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The impact of technological complexity, context, and individuals on the perceived need for budgetary participation, media richness, and information quantity

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THE IMPACT OF TECHNOLOGICAL COMPLEXITY, CONTEXT, AND INDIVIDUALS ON THE PERCEIVED NEED FOR BUDGETARY PARTICIPATION, MEDIA RICHNESS, AND INFORMATION QUANTITY

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THE IMPACT OF TECHNOLOGICAL COMPLEXITY, CONTEXT, AND INDIVIDUALS ON THE PERCEIVED NEED FOR BUDGETARY PARTICIPATION, MEDIA RICHNESS, AND INFORMATION QUANTITY

by

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ABSTRACT

THE IMPACT OF TECHNOLOGICAL COMPLEXITY, CONTEXT, AND INDIVIDUALS ON THE PERCEIVED NEED FOR BUDGETARY PARTICIPATION, MEDIA RICHNESS, AND INFORMATION QUANTITY

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The primary purpose of this study was to examine the importance of technological complexity, contextual variables, and individual attributes as antecedents to participative budgeting. Of secondary interest was the examination of the effect of technological complexity on the perceived need for media richness and increasing amounts of information. The design of the study facilitated these purposes by using a laboratory experiment to examine variables at three levels (i.e., organizational, situational, and individual). Moreover, the study tested the descriptive validity of the Vroom-Jago model of leadership and participative decision making (Vroom-Yetton model as revised by Vroom and Jago, 1988)

and the Daft and Lengel model of information quantity and media richness.

Using a sample of 62 graduate students, a repeated measures laboratory experiment was conducted using a role playing task to gather data regarding perceptions of the relative need for participation, information, and media richness. Scenarios were varied systematically by manipulating technological complexity and Vroom-Jago model situational factors. Significance of variance due to individual subjects was examined as a classification variable.

Results indicated that technological complexity, Vroom-Jago situational factors, and individual subject differences all provided significant antecedents to participative budgeting. Moreover, the Vroom-Jago model was validated as accurate in describing a significant amount of variance in participation allowed. However, the Daft and Lengel model was invalidated by the results in that technological complexity could not be shown as having a significant effect on either the need for information or media richness as prescribed by the model.

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CHAPTER I

INTRODUCTION

Statement of the Problem

Participative budgeting remains a topic receiving much attention in the accounting literature. However, many of the antecedents of participative budgeting remain largely unexplored. From 1970 through 1991 only 4 of 28 empirical studies using either laboratory experimentation or surveys to study participative budgeting examined the antecedents of participation. The remaining studies focused solely on the consequences of participative budgeting (Shields and Young 1993). Moreover, many different theoretical frameworks and variables have been used to study participative budgeting, and yet, its consequences remain little understood. Several reasons may exist for the state of research in this area including a misplaced emphasis on only the consequences of participation.

First, the impact of the perceived need for participation in budgeting is not typically studied and tested from the perspective of the decision making style of the leader who has primary responsibility for the budgeting task. Rather, it is usually studied from the perspective of the subordinate. In general, participation has been treated as an independent variable rather than a dependent variable in such studies. Typically, these studies observe or manipulate levels of subordinate participation and subsequently measure consequence variables such as performance and/or satisfaction. This is done to suggest some normatively appropriate level of participation either universally or contingent upon relationships with

other variables. The question of how much participation *leaders* prefer or seek in a given context, however, remains largely unanswered. The perceived need for budgetary participation influences managerial choice, regardless of particular prescriptions made using normative models as to effectiveness. Ultimately, the degree of subordinate participation is a function of the organization structure as it has evolved and has been influenced by managerial choice rather than a function of subordinate preferences.[1]

Second, since participation has mostly been observed or manipulated rather than measured as a response variable, the degree of participation has typically been treated as an objectively verifiable amount. However, the construct *degree of participation* reflects individual perceptions rather than some easily observable and objectively quantifiable amount (Milani 1975). These perceptions are presumably the factors that shape behaviors. Therefore, measuring perceptions of participation may be more relevant than manipulating an actual degree of participation.

Third, most studies of participative budgeting have been couched in a particular context. However, Chalos and Haka (1989) stated that ambiguous results linking participation to performance suggest that the value of participation is *dependent* on the decision context. A recurrent theme in participation studies containing suggestions for future research has been to examine the impact of context (Milani 1975; Chalos and Haka 1989; Alutto and Belasco 1972; Shields and Young 1993). These problems all reflect the need for a change in research emphasis and perspective.

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[1]For example, as an organization grows in size it tends to decentralize, and subordinates tend to participate more in the budget process. This is a result of structural changes rather than portable subordinate preferences.

In addition to the problem of a misplaced emphasis, the role of technology as an antecedent to participation is not clear. As Brownell and Merchant (1990) explained, process automation increases control over manufacturing processes by direct incorporation of control mechanisms into the technology itself. Therefore, the need for budgetary control and for participation in budget setting is reduced. However, process automation often allows more choices for a manager, such as in work scheduling. To the extent that these choices affect costs for the organization, the manager has a greater ability to participate meaningfully in the budgeting process. Moreover, there exists a divergence in the organization theory literature as to what constitutes technological complexity. Woodward (1965) considered unit and small batch processes to be less complex and continuous production to be more complex. However, Harvey (1968) defined technological complexity on these dimensions as polar opposites from Woodward.

Alternatively, in summarizing the technology-structure research from 1965 to 1980, Fry (1982) found consistent results to support the relation between technology and structure across all definitions, levels, and measures. Moreover, in a recent meta-analysis, Miller et al. (1991) found that different definitions of technology were generally unimportant in affecting the technology-structure relationship.

Focus of the Study

To allay the problem of misplaced emphasis, this study focuses on the perceptions of leaders regarding appropriate decision styles in differing contexts. In effect, the antecedents of participation are studied. The importance of technology in influencing changes in perceptions is an important variable of interest. Bruns and Waterhouse (1975) indicate that

technology increases may lead to structuring and participation. The degree of participation appears to be a consequence of the extant degree of structure in the organization as a result of choices made by those responsible for design of the organization. Consequently, leader perceptions regarding appropriate levels of participation allowed or required of subordinates relevant to a particular task is important. Examining technology as perceived by organization leadership allows the study of the influences of an organizational-level variable.

In addition to the examination of differing levels of technological complexity, this study focuses on differing levels of other contextual variables. These variables are coincident with the Vroom and Yetton (1973) (as revised by Vroom and Jago (1988)) model of leadership style (both versions hereafter referred to as the *Vroom model*). This model specifically identifies important contextual variables which may influence decision making style (i.e., participative or autocratic). This model receives considerable support in organization behavior literature regarding contextually-contingent decision making styles. In fact, the Vroom model is considered by some to be the most widely known and empirically developed model of participative decision making (Tjosvold et al. 1986; Sashkin and Garland 1979; Dipboye 1990). Using these contextual variables, identified a priori as important to choosing degrees of participation allowed in varying contexts, is important for two reasons. First, the model permits a legitimate assessment of the importance of decisional context in affecting perceptions of the need for participation in the budgeting process. This allows examination of the influences of variables at a situation-specific level. The Vroom model is arguably the most comprehensive contingency model of participative decision making and accordingly offers the simultaneous examination of many contextual

moderators in participation-outcome relationships. Second, the examination of the impact of general contextual variables enables the comparison and assessment of the relative importance of technology as a variable believed to be important in the choice of participative decision styles, but one excluded from the Vroom contextual model.

While technology and decisional context manipulations allow examination of variables at both the organizational and situational levels, other contingency theories of participation have studied participation at the individual or personality level. Although the experimental design of this study does not specifically manipulate individual level variables, these effects can be isolated during statistical analysis.[2] This approach was followed in this study. Consequently, this study focuses on effects of participation at three different variable levels (i.e., organizational, situational, and individual) as suggested by Merchant (1981).

The desire to study perceptions of the relative need for participation in a given context requires a reasonably open-ended measure of the degree of participation appropriate for the particular context. This reasoning appears to be coincident with the Vroom-Yetton-Jago work and the suggestions of Milani (1975). Accordingly, allowing for the level of this measure to be set by the subject, rather than testing by assuming some specified or extant level, is more appropriate and should provide more interesting results. For this reason, perceived need for participation was a dependent variable in this study. Also, using the Vroom model allows for various levels of participation to be studied rather than just high

[2]For example, see Seiler and Bartlett 1982; Steers 1977; and Vroom and Jago 1974.

and low.[3]

Daft and Lengel (1986) extended Perrow's (1967) work in the area of technological complexity by adding media richness and amount of information. This was consistent with their hypothesis that in environments characterized by highly unanalyzable technology, equivocality was the primary problem and was properly addressed through richer media. In environments characterized by high variety, they hypothesized that uncertainty was the primary problem and was properly addressed through larger amounts of information. Technology can clearly impact both the degree of analyzability and the degree of variety in a particular context. Therefore, the effects on perceptions of the need for both media richness and amount of information were measured in this study.

Purpose of the Study

The primary purpose of the study was to examine the importance of individual differences, context, and technology in influencing perceptions of the degree of participation appropriate in participative budgeting tasks. Of secondary interest was the effect of technology on the desire for media richness and increasing amounts of information. The design of the study facilitated these purposes by examination of variables at three levels (i.e., organizational, situational, and individual).

Shields and Young (1993) suggested that the equivocal nature of results of participative budgeting studies are due to incomplete models of the process. They claimed that mixed results stem from the lack of understanding regarding why participative budgeting

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[3]Heller and Yukl (1969) proposed a similar model with a continuum of degrees or levels of participation. This was also suggested by Alluto and Belasco (1972). Schweiger and Leana (1986) praised this aspect of the Vroom model.

is used in organizations (i.e., its antecedents). Almost all studies in the literature to date, accounting or otherwise, have focused on the consequences (e.g., performance and satisfaction) rather than the antecedents of participative budgeting. Moreover, several reasons could exist for choosing to use participation in the budgeting process. For example, one leader may wish to positively motivate subordinates by allowing them to be involved in the budgeting process. Another leader may be unconcerned with the motivational effects of participation on employees and may merely be interested in using participation to reduce information asymmetry to improve accuracy in budget estimates. Both reasons are valid antecedents of the process, but each could be expected to provide differing results on employee satisfaction.[4]

As stated earlier, this study also differs from most previous studies in that participation is the dependent variable rather than the independent variable. Measuring participation as the dependent variable reflects the importance of considering managerial choice in the process of allowing various degrees of participation. This approach also allows assessment of the *descriptive* ability of the Vroom model by examining the extent to which situational variables affect how decision makers decide on the amount of subordinate participation appropriate in a particular set of circumstances.

Researchers have historically used one of three approaches (cognitive, affective, and contingency) in modeling participative decision effects. Although the intention here is to use the contingency model approach, the Vroom model allows for integration of cognitive and affective antecedents of the participation process as well. The Vroom model is a

[4]A similar example and further discussion is presented in Shields and Young (1993).

contingency approach that considers both the quality dimension of the decision (cognitive emphasis) and the acceptance dimension of the decision (affective emphasis) (Miller and Monge 1986). Therefore, one reason for using the Vroom model is to allow for as complete a modeling of the antecedents of participation process as possible.

Overview of the Study

In operationalizing the study, subjects took on the role of the decision maker who was primarily responsible for a decision task. The perceived need for budgetary participation, media richness, and amount of information was operationalized as the degree or level which a subject felt would be most appropriate in the given context.

The study used a laboratory experiment where ten systematic budget scenarios were given to each subject in one of two technology conditions. Each scenario presented a budget development task where technological complexity was manipulated in dichotomous alternatives of high or low for each of the five Vroom model participative styles. Subjects were faced with responding to the operating division indicating what resources would be allocated to particular alternatives in a budgeting task.

Although subjects did not actually make the resource allocation decision, they were asked to indicate the method of making the decision they felt was most appropriate for the given context. The five Vroom decision styles were presented to the subject and he or she was asked to choose the one that best fit the situation. These decision styles ranged from completely autocratic to completely group consensus. The Vroom model is designed to produce the same answer for all subjects for a given case when provided with information on standard criteria. However, individual characteristics, such as personality differences,

were of interest also. Therefore, a design using a repeated measures approach on the consecutive trials was used. Variations across cases by each individual were examined to determine situational effects, while variations across individuals by each case were used to determine individual effects (Steers 1977; and Vroom and Jago 1974).

Contribution of the Study

This study is expected to contribute to the body of accounting literature in several ways. First, as mentioned previously, many of the antecedents of participative budgeting remain largely unexplored and the consequences of participative budgeting remain little understood. This condition may be due to a misplaced emphasis. Achieving a better understanding of the antecedents of participative budgeting should help to reconcile conflicting findings of previous studies which focused only on consequences.

Second, even in studies which have examined the perceived need for participation in budgeting (i.e., examining antecedents and treating participation as the dependent variable), this relation is not typically viewed and tested from the perspective of the decision making style of the leader who has primary responsibility for the task. Rather, it is usually viewed from the perspective of the subordinate. Therefore, this study contributes by examining the effect on the person who is primarily responsible for the task, or who, at least, has the greatest opportunity to influence results through control over the degree of participation allowed. Accordingly, this study sets the stage for future studies regarding the examination of consequences of participative budgeting as related to managerial choice. That is, the perceived need for budgetary participation influences managerial choice, regardless of particular prescriptions made as to effectiveness using normative models. This descriptive

approach may therefore be more relevant to real-world decision situations than those used in previous studies. Consistent with contingency theory, the participation allowed or recommended by leaders is likely to vary from one decision context to another. How *subordinates* feel about the degree of participation allowed may be an important factor affecting the decision, but it is only one factor in the decision and cannot be assumed to be a stable factor from one context to another. Perhaps more important are the perceptions of organization leaders and the ability of those leaders to adjust participation levels appropriately to a particular decision making context. Thus, a contribution is anticipated by considering this perspective.

Third, the dominant theme regarding suggestions for future research presented in participation studies in recent years has been to examine the impact of context. Moreover, it seems odd that the one contingency model of leadership style that appears to be widely validated and sufficiently reliable (i.e., the Vroom model) has rarely been empirically tested in the accounting literature (Sashkin and Garland 1979 in Dipbove 1990). This study is also more complete than previous studies. This is achieved by examining leadership style using the Vroom model which integrates the three most popular theories (i.e., cognitive, affective, and contingency) on participative decision making (Miller and Monge 1986). The Vroom model also provides the most comprehensive set of contextual moderating variables on the participation-outcome relation, and allows for a continuum of participative decision styles. In addition, this study examines antecedents of the participation-outcome relation at three different levels.

Fourth, in considering contextual differences, technology appears to be a critically

important variable. However, the impact of technology can appear equivocal due to the various conceptualizations and operationalizations of technology used in prior studies. This study hopes to contribute by strictly defining the construct and operationalization of technology and reconciling previous conceptualizations of the construct by considering its regulatory and sophistication affects as suggested by Mintzberg (1979).

Finally, in addition to the examination of the perceived need for participation in the budgeting process, the effects on perceptions of the need for both media richness and amount of information are measured. Daft and Lengel (1986) suggested a theoretical foundation for hypothesized relationships in this regard. By assuming that uncertainty creates a demand for a greater amount of information, and ambiguity or equivocality creates a demand for richer communication media, provision is made for linking technology to the antecedent of information asymmetry as discussed by Shields and Young (1993). Moreover, the Daft and Lengel model of participation, media richness, and information amount has not been empirically tested in the accounting literature.

Organization of the Dissertation

Chapter II presents a review of selected literature relevant to the current study. Although this review primarily discusses literature from participative budgeting, a review of ancillary literature relevant to the current study is included as well. Studies involving leadership style and managerial choice, technology, and media richness and information processing are also examined.

Chapter III discusses the research strategy and explains the research methodology that was used to conduct the current study. Hypotheses are formally stated and analysis methods

are described in this section.

Chapter IV presents the results of the study and a brief interpretation and discussion. Chapter V presents a detailed discussion of research results and implications. Included in this section are conclusions drawn from the study, limitations of the study, and ideas for future research.

CHAPTER II

THEORY AND LITERATURE REVIEW

Participative Decision Making

Introduction

When considering the extremely large size of the body of literature that exists on participative decision making, it seems that an extremely small amount of consensus has been reached on its effects. Although researchers seem to agree, for the most part, that the effectiveness of participation is dependent upon other factors, the specification of these factors still remains illusive (Miller and Monge 1986).

The three most recent meta-analytic reviews of participation to date have been those of Miller and Monge (1986), Schweiger and Leana (1986), and Wagner and Gooding (1987). Miller and Monge tested cognitive, affective, and contingency models of the effects of participation on satisfaction and productivity. Schweiger and Leana's meta-analysis focused on performance and satisfaction effects of participative leadership. Wagner and Gooding examined the effects of four situational moderators (i.e., group size, task interdependence, task complexity, and performance standards) on five consequences of participation (i.e., task performance, decision performance, motivation, satisfaction, and acceptance).

All three analyses focused on the relationship between participation and its consequences, but none were able to provide strong conclusions with regard to either

magnitude or direction in these relations. Only Miller and Monge (1986) were able to claim any consistency of support for participation-outcome relations, and their effects were weak. Moreover, Wagner and Gooding (1987) concluded that the Miller and Monge (1986) significance conclusion appeared to be based on results that contained percept-percept effects rather than truly significant participation outcome results. Percept-percept methods are described by Leana et al. and exist where: "...data on both participation and outcomes are measured using a single questionnaire at a single point in time from the same group of respondents [and] artificially inflate the relationships between participation and outcomes (1990, 144)." This threat is present in virtually every field study and sample survey due to the difficulty of obtaining both pre and post measures of participation. Even after controlling for potential methods biases in the studies analyzed, Wagner and Gooding (1987) concluded that methodological artifacts explain many of the relationships. In addition, Dipboye claimed that in the..."Miller and Monge stud[y], the differences between laboratory and field could be explained with theoretically meaningful variables that can be manipulated in the laboratory (i.e., time pressure and task complexity) (1990, 23)."

