a linear fashion to form a judgement about the criterion. The effectiveness of information is evaluated in terms of decision performance. Decision performance describes the of accuracy of the judgements made, the accuracy of the decision model, and the consistency of these judgements and models--both for a decision maker over time and between decision makers.

Three types of feedback may be provided to aid the decision maker in formulating better judgements:

1) Outcome feedback which tells the decision maker the actual outcome or value of the criterion that resulted in previous decision making trials,

2) Task properties feedback which tells the decision maker what is happening on the environmental side of the lens--that is, the actual relationship between the cues and the outcome or criterion value, and

3) Cognitive feedback which gives information about the decision maker's side of the lens--that is, how he/she weighted the cues to arrive at his/her prediction.

According to past research in psychology, outcome feedback is not as useful for improving decision making ability or for increasing task learning as task properties, cognitive, and lens model (a combination of task properties and cognitive) feedback (Hirst and Luckett 1992, Hammond et. al 1986). In an auditing setting, accounting researchers have found mixed results (Libby 1981, Ashton 1982). Hirst and Luckett (1992) attempt to reconcile some of these conflicting results by showing that outcome

feedback can be useful, but only in situations where the task is perfectly predictable and the decision maker has high initial task knowledge. Unlike lens model feedback, however, the usefulness of outcome feedback is only realized over time through its impact on task learning.

This study differs from the lens model studies discussed above in three ways,

1) It examines feedback in a different context--management accounting versus auditing

2) It looks at feedback in terms of different dependent variables--motivation and effort related performance rather than judgmental accuracy and consistency

3) It examines a different subject population--accounting workers rather than accountants.

A different stream of research which examines quality performance has studied the effects of different types of feedback in contexts more appropriate to the current study--manufacturing and support services--and, in some cases, from a motivational viewpoint. This literature is made up of writing by consultants dealing broadly with the concept of quality and quality improvement. One theme of this literature involves the importance of process level measures (Johnson 1992b, Meyer 1994). For example, Kaplan and Norton (1994) describe the success Rockwater's change from functional to process oriented measures. Activity based costing provides another example of this theme with its focus on the value of what amounts to process-level information (King 1991, Vercio 1993).

Another important theme of the quality literature is that information should be

customer or externally focused rather than focusing internally on the individual's job (Eccles and Pyburn 1992). Lynch and Cross (1991) agree that quality measures should focus all business activities on customer requirements. Many suggest that information should focus on group performance (Thor 1993 (Ten Rules)), the total company (Heerema and Rogers 1991) or processes (Johnson 1992 (Deming Management)), rather than individual variables to promote teamwork and cooperation.

The goal of this paper is to formalize and test some of these observations about the usefulness of different types of quality feedback. In addition, the paper focuses on an aspect of information usefulness not directly considered by these writers; the information's *motivational* effect.

2.2 Organizational Structure Literature

A stream of literature in organizational behavior that is particularly relevant for this study deals with the effects of the design of work on motivation and performance of workers. The job characteristics model, states that five core job characteristics--skill variety, task identity, task significance, autonomy and feedback--influence three critical psychological states--experience meaningfulness of work, responsibility for outcomes, and knowledge of results--which in turn determine individual outcomes such as motivation, attitudes, performance and satisfaction (Hackman and Lawler 1971, Hackman and Oldham 1976).

The organizational structures discussed in this study differ significantly on four of the job characteristics in the model--skill variety, task identity, task significance and

autonomy. All factors characteristics are stronger in the cross-functional structure. Therefore, as will be seen in the theoretical development and hypotheses section, this theory will play an important part in developing the hypotheses of the paper.

A number of accounting authors have also studied the effect of structure-related variables on motivation and performance of workers, with some of them also looking at the effects of feedback in different structures. Four studies reviewed below provide background because they examine variable with similar characteristics to the organizational structure variable discussed in this paper. Their similarities and differences in relation to the current research will be discussed.

Using a survey methodology, Banker, Potter and Schroeder (1993) found that workers were more likely to receive performance feedback in cases where JIT, TQM and teamwork strategies had been implemented. In addition, they found that using these strategies and providing performance feedback both resulted in higher worker morale. These results suggest that the basic premise of the current study, that both feedback and organizational structure can have a positive motivational affect on workers, is valid.

Using a methodology more similar to the current study, Young, Shields and Wolf (YSW, 1988) examined the relationship between manufacturing strategy and performance. In their study, an assembly line was set up where three individuals worked together to produce toy castles from loc blocks. Three variables were manipulated:

1) inventory control systems design--pull versus push.

2) quality control systems design-process versus output.

3) incentives--Fixed or contingent.

Hypotheses and results suggested that:

1) Process-based quality control was more efficient that output-based quality control under all experimental conditions.

2) The pull inventory system worked more effectively and efficiently with process quality control and the push system worked better in combination with output quality control.

3) The presence of contingent incentives led to more effective and efficient performance.

YSW demonstrate the importance of considering interactive effects between different aspects of the control systems within an organization. However, YSW differs significantly from this study in that it focuses on reactions to management control systems, rather than to feedback.

Young, Fisher and Lindquist (YFL, 1993) studied the effect of cooperative versus non-cooperative groups, finding that cooperative groups outperformed non-cooperative groups. In addition, YFL found that, as expected, groups receiving feedback that they were just ahead or just behind others outperformed groups receiving feedback they were always ahead or always behind. Groups receiving always ahead feedback generated more slack between performance estimates and performance targets.

Two aspects of the YFL study are important in this paper. First, the fact that the sign and magnitude of feedback may influence performance, as found by YFL, will have to be considered in designing the study. This will be discussed at more length in the research methodology section.

In addition, YFL focus on the physical benefits associated with different structures. Specifically, they examine the effect of different levels of cooperation between participants in the different structures. This paper also studies structure, but looks at a different aspect of it. Namely, this study looks at the effect of different levels of skill variety, task identity, task significance and autonomy present in the different organizational structures. The effects of cooperation are not eliminated in the current study, but do not play the primary role in distinguishing the two structures.

A similar explanation can be made for the difference between this study and studies examining the effect of interdependence and uncertainty (for example, Chow, Shields and Chan 1991). The structures studied in this paper may, in practice, possess different levels of interdependence or may be instituted in response to different levels of uncertainty. However, this study does not focus on these factors. Instead, it focuses on the four job characteristics discussed by Hackman and Oldham (1986). Indeed, the task used in this study does not lead to high levels of interdependence. This represents both a weakness and a contribution. First, this is a weakness because it may hamper the external validity of the study. On the other hand, because the study isolates these other variables of skill variety, task identity, task significance and autonomy, it may provide evidence about these variables from a contingency perspective that will be useful in future studies.

CHAPTER III

THEORETICAL DEVELOPMENT AND HYPOTHESES

3.1 The Selective Attention Model

Ilgen, Fisher, and Taylor (1979) suggest that, for a stimulus (such as an object, person or behavior) to have an effect on task behavior, the individual must first pay attention to the stimulus. The *level of attention* paid to the stimulus, coupled with the *characteristics* of the stimulus relative to its environment, then determine its effect on task behavior (Taylor and Fiske 1978, McArthur 1981).

The general form of the selective attention model, or SAM, which is depicted in Figure 1, integrates this research. The discussion of the SAM will be divided into three parts. The first part of the discussion will address the relationship between cognitive contrast (a stimulus characteristic) and levels of attention. The second part of the discussion will examine the relationship between cognitive contrast and task behavior. Finally, individual differences within the SAM will be discussed. Though the relationships discussed in these sections are only hypothesized and are not all explicitly tested in this study, having an idea of the hypothesized nature of the relationships is important for better understanding of the model and is also inherent to the predictions of the paper.

3.1.1 Cognitive Contrast and Selective Attention

High levels of attention, or *selective attention*, to a stimulus means that the stimulus commands an individual's attention in preference to other stimuli (Kahneman 1974). Selective attention has also been described as a preference for more salient stimuli (Taylor and Fiske 1978) or attention-drawing stimuli (McArthur 1981). The stimulus characteristics of unit formation and novelty determine the level of selective attention.

According to McArthur (1981), *unit formation* occurs when stimuli are expected in, fit well with, or form a unit with their environment. Unit formation occurs when observed behaviors agree with past behavior and when actor characteristics coincide with characteristics commonly associated with membership in a category. For example, Zandny and Gerard (1974) gave subjects descriptions of individuals that included information about the person's college major and their personal characteristics, interests, etc. They found that subjects recalled more music-related activities when the person described was labelled a music major rather than a chemistry major.

McArthur (1981) describes *novelty* as present when a stimulus stands out in relation to the individual's expectations or other stimuli in the environment. An example of selective attention to novel stimuli is Taylor, et. al.'s (1977) research showing that, in groups, solo blacks, women or men were deemed more causal and were evaluated more positively or negatively than the same individuals in an integrated group.

In the SAM, a new term, cognitive contrast, describes the degree of unit formation or novelty for a stimulus. *Cognitive contrast* is the degree of similarity (unit formation) or difference (novelty) between a stimulus and cognitive referent. A *cognitive referent* is

an element of the individual's expectations or environment against which stimuli are measured or compared. Some examples of cognitive referents from the selective attention literature include previously hypothesized values or conclusions, expectations, prior observations, mental representations, available instances, and stereotypes[1].

The value of cognitive contrast might be as small as zero, indicating complete agreement between the stimulus and cognitive referent. The value can range as large as 100 percent, where the stimulus is viewed as being maximally different from the referent.

As described above, cognitive contrast has a direct influence on attention levels as shown in Figure 1. Figure 2, group A, shows a number of potential shapes for the function describing the relationship between attention and cognitive contrast. The shape of this function is dependent on characteristics of both the individual and the situation under study. However, according to the proposed model, two general characteristics always describe the relationship between cognitive contrast and selective attention.

First, values of selective attention will range from zero, indicating the stimulus is completely ignored, to some maximum value, representing complete attention. These boundaries can be thought of as 0% and 100% attention to the stimulus. Second, as evidenced by increased attention to unit forming (low cognitive contrast) and novel (high cognitive contrast) stimuli, selective attention will be higher for extreme values of contrast than for moderate values. This gives the proposed function a "U" or "V" shape as shown in some possible graphs for the function shown in Figure 2, Group A.

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[1]A mental anchor as described by Tversky and Kahneman (1974) in their discussion of the anchoring and adjustment heuristic is an example of a cognitive referent. The broader term "cognitive referent" is used here rather than the more familiar term "anchor" to avoid unintentionally limiting the construct to numerical values.

3.1.2 Cognitive Contrast and Task Behavior

The effect of cognitive contrast is not limited to its effect on attention. In fact, most selective attention research does not even measure attention, but some other task behavior hypothesized to result from attention (Taylor and Fiske 1978).[2] Some task behaviors studied in previous research include causal attributions, learning, memory, evaluations, imputation of personal characteristics to others (Taylor and Fiske 1978), evaluations of likelihood of group membership and estimations of the frequency of a class (Tversky and Kahneman 1974).

As shown in Figure 1, cognitive contrast is expected to influence task behaviors through two paths. First, by increasing or decreasing attention, cognitive contrast influences the *strength of the response* or *how much* the individual responds to the stimuli. Whether contrast is high or low determines the *direction of response* or *how* the individual responds to the stimuli. Strength and direction of response make up observed task behavior.

For example, assume a subject, Sue, is asked to recall characteristics of an actor, Andy. Sue will mentally compare what she observes about Andy with her expectations (cognitive referent). These expectations may be based on Andy's category membership (he is a music major) or his surroundings (he is in a group of females). Both low and high contrast between what Sue observes about Andy and what she expects will increase the amount of attention she devotes to him. As attention increases, so will the number of

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[2]This does not mean that attention cannot be measured. Kahneman (1974) discusses various measures of attention including eye movements and time focused on an object.

characteristics she can remember (the strength of her response). Whether contrast is low or high will determine the direction of Sue's response. If Andy fits well with her expectation (low contrast), Sue will remember characteristics about Andy that are *similar* to her expectation. However, if Andy is very different from what she expected (high contrast), Sue will remember more things that are *different* about Andy (McArthur 1981).

Graphically, Sue's behavior, the number and type of characteristics she recalls, can be described by a downward sloping line. Positive values for behavior indicate the remembering of similarities and negative values indicate the remembering of differences. Some potential shapes for this proposed function are shown in the graphs in Figure 2, group B. Like the function relating cognitive contrast to attention, the shape of the function is expected to vary from situation to situation and individual to individual. The proposed function has two important general characteristics.

First, variation in the dependent variable, task behavior, is no longer limited to values between zero and 100%. Unlike attention, behavior may be bounded or not bounded, and it may take on all positive, or some positive and some negative values, depending on what behavior is being studied.

Second, the function slopes downward. Low cognitive contrast will produce an extreme response in one direction and high cognitive contrast will produce an extreme response in the *opposite* direction.

3.1.3 Variations in the Shape of the SAM Functions

As described above, the SAM is made up of two functions, one describing the relationships between contrast and attention and the other relating contrast and task behavior. The shape of both functions is expected to vary with characteristics of the individual and the situation. Three properties of the SAM functions may vary between individuals and situations--general levels of attention/behavior, general sensitivity to contrast effects, and differential reaction to high versus low cognitive contrast.

General Levels of Attention/Behavior--Some individuals have a generally greater capacity for attentiveness to all stimuli in a particular task, regardless of the level of contrast between the stimuli and environment. Similarly, some individuals tend toward different behavior levels because they are simply more motivated to excel in a particular situation. Graphically, these variations in general attention levels/behaviors would be shown by vertical shifts in the SAM curves as shown in Figure 3, panels A and B.

General Sensitivity to Cognitive Contrast Effects--The level of cognitive contrast may have a greater effect on attention and task behaviors for some individuals than others. The situation may also make a difference. For example, the level of involvement of an individual affects the individual's level of selective attention (Taylor and Fiske 1978). The differential sensitivity to cognitive contrast would be graphed by varying the slope of the SAM function as in Figure 4 panels A and B.

Differential Reaction to High Versus Low Cognitive Contrast--An individual may react differently to high versus low cognitive contrast, either because of the person's own psychological makeup or because of situational factors. This effect would be shown in terms of different slopes for low versus high contrast (different sensitivity), or simply by a shift in the SAM curve at some point (different strength of reaction). Two possibilities are illustrated in Figure 5 panels A, B, C and D.

3.2 Applying the SAM

This section applies the basic SAM model to describe how organizational structure and feedback type are expected to jointly influence motivation and performance of workers in the accounting function. The application of the SAM to this problem is illustrated in Figure 6. Feedback is the stimulus being evaluated. Organizational structure implied goals are the cognitive referent for evaluating the level of cognitive contrast for a piece of feedback. Finally, goal setting, and eventually motivation and performance, are the 'behaviors' influenced by the level of contrast between the feedback and organizational structure.

At this point, some additional explanation as to why goal setting is the important performance variable in this application and why organizational structure implied goals serves as the cognitive referent. Latham and Locke's (1991) goal setting theory demonstrates the importance of goal setting to motivation and performance. According to goal setting theory, actions of individuals are motivated by goals. Feedback is only useful if it leads to the setting of goals. Based on this research, we can expect that

individuals will evaluate quality feedback to determine its relevance for setting goals vis-a-vis existing quality goals established by the organization.

But what is the source of organizational quality goals? Organizational quality goals can be communicated directly through organizational policy setting and public statements by upper management. However, most often, the strongest communication devices for organizational goals are indirect. The choice of organizational structure is one such indirect communication device. Specifically, a functional structure suggests goals directed at personal, specialized performance. In contrast, a cross-functional structure suggests broader goals directed at the entire process and its output. Thus, the organizational structure, functional or cross-functional, as a source of operational goals for quality, will be the cognitive referent for evaluating quality feedback.

With the terms defined, the application of the SAM is rather straight-forward. According to the SAM, both high and low contrast between the goals implied by feedback and the goals implied by the organizational structure lead to high attention and a stronger response to feedback. For this application, a stronger response means the feedback has a greater influence on the goal setting process. Because behavior is motivated by goals (Locke and Latham 1990), incorporation of feedback in goal setting also leads to greater impact on motivation and performance.

The level of attention does not describe *how* the feedback influences goal setting, motivation and performance (the direction of response). The direction of response is determined directly by the level of contrast between the feedback and organizational structure. Quality feedback that exhibits low contrast with the organizational structure

should suggest clear, *specific* goals that are easy to interpret for the individual. Strong evidence is available suggesting that more specific goals lead to higher motivation and better performance (Latham and Locke 1991). Therefore, low-contrast feedback should result in improved motivation/performance relative to no feedback.

On the other hand, if the quality feedback exhibits very high contrast with the organizational structure, the feedback may create a degree of confusion or cognitive dissonance. This confusion may interfere with setting of specific goals, leading to the setting of either vague goals, or no goals at all. In terms of goal setting theory, this is a negative response, and will likely result in decreased motivation/performance relative to no feedback.

Moderate contrast will result in very little attention to the feedback and therefore only moderate levels of goal setting and motivation. These levels will be closer to those observed for no feedback than those for high or low contrast feedback.

3.3 Main Effects of Feedback Type and Organizational Structure

As stated in the introduction, the goal of this paper is not just to develop the SAM and apply it, but to describe how feedback type and organizational structure jointly *and* separately influence motivation and performance. Above, the basic SAM model was used to describe how quality feedback and organizational structure *jointly* (or interactively) influence motivation and performance. The potential for separate (or main) effects of feedback type and organizational structure has not yet been addressed.

Based entirely on the SAM, no main effect of feedback type is expected for

attention or goal setting/motivation/performance. According to the SAM, feedback is evaluated relative to the organizational structure, which acts as a cognitive referent. Therefore, the effect of feedback cannot be predicted without specifying which organizational structure is present. Other research to date does not provide a sufficient basis for predicting a main effect for feedback type either (Ilgen, Fisher and Taylor 1979, Luckett and Eggleton 1991). Therefore, this paper will not predict a particular main effect for feedback type, though one may exist.

Similarly, the SAM does not provide information about the separate effect of organizational structure on attention, goal setting, motivation or performance. However, as mentioned in the introduction, it is possible to evaluate the main effect of organizational structure on motivation and performance by using the job characteristics model developed by Hackman and Oldham (1976). Therefore, a relationship between organizational structure and motivation and performance can be added the SAM as shown at the bottom of Figure 6. This relationship will be more completely specified in the next section when hypotheses are developed.

3.4 Hypotheses

3.4.1 The Main Effect of Organizational Structure

The relationship between organizational structure and motivation/performance results from organizational structure's influence on core job characteristics. Therefore, to understand how each organizational structure influences motivation, it is necessary to specify the impact of each structure on the five core job characteristics from the job

characteristics model (Hackman and Oldham 1976). Before doing this, a short description of each structure is in order.

A functional structure emphasizes individual, specialized skill (Howell and Sakurai 1992, Vercio 1993). It is represented by the vertical columns shown in Figure 7, which illustrates an organization. In a functional structure, workers see only a small part of the "big picture" involved in providing a product or service. In accounting, this means the individual may work on only one task like materials management, or payroll or general accounting.[3]

On the other hand, a cross-functional structure focuses on processes that span functions. It is best illustrated by the horizontal rectangles that cut across Figure 7. Workers see a more complete picture of the process. In accounting, a cross-functional structure means that workers perform a wider variety of tasks involved in a process and see its final output. For example, they might be in charge of processing all of the materials, labor and overhead transactions related to manufacturing jobs to produce job cost reports for a customer group or product type.[4]

Structure influences the first four core job characteristics (skill variety, task

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[3]In manufacturing, a functional structure is referred to as a job shop layout. Multiple products are made using general purpose machines that are organized by function (i.e., grinding, painting, etc.) (Dhavale 1993).