Accordingly, the equivocal nature of results regarding the consequences of participation is still apparent. Although these meta-studies do not provide much information in terms of convergence of conclusions regarding participation's consequences, they do suggest that researchers should step back and examine why the consequences of participation are not consistent. This would indicate that current research in participation should pursue a different direction.

Consequently, in an effort to better understand these relationships and perhaps to

reconcile findings of prior studies Shields and Young (1993) recently suggested examining the antecedents of participation. In situations where the reasons for implementing participation (i.e., the antecedents) differ, it would be reasonable to expect that the consequences might also differ. In their study, Shields and Young tested the significance of the participation antecedent *information asymmetry* and linked the relation to firm-wide performance evidencing a significant result.

Miller and Monge (1986) (and most other recent studies) concluded that the effectiveness of participation is contingent upon other factors. Accordingly, the focus should shift to specifying the *conditions* under which participation is effective, rather than the more general issue of whether it is effective or not (i.e., in terms of performance or satisfaction) (Brownell 1982c). This is the predominant theme included in *suggestions for future research* sections of studies in recent years. Examples of studies calling for a contingency approach include the following: The degree of budget participation should be an *individual firm* decision (Milani 1975). "Future research should continue to address the contingent relationships between participation and situation-specific design characteristics (Chalos and Haka 1989, 345)." "Contextual variables,...are correlational antecedents of participative budgeting (Shields and Young 1993, 268)."

General Participative Decision Making Literature

Becker and Green (1962), in a non-empirical work, tried to explain why managerial leadership style is important in the choice of budgeting procedures. At the time, this was an issue which, according to them, was largely overlooked. Primarily they discussed the motivational impact of budgets on people. They mentioned the importance of *setting* or

context, and explained that participation is not a panacea (i.e., it is inappropriate in certain environments). Moreover, Locke and his colleagues point out that field studies do not isolate the effects of participation since no control group is available and other influences are present to confound effects (Locke et al. 1986). Even in laboratory studies regarding universal participation effects, findings often appear to be artifacts of the research setting. Although the setting is contrived, uninterpretable outcomes can result due to the aggregation of various situational factors (Chalos and Haka 1989).

Becker and Green (1962) also conveyed the message that initiation or continuance of participation is only determinable by management. This statement may reflect a sentiment more common to the times, but it also seems to allude to the importance of managerial choice in participative decision making.

Using a sample survey method Alutto and Belasco (1972) examined decisional deprivation and discrepancy between actual and desired participation. They also suggested that not all issues/contexts are equal (i.e., should receive consistent treatment), but vary with the nature of the decision. In addition, they made an important contribution by suggesting that the relative *quality* of participation should be considered. The Vroom model, used in the current study, makes provision for various intermediate levels of participation, thereby allowing the quality or level of participation to vary.

In a comparative examination of the effects of both individual and situational variables, Steers (1977) used the Vroom model to empirically test hypotheses. The Steers study is especially relevant to the current study in that it examined the effects on the degree of participation *allowed* and hypothesized that situational variables are more important

antecedents of participation than individual variables. The Steers study also used a very interesting testing strategy. Essentially, a questionnaire involving 20 participation decision cases was completed by subjects who were both students and workers (lending credibility to the quality of the sample). Then, to assess both situational and individual effects from this same pool of data, response variations across cases by individual were analyzed as situational effects, while response variations across individuals were analyzed by case. Although both individual and situational variables were determined to be significant, situational variables were found to be the more important of the two in influencing participative decision style.

Dickson (1980) used an empirical survey technique to examine the perceptions of both leaders and subordinates regarding the value of direct and indirect participation in work settings. Results showed that both types of participation are valued, but direct participation is valued more than indirect. Perhaps the most important contribution of Dickson's study is that leader perceptions were found to be different from those of subordinates regarding participation. Essentially, leaders specified positive antecedents (e.g., to increase acceptance of decisions and to communicate information) for direct participation and negative antecedents (e.g., the existence of union or general labor power and current political forces) for indirect participation. Subordinates, on the other hand, valued indirect participation more highly than leaders and ascribed positive antecedents (primarily of a motivational nature) to both types. This implies that leaders are concerned with reducing information asymmetry and mitigating the effects of possible negative antecedents to participation, while subordinates are primarily concerned with motivational antecedents. Accordingly, this study

highlights the importance of considering both the antecedents to participation and the relative organizational or decisional position of the parties involved (i.e., whether they are leaders or subordinates) in predicting consequences.

Participative Budgeting Literature

Budgeting

In general, an organizational budget is a tool for planning and control. The budget is used for planning in that it is a quantification of the goals of the organization for a specified time horizon. The control aspect is then concerned with using the budget for monitoring, evaluating, and taking action regarding deviations from that plan (Searfoss 1976). These are perhaps the most obvious functions of budgeting as a tool in organizations. However, other functions of budgets can be added as well, such as coordination, communication, performance evaluation, and motivation.

Coordination is achieved by pulling together and using planning information regarding functional activities (e.g., sales, production, and purchasing). Performance evaluation is typically accomplished by comparing actual results to budgeted results for a given time period and using these variances to distribute rewards and to take corrective action. Communication and motivation then provide antecedents to the performance evaluation process by (1) relaying expectations from management to subordinates, (2) relaying actual results regarding achievements and problems from subordinates to management, and (3) motivating by tying these two communications together by the consequent reinforcement contingencies of rewards and sanctions (Ronen and Livingstone 1975; Kenis 1979).

From the perspective of communication and motivation, budgeting can be viewed as a bargaining process (Pope 1984). This is true, at least to some degree, whether the budget is imposed on subordinates or developed through the participation of those subordinates (Ronen and Livingstone 1975). Because of the interdependent nature of these antecedents and the behavioral complexities involved, special consideration of these items by management is warranted. Consequently, communication and other related items such as translation requirements and media richness are important considerations in reducing information asymmetry between organization levels. Also, factors affecting motivation, such as the degree of participation of various organizational members in the budget setting process, are very important.

Contingency Theory

Research in participative budgeting in the past twenty years has emphasized the contingency theory approach (Milani 1975; Bruns and Waterhouse 1975; Brownell 1981; 1982a; 1982b; 1983a; 1983b; 1985; Merchant 1981; 1984; Seiler and Bartlett 1982; Daroca 1984; Pope 1984; Tiller 1983; Brownell and McInnes 1986; Brownell and Hirst 1986; Chenhall 1986; Mia 1988; 1989; Dunk 1989; Brownell and Merchant 1990; Penno 1990; Pasewark and Welker 1990; Frucot and Shearon 1991; Brownell and Dunk 1991; Kren 1992; Shields and Young 1993; Pasewark and Strawser 1994). In fact, almost all studies published in the accounting literature during this time have used this approach. This is the one approach to participative budgeting studies where researchers seem to agree that continued effort is needed. The contingency approach to participative budgeting is the same contingency approach to organization design discussed by Child (1977) as the dominant

paradigm in organization theory. Merchant summarized the contingency approach as follows: "The basic notion, expressed in both the organizational behavior literature... and in previously mentioned accounting frameworks, is that for maximum effectiveness, the design and use of administrative systems such as budgeting must vary with the setting (1981, 816)."

Universalist theories, on the other hand, claim that participative decision styles are always (universally) good or bad, regardless of the potential influence of other factors. It seems that universalist theories regarding participation-outcome effects have become passe, and researchers have accepted the inconsistency of such claims and the wisdom of using a contingency approach to study participative decision making as it relates to budgeting.

Researchers in participative budgeting still have much to accomplish by using the contingency approach. Approximately thirteen years ago, Merchant suggested two desirable extensions for his study that still remain unfulfilled:

> ...extensions in at least two directions are desirable: (1) toward more intensive studies examining interactions of variables taken a few at a time, such as in a field experiment, and (2) toward broader studies guided by contingency frameworks, so that data may be gathered from samples chosen to magnify the variation on the dimensions of interest while controlling for the many possible interacting factors which may obscure or distort the findings (1981, 827, emphasis added).

Since that time, no field experiments and only a few laboratory experiments have been conducted and published in the accounting literature. Therefore, the much needed control to achieve conclusive findings and to triangulate on the research issues has been severely lacking. Moreover, although researchers have explored a virtual plethora of potential moderating variables of participation-outcome relations, contingency frameworks have not been prolific or sophisticated, but rather have been isolated efforts of individuals.

Researchers in this area tend to carve out islands preventing real progress on integrating our understanding of these complex relationships (Brownell 1982c).

The most recent direction of research in the participative budgeting area using the contingency approach is to focus on the antecedents of participation. Research has clearly shown that participation-outcome research is often equivocal. In trying to understand why this equivocality exists, exploring the reasons why an organization may use participation in budgeting in the first place may be fruitful. The degree to which these reasons for allowing participation differ from one organization to the next may ultimately provide an explanation for differing consequences of participation. The next section discusses this further.

Antecedents of Participative Budgeting

Understanding the antecedents or determinants of participative budgeting is essential to understanding its consequences. However, the systematic study of the causes of participation in budgeting, has been mostly ignored in the accounting literature. Many researchers have suggested that particular antecedents or merely antecedents of participative budgeting in general be studied. Others have merely discussed the possible reasons for differing degrees of participation in budgeting (Onsi 1973; Ronen and Livingstone 1975; Searfoss 1976; Kenis 1979; Brownell 1981; 1982b; 1982c; Daroca 1984; Pope 1984).

Most recently, Shields and Young (1993) explicitly set out to examine information asymmetry as an antecedent to participation in budgeting. They explained that 24 of 28

studies in participative budgeting from 1970 to 1991 examined only its consequences.[5] Shields and Young identified four streams of research concerned with antecedents: (1) contingency theory (includes contextual variables at all levels), (2) motivational/cognitive (includes individual variables), (3) cultural (includes Asian management styles, quality circles, etc.), and (4) information asymmetry (based on agency theory). The current study uses theory from three of the four perspectives (i.e., contingency theory--technology and situational context; motivational/cognitive--variance due to individuals; and information asymmetry--specifically included in the Vroom model and tested as a dependent variable). Primarily, the current study is grounded in a contingency theory perspective which somewhat integrates all other theoretical streams.

Shields and Young (1993) emphasize the indiscriminate use of a diversity of moderating variables and the inconclusiveness of participative budgeting studies. The following statement summarizes the problem:

> Almost all of the extant empirical research on participative budgeting has focused on testing whether participation affects consequences such as motivation, satisfaction and performance. Comparative analysis of these studies reveals that there is diversity in terms of theories, variables and results, and thus, no coherent explanation for the consequences of participative budgeting or its antecedents (Shields and Young 1993, 275).

In reviewing and summarizing the literature in participative budgeting, Brownell refers to the problem as one of emphasis on *consequence* moderators versus *antecedent* moderators:

> ...consequence moderators refer to a set of variables that affect the outcome for the organization of its control system design choices, such as the level of budget

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[5]Actually the report of Shields and Young is not totally complete in this regard. Given their parameters of examining all articles from 1970 through 1991 from *The Accounting Review, Journal of Accounting Research,* and *Accounting, Organizations and Society,* at least five studies appear to be omitted (Daroca 1984; Ronen and Livingstone 1975; Brownell and Merchant 1990; Penno 1990; Frucot and Shearon 1991). However, none of these studies examined antecedents either, only serving to exacerbate the problem.

> participation. It is in this area that accounting research has tended to place emphasis, examining the consequences *of* participation without providing a similar degree of concern with the consequences (of the antecedents) *for* participation. Viewed more generally, researchers have been preoccupied with the impact *of* accounting rather than giving equal consideration to the impacts (of antecedent moderators) *on* accounting (1982c, 145, emphasis in the original).

Brownell (1982c) attempts to create a descriptive model of four classes of moderating variables (i.e., organizational, cultural, interpersonal, and individual) discussed in his literature summary by integrating them into a single unifying framework of participation antecedents and consequences. This model is displayed in Figure 1. The model as shown by Brownell (1982c) and Figure 1 appears somewhat incomplete in light of the ambiguity of causal direction that exists in the literature. Also, the distinction between antecedent moderators and consequence moderators is not as clear as Brownell is depicting. For example, Brownell shows interpersonal and individual variables as *consequence* moderators. However, it seems clear that these variables could behave as determinants (i.e., antecedents) of participation as well.

Consequently, Figure 2 shows the adaptation of Brownell's model to simplify and more accurately represent the relationships. This figure highlights the need for more experimental research to resolve the ambiguity regarding causal direction for specific moderators. Every possible participation decision or setting can be reduced to the elements of the decision maker and the context of the decision. In this case, the context can be construed as anything external to the decision maker (e.g., attributes of the quality of the decision, perceptions of subordinate acceptance, or inherent technological complexity). Individuals, as well as the context, can influence the degree of participation appropriate or allowed. Accordingly, the extant degree of participation can impact both individuals and the

context, ultimately influencing outcomes. These outcomes can then influence individuals and change context further. The cycle is continuous and the moderators ubiquitous. Stated differently, participation influences outcomes indirectly as moderated through individuals and context. In turn, these outcomes influence further participation through individuals and context. Figure 2 retains the depiction of contingent relations as in Brownell (1982c). These relations are also likely to remain contingent as research develops. That is, as relationships become more accurately defined, the illustration in Figure 2 is still likely to remain essentially as shown, only with specific variable names replacing the general antecedent and consequence moderators and with individual variable directional effects specified.

Those studies that have empirically examined the antecedents of participative budgeting, have done so using correlational analysis only (Merchant 1981; 1984; Bruns and Waterhouse 1975; Seiler and Bartlett 1982; Shields and Young 1993). These studies were all conducted with the use of a questionnaire. Although Shields and Young (1993) attempted to assess directional effects via path analysis techniques, all of these studies are subject to the threat of ambiguity with respect to causal direction.

In a study examining interactions and relations between organization structure and budgetary control variables, Bruns and Waterhouse (1975) found significant correlations between participation in budgeting and both perceived control and structuring of activities. The study was concerned solely with antecedents to participation only at the organization level such as size and technology. The relation of technology to participation is of interest in the current study as well. However, Bruns and Waterhouse tested this effect indirectly, and found significance only as moderated by organization structure. Also, the relation of

perceptions of control are relevant only to those answering the questionnaire who were subordinates rather than organization leaders.

Merchant (1981) also examined organization theory variable relations in a partial replication of the Bruns and Waterhouse (1975) study. However, these variables were studied as antecedents to budgeting in general, rather than to participation in budgeting. Also, although he suggested that participation was probably the most studied aspect of budgeting and that an examination of antecedents at multiple levels (i.e., organizational and situational) was needed, he confined his study to the organizational level and budget system design in general.

In a similar study, using the same sample of subordinates from 19 electronics firms, Merchant (1984) again published a study of related but similar organization level variables. Presumably, the data was from one study collected at the same time with the results distributed over the two publications.

Seiler and Bartlett (1982) was the only study that examined antecedents from the perspective of the organization leader. Personality traits were the antecedents studied. Several significant relationships were found. Most notably, perceptions of organization climate, degree to which the budget reflects operating goals, independence, and flexibility were all factors associated highly with participation in budgeting. Seiler and Bartlett (1982) stated that personality variables tend to mask perceptions regarding the true nature of a system. This implies that it is important to control for individual differences when examining the antecedents of participation in budget systems. Accordingly, it seems fitting to test for significant individual differences through analysis methods after the manner of

Steers (1977) and Vroom and Jago (1974).

Although many researchers have suggested that the antecedents of participative budgeting are important and should be considered, few studies have actually done so. The few studies that have examined antecedents have done so using correlation analysis only. Consequently, substantial ambiguity regarding causal direction in relationships studied is present. Moreover, the study of the antecedents of participative budgeting necessitates the treatment of the participation construct as a dependent variable. The next section discusses the lack of studies which have used this treatment as well.

Participation as the Dependent Variable

With the exception of the correlational studies cited in the previous section, there have been no studies in the accounting literature within the past 20 years that have explicitly operationalized participation as a dependent variable. Several studies have suggested this or discussed its importance (Searfoss 1976; Brownell 1982c; Pope 1984). Moreover, when the relation is tested or reported with participation as the dependent variable, a sample survey or field study design is inadequate in assessing causal direction. As stated previously, only correlations can be examined when this is the case. As stated by Brownell in a summary of the participative budgeting literature: "...an extremely important caveat requires mention. Almost without exception, the empirical results reported here were produced with use of survey research techniques, which raises the question of the causal direction of the relationships studied (1982c, 139)."

In a non-empirical discussion article, Pope (1984) presents a diagram which indicates directional influences of antecedents which would suggest the study of participation as the

dependent variable. The role of information communication in participative budgeting is discussed. Mutual influences on the budget include public and private information, leader and subordinate expectations, and leader and subordinate preferences. All of these items enter the process of examining information asymmetry as an antecedent and participation as a dependent variable.

In citing a landmark field study on the behavioral effects of budgeting, that of Argyris (1952), Searfoss indicates that "*true* participation very seldom existed in the budget process (1976, 377)." This highlights the importance of considering the *actual* extant *degree* of participation in terms of the perceptions of those involved. Moreover, the degree of participation is not an objectively verifiable amount. The construct is not easily observable or quantifiable (Milani 1975). Ultimately, the extant degree of participation is not important, but rather the participation perceived that influences behavior. Therefore, measures of perceptions are required.

The next section explores the importance of considering the perceptions of *leaders* in the participative budgeting relation. Obviously, the perceptions of both leaders and subordinates are important to consider, although the former has been largely ignored.