[4]In manufacturing, a cross-functional structure is referred to as a cellular layout and is based on product, part, or service "families" (Dhavale 1993). All machines (grinders, painters, etc.) used to produce a family are grouped together in a work cell. Workers operate all of the machines in the cell and perform support functions like maintenance and personnel management (Foster and Horngren 1988).

identity, task significance, and autonomy) described in the job characteristics model.[5] In a cross-functional structure, interdisciplinary work and cross training result in increased skill variety. Task identity is described as "the degree to which the job requires completion of a "whole" and identifiable piece of work (Hackman and Oldham 1976, p. 257)." In a cross-functional structure task identity is increased by performing a wider variety of tasks for a single customer. A cross-functional structure also increases the worker's perception of task significance, or the importance of the work to the lives of others, because the worker handles the final product and, consequently, has a better idea who the user is and what the user's needs are. Finally, job autonomy is increased in a cross-functional structure through increased decentralization of decision-making.

In sum, a cross-functional structure will lead to greater motivation and performance. This conclusion is supported by the fact that cellular layouts have been successful as part of manufacturing improvement techniques like just-in-time (JIT) (Foster and Horngren 1988, Hall and Jackson 1992, Hanks, Freid and Huber 1994). This success suggests that support areas, including accounting, may benefit from adopting a cross-functional structure. Hence, the following hypothesis:

H_1: A cross-functional structure results in greater motivation and performance than a functional structure for workers in the accounting function.

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[5]The fifth characteristic, feedback, refers to frequency rather than type of feedback and is being held constant in this study.

3.4.2 The Interaction Between Organizational Structure and Feedback Type

The SAM suggests the following general hypothesis:

H_2: Organizational structure and feedback type will interact to determine the level of motivation and performance of accounting workers.

Using the SAM, this hypotheses can be expanded to explain the relative effect of the three types of feedback for each structure. As described by the SAM, contrast between feedback type and organizational structure determines the level of attention, goal setting, motivation and performance. Therefore, the key step in using the SAM to describe how feedback type and organizational structure interact is determining the level of cognitive contrast for each structure/feedback type combination. Assessments of the effect on attention, goal setting, motivation and performance follow directly from this analysis. To facilitate this analysis, the three types of feedback to be examined in this study are first described. The level of contrast between each structure and the three types of feedback is then discussed in turn.

Feedback Types--Three categories of feedback will be examined in the current study. They are person-level, process-level, and organization-level feedback. This categorization neatly captures the many types of feedback recommended in the practical quality literature, and has been used by practical researchers discussing performance measurement (Rummler and Brache 1991, Hronec 1993).

Person-level, process-level, and organization-level feedback differ in *whose* output they measure. Figure 7, which illustrates an organization, can be used to clarify this point. Person-level feedback focuses on individual workers and their behavior on

functional tasks which are described by the vertical boxes in Figure 7. Person-level measures are actionable and immediate. For quality, they examine reliability of the individual--how well the worker performs his job. Traditional measures, such as piece rates and individual error rates, are person-level measures.

Process-level feedback focuses on the horizontal boxes in Figure 7. Process-level measures look at the output of several individuals working together to achieve a common goal. The literature on quality improvement emphasizes process-level measures (Johnson 1992b, Meyer 1994, Kaplan and Norton 1992, 1993). Activity based costing focuses on creating process-level feedback (King 1991, Vercio 1993). Statistical process control techniques (where a product attribute is measured, charted, and compared to a standard, ideal value) also provide process-level feedback. The time required to complete a process and the distance a component travels during its production are also process measures.

Organization-level feedback concentrates on the relation between the two large boxes in Figure 7, the organization and its customers. These broad measures focus on value provided to the customer. The quality literature suggests that customer-based measures help both manufacturing and support services become more customer focused (Kaplan and Norton 1994, Meyer 1994). Customer satisfaction, employee satisfaction, number of product returns or customer complaints, and ratings by outsiders of the company's product or service quality are organization-level measures (Hronec 1993).

Contrast in a Functional Structure--The goals in a functional structure clearly form a unit, exhibiting low cognitive contrast, with person-level feedback. Both focus on the individuals or vertical tasks shown in Figure 7.

Process-level feedback also encompasses these individual activities, but contains "irrelevant" information about other steps in the horizontal process. Thus, in a functional structure, process-level feedback will exhibit moderate cognitive contrast.

Organization-level feedback, which focuses on the relationship between the organization and customer represented by the large boxes in Figure 7, does not connect at all with the vertical columns that are the focus in a functional structure. This implies very high cognitive contrast. *In short, in a functional structure, person-level measures will exhibit low cognitive contrast, process-level measures will have moderate contrast and organization-level measures will have high contrast.*

Because it has low cognitive contrast, person-level feedback will capture the individual's attention and will facilitate goal setting, resulting in the highest levels of motivation/performance. Organization-level feedback, with its high contrast, also will command attention, but will impede goal setting. The result is low levels of motivation/performance. Because process-level feedback has only moderate contrast, it should command minimal attention. The result is goals setting and motivation/performance most similar to what would be observed with no feedback. Thus the following sub-hypothesis:

H_{2a}: In a functional structure, the greatest goal setting, motivation and performance results from person-level feedback. Process-level feedback is next, with levels of goal setting, motivation and performance closest to those for no feedback. Finally, organization-level feedback results in the lowest level of goal setting, motivation and performance.

Contrast in a Cross-Functional Structure--Both the tasks for a cross-functional structure and the information provided by process-level feedback focus on the horizontal boxes in Figure 7. Thus, there is low contrast between a cross-functional structure and process-level feedback.

Organization-level feedback is also somewhat congruent with the focus in a cross-functional structure. The cross-function tasks (horizontal boxes in Figure 7) point directly to the customer; customer satisfaction is the clear and direct output of the process. However, the relationship is not as strong as for process-level feedback, and therefore, contrast will be only moderate.

Person-level feedback, with its emphasis on individual performance and a single, vertical task, is incomplete for a cross-functional structure. Emphasis on person-level feedback is particularly inconsistent with the philosophy of the cross-functional structure. In a cross-functional structure, individual performance is determined by the design of the task or process rather than by individual effort (Deming 1982). Consequently, in a cross-functional environment, person-level feedback is out of place, implying high cognitive contrast. *In sum, in a cross-functional structure, process-level measures will exhibit the lowest cognitive contrast followed by organization-level measures, with person-level measures exhibiting high cognitive contrast.*

The relationship between contrast levels and motivation/performance can be explained in the same way as for the functional structure. Thus, the following sub-hypothesis about motivation/performance for a cross-functional structure.

H_{2b}: **In a cross-functional structure, the greatest goal setting, motivation and performance results from process-level feedback. Organization-level feedback is next, with levels of goal setting, motivation and performance closest to those for no feedback. Finally, person-level feedback results in the lowest levels of goal setting, motivation, and performance.**

Hypotheses 1 and 2 are shown in Figure 8. Note that the mean response to person-level feedback is illustrated as being the same for both functional and cross-functional structures. This relationship is not hypothesized by the paper. The actual relationship between these two points will be determined by the size of the overall main effect for structure and by the size of the simple effects for each feedback/structure combination.

In addition, because process-level feedback is superior to organization-level feedback for both structures, a overall statistical main effect should be observed for feedback type. This main effect is only partially specified. Whether the overall mean for person-level feedback is the same as, greater than or less than the means for process-level and organization-level feedback also depends on the size of the main effect for organizational structure and the simple effects for each feedback/structure combination.

CHAPTER IV

METHOD

A laboratory simulation was used to test the three hypotheses described in Chapter 3. The experiment was a between subjects, factorial design with four levels of feedback (people, process, organization and none) and two levels of organizational structure (functional and cross-functional). Three dependent variables--motivation, performance, and participation in improvement--as well as two mediating variables suggested by the SAM--attention and goal setting--were examined. The subjects, experimental procedures and variables are described in more detail in the sections below.

4.1 Subjects

The subjects for the experiment were 104 students enrolled in principles of management accounting, cost accounting, governmental accounting and EDP auditing. Initially, 125 students signed up for the experiment. 106 subjects (85%) successfully completed the experiment. Twelve failed to attend any sessions (most of these dropped the course). Four attended the first session but failed to attend the second (one of these indicated he had decided to drop the course). Data for three subjects were unusable due

to their failure to complete the experimental task as directed.[6] Of the 106 who completed the task, selected covariate data for two more subjects was missing due to failure of diskettes used to collect and store the data. These two subjects were also deleted from the sample, leaving a final sample of 104 subjects. Including these two subjects in the analyses does not change the results.

4.1.1 The Use of Students as Subjects

A major advantage of using students as subjects in experimental research is that they tend to be homogenous. Therefore, variances in their behavior can more be more clearly attributed to the experimental manipulations. The result is smaller error variances and more powerful statistical tests (Birnberg, Shields and Young 1990).

Some examples of tasks where student subjects have been used successfully include Mowen and Mowen (1986) who found nearly identical results for students and business managers in a business decision-making scenario designed to test the effect of positive versus negative decision frames. Lipe (1993) reported similar results in a study comparing students with member of the Institute of Management Accountants. Both groups exhibited outcome bias and framing effects in evaluating a manager's decision to investigate a cost variance.

Limited support for using students as surrogates is provided by Ashton and

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[6]Two of these subjects spoke English as a second language. The experiment required subjects to learn to use the system in a short period of time, based on written and verbal instructions. Because they read more slowly and required additional explanation, these subjects were unable to achieve a level of performance representative of their ability and effort level within the time frame of the study.

Kramer (1980). They show that students make similar internal control judgements to those of auditors, though the magnitude of their judgements may not be identical. This difference was attributed to the students' lack of practical experience in making this type of judgement. Ashton and Kramer conclude that student subjects can be used successfully in decision-making tasks, but should be used carefully in studies of attitudes and judgement when they have different motivations or experiences than the target population.

Based on this research, one might conclude that students are successful surrogates, allowing for generalizability of findings, when their knowledge, experience and judgement capacity are similar to the target population allowing them to perform in a similar manner, and when they are sufficiently motivated to perform the task. Each of these factors is analyzed below in relation to the current study.

4.1.2 Subject Training and Judgement Capacity

The average accounting clerk has, at most, a basic bookkeeping course, vocational technical training, or an associate degree. They are trained to work at one or a few related tasks requiring similar skills and knowledge to the data entry task used in the experiment. Similarly, subjects on average were sophomores or juniors with two years of education and a basic understanding of accounting principles. Like clerks, they were specially trained to do the narrow range of tasks required in the experiment.

4.1.3 Subject Motivation

Because of their educational background and the repetitive type of tasks they perform, clerks receive a moderate amount of fixed pay. Their advancement opportunities are limited. Therefore, their motivation is expected to be limited and centered around rewards which include continued employment and yearly raises based on subjective performance evaluation.

Though the subjects in this experiment did not have the same motivations as accounting clerks, an effort was made to assure they were sufficiently motivated to perform the task in a similar way. Subjects were either enrolled in a principles of accounting course where job costing was being covered, or they were accounting majors. Therefore, they had some initial interest in the task. Subjects were given extra credit equal to 2.5% of their course grade for attending both experimental sessions. Subjects were told they might receive additional credit up to another 2.5% of their grade, depending on their effort and performance. In actuality, all students received the full credit (5% of their course grade).

4.2 Experimental Procedures

In the experiment, subjects performed a clerical management accounting task. They entered job cost data from printed source documents (time cards, materials requisitions, and/or overhead activity summaries) into a computerized cost accounting system for a bicycle manufacturing company called The Open Road. Their job was to enter the data in the computer, detect and flag errors in the documents, and make

recommendations for improving the system.

During the experiment, each subject attended two sessions, held on consecutive days outside of class time. The first session consisted of an introduction, pre-experimental data collection, training, and an initial, practice data entry period. The session lasted one hour and fifteen minutes. During the second session, subjects received feedback, completed a second data entry period and provided post-experimental data. The second session lasted for one hour.

The procedures for designing and carrying out the experiment are illustrated in the flowchart shown in Figure 9. Each of these steps will be described in more detail in the following sections.

4.2.1 System Design

The cost accounting system was designed to be as realistic as possible while allowing for ease of training. It was a menu driven system programmed in dBase with four sub-systems--a time ticket entry system, a materials requisition entry system, an overhead entry system and a job cost reporting system. The sub-systems were designed with similar menus, formats, procedures and fields so that an individual trained to use one sub-system could easily learn the others. This design permitted functional structure subjects to be trained in only one part of a system (materials requisition entry) and cross-functional structure subjects to be trained in all sub-systems of the job cost sheet preparation process, without adding to the complexity of the task for the cross-functional

structure subjects.[7]

A series of time tickets, materials requisitions and overhead summaries reflecting transactions related to a number of jobs were also developed by the experimenter. To give subjects the opportunity to make errors, the experimenter seeded the time cards, materials requisitions, and activity summaries with mistakes. As with the structure of the three sub-systems, the types of the mistakes for the three types of documents were similar. This helped assure that the cross-functional task of entering all three types of documents was not significantly more difficult than the functional task of entering only one. In addition, to assure that subjects could make improvement recommendations, inefficiencies such as inconsistent ordering of items on the data-entry screens and editing limitations were built into the system.

4.2.2 Pilot Study

An extensive pilot study was conducted to test the training materials, manipulations and procedures. As a result of the pilot study, training materials were refined to decrease the chance that subjects would misinterpret directions. In addition, the feedback manipulation was strengthened as a result of poor results for the feedback manipulation check. Also, to further improve motivation over the pilot study where subjects received only a fixed amount of extra credit, contingent incentives were added. Finally, the experimental procedures were refined. The changes to the experimental procedures warrant further explanation. They involved changes in how subjects were

[7]Training took approximately 35 minutes for the functional structure. An additional 15 minutes was required to train the cross-functional structure subjects.

assigned to experimental conditions and the number and length of experimental sessions conducted.

Assigning Subjects to Experimental Conditions--In the pilot study, subjects were divided into eight groups, one for each cell in the design. Each group met at a different time of day. The advantage of this organization is that it avoids cross-contamination between subjects in the same group but different experimental conditions. Cross-contamination might occur if, for example, a no-feedback subject saw that another subject was receiving feedback and responded differently than if he or she had they not realized that others were being treated differently.

The disadvantage of this organization is that other factors besides the experimental manipulation that differ between groups--such as group dynamics, the time of day or questions asked during training--may be the cause for observed differences in the dependent variables. This problem was evident in the pilot study.

Therefore, the final experiment was organized differently. A schedule for the experiment, illustrating this organization, is shown in Table 1. Subjects were divided into four groups. Structure could not be randomized within groups because the structures required different training. However, to avoid having group characteristics other than the independent variables controlling the results, two different groups were trained for each structure.

Within each group, feedback type was randomized. Therefore, in a particular group, one-fourth of the subjects received person-level, one-fourth process-level, one-fourth organization-level and the final one-fourth no feedback. To minimize cross-

contamination, individuals in different feedback conditions were seated at different rows of computers. The end result is that, for any of the eight cells in the design, individuals will be taken from two different groups, rather than just one, thus at least partly randomizing out the effect of variables that differ from group to group.

The Number and Length of Sessions--The number of experimental sessions each subject was required to attend was also changed as a result of the pilot study. For the pilot study, each subject attended four different experimental sessions. The first one-hour session consisted of training and a data entry period. Subsequent half-hour sessions consisted primarily of data entry. The purpose of including multiple sessions was to examine the differential effects of the experimental manipulations over time. Results of the pilot revealed that subject performance changed very little over time, and these changes were consistent between experimental groups. Thus, four sessions were not needed to get an accurate picture of the experimental effects.

In addition, with four meeting times, scheduling, experimental mortality and decreasing interest levels were all problems. Thus, in the final experiment only the training session and one data entry session were used. These sessions were lengthened to reduce the time-pressure during training and to get a more accurate measure of performance.

4.2.3 Subject Recruiting

Subjects were recruited during class. They were given a printed 'job advertisement' describing the experiment. They were told they would be participating in

an experiment where they would be trained to use a computerized cost accounting system and to act as cost accounting clerks. They were assured that the task would not require any previous computer knowledge. They were also told they would receive extra credit equal to 2.5% to 5% of the course grade for participating in the experiment, depending on their effort and performance.

4.2.4 Introduction/Pre-Experimental Data Collection

When subjects arrived in the computer lab for the first session, they were welcomed to the company (The Open Road). They were assigned to a computer and were given written instructions to begin the program (typing a simple command) and were provided with a training packet. They were told to begin the program and follow the instructions on the screen.

Once they began the program, a brief explanation of the experiment and procedures for assignment of extra credit appeared on the screen. The explanation emphasized that their extra credit would depend on their performance on the accounting task but not on their answers to demographic and attitudinal questions. Demographic questions then appeared on the screen, followed by a series of questions to measure initial task interest, motivation and locus of control. Demographic and attitudinal data were collected through the computer and were automatically stored on the subject's computer disk using a program created by the experimenter. Questions asked are described more fully in later sections and are shown in Appendix A.

Once subjects completed the questions, a series of explanatory screens appeared.

These screens described the company and the department the subject was working for. This description varied depending on which structure condition the subject was in. For the cross-functional structure, subjects saw a description of the job costing department which told about materials, labor and overhead entry and job cost sheet preparation. A series of screens described both the users and the uses of the job cost sheets. For the functional structure, subjects read a description of the materials recording department only. They also saw a description of the users and uses of the job cost sheets, but these screens were not as detailed as those seen by the cross-functional subjects. Finally, subjects in both structures saw a series of screens emphasizing the importance of quality. When subjects completed these preliminary screens, a message telling them to wait for instructions from the trainer appeared.

4.2.5 Training

A single experimenter conducted the training with two additional experimenters circulating throughout the room to answer questions and assure that subjects did not fall behind. When all subjects had completed the initial screens, the experimenter welcomed the subjects to The Open Road and reiterated the mission of the company and the importance of quality.

Subjects in both structure conditions were initially trained in materials requisition entry. First, subjects were instructed how to navigate the menus that formed the backbone of the system. Next, the experimenter provided an overview of the training materials, documents and screens and how they were used. After this, the experimenter

described the process for entering documents and walked the subjects through this process, allowing them to perform the steps for a sample document. The steps were:

1) Enter the data for the document header just as it appears on the document.

2) Look for mistakes in the header data.

3) Flag the mistake by entering an error code in a flag blank at the end of the header field.

4) Enter the data for the first line of the document just as it appears.

5) Look for mistakes in that line.

6) Flag the mistakes by entering an error code in a flag blank at the end of the line.

7) Repeat steps 4 through 6 for the remaining lines.

Subjects also learned how to go back and edit a completed document.

The written training materials covered all items discussed in the training and could be used by subjects as an aid throughout the experiment. The training materials consisted of an 'error points list' that described the fields on the requisition, the mistakes that the subject should look for in each field, and the error code that should be recorded each time a mistake in that field was detected. An example was provided for each type of mistake.

Following training on the requisitions, the cross-functional subjects were also trained to enter time tickets and overhead summaries. This training was conducted using the same procedure as for the requisitions but was more abbreviated as the time ticket and overhead summary entry systems were very similar to the requisition entry system.

The cross-functional subjects were also shown a completed job cost sheet and

error report for the sample job. These reports and how they might be used by management were described in detail, as were procedures for instructing the system to prepare the job cost sheet and error report. As part of the structure manipulation, the functional structure subjects did not receive this training.

4.2.6 Practice Period

Following the training and a question and answer period, subjects in both structures were given a number of documents to enter. At the end of the allotted time, they were told to complete entry of the part of the document they were working on and were reminded to return the next day for the second session. The feedback provided during the second session was based on the subject's performance during this practice period.

4.2.7 Feedback

When subjects arrived for the second session, they were told to start the system and follow directions. Subjects in the three feedback conditions saw feedback on the screen and then answered feedback manipulation checks and motivation questions. The no-feedback subjects answered only the motivation questions.