Leader Perceptions

In the literature review conducted by Brownell, he cites four studies that suggest that, "..the exclusive use of one single leadership style in a budgetary context corresponds to neither reality nor to any prescriptions of leader behavior (1982c, 136)." Based on these results, Brownell "suggests that leader behavior should be *situationally* consistent only (1982c, 136)." On the other hand, it seems ironic that the perceptions of individuals who

are primarily responsible for the extant degree of participation in organizations and have the greatest degree of influence in instigating change in this relationship are usually not studied. Even in studies examining leadership style, it is almost invariably the perceptions of subordinates regarding their leader's style that is studied.

Four notable studies in the accounting literature have studied leader attributes regarding participative budgeting (Seiler and Bartlett 1982; Daroca 1984; Chenhall 1986; and Pasewark and Welker 1990). Brownell (1983b) studied leadership style, but did so using a questionnaire where subordinates, not leaders, were the respondents.

Seiler and Bartlett (1982) examined the relation between budgetary system characteristics and personality traits, hypothesizing that more rigid personalities of leaders discourage participation. Most notable of their findings was that authoritarianism was not found to be correlated with participation.

Daroca (1984) used a laboratory experiment to explore motivation and goal congruity as related to participation in budgeting. Marketing and R&D majoring students were used as subjects in groups blocked by these functions to determine differences between groups as differentially composed for marketing and R&D amounts budgeted. Consensus was used as the operationalization for participation, and one person in each group (leader condition only) played the part of the leader. Results showed that groups with leaders tended to take less extreme positions than did leaderless groups. Overall, positions taken by leaders were found to be significant in influencing group behaviors and preferences. Although this study involves leaders, it is quite different from the current study since leader perceptions were not examined by Daroca.

A unique and commendable approach to examining the perceptions of both subordinates and leaders was used by Chenhall (1986). In his study, a dyadic analysis was used to explore personality variables of both leaders and subordinates. He argued that the mixed results of studies examining authoritarianism were a consequence of examining only the personality of the subordinate. Essentially, he found that homogeneous authoritarianism dyads were associated with positive participation outcomes, satisfaction, and budgetary attitudes. Chenhall made a useful distinction between the objective or executive decision system of individuals and the *perceptions* of individuals. Personality variables are believed to influence perceptions more directly than an individual's executive decision system. This, again, suggests the importance of measuring perceptions rather than trying to measure an objectively determinable degree of participation. Chenhall mentions that it would have been helpful to examine situational conflict in his study. This is a variable that the Vroom model explicitly considers. Moreover, although the Vroom model typically uses decision rules developed according to the perceptions of the leader, the perceptions of subordinates are explicitly considered as criteria in the model.

Apparently the only studies in accounting to use the Vroom model to study participative budgeting were those of Pasewark and Welker (1990) and Pasewark and Strawser (1994). Both of these studies used sample survey methodology and were normative in design, whereas the current study uses an experimental design and is descriptive in design. Pasewark and Welker (1990), using description and recall methodologies (discussed later), found that participation tends to enhance the odds of successful decision making in budgeting. Although no real distinction was made between leaders and subordinates, the

respondents were high-level managers with considerable experience with the budgeting function in their organizations. The Pasewark and Welker (1990) study was the only published study in accounting to attempt a validation of the Vroom-Yetton model.

Pasewark and Strawser (1994) more clearly examined leader perceptions by soliciting perceptions of audit managers in four Big Six firms regarding actual subordinate participation in an audit task. The decision examined was relevant to the current study since it was the estimation of hours required to conduct an audit, fundamentally a budgeting task. Their study used an objective, quantifiable measure of decision quality rather than subjective evaluations of decision success as have been typically used in previous normative studies employing description and recall methodology. Pasewark and Strawser found that the Vroom-Jago model has potential to improve decision effectiveness through increased accuracy in performance and higher subordinate development. The Pasewark and Strawser (1994) study is the first published study in accounting to attempt a validation of the Vroom-Jago model (i.e., the revised Vroom-Yetton model).

Brownell (1982c) discusses behavioral research included in the non-accounting behavioral literature on leadership style and interpersonal variables, identifying three distinct classes of variables (i.e., task, group, and situational characteristics). Brownell notes differences on appropriateness of leader behavior regarding the degree of participation which should be allowed given these criteria. Brownell cites studies showing differences in leadership style used for straightforward, routine tasks versus ambiguous, poorly specified tasks. Among the group and situational variable classes, Brownell cites differences in leadership style for all of the variables operationalized by the Vroom model as revealed in

studies examining one or more of the item variables that the Vroom model considers. Although no accounting studies were mentioned by Brownell on this topic, the current study examines leader perceptions and preferences regarding all of these variable classes.

The importance of considering leader perceptions seems clear. Moreover, the perceptions of leaders regarding participation in budgeting can potentially be influenced by a variety of variables at different levels. Accordingly, the need for empirical research in this area appears equally clear. The next section reviews the experimental research in participative budgeting and explores in detail the insufficiency of evidence that has been provided by this research strategy.

Experimental Research

The participative budgeting literature in accounting contains very few examples of studies using experimental research strategies. Field experiments, as suggested by Merchant (1981), have not been employed at all, and only a few laboratory studies can be cited (Cherington and Cherington 1973; Foran and DeCoster 1974; Brownell 1981; Tiller 1983; Daroca 1984; and Kim 1992).

Brownell (1983a) cited Cherington and Cherington (1973) in discussing the motivational impacts of budgets. Per Brownell, the authors examined budgetary participation and reward structure, where reward structure was operationalized as the degree to which the budget was used in performance evaluation. Results showed that performance and satisfaction were higher when a high degree of participation in budget setting was accompanied by a high degree of importance placed on the budget as a standard in rewarding subordinates. Presumably, this result arises from the fact that employees want to be more

involved in issues that are more likely to affect them in meaningful ways.

Brownell (1981) examined the participation-performance relation as moderated by subordinate locus of control. Students were used in pilot testing and actual managers were used additionally as subjects for the experimental task. Subjects played the role of subordinates, and the results for students were similar to those of the managers, except for locus of control, where managers were predominately more internal. Locus of control (LOC) interacted as a moderator of the participation-performance relation. Participation had a positive effect on individuals who felt that they had a large degree of control over their destiny (high internal LOC), while it had a negative effect on individuals who felt that their destinies were not within their own control (high external LOC). Brownell (1981) demonstrates the importance of considering individual variables (i.e., LOC) as they influence participation-outcome relations.

As discussed previously, Daroca (1984) used a laboratory experiment to explore motivation and goal congruity as related to participation in budgeting. Participation was operationalized by using only one factor level (i.e., that of consensus). Positions taken by group leaders were found to be significant in influencing group behaviors and preferences. The influence of differential leader behaviors shown by Daroca (1984) suggests the importance of considering leader perceptions in participative budgeting.

Tiller (1983) set out to develop and test a model of the participation-performance relation based on a cognitive dissonance model. In his study, the subjects were allowed to choose the level of difficulty of the task in which to perform, and by doing so, as Tiller argued, had participated in the setting of the budget. Tiller's participation induction was

unique in that he allowed the subjects complete freedom in terms of choosing their condition (i.e., high/low task difficulty), while at the same time *suggesting* that they select the particular condition desired. He claimed that this participation induction created a "representative" scenario: "From the perspective of the participation subjects, they participated in the choice of their budget level just as employees might in a participative budgeting context (Tiller 1983, 589)." That is, in the experiment, the subjects likely perceived the encouragement of the experimenter in favoring a particular budget level similar to how they might feel persuaded by an organization leader to agree with his or her choice in budget setting decisions. The manipulation of participation by allowing choice, yet enabling the random assignment of subjects to conditions, was a major contribution in the Tiller (1983) study. Results of the study suggested that participation enhances performance and commitment most when conditions of low pay and difficult to achieve budget levels are present.

Similar to Tiller (1983), Foran and DeCoster (1974) studied the effects of participation as related to cognitive dissonance. Similar to Daroca (1984), participation was operationalized by using only one factor level (i.e., that of consensus). The purpose of the study was to examine the importance of situational and personality factors as related to standard setting. Leader behavior was manipulated by using a confederate who initiated different behavior in each group. However, all subjects and measures were in terms of subordinates. The major finding of the Foran and DeCoster (1974) study was that participation alone is not adequate in producing worker commitment; it must also be accompanied by positive feedback.

The only participative budgeting experiment published in recent years, Kim (1992), examined whether risk preferences are domain-specific (i.e., whether they vary by situational context). Based on Kahneman and Tversky's (1979) prospect theory, Kim provides evidence that latent risk preferences translate into differing risk preferences depending on the context. Results show that context and dispositions contribute to risk preference behaviors and that context contributes more. Providing evidence that risk preferences are not as stable as is normally believed is the major contribution of the study. This finding implies that the context surrounding a decision is important in influencing decision styles used. This assumption is also important in the present study.

Table 1 presents a summary of experimental studies including the potential moderating variables examined in each and the significant contribution and/or findings. Table 2 further elaborates by summarizing the importance or relevance of each experiment to the current study in tabular form. Also, specific enhancements included in the current study are presented that address issues unresolved by the prior research listed.

Several important items should be noted about these experiments as related to the current study. First, Daroca (1984) and Foran and DeCoster (1974) highlight the importance of considering the leader's perceptions, although they failed to do so. Kim (1992) did not study participation from the leader's perspective either, but easily could have done so. Daroca (1984) and Foran and DeCoster (1974) both manipulated leader behavior but measured the responses of subordinates rather than measuring responses of leaders. These studies provide evidence that the perceptions, attitudes, and behavior of leaders provide important antecedents to participation and can be significant moderators in participation-

outcome relationships.

Second, Tiller's (1983) results suggest that task difficulty enhances the desire for participation on the part of subordinates. Although more related to goal setting theory, Tiller's finding and variable choice lends support for hypotheses regarding the moderating effects of technology (specifically *task difficulty*) on participation relationships.

Third, the examination of potential moderating variables in these studies supports the contingency approach to research in the participative budgeting area. Potential moderating variables examined included locus of control, goal congruity, motivation, risk attitudes, situational risk conditions, level of task difficulty, cognitive dissonance, authoritarianism, feedback, and reward structure.

Although these experiments provide useful evidence regarding participative budgeting, the approaches taken and the items studied, as a whole, still leave many questions unanswered. In comparison with the prior experimental research, several important enhancements are offered by the current study. These items are summarized in Table 2.

First, none of the studies listed examined the leaders' perspective in terms of perceptions and preferences as in the current study. Daroca (1984) and Foran and DeCoster (1974) manipulated leader behavior, but still did not examine leader attributions. Second, none of the studies treated participation as the dependent variable. Participation was either manipulated (Brownell 1981; and Tiller 1983) or held constant (Daroca 1984; Foran and DeCoster 1974; and Kim 1992) in each study. Although still a manipulation of participation, Tiller (1983) at least allowed the perception of choice regarding the level of participation desired by the subjects. Third, the studies that did manipulate participation did so on only

two levels (low/high). The current study examined participation preferences on five different levels. Fourth, many of the moderators of the previous studies were incorporated into the current study, such as goal congruity, level of task difficulty, and commitment; while other variables never examined in the accounting literature before were studied (e.g., media richness and leader perceptions). Fifth, all independent variables in the current study were examined as antecedents to participation. None of the experimental studies cited previously examined antecedents to participation. Finally, although the previous studies examined variables at various levels (i.e., organizational, situational, and individual), none of the them examined variables at all three levels as in the current study.

The next section describes the Vroom model and studies conducted regarding its validation. Included is a brief description and theoretical basis, a discussion of its applicability to both laboratory and field research, its relevance to the current study, and a brief methodological overview discussion of how the model was used.

The Vroom Model and Managerial Choice

The Vroom Model

The original Vroom-Yetton model was developed and first discussed in their book on the subject (Vroom and Yetton 1973). The model describes five decision-making styles varying in terms of the degree of subordinate participation used for different decisions. These five styles can be placed on a continuum ranging from autocratic to group consensus in terms of the degree of participation used in each style. Several decision rules describing situational factors are used (7 in the original model and up to 12 in the revised model) to

determine which leader decision style is appropriate for a given decision (i.e., how much subordinate participation to allow, if any) (Vroom and Jago 1988). A decision tree was originally used to evaluate the situational factors to produce a feasible set of decision styles which would be appropriate for a given decision. The decision tree method is still available with the model after being revised, but its use requires restrictive assumptions that are no longer necessary with the revised model. Moreover, the decision rules are now incorporated into a sophisticated system of equations which can be used to predict the optimal decision style, given five-level Lickert-type scales (previously dichotomous) on all but two of the now twelve factors. This system of equations is much more precise and is used in the present study (see Appendix D).[6]

The theoretical basis for the Vroom model was taken from Maier (1963). Maier also viewed leadership style, in terms of participation allowed, on a continuum. In Maier's development, a decision's effectiveness is thought to be the function of three classes of outcomes: (1) the quality of the decision, (2) the acceptance or commitment on the part of subordinates to execute the decision effectively, and (3) the amount of time required to make the decision (Vroom and Jago 1974). The 7 original Vroom and Yetton (1973) model criteria were classified according to criteria related to the first and second of Maier's class of outcomes (i.e., quality and acceptance). In the revision, based on the suggestions implied by the results of empirical testing, *time* and other factors were added (Vroom and Jago 1978).

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[6]A detailed discussion of the Vroom model method can be found in Vroom & Jago (1988). Decision support software is also available through the authors (i.e., Vroom & Jago) which can facilitate application of the model to daily decision making regarding the choice of participative decision making styles in virtually any setting.

Over 60 books and articles have been written which discuss the Vroom model, but relatively few studies have directly tested its validity. In one of the more recent studies testing the Vroom model, it was stated that the Vroom model was "...perhaps the most widely known and empirically developed contingency perspective on organizational decision-making (Tjosvold et al. 1986, 125)." In a meta-study focusing on the agreement of participative research results between laboratory and field, the Vroom model was said to be "the best example of systematic research focusing on situational predictors of PDM (participative decision making)...(Schweiger and Leana 1986, 155)." Given the high regard which the model is given in the literature, it seems odd that more studies have not been published which directly assess its validity during the 20 years since the model was introduced. Moreover, the results of studies on the validity of the model, especially descriptive ones, have been relatively consistent across both laboratory and field (Schweiger and Leana 1986). Perhaps this is because, "Unlike most of the broad-based PDM (participative decision making) research, laboratory studies examining the Vroom and Yetton model have *attempted to encompass the complexity inherent in field settings* (Schweiger and Leana 1986, 160, emphasis added)."

One item that is needed by participative decision models to identify sources of variation among studies is the specification of the *degree of involvement* of the participants in the activities studied (e.g., no involvement, equal involvement, or consensus) (Schweiger and Leana 1986). This requirement is fulfilled by the Vroom model. Perhaps this is one reason why the Vroom model's results have been so consistent across laboratory and field studies. This point is well made by Schweiger and Leana: "...since the theoretical

framework underlying these investigations has specified a variety of participative methods, laboratory as well as field research has been better able to capture these distinctions in a systematic manner that permits comparability across studies (1986, 161)."

As mentioned previously, there have been very few studies conducted either using the Vroom model or testing its validity. Table 3 presents a classification showing the published studies which have tested the validity of the Vroom model to date (a total of 17, i.e., 7 laboratory and 10 field). Schweiger and Leana (1986) present a similar table, breaking down the studies listed by laboratory and field. However, their table excludes recent studies (i.e., those of Heilman et al. 1984; Tjosvold et al. 1986; Paul and Ebadi 1989; Pasewark and Welker 1990; and Pasewark and Strawser 1994), and fails to distinguish high impact studies from other methods. Other studies have been conducted but remain unpublished. These include Zimmer (1978) (a description and recall type study) and Liddell et al. (1986) (a high impact laboratory study).

One of the features that makes the Vroom model so attractive is its completeness. That is, many situational criteria (moderator antecedents) are considered by the model, rather than simply taking the approach of indiscriminantly examining the effects of single variables in moderating relations as many previous studies have done. Also, there is evidence to believe that the Vroom model is more effective when used as a whole, rather than when its individual moderating decision rules are considered in isolation. That is, in stepwise regressions, agreement with the feasible set explains significant variance after partitioning the variance attributable to any single decision rule in the model. Accordingly, the complete model is a better predictor of decision success than any of its parts considered individually

(Vroom and Jago 1978).

As Schweiger and Leana (1986) describe, two methods have generally been used to test the validity of the Vroom model by primarily examining one of two different dependent variables. The two methods include (1) description and recall and (2) contrived scenarios. The description and recall method requires that managers describe a decision scenario and recall their method of disposition regarding the decision. The contrived scenario approach requires the creation of decision situations by the researcher (i.e., a pencil and paper task) and asking the subjects to indicate the approach that would be used or preferred in making the decision (i.e., the degree of participation allowed).

The dependent variables normally examined, include: (1) the degree of participation allowed or preferred given a particular scenario (to evaluate if preferences match the model's prescription), and (2) the *effectiveness* associated with agreement of the subject's recommendation regarding a particular participative decision style with the feasible set prescribed by the model. The former dependent variable examined is a descriptive approach to validation, while the latter approach is normative in nature. Table 3 shows a breakdown of the studies which use each type of method and the dependent variables examined in each. The basic grouping is that of descriptive versus normative and laboratory versus field. While there are some exceptions to this grouping (as shown in the table), this arrangement is adequate to classify most of the studies in a way that helps to understand the research approaches used to date.

The current study follows the contrived scenarios and response methodology while examining the descriptive ability of the model to determine the importance of antecedents

or determinants of participation in particular contexts. Both approaches focus on the *feasible set* from which the model predicts that a solution should be made. However, the normative approach (effectiveness associated with agreement) examines the *consequences* of choices among alternatives, while the descriptive approach examines the *determinants* of those choices (i.e., the item of interest in the current study) (Vroom and Jago 1974). The descriptive approach to validation appears to be the most important at this point in the research stream. Isolated focus on the consequences of participation has not led to fruitful resolution of the research questions regarding participation relations. Moreover, the antecedents of participation have virtually been ignored in research to date. Margerison and Glube made this point in their conclusions to their study which was *normative* in nature: "It is important that government, unions, and management should look at the extensive evidence regarding the *realities* of participation rather than make universal decisions on the basis of theories, or philosophies, of what *should* be (1979, 55, emphasis added)." The fact that this conclusion was made in a study using a *normative* method emphasizes the importance of considering a descriptive approach.

Ten of the seventeen studies shown in Table 3 were conducted by some combination of Vroom, Jago, or Yetton in attempting to validate their own model. However, some validation efforts were made *independent* of the developers of the model. These include Margerison and Glube (1979); Field (1982); Heilman et al. (1984); Tjosvold et al. (1986); Paul and Ebadi (1989); Pasewark and Welker (1990); and Pasewark and Strawser (1994). As Table 3 shows, no validation studies, independent of the developers of the model, have been conducted using the contrived scenarios approach in combination with testing the

descriptive ability of the model. To present additional validation, independent of the model's creators, was one of the achievements of the current study. All five of the Vroom model developers' studies (included in this classification cell) have shown positively significant results. This significance is further supported by the fact that three of the studies were laboratory experiments, while the other two were field studies, evidencing agreement between results obtained across research settings.

The only other cell in Table 3 which shows validation attempts from the accounting literature (i.e., Pasewark and Welker 1990; Pasewark and Strawser 1994), is the normative dependent variable validation by using the description and recall methodology and the normative approach using an objective measure. The description and recall methodology appears to be weak in design and undependable. The method is engendered with several biases in terms of the need to rely on subjects to accurately (1) describe each scenario, (2) remember the protocols used in making the decisions, and (3) evaluate the outcomes in terms of decision effectiveness. Vroom and Jago (1974) admit the problems of this methodology saying that it may have led to confounding of individual differences and situational effects. Also, they noted that only one problem was described by a given manager. It was therefore impossible to identify interactions between individual and situational variables. In addition, Vroom and Jago claim that "the use of standardized cases in testing the group model provided consistent and richer data than use of recalled problems (1974, 756)." The obvious limitation of the use of contrived scenarios is that they only measure behavioral *intent.* However, Jago and Vroom (1978) provide evidence that this problem may not be serious. They found that when behavior in a real situation was compared with intended behavior in

a similar contrived scenario, significant agreement was found (Vroom and Jago 1988). Pasewark and Strawser (1994) greatly improved on previous normative studies by incorporating a more objective measure of performance, that of deviations from budget.

In the current study, evaluating the effects of technology and the Vroom model contextual factors on participative decision styles necessitates contrived scenarios which systematically manipulate these variables. For this reason and due to the disadvantages inherent in the description and recall methodology, the contrived scenarios approach was chosen for the current study. Moreover, using a high-impact study to manipulate a model as comprehensive as the Vroom model in a representative fashion (i.e., so that it would still retain its comprehensive qualities) did not appear to be a workable proposition. Consequently, this method was rejected in favor of a pencil and paper task.

Vroom and Jago (1974) lends guidance in development of contrived cases by employing the rules for compatible sets of problem attributes. Five principles are presented, as first developed by Vroom and Yetton (1973). For example, principle one requires that leader's information, problem structure, and subordinate's goal congruence be varied only when there is a quality requirement to the problem.[7] The contrived scenarios developed for the current study are in every way consistent with these development principles.

Managerial Choice

Although the Vroom model has been used to test relations from the subordinate viewpoint (e.g., Heilman et al. (1984) and Tjosvold et al. (1986)) as well as that of the

[7]The reader is referred to Vroom and Jago (1974) or the original work of Vroom and Yetton (1973) for a complete list of contrived scenario construction rules.

leader, the intention of the model is to consider the perceptions and behaviors of leaders as reflected in managerial choice. Generally, the issue of managerial choice has received comparatively little attention in the organization theory literature to date.

Primarily, organization structure research has been concerned with bivariate relationships (e.g., technology-structure or size-structure) and universalistic approaches to showing that such relationships do or do not exist (Bobbitt and Ford 1980). These studies are incomplete in the sense of considering the possibility of interactions based on contingency theory. Some of the studies that have considered the role of leader style in a contingency approach include Child (1972), Anderson and Paine (1975), Galbraith (1977), Meyer (1975), and Montanari (1978).[8] For example, Meyer (1975) presented results that suggest that leaders moderate the relation between structure and both size and environment (as cited in Bobbitt and Ford 1980, 14). Thompson (1967), in his classic and comprehensive work regarding technology-structure stated that the relation of context to structure is a function of *designer's preferences.*

There are several responses that organization leaders could enact based on their perceptions of differing organizational contexts. The possible responses in trying to manage uncertainty on the part of organization leaders includes information acquisition and information transformation to deal with uncertainty. This process is discussed by Bobbitt and Ford and includes the following comment: "Rather than decomposing complexity, decision makers may elect to involve others in an attempt to deal with the issue. In this

[8]For a more complete list of discussions and other empirical works related to managerial or strategic choice, the reader is referred to Bobbitt and Ford (1980).

case, alternative communication networks may be established or the decision maker may rely on the use of participatory decision making (1980, 16)."

The mechanism of information gathering and processing are dependent variables of interest in the current study. Moreover, an attempt is made to present descriptive evidence of how managerial choice can influence communication and participation given differing antecedents at the individual, situational, and organizational levels.

It seems clear that universalistic approaches to examining organization structure relationships have merit and that technology, for example, has a decidedly important impact on structure. However, it also seems clear that although they may not choose to do so in every case, leaders *can* moderate the relationship between structure and context.

Two of the validation studies of the Vroom model listed in Table 3 took the approach of holding technology constant in their studies while testing both the descriptive and normative abilities of the model in field settings (Margerison and Glube 1979; and Paul and Ebadi 1989). This action implies the importance of technology as an organizational variable which is believed to have overall significance in influencing the participative decision style which should be used by leaders regardless of other situational factors present in a particular context. It is surprising that the Vroom model does not include this variable in their attempt to be complete in modeling a contingency approach. However, technology is an organizational level variable and is perhaps not typically thought of as influencing situational conditions as directly as variables such as those directly related to the quality or acceptance of decisions. Govindarajan (1986), in discussing universalistic and contingency approaches to participation, also spends considerable time discussing the significance of task uncertainty

(i.e., technological complexity) as influencing participation-outcome relations citing both Tushman and Nadler (1978) and Galbraith (1973). The role of technology in this study will be discussed in more detail in the following section.

Technology

The number of studies in the accounting literature that have considered the impact of technology in affecting participative budgeting is significant (Bruns and Waterhouse 1975; Brownell 1981, 1982a, 1982b, 1982c, 1985; Merchant 1981, 1984, 1985; Brownell and Hirst 1986; Mia 1989; Brownell and Merchant 1990; Brownell and Dunk 1991; Kren 1992). Content of these studies is discussed where relevant. However, most of the research on technology relationships, including the basis for most of the discussion in the studies cited above, has come from the organizational theory literature. Most of the technology review is therefore focused in this literature.

Bruns and Waterhouse (1975) indicate that technology increases may lead to structuring and participation. This is primarily thought to be because organizations tend to decentralize and formalize their structure as technological complexity or sophistication increases. With a more decentralized structure, lower level managers tend to perceive themselves as having more influence. They participate more in budget planning. This degree of participation (on the part of lower-level managers) appears to be more a consequence of the extant degree of structure in the organization rather than a *choice* on the part of these lower-level managers. The area of *choice* appears to lie with the upper-level managers in their *allowance* of the subordinates to participate. Consequently, the upper-level managers' perceptions regarding the appropriateness of participation of the subordinates is

more relevant to the determination of the degree of participation used than the perceptions of subordinates.

Bruns and Waterhouse (1975) found that although differing levels of structure resulted in differing levels of interaction in the superior-subordinate relationship (participation), subordinates surveyed uniformly reported being satisfied with their superior-subordinate relationship. This implies that the level of participation may be more driven by the structure of the organization or the context of the situation than the behavioral differences of individuals (such as a portable desire for participation).

Per Mintzberg (1979), regulatory effects refers to the degree to which technology controls activities, while sophistication refers to complex intricacy. In this case, small-batch and unit production would be considered to be low in regulation but perhaps high in sophistication. This would describe an environment of high technological complexity. A continuous or mass production context would likely be characterized by high regulation but low sophistication, indicating an environment low in technological complexity. This concept focuses on the impact of technology on individuals.

Consistent with Mintzberg is Harvey's (1968) concept of *technical diffuseness*. This concept describes technological complexity in terms of the degree to which complex processes yield a variety of products. This concept focuses on the characterization of the mechanisms of technology and considers both the form of technology and the amount of change. These definitions of technological complexity seem to somewhat reconcile conflicting conceptualizations in prior technology studies.

The encouraging aspect of studying the effects of technology is that the divergence

of definitions and operationalizations of technology have generally not been important in producing a significant difference in results. Although conceptualizations have differed significantly, when the research is restructured in common terms, consistent results have generally been found. This conclusion was first made by Fry (1982) in his summary of the technology-structure research from 1965 to 1980. He found consistent results to support the technology-structure relationship across all definitions, levels and measures.

Perrow (1967) conceived an early framework in the study of technology which has become classic since then. Perrow presented a two dimensional model of technology from the perspective of (1) the number of exceptional situations (unfamiliar or non-routine) in the work, and (2) the nature of the solution process (i.e., systematic--to resolve uncertainty; or vague--to resolve equivocality). Using this model of the number of exceptions and relative analyzability, Perrow concluded that technology was so important that there was little point in testing organizational relationships unless we control for technology. Moreover, he suggested that organizations were better conceptualized by technology than by structure.

Withey et al. (1983) conducted an empirical examination of different conceptualizations of work unit technology and scales based on the original work of Perrow (1967). Consistent with Perrow's work, Withey et al. (1983) produced a slightly improved scale by integrating those of Van de Ven and Delbecq (1974); Van de Ven and Ferry (1980); Sims et al. (1976); and Daft and Macintosh (1981). However, they stated that previous scales were found to be quite good and added this conclusion: "Measurement inconsistency has been a problem, but it may not be as great for work unit technology as for other elements of structure (Withey et al. 1983, 61)."

Although the results of Withey et al. (1983) were specifically addressed to work unit technology rather than technology at an organizational level, Fry's study (1982) presents evidence suggesting that this difference is not critical. Moreover, Miller et al. (1991) also conducted a meta-study reaching the same conclusion as Fry (1982) (i.e., different definitions of technology generally do not affect technology-structure relations). Miller and his colleagues suggested that differences in findings are likely due to methods variables. Specifically, they stated that differences noted appear to be due to industrial sector heterogeneity and the average size of units of analysis. They suggested that these items could be controlled for in a field study if necessary. Fortunately, the current study uses a laboratory experiment, where industry and size are not relevant in consistently contrived scenarios across conditions.

Consequently, laboratory studies have the advantage of being able to specify the context. Furthermore, Daft and Lengel suggested using laboratory experiments as a beneficial research strategy to "design-in" differing levels of uncertainty and equivocality in order to systematically examine effects (1986, 569).

In the Miller et al. (1991) study, they stated, citing Fry (1982), that the concept of *routineness* underlies each of the major technology definitions that theorists have developed. They further explain by stating that "...technological routineness appears to be a higher-order technology construct underlying work flow integration, routinization, and production continuity (Miller et al. 1991, 371)."

The concept of routineness is also an integral part of the integrated technology scale developed by Withey et al. (1983). Consequently, routineness was a key concept used in

contriving dichotomous technology scenarios in the current study. Additionally, the regulatory and sophistication aspects of technology (Mintzberg 1979), as well as the degree of technical diffuseness (Harvey 1968) were key concepts considered in scenario construction.

In summary, evidence from prior research has shown that technology itself may lead to structuring and participation in an organization. Also, previous studies using the Vroom model have controlled for technology, thus implying its importance. Moreover, the importance of technology has been shown to be pervasive in prior research across virtually all conceptualizations, operationalizations, and levels. Commensurate with the increase in technology have come innovations in information processing and communication methods that have had an impact on other organizational mechanisms and perceptions. The next section will discuss some of these effects and the degree to which both technology and other contextual variables impact participation relations.

Information Processing and Media Richness

The sequence of technological development discussed previously is important to the measurement of responses regarding information processing and media richness. Accordingly, further explanation may be necessary. The linkage spans from the original work of Perrow (1967) which distinguished between the exceptions and analyzability dimensions of technology to the work of Daft and Lengel (1986). Van de Ven and Delbecq (1974) based their work on the Perrow (1967) model and made the model richer by mapping the Perrow dimensions of analyzability and number of exceptions directly into the concepts of task difficulty and task variability respectively. Withey et al. (1983) refined the

technology research further by producing a more integrated scale based primarily on the scales of Van de Ven and Delbecq (1974). Finally, Daft and Lengel (1986) integrated the concepts of uncertainty and equivocality into the Perrow (1967) model and added the concepts of media richness and information quantity to the framework. It was the Daft and Lengel (1986) model that inspired the inclusion of media richness and information quantity as dependent variables in the current study.

In the Daft and Lengel (1986) study, the attempt is made to integrate several organization design issues/perspectives with the considerations of uncertainty and equivocality, media richness, and information processing. Works integrated include Perrow (1967), Tushman and Nadler (1978), Lawrence and Lorsch (1967), Burns and Stalker (1961), and concepts from several others. Their basic tenet is that organizations process information to reduce uncertainty and equivocality. Also, efforts to reduce uncertainty lead to objective information acquisition, whereas efforts to reduce equivocality lead to exchange of views and shared interpretation (i.e., participation) (Daft and Lengel 1986). Consequently, the concepts of uncertainty and equivocality relate to different measures. This is where media richness is involved.

Media richness was suitably defined by Lengel and Daft as "a medium's capacity to process information...(1984, 7)." *Richness* (Lengel and Daft citing Lengel 1983; and Daft and Lengel 1984) was "...the ability of information to influence or change mental representations and thereby to facilitate learning (1984, 8)." Generally, examples of rich media are those that include communication using non-written, or possibly both non-written and non-verbal, cues that the receiver can interpret to increase understanding. Examples of

media low in richness would include memorandums or formal reports.

Daft and Lengel (1986) believed that the need for media richness increases with increasing ambiguity, equivocality, or vagueness. Accordingly, if important issues are made vague by technology which is very non-routine and associated with a considerable degree of ambiguity, then a richer form of communication is likely desirable. Although the literature does not always make a distinction between uncertainty and ambiguity, the general relation between uncertainty and media richness has received considerable support (Van de Ven et al. 1976; Meissner 1969; Randolph 1978; Holland et al. 1976).

An additional source of ambiguity can be produced by the situational context itself. The Vroom model considers factors which by their very nature interject ambiguity into the situation. These include perceptions of degrees of acceptance, congruence, and conflict, as well as other vague factors such as the quality aspects of the situation. By diagnosing these factors, the decision maker can determine the amount of shared interpretation that is necessary. In the Vroom model, this shared interpretation is considered synonymous with the degree of participation appropriate. Moreover, the surrogation of participation by media richness appears sensible, since media richness appears to map into these same situational factors quite naturally.

Lengel and Daft (1984) hypothesized and confirmed a positive relationship between media richness and translation requirements of communication episodes. *Translation* is defined as "the extent of change or conversion required in perspective between sender and receiver to attain mutual understanding (Lengel and Daft 1984, 6)." Using translation as a surrogate for learning requirements was suggested by Lengel and Daft (1984). It appears

that translation could also serve as a surrogate for information asymmetry on the qualitative dimension.

Banbury and Nahapiet (1979) discussed the antecedents and consequences of information systems as related to organizational context. The authors devote considerable attention to the perceptions and beliefs of organizational members regarding the function and value of information provided by information systems and the degree to which they are influenced by context. Although the article is not empirical, the discussion provides a useful linkage to the current study in terms of the equivocal effect of technology and situational factors on media richness, managerial choice, and the form and type of information systems. They conclude by stating that..."Throughout the analysis, it has been suggested that developments in organizational control technology mean that considerable *choice* exists over both the characteristics of particular systems and the way they are developed and used within the organization (Banbury and Nahapiet 1979, 175, emphasis added)." This conclusion reflects the importance of technology in influencing the degree to which managerial choice has an impact and the degree to which that choice is related to communication in an organization.

In their study involving the Vroom model, Tjosvold et al. considered media richness in their discussion of "...the assumed negative impact of face-to-face interaction (1986, 135)." This negative sentiment has been reinforced by Janis (1972) and Steiner (1972) regarding *groupthink* and *process losses* perspectives. However, the study by Tjosvold et al. "...highlights that interaction itself does not undermine decision-making...(1986, 135)." This possibility is important to consider since an individual's beliefs regarding the benefits of

participation and the use of particular media could influence results. This is an individual variable effect that can be analyzed statistically in a post-hoc fashion in the current study.