Following receipt of the feedback, cross-functional structure subjects were shown the completed job cost sheets and error reports from the previous day's entry. The structure and use of these reports and how they could be prepared using the system was again emphasized. The procedure of giving subjects completed job cost sheets rather

than having them print them themselves was used to save time and avoid confusion caused by the structure of the lab and printers.

4.2.8 Data Entry/Process Improvement Suggestions

All subjects in both conditions were then given additional documents to enter and were reminded the importance of good-quality performance. They then entered documents until an appointed time when they were told to complete entry of the item they were working on and to exit the system. They were also given a form and were instructed to make any suggestions they could think of to improve the system.

4.2.9 Post-Experimental Data Collection

Upon exiting the system, subjects answered questions about attention, goal setting, goal difficulty, task significance, task identity, skill variety, autonomy and post-experimental task interest and motivation. These questions are shown in Appendix A.

4.3 Independent Variables

Organizational structure and feedback type were manipulated between groups as described below.

4.3.1 Organizational Structure

Organizational structure takes on two levels, functional and cross-functional. The main variables manipulated were the exposure of subjects to all facets of the process of

producing job cost sheets, knowledge of how each facet of the process related to the output and familiarity with the output of the process. As described in the previous section, for the functional structure, individuals were trained to perform only one step in the recording process--materials requisition entry. Each individual received a stack of documents to enter and worked independently. Concerning the other steps in the production process, subjects were told only that the data they entered would be combined with data from other workers to produce job cost sheets. Subjects never saw the job cost sheets that were to be the final product of their work.

In the cross-functional structure, subjects were trained to perform all three data entry tasks. Each subject was assigned to a group of three. Each member was assigned several materials requisitions, time tickets, and overhead summaries to enter. It was emphasized that all three members were working together to enter documents for a series of six job cost sheets. Subjects knew that, while one group member might enter the time tickets for a job, another might enter the materials requisitions and still another the overhead information for the same job. In addition, when they finished their own document entry, individuals were encouraged to assist other group members with their tasks.[8] This was intended to increase the extent to which individuals saw all parts of the task and understood their relationship in producing the job cost sheets.

Individuals were also shown the completed job cost sheets. The importance of time ticket, materials requisition and overhead summary information to these completed

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[8]Most subjects did not complete entry of all of their documents, and, therefore, did not help their group members in this way. However, group members did help each other with questions regarding the documents and entry processes. Therefore, the cooperative atmosphere desired was achieved.

job cost sheets was explained. The uses of completed job cost sheets were emphasized.

4.3.2 Feedback Type

The second independent variable was feedback type. There were four conditions--person-level feedback, process-level feedback, organization-level feedback and no feedback (control). Feedback was created based on the subject's actual error rate and appeared on the computer screen when the individual began the program during the second session. Subjects saw an explanation of the type of feedback they would receive, a short description of their performance and a supporting table and graph. They were given information about their own performance, their ranking, and the minimum, maximum and average performance for the group. Appendix B shows the feedback text for all three conditions.

Person-level feedback showed the number of errors made during data entry by the subject. For process-level feedback, the job cost sheet error rate was shown. This rate includes errors made by the subject as well as errors made by others working on the same job cost sheets. For organization-level feedback, subjects received user survey ratings on a scale from 1 to 10. The subjects were told that the ratings were based on a survey of manufacturing and marketing personnel who use the job cost sheets. In actuality, the experimenter simulated organization-level feedback using person-level error rates. This feedback was different from the process-level feedback because it focused on the perceptions of customers rather than the process itself. The no-feedback group began the program by answering the motivation question that others saw after the feedback.

4.3.3 Manipulation Checks

Effectiveness of the manipulation of organizational structure and feedback type were checked. Appendix A contains the wording of the check questions. Table 2 shows the results of these manipulation checks, both in terms of mean responses and cell counts. For the structure manipulation check, subjects chose the one (of two) task description that best described the task they performed. The results in Table 2 support a reasonably successful structure manipulation. Coded '1' for functional and '2' for cross-functional, the mean response for the subjects in the functional structure (1.19) was significantly smaller than the mean response for the cross-functional structure (1.61; p=.0001). In addition, the majority of individuals in the functional structure correctly identified the description of their structure (43 out of 53 or 81%), as did the majority of those in the cross-functional structure (31 of 51 or 61%). This is an overall accuracy rate of 71%.

Actually, the structure manipulation may have been more successful than this accuracy rate suggests. Six individuals either were observed discussing this question or asked the experimenter about the question. They were confused because, though they had been trained to enter all three types of documents, they had not completed all three due to time constraints. Adjusting for the six students observed moves the accuracy rate to 73% for the cross-functional structure and 77% overall.

In addition, a survey of subjects conducted after the experiment revealed that nearly all subjects were able to correctly recognize their structure when asked which tasks they were *trained* to perform. Conclusions that can be drawn based on this survey are limited because subjects had already been briefed about the purpose of the experiment.

However, the results further suggest that the manipulation was more effective than the manipulation check indicates.

The results in Table 2 for the feedback manipulation check also support a successful manipulation. The feedback manipulation check was coded as follows:

1 = organization-level feedback

2 = process-level feedback

3 = person-level feedback

4 = no feedback

Table 2 shows the mean responses for the groups.[9] All mean comparisons show a significant difference in the expected direction. 73% of person-level, 93% of process-level, 65% of organization-level and 84% of no-feedback subjects chose the appropriate description of the feedback they received. This is an overall accuracy rate of 79%. These results suggest a successful feedback manipulation.

4.4 Dependent Variables

The three dependent variables studied are motivation, quality performance, and participation in suggesting quality improvements. Means, standard deviations and ranges

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[9]Based on pilot testing, it seemed possible that subjects might pay attention to the feedback at the beginning of the session but forget its exact content by the end of the session when the manipulation checks are generally administered. As a result, feedback manipulation checks were administered for the person-, process- and organization-level groups right after they looked at the feedback and again at the end of the experiment. The no-feedback group answered the feedback manipulation check at the end of the experiment but not at the beginning to avoid biasing the results by bringing attention to the fact they were not receiving feedback. Results at both administrations were essentially the same. Therefore, the post-experimental results are reported here.

for these variables are shown in Table 3.

4.4.1 Motivation

Motivation was measured immediately after feedback was received but before the individual completed the task. Hackman and Lawler's (1971) experienced work motivation measure was modified to measure motivation of the subject to exert effort for this specific task. The scale consists of three items (described in Appendix A), which were each measured on a scale from 1 to 100. Each subject's responses to these three items were averaged to get the motivation measure used in the analyses.

Coefficient alpha describes the degree of internal reliability for a number of items intended to measure a single construct. Values range from 0 to 1. Values close to one are desirable. The motivation measure had a coefficient alpha of .70, indicating sufficient internal reliability. In a confirmatory factor analysis, all three items loaded on a single factor that explained 69 percent of the total variability in the individual items and thus were deemed to measure a single construct.

4.4.2 Quality Performance

Quality performance was defined as correctly recording each source document, detecting all mistakes that had been seeded in the document by the experimenter, and flagging the mistakes as instructed during training.[10] This aspect of performance was

[10]In clerical tasks such as this one, there is generally a relatively low incidence of actual typographical mistakes. In addition, the program was designed to bring attention to typing mistakes and minimize the volume of typing required. Therefore, it is expected that most incidence of poor quality (errors) will involve failing to detect these mistakes

measured objectively at the end of each experimental session by observing the subject's error rate. Error rates for the sample ranged from 0% to 64%.

4.4.3 Participation in Suggesting Process Improvements

An important key to achieving high quality is participation of workers in identifying ways to improve products and processes (Deming 1982, Scholtes and Hacquebord 1988a, 1988b, Walton 1991). During the second session, the subjects were asked to recommend ways to improve the process. Participation was measured by the number of suggestions made.

4.5 Mediating Variables Related to the SAM

According to the selective attention model (SAM), feedback and structure do not directly determine motivation and performance. Instead, two variables, attention and goal setting, mediate the relationship. Means, standard deviations and ranges for these variables are shown in Table 3.

4.5.1 Attention

Attention was measured in two ways. First, the amount of time spent looking at the feedback was automatically recorded by the system (Kahneman 1974). Times ranged from 90 to 632 seconds.[11] Second, the four items shown in Appendix A were designed to

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and properly flag them.

[11]The observation of 632 seconds was extreme (the next highest observation was 368 seconds). However, it was retained in the sample as the subject spoke English as

measure attention by asking the subjects to retrospectively evaluate the amount of attention they paid. The four items were each measured on a scale from 1 to 100 and were designed with three possible mediators of attention in mind: differential registration, encoding and recall of information (McArthur 1981).[12]

A confirmatory factor analysis on these four items revealed that they were measuring two different constructs. The first two items, which asked directly about attention, loaded heavily on one factor that explained 42% of the variability. The third and fourth items, which dealt with recall, loaded heavily on a second factor explaining 38% percent of the variability. Because the first two items were considered a more direct measure of attention, they were averaged to form the attention measure used in subsequent analyses. This measure had a coefficient alpha of .80 and both items loaded onto a single factor explaining 84% of the total variability.

4.5.2 Goal Setting

Two aspects of goal setting have been shown by past research to be important to motivation and performance--goal specificity and goal difficulty (Latham and Locke 1990). Four items were designed to measure goal specificity and three items were used to measure goal difficulty. All items were measured on a scale from 1 to 100. Individual

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a second language and therefore spent more time reading to assure understanding. Results are robust to deletion of this an other outliers detected throughout the analysis.

[12]Registration indicates whether individuals pick up more information about the stimuli. Encoding refers to how subjects organize the information about these stimuli. And recall refers to how easily subjects retrieve information about the stimuli from memory.

items were averaged to get a final measure. The goal specificity items had a coefficient alpha of .85 and loaded onto a single factor explaining 70% of the variability. The goal difficulty items had a coefficient alpha of .55 and loaded on a single factor that explained 76% of the variability. Because of the low level of reliability for the goal difficulty measure, results dealing with this item should be interpreted with caution.

4.6 Covariates

In describing the SAM, it was suggested that the shapes of the functions relating contrast and attention and contrast and task behavior vary with both individual and situational factors as shown in Figures 3, 4, and 5. If this is the case, these factors should be included as covariates in the study. Six potential covariates discussed in previous research are: locus of control, interest in the task, ability, age/experience, productivity and sign of feedback. Other demographic variables were also used as covariates. All the variables and how they were measured for this study are discussed in more detail below. Means, standard deviations and ranges for the covariates are shown in Table 3.

4.6.1 Locus of Control

Locus of control refers to the individuals' beliefs about who controls the outcomes of their efforts. Individuals with an internal locus of control believe that they can affect outcomes. Individuals with an external locus of control believe they have little control over their state of affairs, but instead they are controlled by fate or by the actions of others. Baron and Ganz (1972) and Baron et. al. (1974) conducted a series of

experiments about the effect of locus of control on response to feedback. They found that individuals with an external locus of control performed better than internals when feedback was provided by the experimenter. Because feedback in the current study was experimenter-provided, externals should respond more to the feedback than internals.

In the experiment, locus of control was measured using a shortened version of Rotter's (1966) original instrument. Each item requires the subject to choose between two statements, one indicating an internal locus of control and the other an external locus of control. The seven items with the highest correlation with the total score in Rotter's study were selected and are shown in Appendix A. The final score for an individual was determined by coding a '1' for an external response and a '0' for an internal response and summing for the seven items. Thus, the final measure could vary from 0 to 7 with a higher score indicating an external locus of control.

4.6.2 Task Interest

Interest in the task influences the individual's desire to respond to feedback (Ilgen, Fisher and Taylor 1979) and makes individuals more likely to seek out feedback (Ashford and Cummings 1985). Task interest was measured with four items modelled after the job involvement scale developed by Lawler and Hall (1970) and a fifth item measuring the subject's interest in accounting as a profession. The last item was added because participation was connected to class grades for an accounting course. Because students tend to be inherently more interested in classes related to their major, one would expect that subjects interested in accounting would also be more interested in the task. The five

items, shown in Appendix A, were all measured on a scale from 1 to 100. The final score was an average of the five. This scale was administered before the experiment. The reliability of the scale was satisfactory with a coefficient alpha of .72. All five items loaded on one factor explaining 54 percent of the variability.

4.6.3 Ability

Ability influences the individual's capacity to perform despite the person's motivation level (Locke et. al. 1981). Ability was measured by the subject's grade point average (self-reported) as well as by their error rate during the initial data entry session.

4.6.4 Age/Experience

Meyer and Walker (1961) found that older people use feedback less than younger people. Ilgen, Fisher and Taylor (1979) suggest that this effect may be due to the relationship between age and experience. They hypothesize that greater experience causes individuals to rely more on their own knowledge than on feedback. This contention is supported by Ashford and Cummings' (1985) finding that tenure with the company is related to how often individuals seek out feedback.

Age (in months), experience in accounting jobs or internships (in months), experience with the dBase software used to program the accounting system (yes or no), and previous enrollment in the accounting systems course (yes or no) were all used as covariates.

4.6.5 Productivity

Quality performance, which is the focus of this study, may depend on how much that individual focuses on speed, or their productivity level. Productivity was measured by the number of items completed divided by the time spent in data entry. The final measure is the number of items completed per second.

4.6.6 Sign of Feedback

Evidence suggests that individuals attend to positive feedback more than to negative feedback, perhaps because they protect themselves from negative feedback through selective attention (see Ilgen, Fisher and Taylor 1979 for a review of this literature). As mentioned in Chapter 2, Young, Fisher and Lindquist (1993) showed that individuals' responses to feedback were affected not only by whether feedback was positive or negative, but also by how extremely positive or negative it was.

Therefore, sign of feedback was measured as the difference between the individual's own error rate and the average error rate for the individual's group. This measure reflects both whether the feedback was positive or negative and its extremity. It also controls for group by group differences and reflects that feedback was presented relative to the group mean, maximum and minimum. Because this measure is perfectly correlated with the error rate dependent variable, it is not used in analyses containing the error rate variable.

4.6.7 Other Demographic Variables

Two other variables, sex and course, were included in the study because of their potential effect on individuals' performance. Because it is a commonly studied and sometimes important individual difference variable, sex was also included as a covariate in the study.

Course was included in the analysis because subjects were drawn from both lower-division, introductory accounting classes as well as upper-division accounting classes. Because these lower-division courses contained a significant number of non-accounting majors, it seemed plausible they might perform differently. Course was a categorical variable with five levels to represent the five courses with students participating in the study.

4.7 Conclusion

This chapter described the design of the study used to test the hypotheses developed in Chapter 3. The next chapter will discuss the procedures used to analyze the data from the experiment and will present the results of the paper.

CHAPTER V

RESULTS

The hypotheses described in Chapter 3 were tested using separate analyses of covariance for each dependent variable--error rate, motivation and number of suggestions--and mean by mean comparisons. The linear models tested for each hypothesis are discussed in the next section. After this, the results of the hypothesis tests, additional tests of mediating relationships suggested by the SAM and tests of covariate relationships discussed in Chapter 4 are described.

5.1 Linear Model

The following linear model describes the analysis of covariance used in this study:

$$Y_{ijk} = \mu + \alpha_j + \gamma_k + \alpha\ \gamma_{jk} + \beta\ (\ X_{ijk} - \tilde{\mu}_x) + \epsilon_{ijk}$$

where:

Y_{ijk}	=	Performance measure for individual i in feedback type j and organizational structure k
μ	=	mean performance score for all subjects
α_j	=	effect of feedback type j
γ_k	=	effect of organizational structure k

$\alpha\gamma_{jk}$ = interactive effect of feedback type j and structure k

ϵ_{ijk} = random error for subject i

β = vector of regression coefficients found when the covariates are regressed on the dependent variables

X_{ijk} = Vector of observed values for the covariates for individual i in feedback type j and organizational structure k

$\tilde{\mu}_x$ = Vector of mean values for the covariates

Hypothesis 1 says that the cross-functional structure will result in greater motivation and performance than the functional structure. Hypothesis 1 was tested by comparing the following null and alternative hypotheses.

$$H_{1o}: \gamma_1 = \gamma_2$$

$$H_{1a}: \gamma_1 < \gamma_2$$

where:

γ_1 = effect for a functional structure

γ_2 = effect for a cross-functional structure

Hypothesis 2a compares the effect of the three different feedback types for the functional structure. The appropriate null and alternative hypotheses are,

$$H_{2ao}: \alpha_1 + \alpha\gamma_{11} = \alpha_2 + \alpha\gamma_{21} = \alpha_3 + \alpha\gamma_{31}$$

$$H_{2aa}: \alpha_1 + \alpha\gamma_{11} > \alpha_2 + \alpha\gamma_{21} > \alpha_3 + \alpha\gamma_{31}$$

where:

$\alpha_1, \alpha_2, \alpha_3$ = effects for person-, process- and organization-level feedback, respectively

$\alpha\gamma_{11}, \alpha\gamma_{21}, \alpha\gamma_{31}$ = interactions for person-, process- and organization-

level feedback with a functional structure

Hypothesis 2b compares the effect of the three different feedback types for the cross-functional structure. The appropriate null and alternative hypotheses are,

$$H_{2bo}: \quad \alpha_2 + \alpha\gamma_{22} = \alpha_3 + \alpha\gamma_{32} = \alpha_1 + \alpha\gamma_{12}$$

$$H_{2ba}: \quad \alpha_2 + \alpha\gamma_{22} > \alpha_3 + \alpha\gamma_{32} > \alpha_1 + \alpha\gamma_{12}$$

where:

$\alpha\gamma_{12}, \alpha\gamma_{22}, \alpha\gamma_{32}$ = interactions for person-, process- and organization-level feedback with a cross-functional structure

5.2 Hypothesis Tests

The results of the hypothesis tests are described in more detail in the following sections. The results of the analyses of covariance are shown in Table 4. Mean comparisons were performed using two different types of means. The first were the least square, or covariate adjusted, means. The second type of means tested were the actual means with no adjustment for covariates.

5.2.1 Hypothesis 1--Main Effect for Structure

The first hypothesis says that a cross-functional structure will lead to higher motivation and performance than a functional structure. If hypothesis 1 is true, there will be a significant main effect for structure in the ANCOVAs. As shown in Table 4, there was no structure effect in the error rate or motivation ANCOVAs, but there was a significant structure effect when the dependent variable was the number of suggestions. To examine these effects in more detail, Figures 10, 11 and 12 graph both the adjusted

and unadjusted means, by structure, for each of the dependent variables. The pattern of results is opposite of what is stated in the hypotheses. The functional structure subjects had lower unadjusted error rates (adjusted error rates were essentially the same), higher motivation and made more suggestions.

Given that hypothesis 1 may be rejected, the next question becomes, "Why did the predictions of hypothesis 1 fail to hold?" Hypothesis 1 was based on beliefs that the cross-functional structure would lead to greater feelings of task identity, task significance, skill variety and autonomy. These characteristics are, in turn, associated with greater motivation and performance (Hackman and Oldham 1986). Thus, two relationships are important--the relationship between structure and the job characteristics and the relationship between these characteristics and the dependent variables of error rate, motivation and number of suggestions.

Table 5 shows the results of analyses designed to test these two linkages. Panel A shows the results of t-tests comparing perceptions of the job characteristics for the functional and cross-functional groups. Mean responses for each characteristic shown in the table are for the questions shown in Appendix A. Looking at the means shows that, contrary to hypothesis 1, differences between the cross-functional and functional structures in regard to perceptions of task identity, task significance, and autonomy were insignificant. Had they been significant, the pattern of responses was opposite what would be expected based on Hackman and Oldham's model. That is, task identity, task significance and autonomy were *lower* for the cross-functional structure. On the other hand, the cross-functional structure did show significantly greater skill variety.