The accounting literature has examined communications and information processing as related to participative budgeting in a small number of cases (Merchant 1981; Pope 1984; and Kren; 1992). In Merchant's (1981) correlational study, the *amount* of information detail in the budget system examined was significantly related to participation. Pope (1984), in a non-empirical work, discussed information as a source of influence in the participative budgeting process, claiming that the benefits could include increasing motivation as well as reducing information asymmetry. The role of bargaining in the budget setting process was stated as both to induce revisions of perceptions and to induce revisions of preferences. The dimension of perceptions suggests an information asymmetry antecedent to participation while the dimension of preferences suggests a motivation antecedent to participation. Kren (1992) studied the effects of job-relevant information on the participation-performance relation. Essentially, the *job-relevant information* construct appears to be the same as the *information sufficiency* factor included in the Vroom model.

None of these accounting studies examined or discussed the concept of media richness, translation requirements, or the differential effects of uncertainty and equivocality in influencing communication media. However, since both increased participation and increased media richness are believed to be directly affected by changes in the independent variables of interest (i.e., technology and Vroom contextual variables), they were both included as response measures in this study. Accordingly, the consideration of the effects of media richness and participation preferences in different communication episodes should

provide an important contribution to the accounting literature. This is especially cogent when considering the conclusion of Locke and Schweiger in their meta-analysis of over 200 studies (1979) that managerial information is "the single most important contextual factor determining the usefulness of participative decision making (as quoted in Chalos and Haka 1989, 336)."

To summarize, the effect of the antecedents to participative budgeting (i.e., technology, personality, context, etc.) are believed to have a commensurate effect on information and media. The current study explores this relationship based primarily on the work of Daft and Lengel (1986). Additionally, the discussion of translation requirements by these authors appears to provide a useful conceptualization for understanding information asymmetry as an antecedent to participative budgeting. The impact of translation requirements and preferences regarding varying degrees of participative budgeting on media richness has never been studied in the accounting literature. However, based on the work of Daft and Lengel (1986), relationships in this area appear intuitive.

CHAPTER III

HYPOTHESES AND RESEARCH METHODOLOGY

Focus of the Study

Assessment of leader perceptions regarding the appropriate levels of participation allowed or required of subordinates relevant to a particular task and/or context was empirically examined in this study. Using a contingency approach, a methodology was adopted to examine the impact of variables at three different levels (i.e., individual, situational, and organizational). At different times, prior research has shown all three of these variables to be significant in influencing the degree of participation allowed. Using a descriptive approach, with participation as a dependent variable, an attempt was made to shift attention from a focus on the consequences of participative budgeting examined in previous studies to a focus on the antecedents of participative budgeting. Using the Vroom model to operationalize the study integrated the three most popular approaches to modeling participative decision effects (i.e., cognitive, affective, and contingency perspectives). Moreover, the study attempted to provide an empirical validation for the Vroom model and to allow as complete a modeling of the antecedents of the participative budgeting process as possible. The impact of technology on perceptions of the need for information quantity and media richness was also empirically examined. Technology's impact on information quantity and media richness was examined to provide a partial validation of the work of Daft and Lengel (1986) and to link their framework to that of participative budgeting.

Hypotheses

Hypotheses tested are grouped into five areas and are listed in Table 4. These include (1) the effects of technology, situation, and individuals on participation; (2) the need for information and media richness; (3) the relative importance of organizational, situational, and individual factors; (4) the correlation of participation, information quantity, and media richness; and (5) self-insight measures.

Effects of Technology, Situation, and Individuals

Previous studies have evidenced differing participation effects resulting from technology, situational factors, and individual differences. Therefore the following hypotheses (in alternative form) were proposed:

H_1: There is a significant positive effect of technological complexity on the perceived need for subordinate participation in budgetary decision making.

H_1 can alternatively be presented as:

$$R_k1_{2j} < R_k1_{1j}$$

where,

R_k1_{2j} = Repeated measurement of degree of participation for all responses in the low technology condition.

R_k1_{1j} = Repeated measurement of degree of participation for all responses in the high technology condition.

H_2: There is a significant positive effect of predictions of the Vroom model on the perceived need for subordinate participation in budgetary decision making. That is, the Vroom model is significant in describing the behavior of individuals regarding participative budgeting.

H_2 can alternatively be presented as:

$$R_k1_{i1} < R_k1_{i2} < R_k1_{i3} < R_k1_{i4} < R_k1_{i5}$$

where,

R_k1_{i1} = Repeated measurement of degree of participation for all responses in the AI Vroom model condition.

R_k1_{i2} = Repeated measurement of degree of participation for all responses in the AII Vroom model condition.

R_k1_{i3} = Repeated measurement of degree of participation for all responses in the CI Vroom model condition.

R_k1_{i4} = Repeated measurement of degree of participation for all responses in the CII Vroom model condition.

R_k1_{i5} = Repeated measurement of degree of participation for all responses in the GII Vroom model condition.

Hypothesis Two goes directly toward assessment of the descriptive validity of the Vroom model. This hypothesis presents the belief that the Vroom model provides a valid descriptive representation of actual leader behavior based on the existence of differing combinations of contextual or situational factors. This hypothesis does not make predictions regarding the normative validity of the model, but rather focuses on the antecedents of participation consistent with managerial choice.

H_3: There is a significant difference between individuals regarding the perceived need for subordinate participation in budgetary decision making given a particular organizational and situational context.

H_3 can alternatively be presented as:

At least one of the following is $\neq$: $R_1l_{ij} \neq R_2l_{ij} \neq R_3l_{ij} ... \neq R_nl_{ij}$

where,

R_nl_{ij} = A particular measurement of degree of participation for subject n in a particular technology/Vroom model condition (i.e., factor level combination).

Hypothesis Three presents the belief that a significant amount of variance exists between individuals as a result of inherent differences in leadership style. That is, when

other influences are held constant, leaders will often still exhibit significant differences in participative decision approaches to budgeting merely as a result of individual attributes (e.g., personality traits).

Need for Information and Media Richness

Based on Daft and Lengel (1986), the amount and communication mechanisms of information tend to change with differing amounts of uncertainty. Therefore, the following hypotheses were proposed:

H_4: There is a significant positive effect of technological complexity on the perceived need for information.

H_4 can alternatively be presented as:

$$R_k2_{2j} < R_k2_{1j}$$

where,

R_k2_{2j} = Repeated measurement of the perceived need for information for all responses in the low technology condition.

R_k2_{1j} = Repeated measurement of the perceived need for information for all responses in the high technology condition.

H_5: There is a significant positive effect of technological complexity on the perceived need for media richness.

H_5 can alternatively be presented as:

$$R_k3_{2j} < R_k3_{1j}$$

where,

R_k3_{2j} = Repeated measurement of the perceived need for media richness for all responses in the low technology condition.

R_k3_{1j} = Repeated measurement of the perceived need for media richness for all responses in the high technology condition.

Hypotheses Four and Five are related to Hypothesis One in that they specify expected

results of the effects of technology. This group of hypotheses proposed that the *amount* and *form*, in terms of the relative richness of various media, of communication of leaders with their subordinates in the budget setting process is a monotonically increasing function of technological complexity. That is, in environments where technology is complex, organization leaders will perceive a need for more information and will desire to use richer media which facilitate interpretation of ambiguous data. This effect was expected on the part of leaders, similar to Hypothesis One, in an attempt to resolve uncertainty faced by the organization to achieve a commensurate level of assurance of the accuracy of budget predictions.

Relative Importance of Organizational, Situational, and Individual Factors

Although prior research has shown organizational, situational, and individual factors to be important in influencing participation, the relative importance of these variables is not clear. Therefore, the following hypotheses were proposed:

H_6: Technological complexity is more important in explaining variance in the perceived need for subordinate participation than situational factors.

H_6 can alternatively be presented as:

$$R_k\sigma^2 1_j < R_k\sigma^2 1_i$$

where,

$R_k\sigma^2 1_j$ = Percent of variance in the perceived need for subordinate participation explained by the Vroom model conditions.

$R_k\sigma^2 1_i$ = Percent of variance in the perceived need for subordinate participation explained by technological complexity conditions.

H_7: Situational factors are more important in explaining variance in the perceived need for subordinate participation than individual factors.

H_7 can alternatively be presented as:

$$R_k\sigma^2 1 < R_k\sigma^2 1_j$$

where,

$R_k\sigma^2 1$ = Percent of variance in the perceived need for subordinate participation explained by individual differences.

Hypotheses Six and Seven present the relative importance of the three level variables (i.e., organizational, situational, individual) in a sequential fashion. That is, technology was hypothesized to be the most important variable-type of the three in affecting perceptions of the need for participation from subordinates in the budget setting process. Following technology in importance would be situational factors, and finally differences inherent in individuals. Although all of these variables were predicted to have a significant influence on participative decision style, some were expected to be more important than others.

Correlation of Participation, Information Quantity, and Media Richness

The following hypothesis provided a link for the relationship between the perceived need for participation, information, and particular communication media:

H_8: There is a significant correlation between the perceived need for participation, the perceived need for information, and the perceived need for media richness.

H_8 can alternatively be presented as:

$$RHO_{1,2} \neq 0;\ RHO_{1,3} \neq 0;\ RHO_{2,3} \neq 0;$$

where,

$RHO_{1,2}$ = The correlation of response variable 1 (i.e., degree of participation) with response variable 2 (i.e., information quantity).

$RHO_{1,3}$ = The correlation of response variable 1 (i.e., degree of participation) with response variable 3 (i.e., media richness).

$RHO_{2,3}$ = The correlation of response variable 2 (i.e., information quantity) with response variable 3 (i.e., media richness).

This hypothesis proposed that the perceptions of leaders are very similar regarding the need for participation, information, and media richness. Indeed, one of the antecedents to participation is likely the desire to reduce information asymmetry. Accordingly, using or increasing the information available could facilitate the reduction of information asymmetry, as could communication media which allow greater interpretation of ambiguous information cues. Therefore, these three constructs appeared to share the common antecedent of information asymmetry and were predicted to be significantly correlated.

Self-Insight Measures

Several factors could account for the perceptions of leaders regarding the need for participation in various settings. The following hypotheses proposed reasons for perceptions regarding these antecedents:

H_9: The primary antecedents to allowing participation in budgetary decision making include (1) the positive motivation of subordinates and (2) the reduction of information asymmetry.

H_9 can alternatively be presented as[9]:

$$A_1 - 3 > 0;\ A_2 - 3 > 0$$

where,

A_1 = Mean response to the motivation of subordinates construct.
A_2 = Mean response to the information asymmetry construct.

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[9]The mathematical presentation of hypotheses nine and ten uses the number "3" to indicate that the self-insight answers are expected to result in a mean affirmative response when presented on a five-point scale of 1=no; 2=probably no; 3=maybe; 4=probably yes; and 5=yes.

H_{10}: A primary constraint to allowing participation in budgetary decision making is time.

H_{10} can alternatively be presented as:

$$A_3 - 3 > 0$$

where,

A_3 = Mean response to the motivation due to time construct.

Research Methodology

Research Strategy

A laboratory experiment was the research strategy used in the current study. This strategy was chosen for several important reasons.

First, although a limited number of studies have empirically examined the antecedents to participative budgeting, they have done so using correlational analysis only (Merchant 1981; 1984; Bruns and Waterhouse 1975; Seiler and Bartlett 1982; Shields and Young 1993). Without being able to insure that cause precedes effect in time, there is no way to be sure of the direction of the relationship. By using a laboratory experiment, the current study attempted to resolve the problem noted in prior studies of ambiguity regarding causal direction of effects.

Second, with the exception of the correlational studies cited in the previous paragraph, there have been no studies in the accounting literature which have explicitly operationalized participation as a dependent variable. As is illustrated in Figure 2, several variables can behave as both antecedent and consequence moderators of participation relations. Therefore, even though certain studies have chosen to adopt the perspective of

participation as the dependent variable, the true direction of effects is equivocal. Only experimental procedures are able to resolve this equivocality.

Third, where important correlations were found in the previous studies, a laboratory experiment can be used to refute or corroborate findings. That is, a laboratory experiment can be used to provide triangulation of methods. Prior studies have attempted to maximize mundane realism by using field study methodology. However, they must admit to the limitations of a lack of precision and control and the ambiguity of causal direction mentioned previously.

Fourth, previous studies have been criticized due to the problem of percept-percept effects (Wagner and Gooding 1987). That is, since pre and post participation-outcome measures are difficult to obtain with field study and survey research strategies, studies using these methodologies are subject to potential bias. Experimental strategies can be used to prevent such biases from resulting in effects that are merely due to methodological artifacts.

Fifth, differences in findings among previous studies regarding the impact of technology have been suggested to be due to methods variables regarding industrial sector heterogeneity and the size of units of analysis (Miller et al. 1991). Using a laboratory experiment allows the control of these factors through consistently contrived scenarios across conditions.

Finally, using an experiment allows testing of the effects of variables on participation at all three levels simultaneously (i.e., individual, situational, and organizational). Consequently, comparing the effects of findings on these different variable types will not be confounded by the diverse settings of the various prior studies.

Subjects and Recruitment

Subjects used in the experiment were graduate students. These subjects were taken from a large southwestern university and were recruited to participate on a voluntary basis. The use of students as subjects in behavioral research as surrogates for managers is a controversial issue as noted by Daroca (1984) and often requires defense.

Ashton and Kramer investigated this issue directly regarding behavioral accounting research. They found, and cited other studies supporting the same conclusion, that "...studies which have focused on *decision making* have found considerable similarities in the decisions and the apparent underlying information-processing behavior of student and non-student groups (1980, 1, emphasis in the original)." Brownell used both students and managers in a laboratory experiment examining participation in budgeting and found that "With minor exceptions, the results obtained for the student sample were also obtained for the manager sample (1981, 855)." In the organizational behavior literature, Dipboye (1990) discussed at least five studies which made direct comparisons between students and non-students regarding *leadership* behavior. Allen and Ruhe (1976) in comparing students and military personnel found differences on only four of thirty-two comparisons. Jago and Vroom (1982) noted that students were generally more democratic than managers, probably due to their autocratic role, but noted no relative systematic differences otherwise. Kavanagh (1975) found that managers who tended to be bureaucratically oriented were different from students on some behaviors, but even these differences were insignificant. Fleming (1969) and Moskowitz (1971), in separate studies requiring analysis of a business case, noted insignificant or only marginally significant differences between students and managers.

Consequently, Dipboye concluded as follows: "In summary, the research comparing students vs. nonstudents, and laboratory vs. field, has yet to provide a convincing demonstration that leadership processes among students in the laboratory fundamentally differ from those among nonstudents in field settings (1990, 24)."

The current study also defends the choice of using students as subjects based on this prior research evidence. Due to the compelling feature of accessibility and the nature of the task regarding leadership and decision making, the use of students as subjects appears acceptable in this study.

As part of the recruitment process, subjects were asked to sign up for the experiment on a sign-up sheet (see Appendix A-1) and were asked to take and complete a reminder card (see Appendix A-2). Also, they were required to sign and return an informed consent form (Appendix A-3).

Experimental Setting

The setting for the experiment was a classroom of no special purpose since the task was of a pencil and paper nature. Each subject received a similar packet which included the cover story and instructions, ten cases, and questions for dependent variable measures, manipulation checks, and post-experimental demographic data and protocol. Administration of the task was under exam-like conditions to prevent co-acting effects. That is, subjects were instructed not to talk to their neighbor and they were as spatially separated as possible. Also, they were monitored throughout the session by the experimenter. Signs reading *do not disturb* were posted outside the room, and windows were covered to prevent subject distraction. All subjects began work on the task at the same time and no one was admitted

to the room once the experiment had begun.

The Sample

The target sample size of observations was expected to be approximately 60 subjects. Treatment conditions were administered concurrently with each subject receiving the same 10 cases in counterbalanced sequence in each of the two technology conditions (i.e., high and low). Counterbalancing the sequence of cases was the only systematic difference between the treatment of subjects within each between-subjects factor condition. That is, regarding the two manipulated factors (i.e., technological complexity and the prescribed Vroom model level), technological complexity was a between-subjects factor for two subject groups, while the prescribed Vroom model level was a within-subjects factor for all subjects in each technological complexity factor level condition. Session size did not appear to be critical and was based on classroom scheduling, room size, the need for the achievement of sample size, and other convenience factors.

Experimental Design

A two (level of technological complexity) by five (level of participation prescribed) crossed-nested ANOVA design was used. Two equal sized groups were used for each technological complexity condition (i.e., high=odd subject numbers; low=even subject numbers). Each subject received two cases for each factor level combination for the respective technological complexity group they were in to achieve a total of ten cases each. An illustration of the design is presented in Figure 3.

Experimental Task

The experimental task consisted of subjects responding to questions regarding the perceived need for budgetary participation, information, and media richness given ten systematically varied cases in a pencil and paper task. In the general problem situation, subjects were asked to play the role of a plant manager faced with responding to the operating division indicating how resources were to be allocated to particular alternatives in a budgeting task (see Appendix B-1 and B-2). Although subjects were not required to actually make the allocation decision, they were asked to indicate the method of making the decision which appeared most appropriate for the given context. The subjects were asked to indicate the participative style they would use for each case, the degree to which information was sufficient, and the form of communication media they would use to communicate with subordinates during the process of making the decision.

Each subject packet had a title page identifying the subject by number (see Appendix A-5) immediately followed by the cover story, instructions, cases, and questions. Each subject received the same ten cases in counterbalanced sequence varied systematically regarding the Vroom factor within their respective technological complexity factor level condition. A total of only ten of the cases were unique across both technological complexity conditions (i.e., only five unique cases per subject). This allowed two observations per subject on each case-type to provide enough degrees of freedom to test for higher level interaction effects. The five *unique* cases are presented in Appendices B-5 through B-9. Five combinations of the twelve factors included in the Vroom model were presented across the cases within each technological complexity condition (i.e., low, high).