Panel B of Table 5 shows correlations between the four job characteristics and motivation and performance. Hackman and Oldham's model predicts negative correlations between the four job characteristics variables and error rate, and positive correlations between the job characteristics, motivation and the number of suggestions. The correlations in Table 5 Panel B are consistent with these predictions, except for the skill variety measure where high skill variety was associated with higher error rates, lower motivation and fewer suggestions. However, again, these correlations are not significant.

The evidence in Table 5 suggests that one reason why hypothesis 1 may not have been supported is that the subjects did not see the structures as possessing the expected job characteristics and these characteristics were not associated very strongly with the expected motivational and performance outcomes.

These problems may indicate that structure was not successfully manipulated as intended in the short time frame of the study. This potential limitation of the study is examined in section 6.2.1. If the results were due to the shortened time period, this may suggest a modification to Hackman and Oldham's model to allow for effects of the time period. Opportunities for further research to examine these modifications will be examined in section 6.3.2.

5.2.2 Hypotheses 2a and 2b--Interaction Between Feedback and Structure

Hypotheses 2a and 2b suggest a significant interaction between organizational structure and feedback type. This interaction should take the form shown in Figure 8.

That is, in the functional structure, person-level feedback should be superior, followed by process-level and finally organization-level feedback. In the cross-functional structure, process-level feedback will be superior, followed by organization-level and finally person-level feedback. Looking at Table 4 reveals that the interactions for all three variables are insignificant. Furthermore, the individual means, both adjusted an unadjusted (shown in Figure 13, 14, and 15), reveal patterns contrary to those hypothesized, or no pattern at all. The only significant differences are in Figure 15 for the number of suggestions. These differences are between the functional and cross-functional groups and reflect the main effect for structure discussed earlier.

These results suggest that the effects of different types of feedback are not dependent upon the organizational structure used and, thus, hypotheses 2a and 2b may be rejected.

5.2.3 Main Effect for Feedback

No hypotheses about a main effect for feedback type were suggested by the SAM. However the lack of results for the interaction suggest the question "Does the type of feedback provided have *any* effect at all?" The clear insignificance of both the main effects of feedback and contrasts comparing the no feedback group to all of the other groups (shown at the bottom of Table 4) reveal that the answer to this question is "no." Thus, the clear conclusion is that feedback had no effect whatsoever in this experiment. One possible explanation for the lack of a feedback effect is that the manipulation was unsuccessful. Since the feedback manipulation checks showed that subjects were able to

discern the type of feedback they received, this explanation does not seem likely. Suggestions for future research examining other potential reason for this effect are discussed in section 6.3.3.

5.3 Tests for Selective Attention Model Mediators

The hypotheses of this paper derive from expected relationships between attention, goal setting, motivation and performance. Specifically, according to the SAM, certain combinations of organizational structure and feedback will lead to greater attention to feedback, which in turn influences goal specificity and goal difficulty, which ultimately influence motivation and performance. Examining the relationship between feedback and organizational structure and these mediating variables may reveal why the results of the experiment differ from the hypotheses based on the SAM.

5.3.1 Attention

The first relationship examined was for attention to feedback. An analysis of covariance where attention (measured first using a self-report and second using the time spent looking at the feedback) was the dependent variable and organizational structure and feedback type were the independent variables. Data for the 79 subjects who received feedback was included in the analysis. The same covariates were included in this analysis as in the primary analyses use to test the hypotheses. The fit hypothesis would be supported by a significant interaction between organizational structure and feedback type. As shown in Table 6, the interaction is not significant for either measure of

attention.

5.3.2 Goal Setting

It is possible that the lack of results for the attention variables may be due to poor measurement or lack of content validity of the attention measures. If this is the case, and the SAM is valid, there could still be a relationship between structure/feedback and goal specificity and/or goal difficulty. However, as shown in Table 6, the interaction between structure and feedback type is not significant for either goal specificity or goal difficulty.

5.3.3 Relationships Between SAM Constructs

These disappointing results point to a need to reevaluate the existence and nature of the relationships between structure, feedback and individual motivation and performance. However, they do not necessarily eliminate the possibility that some relationships described by the SAM may be valid. Indeed, it is possible that the SAM may be valid, but parts of the experiment simply did not accurately capture the SAM constructs. This possibility can be examined by looking at the interrelationships between the variables of attention, goal setting, motivation and performance which make up the SAM.

Table 7 shows a correlation matrix for the variables that make up the SAM. This matrix shows most correlations in the expected direction, though many are not significant. The most surprising result shown in Table 7 is that three dependent variables are consistently uncorrelated with correlations of -.02, -.00 and .03. This may point to

ineffectiveness in measuring one or more of these constructs, a problem that could explain a number of the insignificant effects discussed in the previous section.

The strong positive correlations between the post-experimental measure of attention and both goal setting measures support the contention that greater attention to feedback may lead to the setting of more specific and difficult goals. However, this is not entirely consistent with the SAM, as the SAM theorizes a curvillinear relationship whereby attention will sometimes lead to more goal setting and sometimes will impede goal setting, depending on the fit between organizational structure and feedback type. This curvillinear relationship was ruled out in earlier analyses that showed no significant interaction between organizational structure and feedback type when attention was the dependent variable (see Table 6).

Some significant correlations do exist between the mediating variables described by the SAM--attention and goal setting--and two of the dependent variables--error rates and motivation. Higher goal difficulty is associated with lower error rates and higher motivation, as suggested by goal setting theory. Similarly, a significant positive correlation exists between goal specificity and motivation. Goal specificity is also associated with lower error rates, as expected, though the correlation between these two variables is insignificant. Goal specificity and goal difficulty are not, however, related to the number of suggestions.

The lack of correlation between goal setting and error rates but not goal setting and the number of suggestions may indicate that goal setting is motivated by the provision of feedback. This is because feedback was provided for the number of errors,

but not for the number of suggestions. However, this effect also may be caused by the wording of the goal setting measure, which focused more on error rates than suggestions. Therefore, additional research is needed to draw conclusions from this result.

5.4 Results Related to the Covariates

A number of covariates were included in the study. Assuming no correlation between the independent variables and the covariates, including the covariates in the analyses reduces the variance in the error term by extracting their effect on the dependent variable, increasing the probability that significant differences caused by the independent variable will be detected. If the covariates are correlated with the independent variables, including the covariates allows the experimenter to remove their affect on the dependent variable, isolating only the affect of the independent variable under study.

In addition, explicitly measuring the covariates allows the researcher to study their effects. The following analysis looks at the importance of each covariate in the main analyses used to test the hypotheses. The relationship between the covariates and the dependent variables is examined more thoroughly through the use of analyses of variance and mean comparisons which include the independent variables, the covariate under study (mean split and treated as blocking variables), and interactions.

5.4.1 Locus of Control

The results for the locus of control variable reveal a potential limitation on conclusions about this variable that can be drawn from this study. The statistics in Table

3 indicate that locus of control scores ranged from 0 to 4 while the possible range for scores was 0 to 7. Thus, the subjects were all internals; they varied only in their degree of internality.

According to past research, an interaction between locus of control and feedback type was expected because externals were expected to react more to the feedback than internals. No interaction between locus of control and feedback was found. In addition, locus of control was not a significant covariate in any of the ANCOVA's shown in Table 4. However, when the other covariates were removed and locus of control was made into a categorical variable, a significant main effect for locus of control appeared when error rate was the dependent variable. A marginally significant ($p=.09$) main effect was also present when the number of suggestions was the dependent variable.

Further examination of the main effect of locus of control through mean-by-mean comparisons reveals that individuals with a more external locus of control outperformed internals with lower error rates and more suggestions. This effect is reasonable, as externals would be more concerned with perceptions of the experimenter, who was present during the entire experiment. They would, therefore, work harder, despite their similar level of motivation to the internals.

5.4.2 Task Interest

As shown in Table 4, task interest was an important covariate in the motivation ANCOVA's. Further analysis confirms that individuals with higher task interest were more motivated. What is perplexing is that this motivation did not lead to significant

differences in performance. This may indicate that motivation and performance were not related for this task, possibly because success in the task was related more to cognitive ability than to motivation or effort. This proposition is weakly supported by the positive relationship between ability and performance discussed in the next two sections.

5.4.3 Ability--Grade Point Average

Grade point average (GPA), one measure of ability, was an important covariate in the ANCOVA for number of suggestions. Further analysis reveals that the relationship between GPA and the number of suggestions is as expected. Individuals with a high GPA outperformed low GPA subjects.

5.4.4 Ability--Initial Error Rate

The individual's error rate during the training session was an important covariate in the ANCOVA for error rate, as expected (see Table 4). Further analysis confirmed that individuals with a low initial error rate also had significantly lower subsequent error rates.

5.4.5 Age

Age was included as a covariate in the analysis based on previous research suggesting that older people respond less to feedback than do younger people. Age was not a significant covariate in any of the ANCOVA's shown in Table 4. More detailed analyses did not reveal any age effects, either.

5.4.6 Experience

Experience was important for two reasons. First, experience has been found to be negatively related to the degree to which individuals respond to feedback. Second, more experienced individuals might be expected to outperform unexperienced individuals, regardless of the feedback received. Three measures of experience were used:

1) Months of accounting experience

2) Prior experience with the dBase software used to program the system (yes or no). Though knowledge of the software was in no way required to use the system, to an experienced user, it would be apparent that the system was programmed using dBase. Therefore, an experienced user might be more comfortable with the system, simply because of its familiarity.

3) Whether or not the individual had taken the accounting information systems course (yes or no). Because the systems course discusses system design and improvement, having taken the course might influence the number of improvement suggestions the subject could make. Because the systems course also involved significant computer use, having taken the course might also influence motivation and error rate by decreasing computer anxiety.

The only significant effect in the ANCOVA's is for dBase experience when error rate is the dependent variable. Further analysis, dropping other covariates, reveals a main effect of accounting experience when error rate is the dependent variable. As expected, individuals with more experience had lower error rates. No effects were found for

previous experience using dBase. Whether the subject had taken the accounting information systems course had a significant, direct effect on both error rate and the number of suggestions made, with a lower error rate and more suggestions for subjects who had taken the course.

5.4.7 Productivity

Productivity was not a significant covariate in any of the primary analyses. However, after removing covariates, results revealed a significant negative relationship between productivity and motivation. At first this is perplexing. However, because motivation was measured in terms of motivation to achieve high quality, it is possible that individuals who focused on quality (i.e. few errors) worked more slowly and completed fewer entries.

5.4.8 Sign of Feedback

Sign of feedback was included as a covariate because of evidence suggesting that individuals attend more to positive than to negative feedback. As indicated in Table 4, sign of feedback was an important covariate in the ANCOVA with number of suggestions. However, it was not significant when other covariates were removed.

5.4.9 Other Demographic Variables

Neither course nor sex was an important factor in the ANCOVAs.

CHAPTER VI

CONCLUSION

6.1 Summary

This research developed a model called the Selective Attention Model (SAM) that describes how attention to feedback and goal setting based on that feedback influence both motivation and performance. The importance of goals implicit in the organizational structure to the process was emphasized. Motivational effects, rather than learning or cuing effects, were isolated because of their importance in quality improvement. Hypotheses derived from the model were tested using a laboratory simulation of a cost accounting task.

The study had three phases. In the first phase, the theoretical model (SAM) was developed. The SAM represents a significant contribution to the theoretical literature. The SAM is useful because it explicitly examines the cognitive process through which stimuli (like feedback) and environmental variables (like organizational structure) interact to influence individuals' reactions to the stimuli.

In the second phase of the study, the SAM was applied to answer the question of how feedback and structure influence motivation and performance. This phase included developing hypotheses and designing a laboratory study to test these hypotheses. A

complete cost accounting system for a bicycle manufacturing company called The Open Road was developed for use in the laboratory simulation. Training materials and procedures were also written. In addition, data to be used in the experiment were developed. The careful attention to detail taken while developing the system, training materials and data not only made the experiment more realistic, but also resulted in a system that can be used as a learning aid in future accounting classes.

In the final phase of the research, the laboratory study was conducted, and the results were compiled and discussed. Though the results of the tests do not support the hypothesized relationships between feedback and organizational structure suggested by the SAM, some support is provided for the underlying relationships that are part of the SAM. This creates opportunities for future research which will be discussed in more depth in section 6.3.

Section 6.3 also discusses two other opportunities for future research identified by the study. First, there was weak evidence of a relationship between structure and performance. However, this effect was contrary to research conducted by Hackman and Oldham. Second, feedback, regardless of its type, had little effect on subjects' motivation and performance. This is despite past research suggesting feedback *will* influence both motivation and performance.

Before discussing these opportunities for research, some of the limitations of the current study that give rise to these opportunities will be discussed.

6.2 Limitations

The conclusions based on this research are limited by three important factors. These factors are the success of the structure manipulation, the measurement of the variables and the external validity of the laboratory study used for the testing the hypotheses.

6.2.1 Success of the Structure Manipulation

Section 4.3.1 describes the structure manipulation. The cross-functional and functional structures differ in terms of the degree to which the subjects saw all facets of a process, understood the end product and were aware of how each facet of the process was necessary to produce the end product. Based on Hackman and Oldham's job characteristics model, the cross-functional structure was expected to result in higher task identity, task significance, task variety and autonomy and in turn greater motivation and performance. Therefore, this is a worthwhile manipulation.

However, it appears that the subjects did not interpret the manipulation as expected. Contrary to expectations, the cross-functional structure subjects perceived lower task significance, task identity and autonomy than the functional structure subjects (see Table 5, Panel A). One likely reason for this is the length of time allowed for the subjects to perform the experimental task. Both groups had about the same amount of time for training and practice. However, the cross-functional structure subjects had to learn to perform three tasks--materials requisition entry, time ticket entry, and overhead summary entry--while the functional structure subjects had to learn only one task--

materials requisition entry. Given the limited time for the experiment, the cross-functional structure subjects may have been too rushed to understand the job cost sheet production process well enough to identify with it, understand its significance or to have the feeling of autonomy associated with completion of a whole process. In addition, the time limitation curtailed their interaction with one another, eliminating another opportunity for the subjects to recognize the relationships between the tasks and the contribution of each task for producing the final product.

The time limitation may also explain the superior performance by the functional structure subjects at suggestion improvements. The functional structure subjects had fewer tasks and therefore more time to contemplate the effectiveness of the system and possible improvements. Again, cross-functional structure subjects were simply too rushed.

The reason for keeping the time frame relatively constant between the structures was to avoid differences in fatigue levels. In addition, efforts were made to maintain a similar level of complexity for the structures to avoid confounding complexity with task identity, task significance, task variety and autonomy. Retrospectively, it would have been better to recognize that complexity is an inherent part of a cross-functional structure that cannot be removed in the laboratory any more than it can be removed in practice. Recognizing this, future studies should allow individuals in the cross-functional structure more time to learn and understand the task. Measures of fatigue should be collected so that its effects can be used as a covariate, thus controlling for this factor. Measures of task complexity should also be collected, and the relative importance of complexity, task

identity, task significance, task variety and autonomy should be compared to obtain a better understanding for how each of these aspects of structure influences motivation and performance.

6.2.2 Variable Measurement

Two concerns regarding variable measurement are important: (1) common method variance, and (2) conclusions about causality. Common method variance is a problem when two variables are measured using the same technique. Illusory correlations may be observed between these variables because they were measured using the same method. This problem may provide some explanation for the significant correlations between attention, goal specificity and goal difficulty. The attention and goal setting measures were both collected post-experimentally and all three measured used the same type of measurement scale. Thus, individuals may have tried to provide consistent answers for these different questions, leading to unrealistically high correlations between the variables.

In addition, limitations in the ability to make conclusions about the causal relationships between the attention, goal setting, motivation and performance variables are caused by when these constructs were measured. Whenever information about attitudes or behavior is directly elicited from subjects, a tradeoff exists. To make conclusions about causal relationships between variables, variables that are hypothesized to be causally related must be measured in sequence. Thus, if feedback influences attention, which influences goal setting which in turn influences motivation and

performance, attention and goals must be measured after feedback is received but before the individual performs the task.

The other side of this issue is that measuring variables like attention and goal setting may induce goal setting where it may not have occurred otherwise, thus impacting behavior and artificially inflating or masking the effect of feedback on behavior. To avoid this problem, attention and goal setting were measured during post-experimental data collection. This precludes any conclusions about causal relationships where these variables are involved.

As a result of these limitations, future research examining the relationships hypothesized in the SAM should carefully test the relationships. Techniques that allow for stronger conclusions about causality, while avoiding induced attention or goal setting, should be used.

6.2.3 External Validity of the Method Used

The second major limitation of the study deals with the methodology used. Any laboratory study is limited to the extent that it cannot include all variables that would appear in an actual setting. In addition, although efforts were taken to make the current study as realistic as possible, a certain degree of simplification was necessary because of the limitations of facilities and subject's time. One example of such simplification was the exclusion of interdependencies between individuals that may exist in a cross-functional structure in real-world settings. All these limitations affect the generalizability or external validity of the study. To enhance the generalizability of the findings,

additional research should be conducted studying the same question but using other methods such as field studies or questionnaires.

6.3 Opportunities for Further Research

Three opportunities for further research will be examined below.

1) Research Examining the SAM Relationships
2) Research Examining the Relationship Between Job Characteristics and Motivation and Performance
3) Research Examining the Conditions Necessary for a Feedback Effect

6.3.1 Research Examining the SAM Relationships

Despite lack of support for the hypotheses derived from the SAM, relationships between goal setting, goal difficulty, attention to feedback and motivation and performance were observed. Therefore, the SAM can be used as a model for future research that looks in more depth at how feedback might draw individuals' attention and direct goal setting activities.

6.3.2 Research Examining the Relationship Between Job Characteristics and Motivation and Performance

One other opportunity for further research is suggested by the findings related to hypothesis 1. In the experiment, the subjects perceived greater task identity, significance and autonomy with the simpler, though incomplete, functional structure task. The functional structure was also associated with lower error rates, higher motivation and

more suggestions. In the previous section, it is suggested that these effects are due to greater time pressure in the cross-functional structure. Therefore, this behavior may not have manifested had the time frame been longer. However, if this behavior persists in real world situations where conditions are similar to those in the experiment, such as early stages of adoption of cross-functional structures, or conditions of extreme time pressure, Hackman and Oldham's job characteristics model should be modified to reflect the effect of time frame. Other models relating job characteristics and work behavior (see Campion 1988 and Campion and Berger 1990) support the possibility that the effect of Hackman and Oldham's job characteristics may vary depending on environmental conditions and the dependent variable of interest. Therefore, further testing is needed to examine the applicability of Hackman and Oldham's model under conditions such as early implementation and under conditions of high time pressure.

A replication of the current study where cross-functional structure subjects are given more time to learn the task would be a beginning. Additional studies that explicitly manipulate time pressure or measure attitudes and performance over time would also be helpful. However, to fully examine the effects of adoption stage and time pressure, a longitudinal field study is needed. An organization could be identified where different groups of new employees were exposed to functional versus cross-functional tasks requiring similar skill and knowledge levels. By observing and measuring the subjects' motivation and performance over time, the relationships suggested by the model could be tested. Different perceptions of time pressure could be measured and its effect could be examined. Because of the design, other individual difference factors could be controlled

through covariation or through matching.

6.3.3 Research Examining the Conditions Necessary for a Feedback Effect

The final result that warrants further investigation is the finding of no interactive or main effect for feedback. Though they have not specifically studied the effects of the different types of feedback examined in this study, the psychology and organizational behavior literatures have consistently found effects of providing some feedback, relative to no feedback at all. Three potential explanations of why feedback had no effect in this study that suggest additional research are:

1. The task was so uninteresting that subjects were not motivated.
2. The method of delivering the feedback is important in determining its effect on motivation and performance.
3. Feedback has no motivating effect when learning and cuing properties are not also present.

The first explanation is that the subjects understood what type of feedback they received but simply were not motivated by the task significantly enough to care about the feedback. Thus, future research should study the same variables, while varying the level of task interest experienced by the subjects.

The second explanation for no feedback effect is that the method of delivering the feedback influenced individuals' reactions to it. Deming's writing would suggest that the way feedback is delivered may have an effect. Though others have studied how leadership style influences subordinate performance, little attention has been given to

leadership style as it relates to how feedback is delivered.

The use of qualitative feedback provided personally by a superior may have different effects than the impersonal, quantitative feedback provided in this study. In addition, only one type of feedback was provided to a particular individual in this study. In practice, an individual may receive more than one level of feedback. Thus, the effect of receiving different types of feedback simultaneously should be considered by future research. In addition, studies focusing on other characteristics of feedback delivery, for example, whether it is stated in terms of cost or units, might provide interesting results.

The final explanation for no feedback effect is that the feedback simply had no value because it did not allow for cuing or learning. That is, the feedback did not give subjects information to help improve their performance. This explanation does not eliminate the possibility of motivation effects of feedback. Instead it says that individuals are motivated by feedback, but only when that feedback can be used to improve performance. Based on comments made by the subjects, this explanation seems plausible.

If this explanation is correct, modifications to the selective attention model are appropriate. These modifications would result in the new SAM depicted in Figure 16. In essence, two aspects of feedback should be considered in the model.

1) Feedback type--person-level, process-level, organization-level

2) Feedback use--motivation, cuing, learning

Based on the current study, when feedback can only be used for motivation, it has no influence on motivation or performance. However, when it has cuing or learning

properties or both, the relationship between feedback type, structure and motivation and performance discussed in the study may hold. In general, feedback that has only information about outputs or results can only be used for motivational purposes. To the extent that feedback gives information about the actual procedures used or the procedures that should have been used to perform the task, it may have either cuing or learning properties, or both. Future research should examine this modified model in more detail.

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TABLES

Table 1
Schedule for the Experiment

	Functional 8:30 a.m.	Cross-Functional 12:00 p.m.	Cross-Functional 5:00 p.m.	Functional 6:15 p.m.
Person-level	x	x	x	x
Process-level	x	x	x	x
Organization-level	x	x	x	x
No-feedback	x	x	x	x

Table 2
Manipulation Checks

Panel A--Structure

				Cell Counts		Percent
Structure	Expected	Mean*	St. Dev.	Funct.	X-Fn.	Correct#
Functional	1	1.19	0.39	43	10	81%
Cross-Functional	2	1.61	0.49	20	31	61%

*p-value for the t-test comparing the means is .0001
#Overall percent correct is 71%

Panel B--Feedback

				Response Cell Counts				Percent
Feedback Type	Expected	Mean*	St. Dev.	Person	Process	Org.	None	Correct#
Person	3	2.58	0.76	19	3	4	0	73%
Process	2	1.93	0.27	0	25	2	0	93%
Organization	1	1.54	0.81	5	4	17	0	65%
None	4	3.72	0.74	2	1	1	21	84%

*p-values for t-tests of mean comparisons are all significant for a=.05
#Overall percent correct is 79%
Note: data is for the second administration of the feedback manipulation.

Table 3
Means for All Subjects

	Average	Std. Dev.	Min.	Max.	Scale Min.	Scale Max.
Number of Subjects	104					
Dependent Variables:						
Error Rate (T2)	10.3%	11.8%	0%	64%	--	--
Motivation (T2)	79.0	18.3	10	100	1	100
Suggestions	2.9	1.6	0	8	--	--
SAM Variables:						
Attention (n=79)	77.1	24.0	1	100	1	100
Feedback Time (n=79)	185.2	77.5	90	632	--	--
Goal Specificity (n=103)	75.8	22.2	1	100	1	100
Goal Difficulty (n=103)	76.8	17.7	15	100	1	100
Covariates:						
Age	23.8	4.6	18	41	--	--
Acctg. Experience (months)	11.7	26.6	0	180	--	--
GPA	3.1	0.5	2	4	--	--
Task Interest	78.1	17.5	13	100	1	100
Locus of Control	2.9	1.1	0	4	0	7
Ability--Error Rate	7.2%	9.4%	0%	48%	--	--
Productivity	0.0262	0.0092	0.0079	0.0614	--	--
Other Variables:						
Task Significance--question 1	85.94	15.82	40	100	1	100
Task Significance--question 2	84.54	20.95	5	100	1	100
Task Identity	82.23	18.82	25	100	1	100
Skill Variety	51.02	32.28	1	100	1	100
Autonomy	77.14	23.16	1	100	1	100

Table 4
Results: Dependent Variables

	Error Rate Type III S.S.		Motivation Type III S.S.		Suggestions Type III S.S.	
	F	p	F	p	F	p
Structure	.00	.9865	1.45	.2318	**7.03**	**.0096**
Feedback	.53	.6615	.23	.8720	.21	.8921
Structure*Feedback	.14	.9344	.50	.6816	.47	.7024
Age	.36	.5483	.01	.9188	.10	.7585
Sex	.06	.8144	.97	.3285	1.25	.2667
Accounting Experience	.47	.4935	.42	.5167	.13	.7203
Experience with dBase	**4.38**	**.0394**	.31	.5803	2.20	.1415
Course	1.60	.1823	.56	.6908	.47	.7558
GPA	.28	.6008	.41	.5263	**7.50**	**.0076**
Accounting Systems	.67	.4141	.01	.9343	1.73	.1924
Repeating Experiment	.11	.7465	.07	.7963	**4.25**	**.0424**
Task Interest	2.92	.0911	**21.68**	**.0001**	.25	.6197
Locus of Control (internality)	2.65	.1074	.88	.3518	2.41	.1248
Ability--Error Rate	**14.24**	**.0003**	.51	.4793	.05	.8254
Productivity	.40	.5293	.61	.4363	.80	.3751
Sign of Feedback	*	*	.48	.4900	**4.50**	**.0370**
No Feedback vs. Feedback	.00	.9666	.00	.9778	.09	.7609
R square for model	46%		31%		32%	
number of observations	104		104		104	

* Sign of feedback cannot be used in an analyses involving error rate because these variables are perfectly correlated.

Table 5
Job Characteristics Relationships

Panel A--The Relationship Between Structure and Job Characteristics

	Mean Score				
Structure	Task Identity	Task Sig.	Task Sig2	Skill Variety	Auton
Functional	83.94	85.85	87.38	44.87	79.60
Cross-Functional	80.49	86.04	81.65	57.29	74.63
p-value for t-test	.35	.95	.17	.05	.28

Panel B--The Relationship Between Job Characteristics and Motivation/Performance

	Job Characteristic				
Dependent Variable	Task Identity	Task Sig.	Task Sig2	Skill Variety	Auton
Error Rate	r = -.14	r = -.08	**r= -.20**	**r = .16**	r = -.04
	p = .16	p = .45	**p = .04**	**p = .10**	p = .68
Motivation	r = .04	r = .16	r= .09	r= .01	r = .03
	p = .72	p = .10	p = .32	p = .93	p = .78
Number of Suggestions	**r = .19**	r = -.04	**r = .22**	r= -.11	r = .08
	p = .06	p = .68	**p = .02**	p = .29	p = .42

Table 6
Results: Mediators Related to the SAM

	Attention Type III S.S.		Feedback Time Type III S.S.		Goal Specificty Type III S.S.		Goal Difficulty Type III S.S.	
	F	p	F	p	F	p	F	p
Structure	5.68	.0287	**6.26**	**.0152**	**6.25**	**.0145**	3.71	.0576
Feedback	.52	.4539	.33	.7211	.28	.8376	.78	.5064
Structure*Feedback	.31	.6311	.26	.7707	.32	.8136	.59	.6221
Age	1.00	.4241	2.73	.1037	3.54	.0634	.21	.6472
Sex	.04	.7530	.14	.7096	2.86	.0950	.24	.6280
Accounting Experience	.35	.4844	.68	.4140	.74	.3923	.75	.3893
Experience with dBase	2.84	.1319	.26	.6135	.12	.7284	1.36	.2472
Course	1.68	.2420	.25	.9097	1.35	.2588	.86	.4921
GPA	.18	.7382	.29	.5943	.16	.6900	.49	.4849
Accounting Systems	1.10	.3684	.98	.3255	.01	.9350	.18	.6688
Repeating Experiment	1.12	.2584	3.09	.0839	**4.06**	**.0472**	**4.03**	**.0480**
Task Interest	**9.88**	**.0026**	.86	.3566	**7.01**	**.0098**	**5.49**	**.0217**
Locus of Control (internality	2.09	.1721	.48	.4915	.05	.8175	.16	.6900
Ability--Error Rate	.07	.5670	.40	.5299	2.35	.1289	.01	.9137
Productivity	**7.05**	**.0091**	3.81	.0559	.91	.3434	.94	.3364
Sign of Feedback	.20	.4778	.02	.9011	.99	.3228	**5.40**	**.0227**
No Feedback vs. Feedback	--	--	--	--	.15	.6966	1.19	.2783
R square for model	42%		37%		33%		28%	

Table 7
Correlations

	Mot.	No. Sug.	FB Time	Att.	Goal Spec.	Goal Diff.
Error Rate	r=(.02) p=.87	r=(.00) p=.97	r=.14 p=.22	r=(.01) p=.94	r=(.13) p=.19	**r=(.22) p=.02**
Motivation		r=.03 p=.77	r=.06 p=.60	**r=.48 p=.01**	**r=.46 p=.01**	**r=.37 p=.01**
No. Suggestions			r=(.03) p=.78	r=.07 p=.56	r=.08 p=.44	r=(.01) p=.95
FB Time				r=.09 p=.43	r=.10 p=.41	r=(.09) p=.46
Attention					**r=.49 p=.01**	**r=.40 p=.01**
Goal Specificity						**r=.58 p=.01**

FIGURES

Figure 1
The Selective Attention Model
General Form

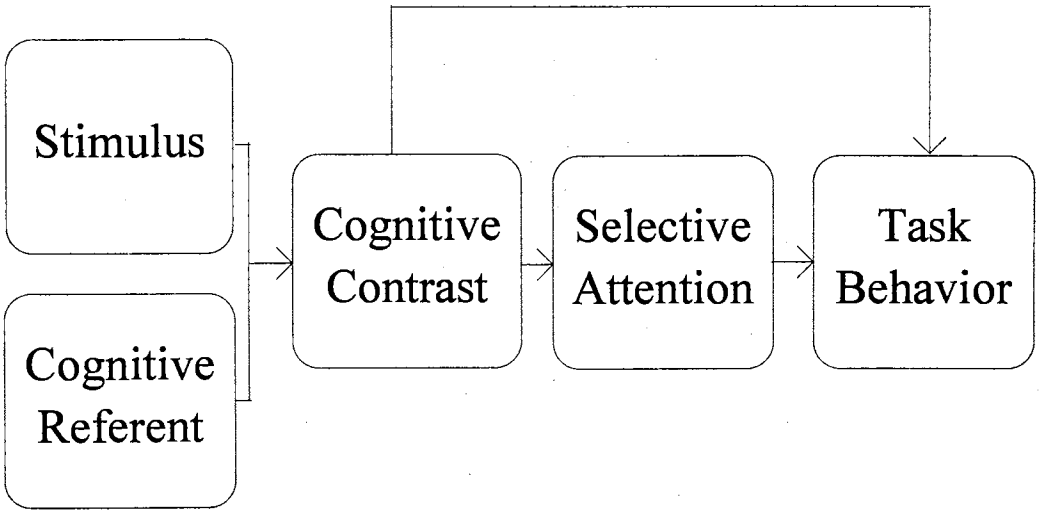
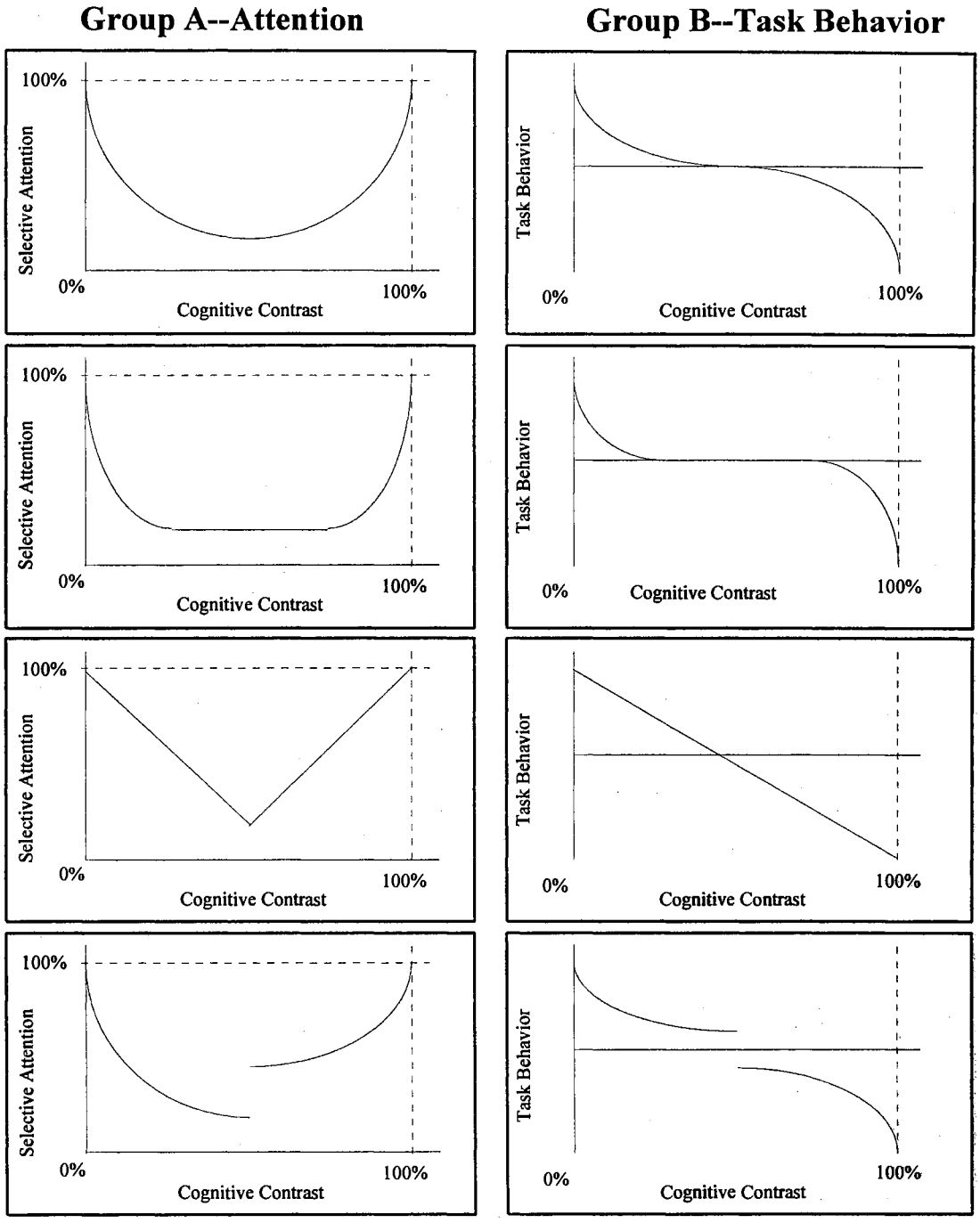


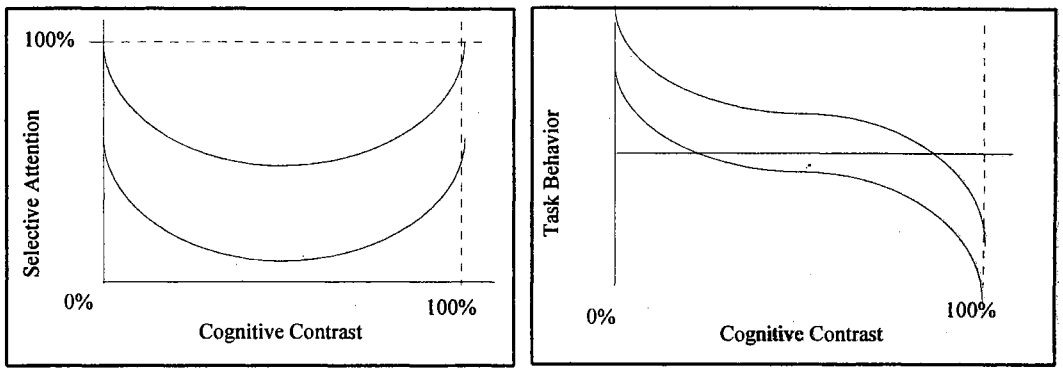
Figure 2
Functional Forms of the Selective Attention Model



Note: The exact placement of the function relative to the horizontal axis is unimportant for the curves in group B. The SAM function may lie entirely or partially above the axis, depending on the scale for measuring the behavior of interest.

Figure 3
The Effect of Varying SAM Characteristcs Change in General Attention/Behavior Effects

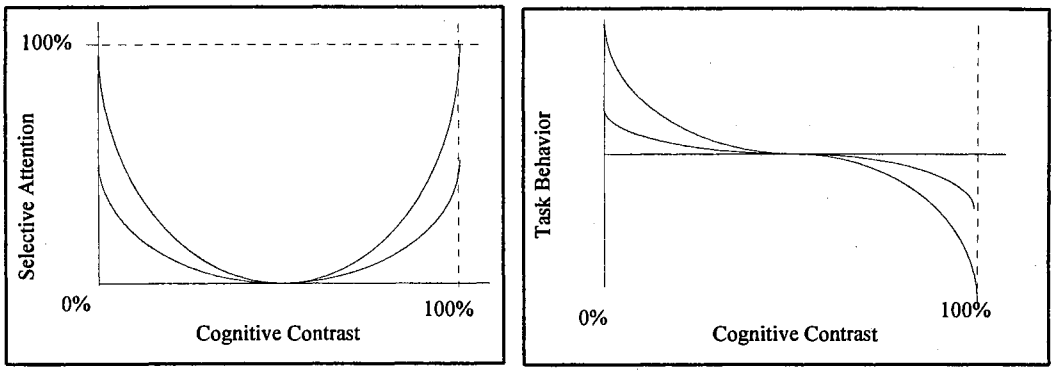
A--Attention **B--Task Behavior**



Note: The exact shape of the SAM curves, as described in the text, will vary. A curved SAM function is used in these illustrations for simplicity and comparability.

Figure 4
The Effect of Varying SAM Characteristics Changes in Sensitivity to Contrast

A--Attention **B--Task Behavior**

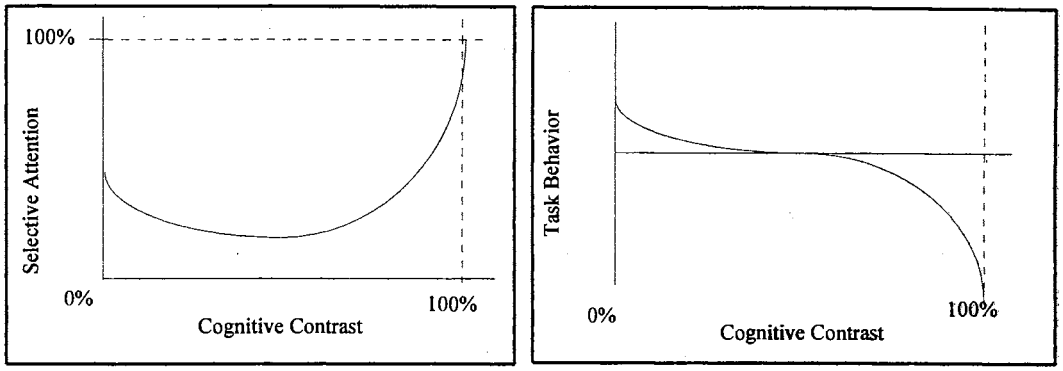


Note: The exact shape of the SAM curves, as described in the text, will vary. A curved SAM function is used in these illustrations for simplicity and comparability.