Deception was not involved. The subjects were asked to read the cover story, the cover story was verbally summarized by the experimenter (see *Experiment Overview* in Appendix A-6), and then the subjects were free to work the ten trials and answer the post-experimental questions on their own. Upon completion of the trials, the subjects were given a debriefing form which they were required to sign and return (see Appendix A-4). After returning the debriefing form and other materials, the subjects were free to leave.

Since this was a judgment task in which performance was not a measure of interest, explicit compensation was not necessary. However, each subject received course credit as a consequence of their participation in the experiment. This was subject to the preferences of the particular instructor in each class used.

Independent Variable Manipulations

Vroom Factors

Five of the twelve Vroom criteria (per Vroom and Jago 1988) were systematically varied dichotomously in the extremes (i.e., at a level of 1=no or 5=yes) over ten trials for each subject as a factor of analysis. The factor included the following five different dichotomous items: (1) If you were to make the decision yourself would the employees likely be committed to your decision? (2) Do the subordinates share organizational goals in solving this problem? (3) Are subordinates likely to disagree among themselves over the preferred course of action? (4) Does a critically severe time constraint limit your ability to involve subordinates? (5) Are the costs in bringing together geographically dispersed subordinates prohibitive?

Five possible combinations of these factors and the model's prescriptions regarding each one, given example data at a moderate level on the other factors (except where fixed), is presented in Table 5. Five cases were actually used from 32 possibilities chosen based on the highest equation value of prescriptions available for the given category (i.e., AI, AII, CI, CII, or GII) consistent with the Vroom and Jago (1988) software. These are case numbers 24, 19, 2, 5, and 13 for the AI, AII, CI, CII, and GII categories, respectively. It should be noted, however, that values of the remaining seven factors sometimes influenced the Vroom model prescription changing the category. Therefore, a feasible set was generated. This feasible set included categories which were, at least, adjacent to the category shown (e.g., CI prescriptions might include AI and CII in the feasible set). Accordingly, a reasonable sample of each category's responses was expected. Table 5 presents the five problem attributes systematically manipulated in the ten cases, their switches, and their scaled values. Vroom Group Model equations are presented in Appendix D.

Four of the remaining seven Vroom model factors relate to the quantity of information available and the importance of time and subordinate development to the subject. These four items were used as response variable measures on a five point scale as provided by Vroom and Jago (1988). This avoided dictating the subjects' feelings to them regarding their motivation to allow participation. Also, the degree to which information was sufficient was a dependent variable of interest which might otherwise have been ambiguous in the cases. Subject responses on these items were inserted appropriately into the input areas provided on a spreadsheet (see Appendix D) to calculate the Vroom model prediction to compare with the subject responses concerning the level of the perceived need for

participation. Therefore, these predictions were also only available after the subject responses had been obtained. Two questions for each item were included to capture the subject responses and provide a reliability check. Questions for two of the four items (i.e., leader information sufficiency and subordinate information sufficiency) were included with each case (Appendix C-3 and C-4 respectively), while questions for the other two items (i.e., motivation due to time and motivation due to subordinate development) were included in the post-experimental questionnaire only (Appendix C-5.2 and C-5.3 respectively). Perceptions of information sufficiency were expected to change across cases, while motivation factors were defined to be stable across cases (Vroom and Jago 1988).

The other three remaining Vroom model factors were held at fixed levels across all cases. Importance of the technical quality of the task and the importance of subordinate commitment were given a fixed *high* rating of 5 and were accordingly considered very important across all cases. This should be consistent with typical budgeting tasks. Problem structure was fixed at a minimum level of 1. The scenario used presents a problem which is not well-structured as defined by Vroom and Jago (1988). That is, although the alternatives in the decision are clear and the objective is well known, the outcomes of either of the alternatives and the appropriate procedures in choosing among alternatives are unknown and ambiguous.

The combination of the systematic manipulation of five of the twelve factors, the response of subjects on four of the twelve factors, and the fixed levels of the other three factors results in a possible combination of 20,000 different scenarios. That is, over each ten cases, combinations of Vroom model factors available to the subject include $2^5 \times 5^4 \times$

1 = 20,000 possibilities spanning every category of participation (i.e., AI through GII) prescribed by the model. This combination of manipulations, responses, and controls allowed a wide amount of variation while maintaining an ability to conduct a manageable study. Table 6 summarizes the Vroom factor manipulations, responses, and controls.

According to the Vroom and Jago (1988) model software, the scaled values presented in Table 5 were rescaled before insertion into the prescriptive equations presented in Appendix D. The rescaling results in a linear transformation specific to the model. Ultimately, the Vroom model uses the combined equations to calculate optimal method predictions shown as the final category result in Table 5 (i.e., AI, AII, CI, CII, or GII). The model chooses the most appropriate decision style which would be expected to provide the greatest overall effectiveness in the given situation.

Technology

Technological complexity was manipulated using a dichotomy of low and high levels. The environment *low* in technological complexity was described as easily analyzed, well-understood processes involving highly-automated equipment which is highly regulating of individual activity. Also, the process requires a low degree of judgment, craftsmanship, and creativity (low sophistication). These routine processes are designed to yield a single standardized product (see Appendix B-4).

The environment *high* in technological complexity was described as difficult to analyze processes which are not well-understood involving general purpose tooling and equipment which is non-regulating of individual activity. Also, the process requires a substantial amount of judgment, craftsmanship, and creativity (high sophistication and

complex intricacy). These non-routine processes are designed to yield a variety of unique or customized products (see Appendix B-3).

Response Variable Measurements

All of the response variable measurements (i.e., dependent variable measures) are included in Appendix C. Two questionnaire items for every variable were included to provide a means of assessing reliability. The only exception to this is where the Vroom model provided a means for assessing the degree of participation preferred using a scale with previous empirically supported reliability. The sequence of presentation of the questions for each case was in counterbalanced order for each subject to preclude order effects. Discussion of the questionnaire items is provided in the next sections.

Participation

The participation construct is concerned with the degree to which the leader's subordinates are involved in making the decision. The Vroom model presents a continuum of five levels of participation from none (i.e., a completely autocratic decision style not involving subordinates at all) to total (i.e., a decision style based totally on group consensus). The response measure is presented in Appendix C-1.

Media Richness

The media richness construct was consistent with Lengel and Daft (1984). In their study, Lengel and Daft defined media richness as a medium's capacity to process information. Given the purpose of a communication task, respondents were asked to select the medium they would use to send and receive information. The two questionnaire items

regarding media richness in the current study were consistent with this definition and operationalization by Lengel and Daft (1984). Moreover, one of the questions asked for the most appropriate medium, while the other asked for all media used. This appears to be necessary since communications between leaders and subordinates are not necessarily limited to only one medium for a given case (see Appendix C-2).

Information Quantity

The information quantity construct is concerned with the perceived need for additional information to make the decision or to find an acceptable solution to the problem. This item used one of the Vroom factors supplied by the subject (i.e., that of *leader information sufficiency*) and an additional question was added based on the theoretical perspective provided by Vroom and Jago (1988). The information quantity construct refers to data relevant to the technical or rational aspect of the problem in terms of maximizing the effectiveness of the decision for the organization (see Appendix C-3).

Vroom Response Measures

Four of the Vroom model factors, as noted earlier, were used as response variable measures which were inserted into the Vroom model spreadsheet for calculation of the Vroom model prediction. Moreover, two of these factors were used to help assess Hypotheses Nine and Ten. One of these factors, *leader information sufficiency*, was discussed in the previous section. Two questionnaire items for each of these factors were included to provide a means of assessing reliability. The three other factors included (1) motivation due to time constraints (see Appendix C-5.2), (2) motivation due to the desire to

provide subordinate development and/or motivation (see Appendix C-5.3), and (3) subordinate information sufficiency (see Appendix C-4).

Post-Experimental Questions

Manipulation Checks

Two manipulation check questions for the technological complexity condition were included. Two items were provided to enable a reliability computation to be made (see Appendix C-5.1). Since a given subject received only one level of the technological complexity factor (i.e., either high or low), manipulation check questions for each case were not necessary.

Regarding the five Vroom factors manipulated, no manipulation checks were necessary since no ambiguity should have existed regarding the nature of the item. That is, rather than presenting a case which describes a situation to maximize or minimize each factor, as prior studies have done, each subject was explicitly told of the factor level present on the item specified. Refer to the cases presented in Appendix B for examples.

Although it is important to insure that subjects acknowledge the existence of each factor level, the administration of the manipulations concerning the Vroom model factors was not ambiguous. That is, all subjects received the manipulations of the factors as described by Vroom and Jago (1988). The factor levels were clearly presented in each case. However, the manner in which the subjects perceived the manipulations relevant to each case is an empirical issue regarding the validity of the Vroom model. In other words, whether the subjects chose to ignore the factors is a separate validity issue rather than a manipulation

issue.

Self-Insight Questions

Three sets of questions to test Hypotheses Nine and Ten were included in the post-experimental questionnaire. These were also in pairs to allow a reliability assessment for each of the three constructs. The objective of these measures was to assess the degree to which these constructs provided antecedents to allowing participation. Two Vroom model factors were used to assess (1) motivation due to time (see Appendix C-5.2) and (2) motivation due to the desire to develop or motivate subordinates (see Appendix C-5.3). The final measure was designed to assess the importance of information asymmetry as an antecedent to participation (see Appendix C-5.4).

Demographic Data

General questions were used to capture demographic data at the end of all cases (see Appendix C-5.5). These items related to the nature of the sample and the validity of experimental procedures.

Debriefing

Since no deception was involved, the debriefing procedure consisted merely of the distribution of a form explaining the items of interest in the study in general terms (see Appendix A-4). These forms were signed and returned to the experimenter at the conclusion of each session.

Statistical Analysis

Models

The primary statistical analysis was conducted using fixed effects ANOVA models for each dependent variable. Hypotheses One through Seven were analyzed using these models containing up to three factors (i.e., subject, Vroom model, and technological complexity) as appropriate. The perceived need for subordinate participation was the dependent variable of interest for Hypotheses One, Two, Three, Six and Seven. The perceived need for information and the perceived need for media richness were the dependent variables of interest for Hypothesis Four and Hypothesis Five, respectively. The fixed effects ANOVA model can be expressed using the following equation:

$$Y_{ijkm} = \mu... + \alpha_i + B_j + \gamma_{k(i)} + (\alpha B)_{ij} + (B\gamma)_{jk(i)} + \varepsilon_{m(ijk)}$$

where,

Y_{ijkm}	=	Dependent variable measurement in the ith and jth conditions for subject k, observation m.
$\mu...$	=	Overall mean.
α_i	=	Effect of technological complexity condition i (i = 1, 2).
B_j	=	Effect of Vroom model condition j (j = 1, 2, 3, 4, 5).
$\gamma_{k(i)}$	=	Effect due to subject k (within technological complexity (k = 1, 2, 3,...n where, n = # of subjects)
$(\alpha B)_{ij}$	=	Interaction of technological complexity with Vroom model effects.
$(B\gamma)_{jk(i)}$	=	Interaction of Vroom model with subject effects (within technological complexity).
$\varepsilon_{m(ijk)}$	=	Model error terms in the ith and jth conditions for subject k, observation m.
i	=	1 = high technological complexity; 2 = low technological complexity.
j	=	1 = AI; 2 = AII; 3 = CI; 4 = CII; 5 = GII.
k	=	Subject (1, 2, 3,...n)
m	=	Observation for subject k in the ith and jth conditions.

ANOVA models were used to evaluate Hypotheses One through Five. A three factor

model for comparative effects, with differing factors as specified in the hypotheses, was used to evaluate Hypotheses Six and Seven. Accordingly, the form of the above equations representing the ANOVA models used was adjusted for the exclusion of terms as appropriate.

If interactions were interpreted as practically insignificant among the factors, then the above factor effects model could be used to interpret the results. Otherwise, a cell means model was included to conduct pairwise comparisons of means between specific factor level combinations for significance. Moreover, planned pairwise comparisons were conducted to test Hypothesis Two fully and to further explore directional effects. The ANOVA cell means model can be expressed using the following equation:

$$Y_{ijkm} = \mu_{ijk} + \varepsilon_{ijkm}$$

where,

Y_{ijkm}	=	Dependent variable measurement in the ith and jth conditions for subject k, observation m.
μ_{ijk}	=	Parameters representing the ith level of technological complexity and the jth level of Vroom model, for the kth subject.
ε_{ijkm}	=	Model error term in the ith and jth conditions for subject k, observation l.
i	=	1 = high technological complexity; 2 = low technological complexity.
j	=	1 = AI; 2 = AII; 3 = CI; 4 = CII; 5 = GII.
k	=	Subject (1, 2, 3,...n)
m	=	Observation for subject k in the ith and jth conditions.

Hypothesis Testing

Hypotheses One through Eight are mathematically represented in the hypothesis section and graphically represented in the Experimental Design Matrix in Figure 3. Each hypothesis is presented again in this section along with a discussion of specific methods used to analyze each hypothesis or hypothesis group.

H_1: There is a significant positive effect of technological complexity on the perceived need for subordinate participation in budgetary decision making.

A direct relationship between technological complexity and the perceived need for subordinate participation requires a positive direction and significance for the technological complexity term (i.e., α_i) in a three factor ANOVA model. Examination of the factor level means and P value for this term provides the evaluation.

H_2: There is a significant positive effect of predictions of the Vroom model on the perceived need for subordinate participation in budgetary decision making. That is, the Vroom model is significant in describing the behavior of individuals regarding participative budgeting.

A significant relationship between predictions of the Vroom model and the perceived need for subordinate participation requires a positive direction and significance for the Vroom model term (i.e., B_j) in a three factor ANOVA model. Examination of the factor level means and P value for this term provides the evaluation. Planned pairwise comparisons were conducted between the five Vroom model levels to explore the nature of significant factor effects. Although individual attributes comprising the Vroom model should vary regarding directional effects, the overall prediction for the Vroom model term is also directional in predicting participation levels. This methodology also allows individual Vroom model attributes to be examined ex-post if desirable.

As mentioned previously, predictions of the Vroom model were obtained using a spreadsheet which contains Vroom and Jago (1988) equations used in their software which prescribes a desired decision style for various cases (see Appendix D). These predictions provide the criteria for comparison to evaluate the descriptive ability of the Vroom model in this study.

H_3: There is a significant difference between individuals regarding the perceived need for subordinate participation in budgetary decision making given a particular organizational and situational context.

A significant difference between individuals regarding the perceived need for subordinate participation requires significance without regard to direction for the individual model term (i.e., γ_k) in a three factor ANOVA model. Examination of the P value for the *subject* term provides the evaluation.

H_4: There is a significant positive effect of technological complexity on the perceived need for information.

H_5: There is a significant positive effect of technological complexity on the perceived need for media richness.

A direct relationship between technological complexity and either the perceived need for information or the perceived need for media richness requires a positive direction and significance for the technological complexity model term (i.e., α_i) in separate one factor ANOVA models. Examination of the sign of the coefficient and the P value for this term in each one factor model provides the evaluation.

H_6: Technological complexity is more important in explaining variance in the perceived need for subordinate participation than situational factors.

H_7: Situational factors are more important in explaining variance in the perceived need for subordinate participation than individual factors.

The amount of variance explained by each factor, relative to the other factor, can be examined directly by reviewing variance data included in a three factor ANOVA model. The larger percent of variation explained by each factor provides the criterion for evaluation.

H_8: There is a significant correlation between the perceived need for participation, the perceived need for information, and the perceived need for media richness.

A Pearson correlation coefficient matrix was produced which lists correlation coefficients among the three dependent variable observations and a P value for each. The P value provides the criterion for evaluation and was interpreted as the probability that the correlation was significantly different from zero, under the null hypothesis that RHO=0.

H_9: The primary antecedents to allowing participation in budgetary decision making include (1) the positive motivation of subordinates and (2) the reduction of information asymmetry.

H_{10}: A primary constraint to allowing participation in budgetary decision making is time.

The responses to the six post-experiment questions representing the three constructs of (1) motivation of subordinates, (2) information asymmetry, and (3) time were evaluated using t tests for each construct. The t tests were each one-tailed directional tests of the significance of each item. The importance of each item in providing an antecedent or constraint to participation was of interest in this analysis. Examination of the P values of each term for significance provides the evaluation.

Protection Against Inflated Type I Error

For interpretation of overall factor effects in any ANOVA analysis, interactions with other factors cannot be significant. If interactions are significant, then pairwise comparisons of cell means are necessary to interpret results meaningfully. These pairwise comparisons may require adjustment to achieve usage of the proper experiment-wise error rate.

Moreover, Hypotheses One, Four, and Five examine the effects of one factor (i.e., technological complexity) on three dependent variables. Although a multivariate technique such as MANOVA could be used rather than separate ANOVAs, often the results of such

methods are difficult to interpret. Therefore, the use of separate ANOVAs was planned. However, using separate ANOVAs provides the risk of making a type I error due to an inflated experiment-wise error rate.

Therefore, to control the experiment-wise error rate so as to prevent improper rejection of statistically insignificant hypotheses, an adjustment was made to the alpha level using a Bonferroni procedure. Specifically, since three of the hypotheses were tested in this manner, an alpha level of 0.017, $1-(1-0.0170)^3$, for each separate ANOVA yielded an overall experiment-wise alpha level of at least 0.0501. Therefore, results for these hypotheses were interpreted using an alpha level of 0.017 as equivalent to a 0.05 level for an equivalent MANOVA procedure. Similarly, an alpha level of 0.003 was treated as equivalent to a 0.01 level for an equivalent MANOVA procedure.