Figure 5
The Effect of Varying SAM Characteristics
Different Reaction to High versus Low Contrast

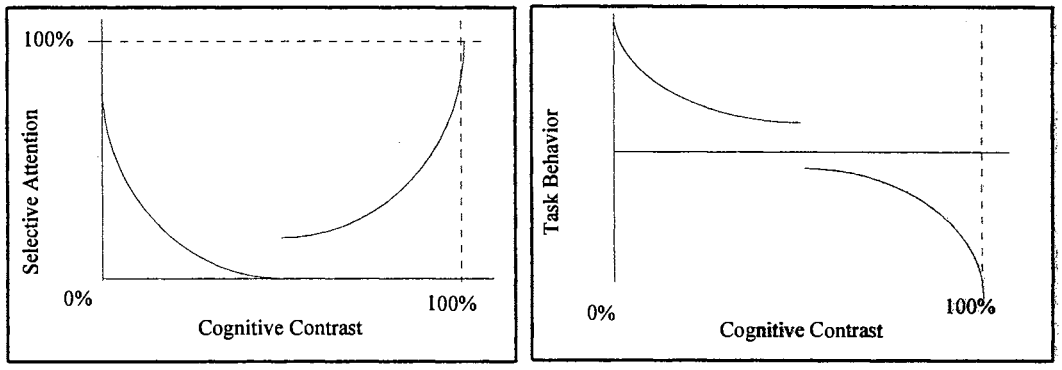
Change In Sensitivity

A--Attention **B--Task Behavior**



Change In strength of Reaction

A--Attention **B--Task Behavior**



Note: The exact shape of the SAM curves, as described in the text, will vary. A curved SAM function is used in these illustrations for simplicity and comparability.

Figure 6
The Selective Attention Model
As Applied to Quality Motivation and Performance

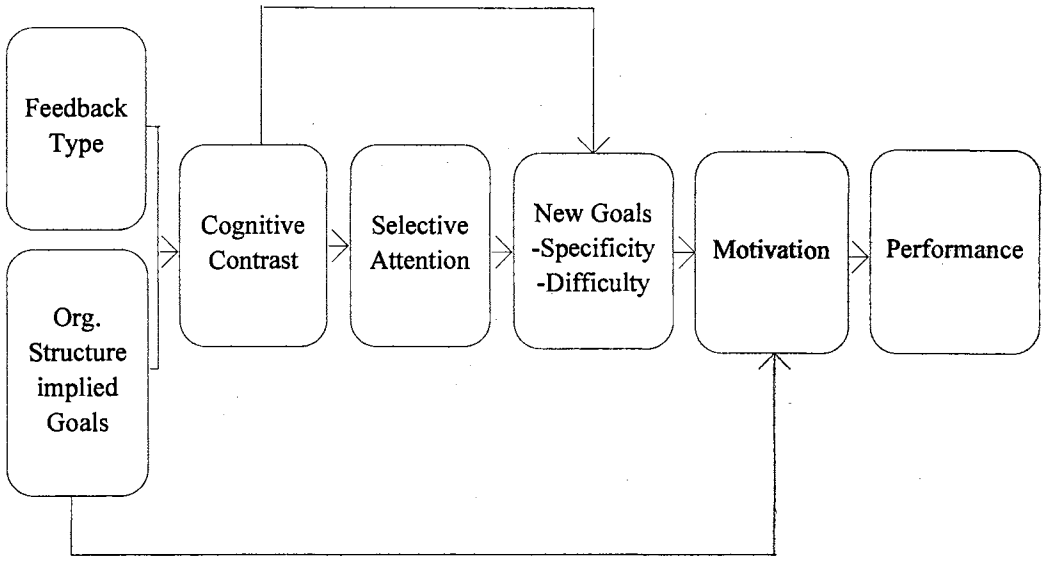
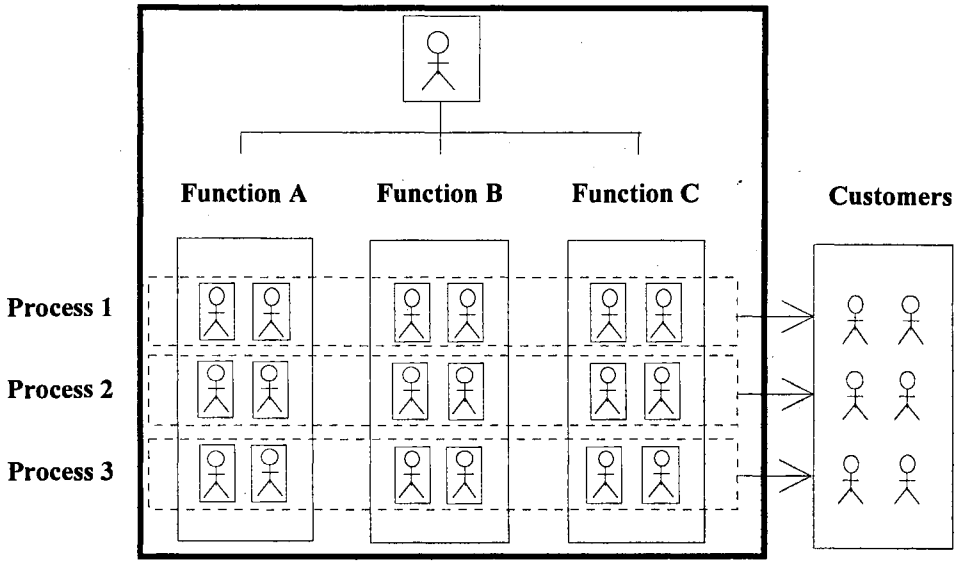


Figure 7
The Organization



Adapted from: Rummler and Brache, 1991.

Figure 8
Hypotheses

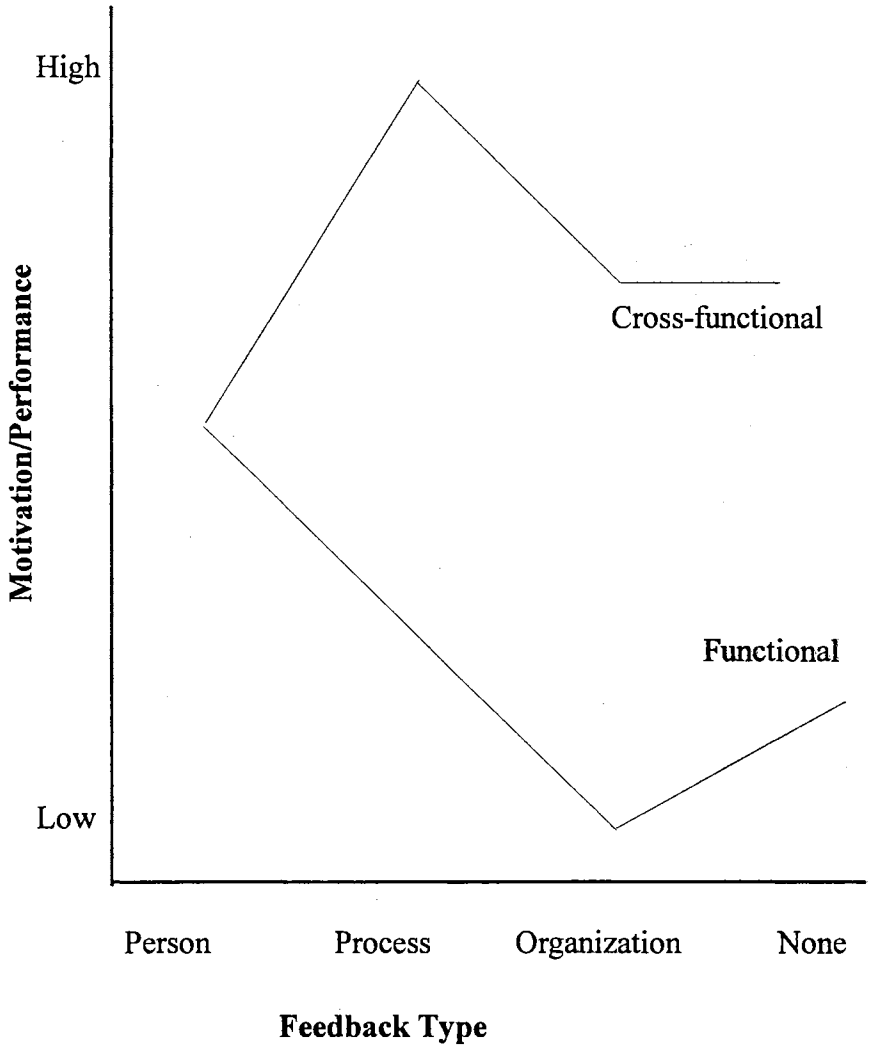


Figure 9
Experimental Procedures

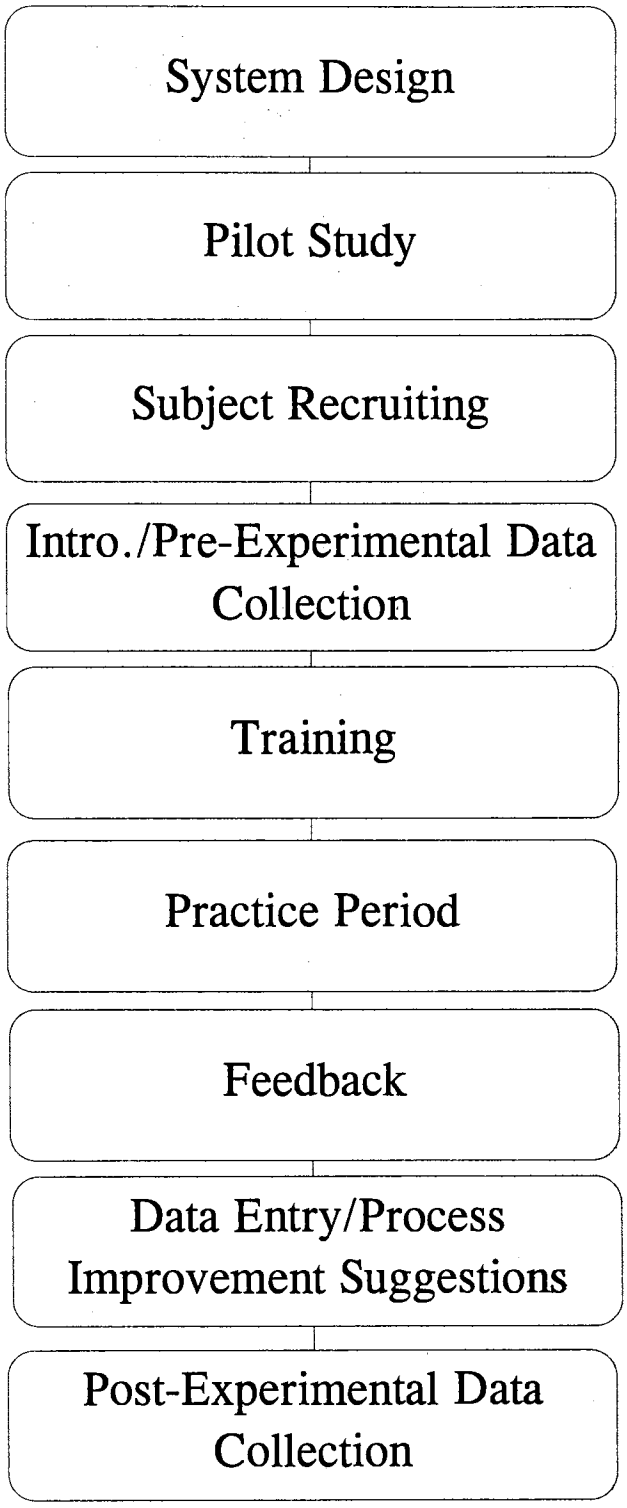


Figure 10

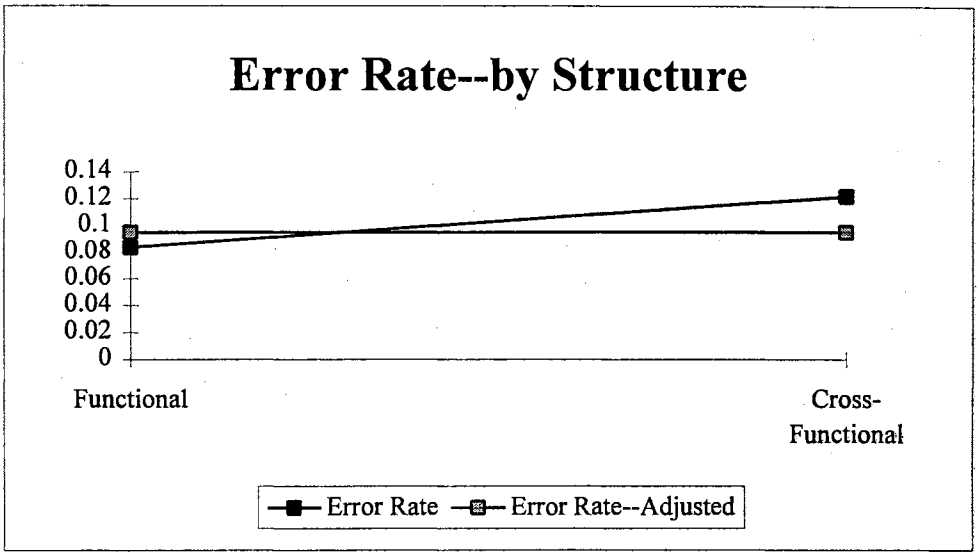

Error Rate--by Structure
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Functional
Cross-
Functional
Error Rate
Error Rate--Adjusted

Figure 11

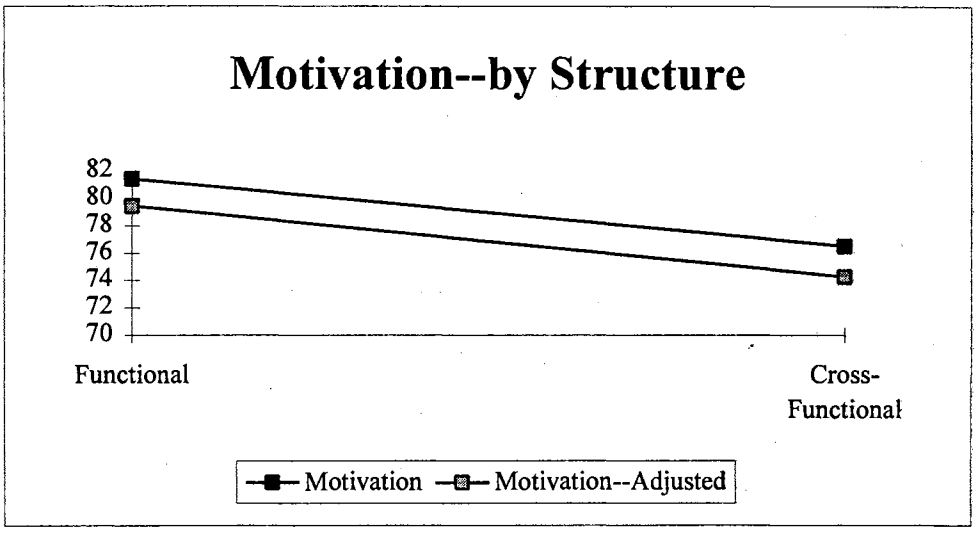

Motivation--by Structure
82
80
78
76
74
72
70
Functional
Cross-Functional
Motivation
Motivation--Adjusted

Figure 12

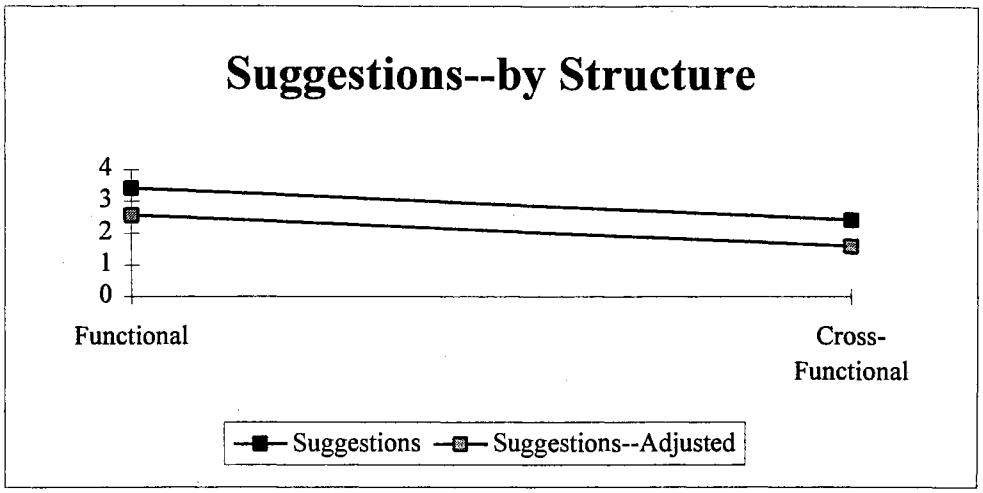
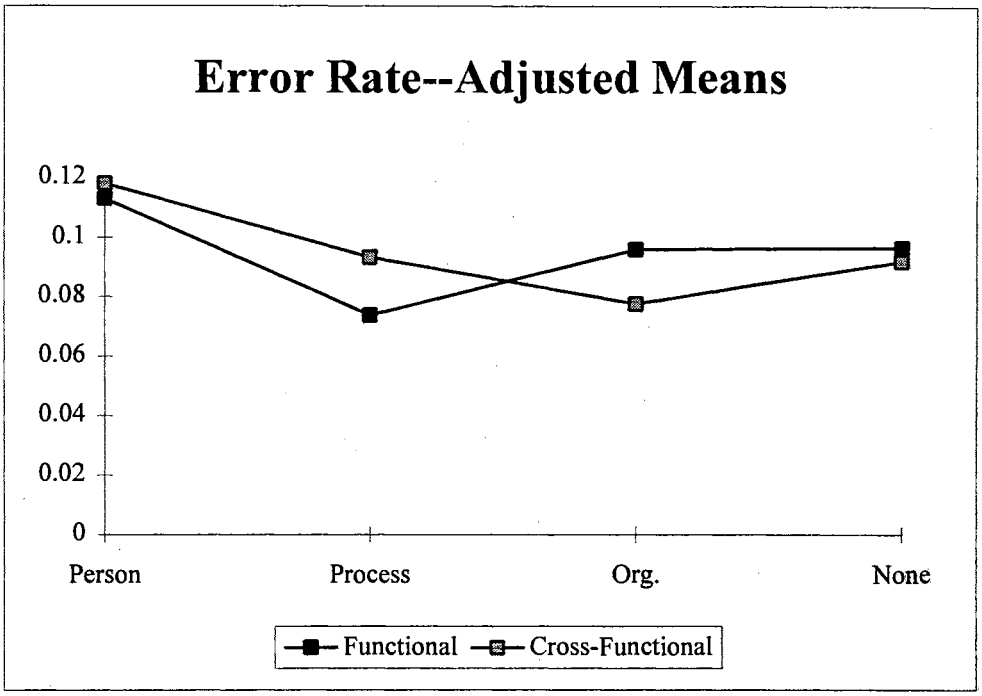

Suggestions--by Structure
4
3
2
1
0
Functional
Cross-
Functional
Suggestions
Suggestions--Adjusted