CHAPTER IV

RESEARCH RESULTS

Sample Characteristics

The sample consisted of 62 graduate students taken from two managerial accounting courses. Five of the 62 subjects failed to complete the post-experiment questionnaire. Accordingly, demographic data was not available for the five subjects who omitted responses. Also, one subject's responses were determined to be undependable during outlier analysis and were discarded. Therefore, where the sample data involved post-experiment questionnaire items the number of subjects used was adjusted to 56. Where the sample data did not involve post-experiment items the number of subjects used was 61 and excluded only the outlying responses.

The average age of the 56 subjects was 29.1 years of which 33 (59%) were male and 23 (41%) were female. Subjects had average full-time work experience of 6.0 years, and 36 subjects (64%) stated that they had supervisory experience.

Reliability Analysis

Reliability computations were made on all pairs of questions which were used in both the case questionnaire and in the post-experiment questionnaire. Variable measures on four constructs were obtained using seven questions in the case questionnaire. These included (1) perceived need for participation, (2) perceived need for media richness, (3) perceived

leader information sufficiency, and (4) perceived subordinate information sufficiency. Only one measure was obtained for the perceived need for participation. This was the Vroom model measure which has been rigorously validated in repeated studies over many years.

Additionally, variable measures on four constructs were obtained using eight questions in the post-experiment questionnaire. These include (1) technological complexity, (2) subordinate development motivation, (3) time constraint motivation, and (4) information quantity.

Pearson correlation coefficients are presented in Table 7. As can be seen in the table, the measures of the time constraint motivation (MT1 and MT2) variable appear to have a relatively low correlation at a Rho of 0.31755; P value 0.0171. Also, the measures of subordinate development motivation (MD1 and MD2) are perhaps borderline at a Rho of 0.58183; P value 0.0001. Although these items are obviously correlated, a higher Rho value would have been desirable. Results involving these measures should be interpreted in light of these values. Otherwise, the correlations as shown in Table 7 appear to reveal adequate reliability for the measures.

Manipulation Check

A manipulation check was performed on the technological complexity variable. The two questions relating to this item are presented in Appendix C-5.1. Means for the high and low technological complexity conditions for each of the two questions were high = 4.42 and 4.15; low = 1.78 and 1.83. These means represent scores on a five-point scale ranging from 1 = very low technological complexity to 5 = very high technological complexity. Using a one-factor (i.e., technological complexity) ANOVA with the mean responses to the

technological complexity questionnaire items as the dependent variable, an F statistic of 221.45 was obtained at a P value of 0.0001. Consequently, the manipulation of technological complexity was deemed successful.

Power Analysis

Due to the number of subjects used in the study (i.e., 61 and 56) and the repeated measures design employed, a formal power analysis regarding all F tests used revealed results that were extreme. For all hypothesis tests conducted using case data, ten observations were obtained for each subject making the sample size N=610 and N=560. Power analysis computations were conducted to confirm a statistical power that is virtually 100% for every dependent variable at any acceptable significance (i.e., alpha) level using the cell means model. Noncentrality parameters for each dependent variable were 4.5672 for the perceived need for participation, 4.2408 for the perceived need for information, and 4.0398 for the perceived need for media richness.[10] Accordingly, the probability of making a Type II error appears to be minimized in this study. Moreover, the estimates of interest appear to have sufficient precision to be useful.[11]

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[10]Per Neter, et al. (1990), the noncentrality parameter represents a measure of how unequal the cell means are (i.e., the effect size). The larger the noncentrality parameter, the higher the power and the smaller the probability of making a Type II error for a given alpha risk of making a Type I error. Moreover, an effect size may be considered large if it is greater than or equal to 3.

[11]Per Neter, et al. (1990), the two major benefits to achieving high power in statistical testing are the minimization of making Type II errors and the ability to obtain desired precision in estimates. Accordingly, power in this context is defined as the probability that a test statistic will lead to a correct conclusion regarding the statistical test being conducted.

Assumptions Analysis

Statistical Assumptions and Interactions

The primary statistical methodology followed in this study was univariate ANOVA with adjustments as needed for the achievement of a proper experiment-wise error rate. Accordingly, it was necessary to insure that the assumptions of the univariate ANOVA model were satisfied for the data in this study. These assumptions include normality, equal variance, and independence of the error terms.

Assumptions were tested on the initial three-factor ANOVA model using various univariate plots (i.e., residuals against fitted values, box plots, normal probability plots, and histograms).[12] Counterbalancing and randomization procedures appeared to preclude nonindependence effects. However, the assumptions of normality and equal variance appeared to be compromised by the effects of several outlying observations. Examination of these observations revealed two observations for two different subjects which appeared to be in error and almost all observations for an additional subject which appeared to be undependable (i.e., extremely inconsistent as indicated by large deviations in the residuals). Adjustment of the two errors was made by replacing the two values with the same response as given on the identical case for the respective subjects. The undependable observations for the other subject were completely discarded from the analysis.

Plots of the residuals for all ANOVA models (after adjustment for outliers) appeared

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[12]Per Tabachnick and Fidell (1989), if the sample is large it is a good idea to look at the shape of the distribution. In a large sample, a variable with significant skewness or kurtosis often does not deviate enough from normality to make a realistic difference in the analysis. In other words, with large samples the significance levels of formal tests are not as important as the visual appearance of the distribution.

to indicate the presence of normality and equal variance. Moreover, univariate statistics (i.e., skewness and kurtosis) in the current study were well within tolerable limits per examples presented by Tabachnick and Fidell (1989). A significant three-way interaction effect (P value = 0.0011) was present however.

Several transformations of both the independent and dependent variables were attempted but were ineffective in making the three-way interaction effect statistically insignificant. Moreover, compliance with statistical assumptions was not improved by conducting the transformations.

Precepts of Control

Precepts of control assumed to exist in experimental designs include dominance, privacy, nonsatiation, salience, and parallelism. The salience precept assumes that subjects will perceive rewards provided as being tied to their performance of the experimental task. In a similar fashion, nonsatiation assumes that a subject will always prefer an alternative yielding a greater reward. Since the experimental task in the current study was a judgmental task where perceptions or intentions (i.e., behavioroid measures) rather than performance was of interest, no attempt to provide a link between performance and rewards was made. Consequently, the salience and nonsatiation precepts are not applicable.

The dominance precept assumes that subjects will be sufficiently compensated to offset any nonmonetary subjective costs of insuring the subjects' participation. To examine the provision of dominance in the current study, an item was included in the post-experiment questionnaire which asked the subjects how satisfied they were. The item addressed their satisfaction with extra credit points provided to them by their course instructors for their

participation in the experiment given the amount of effort they expended. On a five point scale ranging from 1 = not at all satisfied, to 5 = very satisfied, the mean response was 4.0 indicating that on average the subjects were mostly satisfied with the extra credit granted to them for their participation in the experiment. Therefore, the dominance precept appeared to be satisfied in the study.

Privacy is a control precept regarding independence. That is, privacy is concerned with insuring that each subject worked independently on their respective experimental tasks to insure that co-acting effects are not present. To insure that the precept of privacy was met, the experiment was conducted under exam-like conditions in each classroom. Subjects were instructed not to talk to their neighbors and the task was closely monitored by the experimenter to provide assurance of these conditions. Moreover, an item was included in the post-experiment questionnaire which asked each subject if they talked to any other participants during the experiment. All subjects answered this question in the negative, indicating that each worked alone. Consequently, privacy appears to have been reasonably insured.

Parallelism is a precept which assumes that experimental results obtained are useful outside the laboratory. This precept does not necessarily imply generalizability, but merely that important elements of the objectives being studied are captured. The consideration of parallelism should encourage the researcher to consider whether or not key constructs capture the relevance of real systems. In the current study, key constructs appear adequately presented to elicit genuine behavioroid measures from the subject participants. In addition, the severity of a potential violation of this precept is mitigated somewhat by the fact that

many non-laboratory studies have been previously performed.

Demographic Data Analysis

Counterbalancing of the sequence of trials, randomization of paragraph presentation, and the random assignment of the between-subjects technology conditions was assumed to have controlled for systematic effects other than treatments. To test for this assumption, various demographic data were treated as dependent variables in multiple one-factor ANOVA models along with the independent variable factors of interest in the study (i.e., technology and Vroom). These demographic items included (1) gender, (2) age, (3) work experience, (4) supervisory experience, (5) existence of personal and organizational relationships, (6) understandability of instructions, and (7) satisfaction with extra credit. No significant results were found for any of the variables at an alpha level of 0.05. This gives further assurance of the unlikely existence of significant co-variation among the demographic data collected and the factors manipulated in the study.

Validity of Subjects

Further testing was desired due to the importance of determining whether or not individuals with no supervisory experience (i.e., non-managers) would give systematic responses that differed from managers. Accordingly, all responses were omitted from the data set for subjects which claimed to have had no prior supervisory experience. This left a sample size of N=360. The same models used for hypothesis testing were used to analyze this remaining data. Significance levels and correlations were essentially the same using the data for the subjects having supervisory experience as for data of the overall sample. That

is, results were equivalent whether the non-supervisory subjects were included or not.

This result is significant since it goes directly toward assessment of the validity of the subjects comprising the sample. The generalization can therefore be made that the graduate students used in this study provided overall results essentially the same as those of managers possessing supervisory experience.

Although results for the *overall* sample were fundamentally the same as those of the sample of subjects with supervisory experience, there could still remain fundamental differences between those subjects having supervisory experience versus those not having such experience. To test for these effects the significance tests and correlations examined in the study were used to run both samples of data (i.e., supervisors and non-supervisors). Results of significance tests are presented in Table 8 while correlations of the dependent variables are presented in Table 9.

Most notable among the differences in the significance tests was the way technology was perceived by the two groups. Technology was perceived as being much more important to choosing an appropriate level of participation for supervisors (P value = 0.0006) than for non-supervisors (P value = 0.0655). However, technology appeared to be much less important to supervisors than non-supervisors in affecting their perceptions of the amount of information they needed to make an effective decision (P values = 0.6377 and 0.0568 respectively).

Interpreting the correlations for the supervisors versus the non-supervisors is more difficult. All three dependent measures appeared somewhat related for supervisors although the correlations were not particularly high. The results for the non-supervisors were less

equivocal. The participation/information and information/media richness correlations appeared to show no relationships for non-supervisors. However, the participation/media richness correlation was fairly strong (Rho = 0.38510; P value = 0.0001) for non-supervisors. All directional effects for significant correlations were as expected.

Hypothesis Tests

The ten hypotheses of the current study, divided into five general categories, are presented in Table 4. The following section presents the results of testing for these hypotheses specifically.

Effects of Technology, Situation, and Individuals

The first three hypotheses relate to the main effects of technological complexity, situational factors (as presented by the Vroom model), and individual subject differences as they affect the perceived need for subordinate participation in budgetary decision making. All three hypotheses were tested simultaneously by employing a crossed nested mixed factor ANOVA model and are restated in alternative form as follows:

H_1: There is a significant positive effect of technological complexity on the perceived need for subordinate participation in budgetary decision making.

H_2: There is a significant positive effect of predictions of the Vroom model on the perceived need for subordinate participation in budgetary decision making. That is, the Vroom model is significant in describing the behavior of individuals regarding participative budgeting.

H_3: There is a significant difference between individuals regarding the perceived need for subordinate participation in budgetary decision making given a particular organizational and situational context.

Due to the complexity inherent in the crossed nested mixed factor design, usage of

standard ANOVA table results is not appropriate. The computation of F statistics in this type of design requires the adjustment of the expected mean squares used as the denominator in the calculation. Moreover, the nested design results in the elimination of all but two possible interaction terms (i.e., one two-way interaction and one three-way interaction). Results of the ANOVA model are presented in Table 10.

As noted previously, a nontransformable three-way interaction was found between the three factors present in the model. The importance of this interaction effect may be somewhat overstated however, due to the extreme power present in the model.[13] Consequently, the reader may wish to interpret the statistics presented as primarily indicative of main effects.[14] Either way, the three variables (i.e., technological complexity, Vroom model situational factors, and individual subjects) are each statistically significant (P values = 0.0001) without considering any additional effects which may be present due to the partitioning of aggregate variance present in the three-way interaction term. Consequently, all three hypotheses are confirmed.

Need For Information and Media Richness

Hypotheses Four and Five relate to the impact of technological complexity on perceptions of the relative need for information and media richness. These hypotheses are

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[13]For example, although there is very little difference in the two F values for TECH*VROOM and VROOM*SUBJECTS(TECH) of 1.17 and 1.82 respectively, the former results in a p-value of 0.3259 while the latter results in a p-value of 0.0001. This result ensues because the TECH*VROOM model term uses only 4 degrees of freedom while the VROOM*SUBJECTS(TECH) term uses 197 degrees of freedom.

[14]Per Neter, et al. (1990), the determination of whether interactions are important or unimportant is difficult. Sometimes when two factors interact, the interaction effects are so small that they are considered to be *unimportant interactions*. Occasionally, it is meaningful to consider the effects of each factor in terms of the factor level means even when important interactions are present.

restated in alternative form as follows:

H_4: There is a significant positive effect of technological complexity on the perceived need for information.

H_5: There is a significant positive effect of technological complexity on the perceived need for media richness.

Due to the desire to obtain comparable results to a multivariate procedure while maintaining the qualities of interpretability inherent in a univariate ANOVA model, a Bonferroni-type adjustment was used to restate P values relating to the ANOVA F statistics. Accordingly, the effect of technological complexity on the perceived need for information was insignificant at an adjusted P value of $1-(1-0.1995)^3 = 0.4870$. Moreover, the effect of technological complexity on the perceived need for media richness was insignificant at an adjusted P value of $1-(1-0.3041)^3 = 0.6630$. Therefore, neither of the two hypotheses were confirmed.

Relative Importance of Organizational, Situational, and Individual Factors

Hypotheses Six and Seven were designed with the intention of being able to determine the relative importance of the organizational, situational, and individual factors used in the study in explaining perceptions of participation needed. They are restated in alternative form as follows:

H_6: Technological complexity is more important in explaining the variance in the perceived need for subordinate participation than situational factors.

H_7: Situational factors are more important in explaining the variance in the perceived need for subordinate participation than individual factors.

The ability to rank the variables in terms of relative importance depends upon the ability to partition the relative variance in the perceived need for participation explained by

each of the individual factors. As noted previously, a statistically significant three-way interaction was found which makes interpretation of these results very difficult. However, the practical importance of the three-way interaction present here is a matter of judgment. Therefore, the author has chosen to present the percent of variance explained (eta squared per Table 10) and leave interpretation of the importance of the interaction to the reader.

If main effects are considered interpretable (i.e., the three-way interaction is considered unimportant), then relative variance can be examined by considering values as adjusted for degrees of freedom.[15] Unfortunately, as of this writing, there does not exist an acceptable method for adjustment for differing degrees of freedom for the particular design used in this study (Vaughan and Corballis 1969). Therefore, values presented in Table 10 include only the unadjusted eta squared along with F statistics, P values of significance, and degrees of freedom for each model element. From a purely subjective perspective, by considering the F values and the degrees of freedom employed for each term, the Vroom model and technology factors appear to explain the most variance in perceptions of the need for participation. Strength of association of these factors appears to be followed by effects due to subjects in size. Therefore, subject to the conclusion regarding the unimportance of the three-way interaction, and the interpretation of relative strength of association, Hypotheses Six and Seven may have been confirmed. If the reader chooses to interpret the three-way interaction as important, then the relative variance of the individual

[15]Prior studies present results for relative variance explained without adjusting for differing degrees of freedom present among the factors in the analysis (i.e., by presenting eta squared). Examples of this presentation can be found in Steers (1977) and Vroom and Yetton (1973). It is this author's opinion that results presented in this manner without explanation can be misleading and were merely an artifact of a lower level of sophistication in statistical methods existing at that time. However, unadjusted results are presented for purposes of comparison.

factors in the model cannot be interpreted meaningfully and Hypotheses Six and Seven cannot be addressed.

Correlation of Participation, Information Quantity, and Media Richness

Hypothesis Eight concerns the relationships expected among the dependent variables and is presented in the alternative form as follows:

H_8: There is significant correlation between the perceived need for participation, the perceived need for information, and the perceived need for media richness.

Results of the Pearson correlation coefficients and their respective P values are presented in Table 9. All relationships are in the directions expected, and the hypothesis is partially confirmed. That is, perceptions of the need for both participation and information are correlated at Rho = -0.16585; P value = 0.0001 and perceptions of the need for both participation and media richness are correlated at Rho = 0.23809; P value = 0.0001. However, perceptions of the need for both information and media richness resulted in a Rho = -0.04508; P value = 0.2663 (a non-significant relationship).

Self-Insight Measures

Hypotheses Nine and Ten address the subjects' own self-insight into what would motivate their actions regarding appropriate levels of subordinate participation in budgetary decision making. These hypotheses are restated as follows:

H_9: The primary antecedents to allowing participation in budgetary decision making include (1) the positive motivation of subordinates and (2) the reduction of information asymmetry.

H_{10}: A primary constraint to allowing participation in budgetary decision making is time.

Possible responses for these measures were constructed on a five-point scale where 1=definitely no or no importance; 2=no or low importance; 3=maybe or average importance; 4=yes or high importance; and 5=definitely yes or critical importance. Therefore, a response of greater than three was considered to be an affirmative answer to the questionnaire item. Statistical procedures accordingly took the form of testing for the significance of departures from three minus the sample mean under the null hypothesis that $\mu=0$.

The results of one-tailed t tests revealed that subordinate motivation and information asymmetry were perceived as being very important to the allowance of subordinate participation at t = 8.33609; P value = 0.00000 and t = 9.622793; P value = 0.00000 respectively. Therefore Hypothesis Nine was confirmed. The perception of time as an important constraint to allowing participation was borderline significant at t = 1.58171; P value = 0.05972. Therefore Hypothesis Ten was principally confirmed also.