Figure 13

Panel A



Panel B

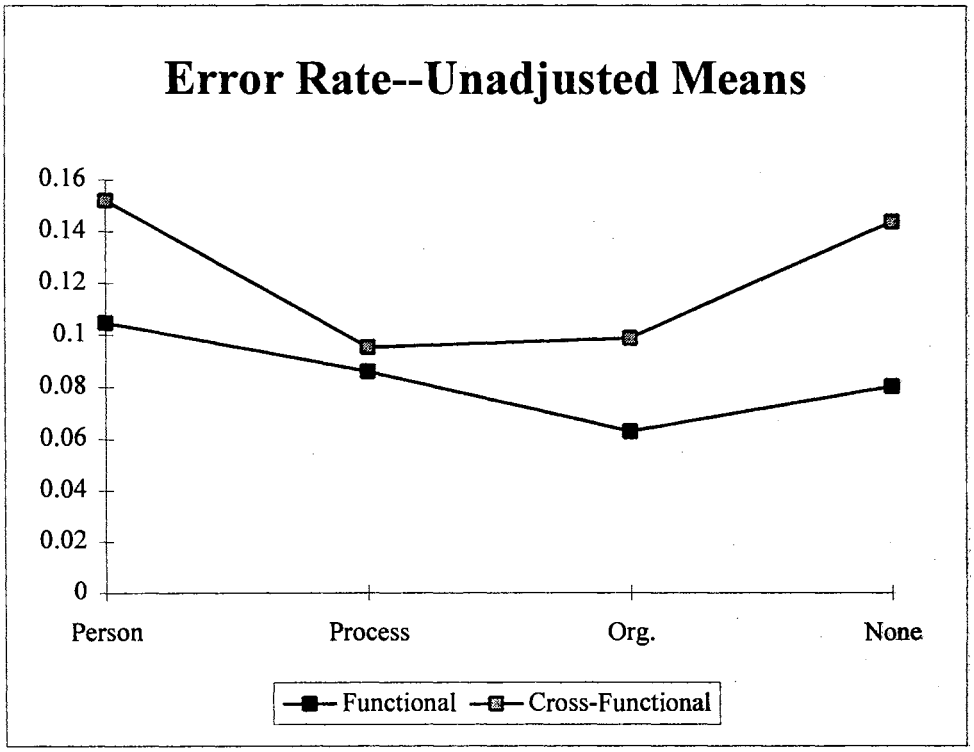
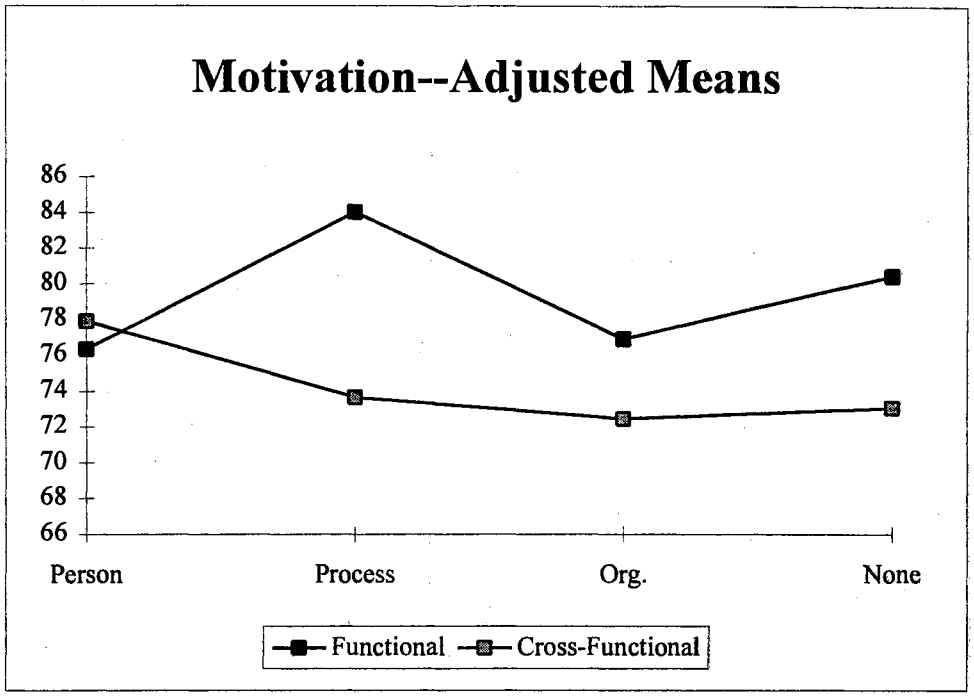


Figure 14

Panel A



Panel B

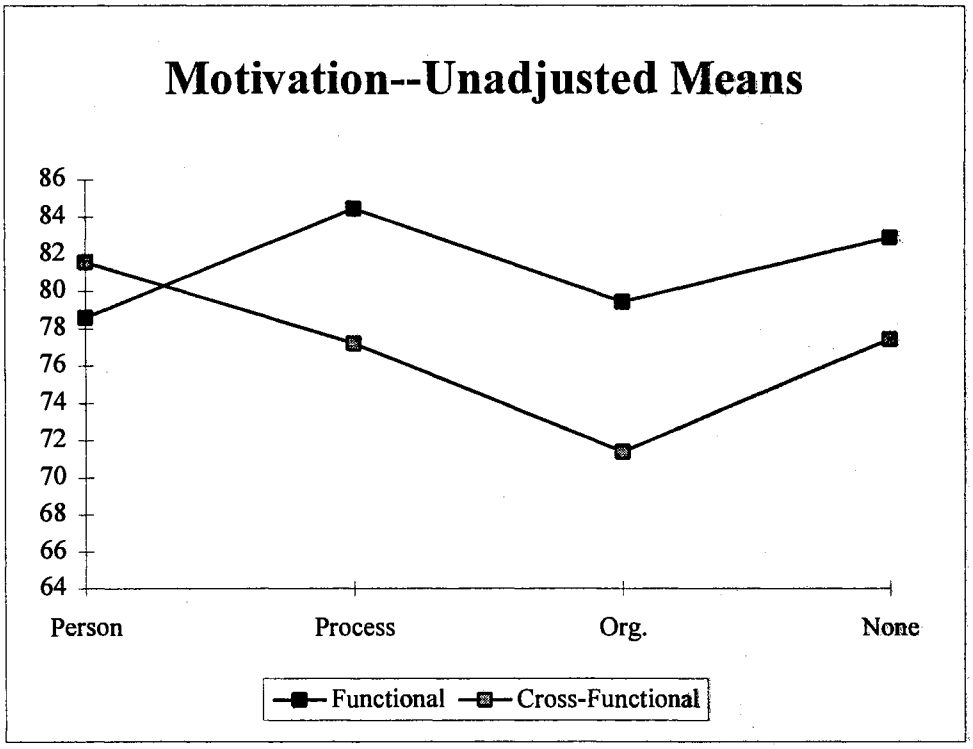
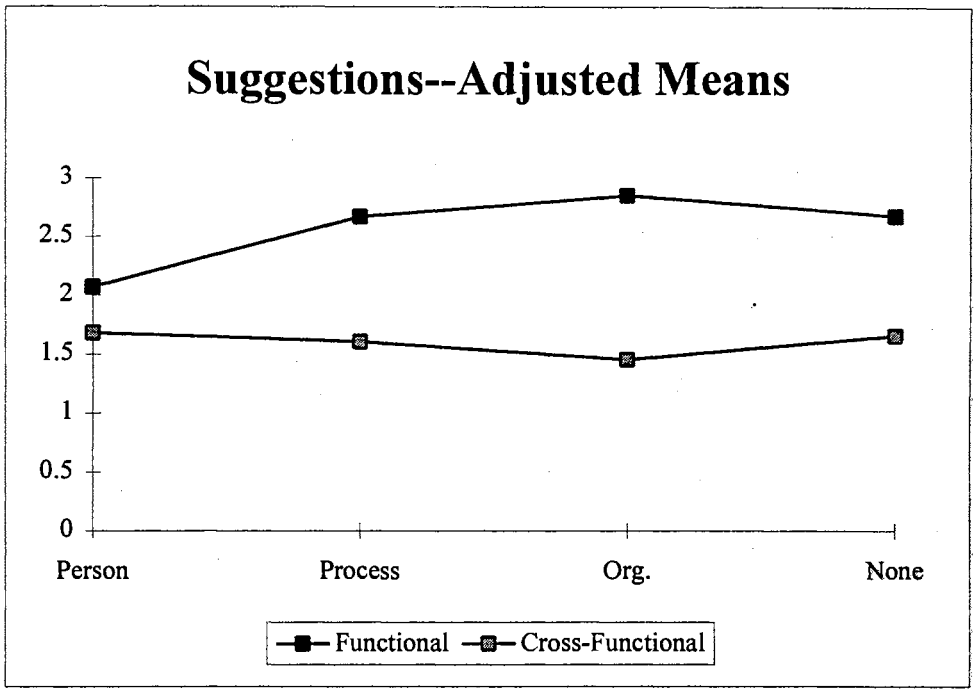


Figure 15

Panel A



Panel B

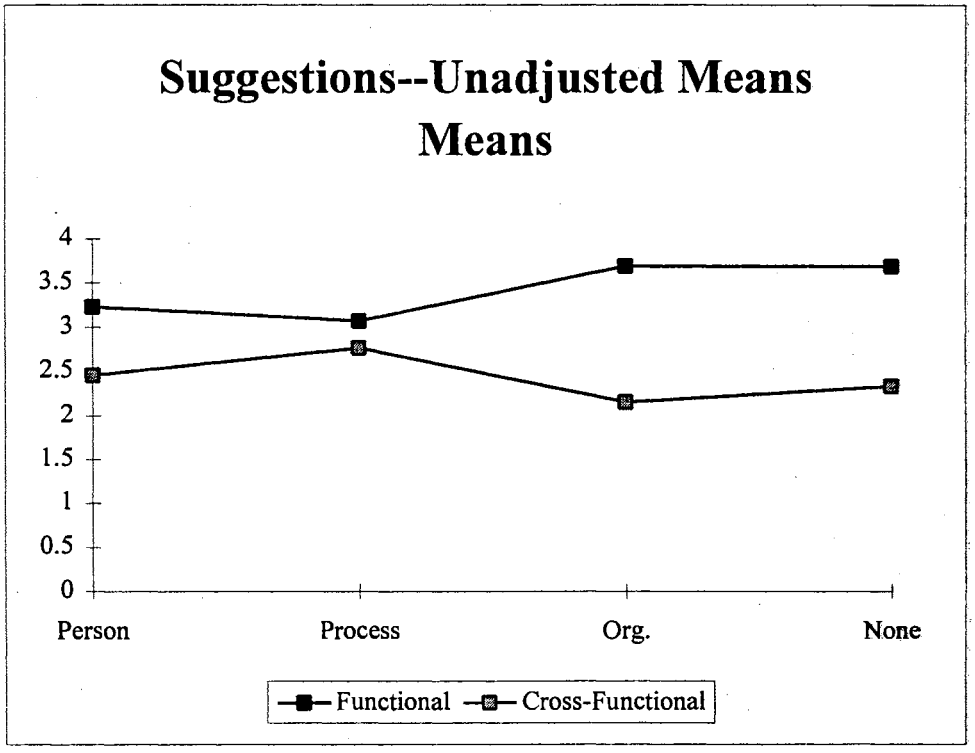
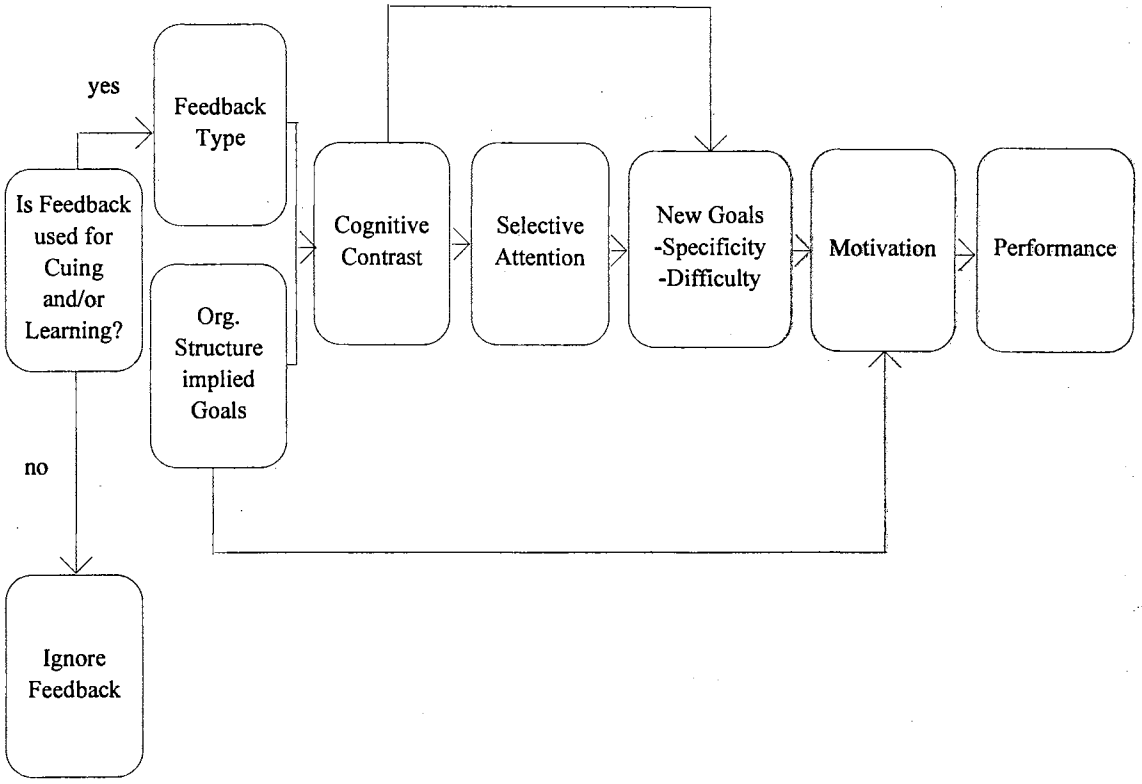


Figure 16
The Selective Attention Model
As Modified to Reflect the Effect of Feedback Use



APPENDIXES

APPENDIX A--VARIABLE MEASURES

VARIABLE MEASURES

The responses to these questions were all obtained through the computer. Before any information was collected, the following notice appeared on the screen.

Your participation in this lab is strictly voluntary. You may choose to leave at any time, however, you will not earn any extra credit if you leave before the lab is complete or if you do not attend all of both sessions, today and tomorrow.

During the lab, you will do two kinds of things. You will answer questions that appear on the screen and you will perform a data entry task. Your answers to the questions that appear on the screen WILL NOT influence the amount of extra credit you receive. Your answers will be kept strictly confidential. Your professor will not see your answers. You will not be identified by name in any reports associated with this project.

Your performance on the data entry task WILL influence the amount of extra credit you receive. Important aspects of performance will be described during the training you will receive later in the session.

Unless otherwise indicated, the following directions were used for the dependent variable, covariate and manipulation check questions.

Indicate your agreement with the following statement by typing a number from 1 to 100 where a 1 indicates complete disagreement with the statement and 100 indicates complete agreement with the statement as illustrated by the following scale:

```
     1                          50                          100
     |--------------------------|--------------------------|
completely                neither agree                completely
 disagree                 nor disagree                  agree

                          [QUESTION TEXT]

              Type a Number from 1 to 100  _______
```

MANIPULATION CHECK--FEEDBACK

PLEASE TYPE THE NUMBER OF THE ONE STATEMENT THAT BEST DESCRIBES THE INFORMATION ABOUT PERFORMANCE YOU SAW ON THE COMPUTER SCREEN AT THE BEGINNING OF THE SESSION.

1. The information told about USER SURVEY RATINGS of the job cost sheets I helped prepare and compared the user survey ratings for the job cost sheets I helped prepare to the user survey ratings of job cost sheets prepared by others.

2. The information told about the OVERALL JOB COST SHEET ERROR RATE for my group and compared my group's overall job cost sheet error rate to the overall job cost sheet error rates for other groups.

3. The information told only about MY OWN INDIVIDUAL ERROR RATE for the part of the job cost sheets I entered and compared my individual error rate to the individual error rates of others.

4. I received NO FEEDBACK on the screen at the beginning of the session.

Enter either a 1, 2, 3 or 4 _____

MANIPULATION CHECK--STRUCTURE

PLEASE TYPE THE NUMBER OF THE STATEMENT THAT BEST DESCRIBES THE JOB YOU PERFORMED.

1. I performed only one of the data entry tasks necessary to produce job cost sheets--materials requisition entry.

2. I performed all of the data entry tasks necessary to produce job cost sheets--materials requisition entry, time ticket entry, and overhead summary entry--during at least one session.

Enter either a 1 or 2 _____

MOTIVATION

Administered at the beginning of the second session, directly following feedback.

MOT1 Doing well on the data entry tasks will give me a sense of personal satisfaction.

MOT2 Doing well on the data entry tasks will make me feel good about myself.

MOT3 I will feel bad if I do poorly on the data entry task.

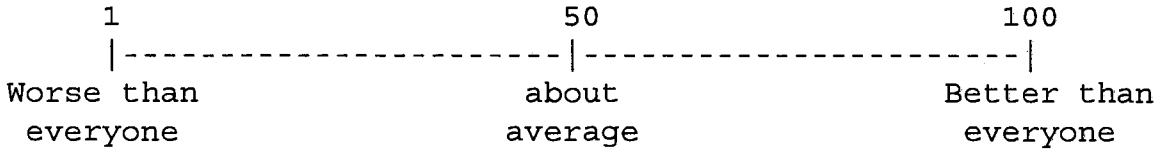
ATTENTION

ATT1 I tried to remember the feedback about my performance I received at the beginning of each session.

ATT2 I paid a lot of attention to the feedback I received about my performance at the beginning of each session.

ATT3 On average, I felt that I performed well on the data entry task.

ATT4 Use the following scale to answer the next question.



Try to remember the performance feedback you received at the beginning of this session. According to the feedback, how did you perform in the first session?

Type a Number from 1 to 100 _____

GOAL SPECIFICITY

GS1 I set performance goals for myself while working on the data entry task.

GS2 I set specific targets for myself about the level of quality I would try to achieve on the data entry task.

GS3 I set specific targets about the amount I would improve on the data entry task during the second session.

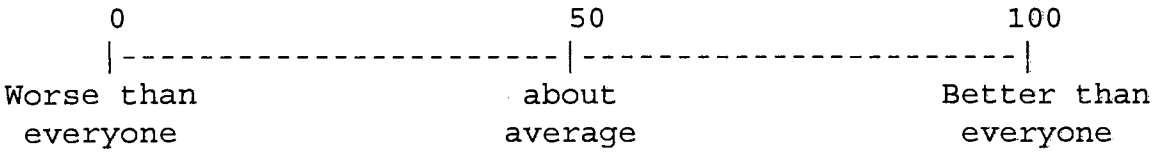
GS4 I had a specific level of performance in mind as I worked on the data entry task.

GOAL DIFFICULTY

GD1 The performance goals I set for myself about quality were relatively difficult.

GD2 I always tried to achieve a level of performance in terms of quality higher than what I had achieved before.

GD3



Based on the scale shown above, compared to the other participants, I think the level of quality I tried to achieve was:

Type a Number from 0 to 100 _____

LOCUS OF CONTROL

Below is a pair of statements. One statement in the pair is labelled 1 the other is labelled 2. Please indicate which statement with which you most agree by placing the number (1 or 2) corresponding to that statement in the box. You may not agree completely with either statement. That is OK. Please enter the number corresponding to the one you agree with most.

Enter either a 1 or a 2 _____

LOC1	1.	This work is run by the few people in power, and there is not much the little guy can do about it.
	2.	The average citizen can have an influence in government decisions.
LOC2	1.	When I make plans, I am almost certain that I can make them work.
	2.	It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyway.
LOC3	1.	In my case, getting what I want has little or nothing to do with luck.
	2.	Many times we might just as well decide what to do by flipping a coin.
LOC4	1.	By taking an active part in political and social affairs the people can control world events.
	2.	As far as world affairs are concerned, most of us are the victims of events we can neither understand, nor control.
LOC5	1.	It is impossible for me to believe that chance or luck plays an important role in people's lives.
	2.	Many times I feel that I have little influence over the things that happen to me.
LOC6	1.	Sometimes I feel that I don't have enough control over the direction my life is taking.
	2.	What happens to me is my own doing.
LOC7	1.	Without the right breaks, one cannot be an effective leader.
	2.	Capable people who fail to become leaders have not taken advantage of their opportunities.

TASK INTEREST

Administered prior to and following the experiment.

TI1	I think this lab (will be/was) interesting.
TI2	I (am looking forward to/enjoyed) finding out about how actual accounting work is performed during this lab.
TI3	(I am/this lab made me) curious about how actual accounting work is performed.
TI4	Managerial Accounting is fun.
TI5	I am considering a career in accounting.

TASK DIFFICULTY

Administered following the experiment.

DIFF	The task I performed was very difficult.

QUALITY EMPHASIS

Administered following the experiment.

Q1	Quality was important to my superiors at the Open Road.
Q2	My input about quality improvement was sought and considered.
Q3	Improving processes to increase quality was important at the Open Road.

TASK IDENTITY

Administered prior to and following the experiment.

IDENT1 I understand how the cost of a job is determined.

TASK SIGNIFICANCE

Administered prior to and following the experiment.

SIG1 I understand the importance of producing job cost sheets (as a result of participating in this lab).

Administered following the experiment

SIG2 I understood the purpose of the job I performed.

SKILL VARIETY

Administered following the experiment.

VARIETY The work I performed was varied.

AUTONOMY

Administered following the experiment.

AUTON I could complete job cost sheets by myself if I needed to.

DEMOGRAPHIC DATA

Name: John Doe Press RETURN if OK

Age: _____

Sex: MALE Press the Space Bar to change the value

Course where you were recruited to participate in this lab:
Management Accounting Press the Space Bar to change the value

Have You worked in an accounting job internship or other job where you worked with accounting information like accounts receivable, accounts payable, cash receipts, cash payments, payroll, property or product costs?

YES Press the Space Bar to change the value

How long did you work in this job? Years___ Months___

Describe the job:_____

Did you participate in a lab similar to this one as part of Accounting 2203 last semester (Spring 1995)?

YES Press the Space Bar to change the value

Have you taken Accounting 3603 (Accounting Information Systems)?

YES Press the Space Bar to change the value

What is Your approximate GPA? (i.e. 3.8) _____

Have you ever used Dbase, except for in Accounting 3603?

YES Press the Space Bar to change the value

When? IN MSIS 2103--COMPUTER CONCEPTS
IN MSIS 4013--DATABASE
IN ANOTHER CLASS
AT WORK
MORE THAN ONE OF THESE

Press the Space Bar to change the value

APPENDIX B--FEEDBACK

FEEDBACK

The following message appeared on the screen prior to administration of feedback.

Following is information about your performance during the last data entry session. This information, information about your performance on the upcoming data entry session and information about the suggestions you make for improving the system, will be used to determine the amount of extra credit you receive. Remember, your answers to the questions that appear on the screen will not influence the amount of extra credit you receive, only your performance on the data entry task.

PERSON-LEVEL FEEDBACK

Explanation

Good performance and high quality are the same at the Open Road. Good performance is achieved when you achieve high quality. Good quality means that YOU, INDIVIDUALLY:

1) Did not make any typing mistakes.
2) Entered all necessary flags.
3) Did not enter any un-necessary flags.

The next few screens give you information about the Open Road's most important measure of quality, YOUR OWN INDIVIDUAL ERROR RATE.

Preparing job cost sheets requires entering materials, labor and overhead. Your individual error rate tells ONLY about how YOU did on your part of the job cost sheets--materials requisitions. It DOES NOT include information about the part of the job cost sheets prepared by (others/your other group members).

To get YOUR INDIVIDUAL ERROR RATE, the number of errors you made is divided by the number of document lines you entered. For example, if you entered 25 document lines and made 5 errors, your error rate would be 5/25 = 20%.

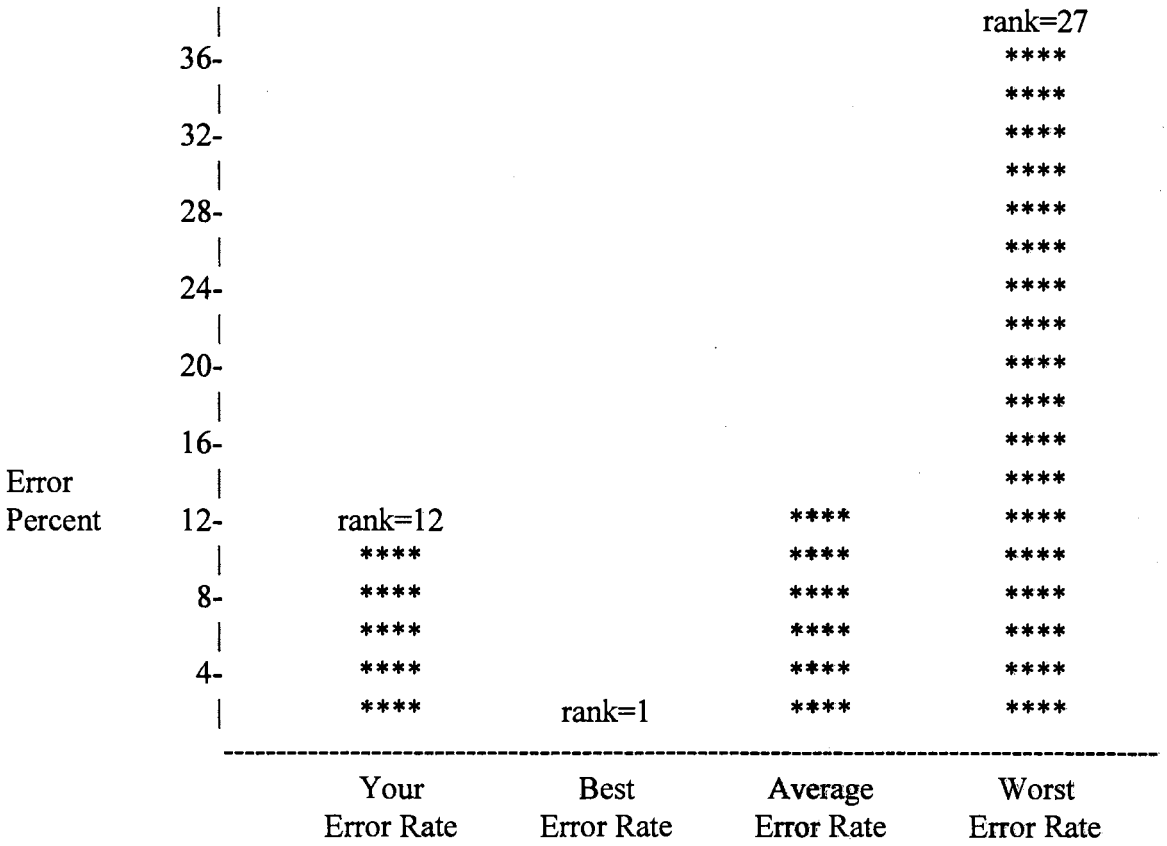
Description of Results

You entered a total of 50 document lines. You made 5 errors while entering these lines. Your individual error rate was 10 percent. The average individual error rate for all participants was 12 percent. Individual error rates varied from 0 percent to 36 percent. Out of 27 participants, you ranked number 12 based on your individual error rate.

Numerical Summary of Results

Summary Information for All Participants:		
Number of Participants	36	
Best Individual Error Rate	0	percent
Average Individual Error Rate	12	percent
Worst Individual Error Rate	50	percent
Information About Your Performance:		
Number of Document Lines You Entered	50	
Number of Errors You Made	5	
Your Individual Error Rate	10	percent
Your Overall Ranking (out of 27 participants)	12	

Graphical Summary of Results



PROCESS-LEVEL FEEDBACK

Explanation

Good performance and high quality are the same at the Open Road. Good performance is achieved when you achieve high quality. Good quality means a GROUP of individuals, working TOGETHER on the same JOB COST SHEETS:

1) Did not make any typing mistakes.
2) Entered all necessary flags.
3) Did not enter any un-necessary flags.

The next few screens give you information about the Open Road's most important measure of quality, the OVERALL JOB COST SHEET ERROR RATE, which evaluates the performance of a group of individuals working together on the same job cost sheets.

[next two paragraphs are for the functional structure only]
To prepare job cost sheets, materials requisitions must be entered into the computer to determine the total materials cost for the jobs. That is what you did. However, because materials entry, labor entry and overhead entry are all necessary to prepare job cost sheets, the OVERALL JOB COST SHEET ERROR RATE includes errors you made entering materials requisitions as well as errors made by others who entered time tickets and overhead summaries.

To get the OVERALL JOB COST SHEET ERROR RATE reported in the next few screens, you were grouped with two other people who entered information for the same job cost sheets as you did. One of those people entered time tickets and the other entered overhead summaries.

The OVERALL JOB COST SHEET ERROR RATE includes errors you made, PLUS errors made by the other two people in your group on the job cost sheets.

For example, say you entered 40 lines and made 5 errors and your other two group members each entered 30 lines and made 10 errors. AS A GROUP you entered (40 + 30 + 30) = 100 lines and made (5 + 10 + 10) = 25 errors. The OVERALL JOB COST SHEET ERROR RATE is 25/100 = 25%

Description of Results

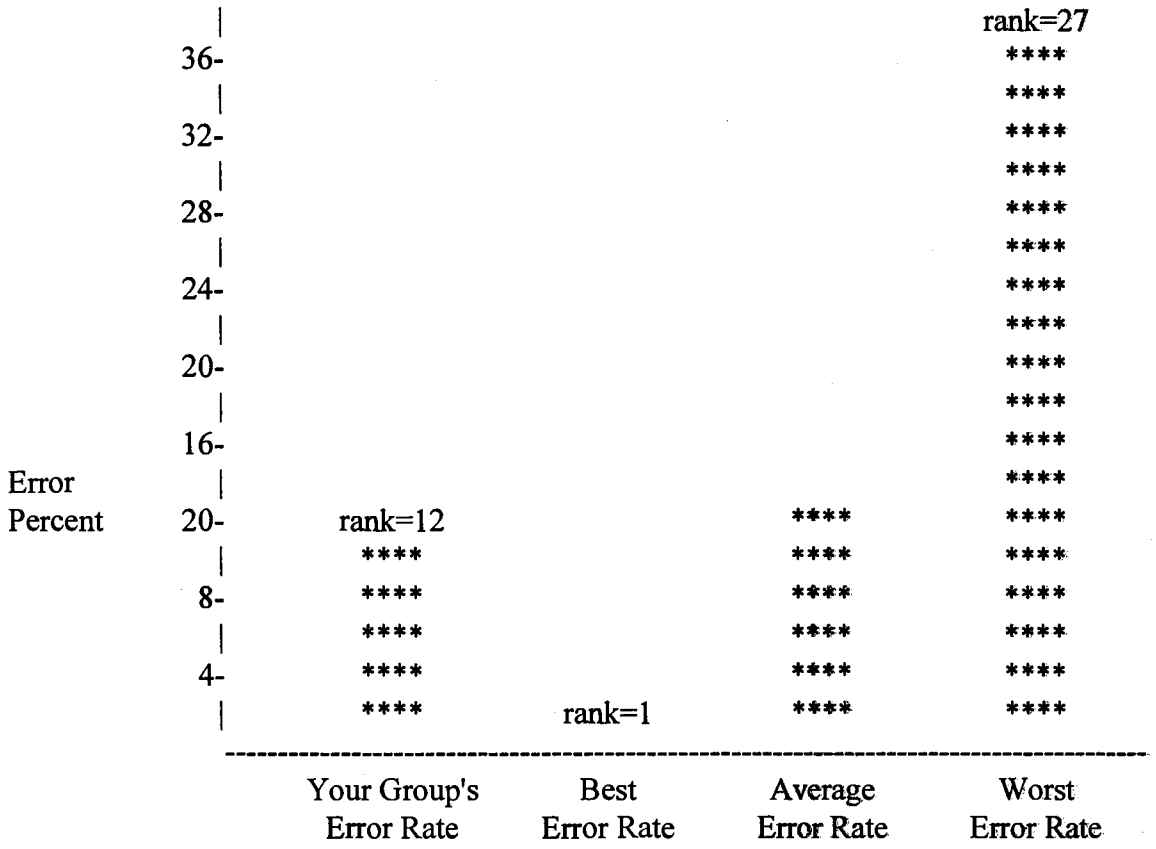
Your group entered 150 document lines. These lines were for 6 job cost sheets. 15 errors were found in your group's job cost sheets. This is an overall job cost sheet error rate of 10 percent for your group. The average overall job cost sheet error rate for all groups was 12 percent. Overall job cost sheet error rates varied from 0 percent to 50 percent. Out of 27 groups, your group ranked number 12.

Numerical Summary of Results

Summary information for all Groups:		
Number of Groups	27	
Best Group Error Rate	0	percent
Average Group Error Rate	12	percent
Worst Group Error Rate	36	percent

Information About Your Group's Performance:		
Document Lines Entered by Your Group	150	
Job Cost Sheets Completed by Your Group	6	
Job Cost Sheet Errors for Your Group	15	
Your Group's Error Rate	10	percent
Your Group's Ranking (out of 27 groups)	12	

Graphical Summary of Results



ORGANIZATION-LEVEL FEEDBACK

Explanation

Good performance and high quality are the same at the Open Road. Good performance is achieved when you achieve high quality. In accounting, good quality means that the USERS of our job cost sheets are pleased.

These users include MARKETING PERSONNEL, who need information for bidding future jobs, setting prices, and projecting sales. Users also include MANUFACTURING MANAGERS who need information to identify ways to control and even decrease costs.

The next few screens give you information about the Open Road's most important measure of quality, USER SURVEY RATINGS. They evaluate the job cost sheets you helped prepare, based on USER preferences.

[functional structure only]
The USER SURVEY RATINGS evaluate the job cost sheets as a whole. This means the ratings evaluate the quality of the materials data you entered PLUS the quality of the labor and overhead data entered by people in other departments.

[cross-functional structure only]
The USER SURVEY RATINGS evaluate the job cost sheets as a whole, including the materials, labor and overhead sections. Because you may have entered materials for one job, labor for another and overhead for yet another, this means the user survey ratings evaluate the quality of the data you entered PLUS the quality of the data entered by your other group members.

In developing USER SURVEY RATINGS, marketing personnel and manufacturing managers described the most important quality factors and evaluated the quality of sample job cost sheets. A rating scheme, which evaluates job cost sheets on a scale from 1 to 10, was then developed based on their answers.

The job cost sheets you helped prepare, as well as job cost sheets prepared by other groups, were evaluated and assigned a user survey rating between 1 and 10 based on the results of the survey of marketing and manufacturing personnel described above.

Description of Results

Ratings on a Scale of 1 to 10
As Rated by Marketing and Manufacturing Personnel

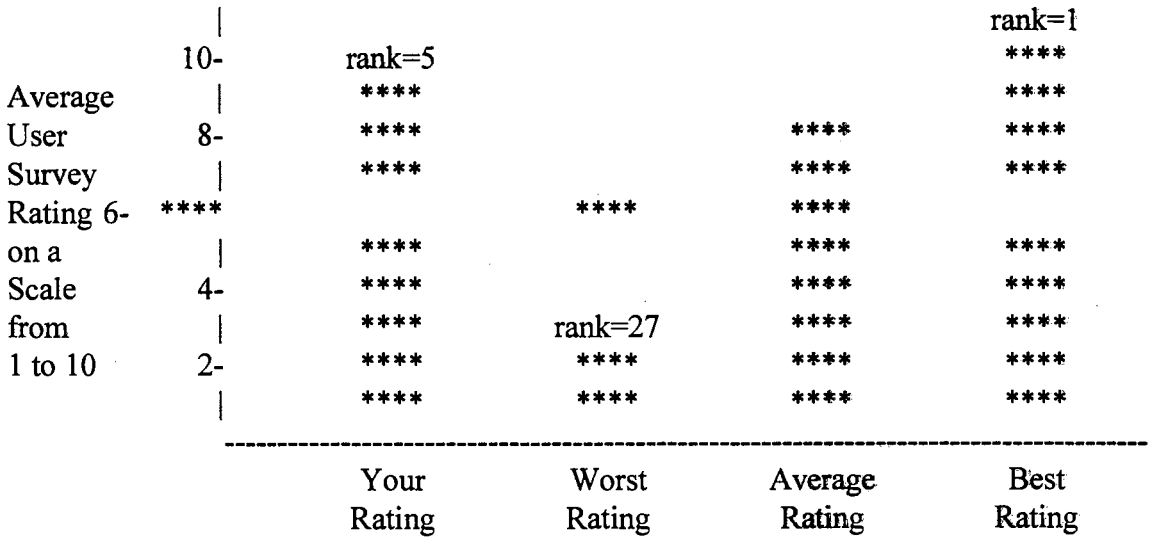
The job cost sheets you helped prepare received a user survey rating of 9. The average user survey rating was 8. User survey ratings for all participants ranged from 2 to 10. Out of 27 groups of job cost sheets, the job cost sheets you helped prepare were ranked number 12.

Numerical Summary of Results

Ratings on a Scale of 1 to 10
As Rated by Marketing and Manufacturing Personnel

Summary Information for all Participants:	
Number of Groups	27
Best User Survey Rating	10
Average User Survey Rating	8
Worst User Survey Rating	2
Information About Your Performance:	
User Survey Rating for The Job Cost Sheets You Helped Prepare	9
Your Group's Ranking (out of 27 groups)	12

Graphical Summary of Results



VITA

Stacy E. Kovar

Candidate for the Degree of

Doctor of Philosophy

Thesis: A THEORETICAL AND EMPIRICAL EXAMINATION OF THE EFFECTS OF FEEDBACK AND ORGANIZATIONAL STRUCTURE ON MOTIVATION AND PERFORMANCE

Major Field: Business Administration

Biographical:

Personal Data: Born in Kingman, Kansas on September 29, 1967, the daughter of Bill and Cora Lou Strait.

Education: Graduated from Kingman High School in May 1986; received Bachelor of Business Administration degree from Washburn University, Topeka, Kansas in May 1990; received Master of Science in Accounting degree from Oklahoma State University, Stillwater, Oklahoma in May 1992. Completed the requirements for the Doctor of Philosophy degree with a major in Accounting at Oklahoma State University in May 1996.

Experience: Served as an internal audit intern for the Kansas Department of Revenue, summer of 1988, and for KPL Gas Service in Topeka, Kansas, summer 1989 to summer 1990. Employed by the School of Accountancy at Oklahoma State University as a graduate assistant, August 1990 to May 1995. Employed as an assistant Professor of Accountancy at the University of Memphis, August 1995 to present.

Professional Memberships: American Accounting Association, auditing, management accounting and information systems sections; Institute of Management Accountants; American Institute of Certified Public Accountants; Kansas Society of Certified Public Accountants; Institute of Internal Auditors.

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 11-30-94 **IRB#:** BU-95-011

Proposal Title: QUALITY PERFORMANCE: THE IMPACT OF FEEDBACK AND ORGANIZATIONAL STRUCTURE ON MOTIVATION AND PERFORMANCE IN THE ACCOUNTING FUNCTION

Principal Investigator(s): Maryanne M. Mowen, Stacy E. Kovar

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

APPROVAL STATUS SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Provisions received and approved.

Signature: _____ Date: January 13, 1995

Chair of Institutional Review Board