Pairwise Comparisons

The examination of twenty-five pre-planned pairwise comparisons was desired in order to more closely examine the effects of two of the factors (i.e., technological complexity and Vroom situational influences) on the perceived need for subordinate participation. Moreover, the presentation of pairwise comparisons is desirable to provide additional interpretation of ANOVA results given the existence of a statistically significant interaction.

Given the nature of the nested design, each of these contrasts had to be computed using individual contrast statements in a standard statistical package (i.e., SAS) and then adjusted for the appropriate denominator expected mean squares and degrees of freedom. Additionally, for some of the contrasts (i.e., those comparing across technology levels), there

was no directly available, or appropriate, F test. Consequently, an appropriate denominator for these F statistics was an estimate developed from two combined expected mean squares. To assess the level of significance in this case, degrees of freedom were approximated using Satterthwaite's formula (SAS Institute 1991). This required that the estimated denominator expected mean squares for the F statistics, the F statistics themselves, and the denominator degrees of freedom for significance (i.e., P values) be calculated by hand. Significance results are presented in Tables 11 and 12. Cell means are presented in Figure 4 in experimental design matrix form (i.e., paralleling Figure 3).

Table 11 presents the results of F statistics and corresponding P values based on the assumption that the three-way interaction in the model is not important. That is, the cell means, F statistics, and corresponding P values are computed based on a reduced cell-means model which omits the three-way interaction term. In addition, Table 12 shows comparative results based on the full model which includes the three-way interaction term. This table only includes nine of the 25 pre-planned pairwise comparisons. That is, the nine comparisons presented in Table 12 are the only ones which are estimable since the others contain interaction effects with the SUBJECTS factor. As previously noted, presentation of results from both models allows the reader to interpret the effects based on his or her own conclusions regarding the significance of the 3-way interaction.

Table 11 reveals significant differences in the cell means in 20 of the 25 pairwise comparisons based on the reduced model at an alpha level of 0.05. Significant technology effects appear for every level of the Vroom model with the exception that borderline significance is present at levels three and five (P values of 0.0659 and 0.0598 respectively).

In addition, insignificant effects between the Vroom model levels within technology appear to be localized between the first and second conditions primarily. The only exception to this is the insignificance noted between the third and fourth conditions of the Vroom model within the high technological complexity condition. The unequivocal nature of the three Vroom model insignificant pairwise comparisons is clear at P values of 0.2848, 0.3778, and 0.8392.

Table 12 shows that all pairwise comparisons which were estimable given a significant three-way interaction produced significantly different cell means at an alpha level of 0.05 with only one exception. The exception was between the third and fourth Vroom model conditions within the high technological complexity condition (P value = 0.2784). Moreover, an interesting result notable from this table is that all three-way interaction is localized within the first two Vroom model conditions. This conclusion is reached by observing that *none* of the contrasts involving the first two Vroom model conditions were estimable (i.e., they are omitted from Table 12), implying that they are confounded with the interaction due to subjects. Conversely, *all* of the contrasts are estimable which include the other Vroom model conditions. Further discussion of what these results might suggest will be presented in Chapter V.

Summary of Hypothesis Tests

Briefly, Hypotheses One, Two, Three, and Nine were unequivocally confirmed; Hypotheses Six, Seven, Eight, and Ten revealed borderline results or were subject to interpretation; and Hypotheses Four and Five failed to be confirmed. Interpretation of results regarding Hypotheses Six and Seven is subject to the conclusion regarding the relative

importance of interaction contained in the factor analysis. Testing of Hypothesis Eight was partially confirmed with the significant correlation of two of three comparisons. Hypothesis Ten revealed a statistical significance that was borderline (i.e., 0.05972).

Generally, the primary hypotheses of interest in the study (i.e., Hypotheses One, Two, and Three) regarding the effects of variables at three different levels on participation in budgeting were confirmed causing the study overall to be a success. Even though not all hypotheses were confirmed, the results as a whole should be considered informative and will be discussed in the following chapter.

Ancillary Data Analysis

Although not a formal hypothesis of interest in this study, the significance of specific Vroom model factors has received attention in prior studies. Accordingly, a similar analysis was conducted to determine the individual contribution of nine of the Vroom model factors in the study.[16] Using a simple ANOVA model with the individual Vroom items as independent factors, the effect on the perceived need for participation was examined. In summary, all of the nine factors were statistically significant at an alpha level of 0.05 in individually influencing the perceived need for participation in the study.

The following chapter discusses the significance of the findings of the study and provides further interpretation of the results. In addition, limitations of the study are noted and conclusions and contributions made by the study are presented in light of these limitations. Finally, suggestions for future research are provided.

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[16]The other three factors comprising the full twelve-factor Vroom model were fixed in this study.

CHAPTER V

DISCUSSION AND CONCLUSIONS

Given the power inherent in the study, statistical results of significance provide a very dependable basis for making inferences. Moreover, the testing of subject validity provided evidence to suggest that the graduate student participants provided good surrogates for managers. In fact, based on the demographic data gathered, many of the subjects were indeed managers with supervisory purview. In addition, manipulation of technological complexity was tested and found to be successful, serving to further validate the study. Precepts of control for experimental designs appeared to be satisfied. Reliability statistics for almost all questions for which the subjects were asked to respond were considered adequate. Exceptions to this included only some self-insight measures and will be discussed further in the limitations section. Consequently, results of the study appear to provide an adequate basis for several conclusions.

Conclusions and Implications of Findings

Main Hypotheses

The primary purpose of the study was to examine the importance of technological complexity, contextual or situational factors, and individual subject differences in influencing perceptions of the degree of participation appropriate in a participative budgeting task. Results confirmed that all three of these constructs have an impact on perceptions.

Moreover, the results provide evidence that individual leaders are influenced by factors at all three of these levels in determining how much participation is appropriate in a budgeting task. That is, influences at the organizational, situational, and individual levels all provide antecedents to participation.

In pairwise comparisons of the effects of technology and situational factors considered together, technology resulted in significant differences at an alpha level of 0.10 at all levels of the Vroom model. Furthermore, all but two comparisons of technology within Vroom were significant at an alpha level of 0.05. Consequently, subjects believed technology to be an inherently important antecedent to participation.

The Vroom model factor shows significant differences within technology on all but three comparisons out of 20. Further discussion is warranted here since these results are clearly explainable. Two of these insignificant differences occur between the first and second levels of the Vroom model (i.e., AI v AII) where interaction with individual subjects is severe. Two factors contribute to the statistical insignificance found here. First, several statistical techniques were conducted by Vroom and Yetton to show that the five levels of participation in the model are not interval scaled. A scale was developed by these originators of the model which depicts actual scaling based on a sample of 2,631 managers as AI=0, AII=1, CI=5, CII=8, and GII=10 (Vroom and Jago 1988). Although the end points on this scale of zero and ten are arbitrary, a researcher would obviously expect to see more differences between other levels of the model where the interval spreads are typically four, three, and two units than where the difference is likely to be only one unit.

Second, the Vroom model makes very little distinction between levels one and two

based on the five factors manipulated. That is, differences between levels AI and AII in the model are distinguished primarily based on the *LI* and *MT* variables (i.e., leadership information sufficiency and motivation due to time). Neither *LI* nor *MT* were manipulated in the study, but rather were used as response variables. Therefore, the subjects self-selected into these conditions. Moreover, *MT* was allowed to vary only *between* subjects in the experiment since it was measured in the post-experiment questionnaire. Therefore, it is not surprising that the five manipulated Vroom factors did not have an effect on perceptions at these levels. This result, in fact, is predicted by the model.

The only other insignificant pairwise comparison was between Vroom levels three and four (i.e., CI v CII) within the high technological condition. In fact, sample means at these levels were in a direction opposite of the model's predictions (i.e., the level three mean was higher than the level four mean). These results are also explainable in terms of the model. Upon closer examination of case three and four, the systematic differences on manipulated factors are (1) whether a geographic constraint exists and (2) whether subordinate conflict exits. Low goal congruence is present for both case three and four. Per Vroom and Jago (1988), where goal congruence is low but subordinate conflict is high, subordinate development is likely to be higher with a CI decision style than CII.

> ...under conditions of low goal congruence, conflict offered no particular benefit to decision quality. With regard to subordinate development, not only is there no additional benefit to participation under these conditions, there is a potential liability. Without a shared organizational purpose, conflict in a group setting can be *de*structive rather than *in*structive (Vroom and Jago 1988, 155, emphasis in the original).

Vroom and Jago (1988) follow this discussion with the general rule that decision makers should move away from CII and GII when subordinates do not share organizational goals

and there is conflict among subordinates over preferred solutions. This is, in fact, exactly what the subjects in the experiment did.

The only remaining question is why the subjects made a clear (statistically significant) distinction between these levels (i.e., CI and CII) in the low technological complexity condition but not in the high technological complexity condition. Consistent with Vroom, this may be because the subjects perceived the need to motivate low-skilled, low-tech subordinates as much more important than the need to motivate high-skilled, high-tech subordinates. That is, the subjects may have thought that the group setting might be *more* destructive to the motivation of the low-tech subordinates. This explanation would make sense if the high-skilled, high-tech employees were perceived to be more self-motivated as a rule.

Overall, the main hypotheses are confirmed in the study and the importance of factors at all three levels as antecedents to participative budgeting has been shown. The impact of variables at all of these levels should be considered by decision makers and researchers. In addition, the design of the study provides a validation of the Vroom model as strongly descriptive of the actual decision making tendencies of managers via the contrived scenarios methodology.

Relative Importance of Factors

As noted previously, determining the relative importance of the three factors in this study is very difficult. This is especially true when comparing the effects due to technology and the effects due to Vroom model factors. A judgment can be made upon examination of the information in Table 10 that technology and Vroom factors are likely to have a higher

degree of association with participation than the subjects factor would. Although since neither eta squared nor the F statistic are effective in showing relative strength of association with this design, which of the two factors (technology or Vroom) explains more variance than the other cannot be clearly determined. Several limitations are inherent in results related to this aspect of the study and to strength of association comparisons for experiments in general. These will be discussed further in the limitations section.

Information Quantity and Media Richness

Perhaps the most disappointing aspect of the study was the failure to achieve results that would validate the Daft and Lengel (1986) model regarding the effects of technological complexity on information quantity and media richness. Although in spite of the results achieved, it remains this author's opinion that technology can impact both the degree of analyzability and the degree of variety inherent in a particular decision context. However, the extreme degree of statistical insignificance resulting in such a statistically powerful study prompts the examination of methodological issues to explain the findings. Accordingly, the limitations inherent in the study should be especially considered here.

The validation of the Daft and Lengel model in this study would appear to be dependent on the ability to systematically vary perceptions of uncertainty and ambiguity as a result of the technological complexity manipulation. In this regard the subjects may have perceived the general problem situation as containing a great lack of information in *both* the low and high technological complexity conditions. If this was the case, then the strength of this perception could have overshadowed any effects attributable to the technology manipulation. That is, the lack of significant effects could have been due to the lack of

variation inherent in such an esoteric setting.

Another reason for these results may be that the behavioroid measures (i.e., measures of intentions) do not accurately convey the true actions of the managers. Accordingly, uncertainty and ambiguity may truly differ between an organizational structure that is high in technological complexity versus one that is low in technological complexity, but yet not impact the perceptions of the managers of those organizations.

Correlation of Dependent Measures

Results on correlations of all dependent measures reflect a difference between supervisors and non-supervisors in the sample. All three constructs (i.e., perceptions of participation, information quantity, and media richness) are apparently related when non-supervisory subjects are excluded from the sample. However, the relation of information quantity to media richness is only borderline significant. This is at least partially due to the fact that the results of correlations on information quantity and media richness are offset by a relation in the opposite direction for non-supervisors. This may again be due to the esoteric nature of the setting. Also, the lower correlation between information quantity and media richness may have resulted because the two constructs address different problems or issues. That is, information quantity affects uncertainty, whereas media richness affects ambiguity. It should be noted, however, that strong correlations are not necessary to confirm Hypothesis Eight. The dependent measures are arguably related, but yet they are still believed to be different constructs.

Self-Insight Measures

Although self-insight measures do not present evidence that is as compelling as those derived from a manipulated factorial design, results are nevertheless interesting and can be informative. Consistent with the results of the other parts of the study, subjects on average perceived both the motivation of subordinates and information asymmetry to be important antecedents to their decisions regarding participation allowed. Time was perceived to be somewhat of a constraint to allowing participation, but it was clearly not as important to the subjects in determining participation allowed as were the other two self-insight factors.

Limitations

Although subject validity was tested and found to be very high, the sample was still not solely comprised of practicing managers. Many readers will believe this to be the most important limitation of the study. Although many of the subjects claimed to have had supervisory experience, the nature and recency of that experience is unknown.

As noted previously, reliability of two of the Vroom model response measures (i.e., motivation due to time, *MT*; and motivation due to development, *MD*) was not as high as desired. This indicates that on average the subjects may not have perceived the two questions on each of these respective constructs to be asking exactly the same thing. Repeated attempts to increase reliability were made through piloting efforts but were never quite able to remedy this problem. However, since both of these measures were present on the post-experiment questionnaire rather than the case questionnaire, variation across cases (i.e., within subjects) should not be affected. Even so, the measures could have impacted results across subjects.

The esoteric nature of the experimental setting may have affected the results on Hypotheses Four, Five and Eight. Significance was clearly absent on Hypotheses Four and Five and may be due to this feature of the experimental design. Results on Hypothesis Eight were somewhat equivocal and could have been affected by this design feature as well. In this study, the experimental setting was intentionally constrained so that systematic effects could be isolated. However, the chance of missing an effect due to the presence of such a constraint is a design tradeoff which is unavoidable.

In estimating the relative strength of association between the main model factors and the participation dependent measure, several limitations apply. First, two of the factors (technology and Vroom) are fixed in the study. That means that the results of the study cannot be generalized to other factor levels that may have been omitted in the study. Therefore, the magnitude of effects coincident with these omitted factor levels is unknown. Second, relative measures of association in experimental design are always subject to inaccuracies due to the relative strength of the manipulations (Maxwell, et al. 1981). That is, since in an experimental setting the states of nature are contrived rather than observed, the strength of the results are subject to the relative strength of experimental realism created for each independent factor manipulated. Problematic here is the complication inherent in the design. That is, in a multifactor repeated-measures model where the effects are nonadditive there is no design in which an independent estimate of variance for all factor effects is available (Vaughan and Corballis 1969). Moreover, if the significant three-way interaction is ignored and treated as unimportant (i.e., the model is assumed additive) the unequal number of observations within the cells still creates complications. In fact, for

models containing random effects such as this one, when unequal cell sizes are present, there appear to be no satisfactory measures of relative association (Vaughan and Corballis 1969). Therefore, conclusions of this study regarding the relative association of the independent factors with participation are tenuous at best.

This study examines perceptions of leaders regarding the level of subordinate participation appropriate to a particular context. The Vroom model suggests criteria important to that decision that should be (from a normative perspective), and perhaps are (from a descriptive perspective) considered in this decision. However, the Vroom model does not make any suggestions for improving the accuracy of *perceptions* regarding a particular criterion. Consequently, the usefulness of the model is subject to the accuracy of such perceptions by the user(s) of the model.

Finally, the study is subject to the usual limitations inherent in an experimental design. Specifically, experimental designs are lower in mundane realism serving to impair the generalizability of results. Moreover, although experimental designs maximize precision and control, they often do so at the expense of realism of context. Since these limitations apply to all experimental designs it would be unrealistic to expect that they would not apply to the present study as well.

Contribution of the Study

The present study appears to contribute to the body of accounting literature in several ways. First, antecedents to participative budgeting appear to include multiple influences at various levels (i.e., organizational, situational, and individual). One of the features that makes results on variables at different levels difficult to compare is the fact that they are

confounded with the context in which the effects are obtained. This study has shown within an esoteric context that all three variable levels are influential antecedents to participation in budgeting decisions.

Second, this study has examined subordinate participation in participative budgeting from the perspective of the leader who has primary responsibility for the decision task. Previous studies have focused almost exclusively on subordinate perspectives. Accordingly, this study reveals that several antecedents are important in influencing managerial choice regarding the amount of participation perceived to be appropriate in a given context. Moreover, the results clearly show that preferences for participation on the part of leaders are not uniform across situational contexts nor are they consistent from one leader to the next. In addition, it is clear that leaders believe that appropriate participation levels differ among organizations with divergent technological complexity. Overall, subjects in this study showed a remarkable ability to adapt and adjust their decision styles to differing organizational structures and situations.

Third, this study provides an unequivocal validation of the descriptive accuracy of the Vroom-Jago model. This validation provides important evidence supporting the model's application to budget decision making in accounting. Accordingly, this study will arguably provide the most comprehensive modeling of contextual moderating variables as affecting participative budgeting and will provide the most detailed continuum of participative decision styles to date in the accounting literature. In addition, the three most popular theories regarding participative decision making (i.e., cognitive, affective, and contingency) are integrated by operationalizing the Vroom model in this study.

Finally, the current study provides an operationalization of technology which considers regulatory and sophistication effects and examines the effects of this operationalization on perceptions of information quantity and media richness. Based on the results achieved in this regard, the Daft and Lengel model of participation, media richness, and information quantity was invalidated in this study. Due to the extreme power present in the study and the extreme insignificance of the effects, the results appear especially compelling regarding leader perceptions involving these constructs.

Suggestions for Future Research

The current study presents initial results on antecedents of participative budgeting which could be extended in several ways. Although the results appear to establish the existence of antecedents to participative budgeting at organizational, situational, and individual levels, some of the effects within these levels are unknown. For example, although individual subjects differences were found, these differences could be attributed to differing experience, background, and/or training, or they could be attributed to one or a host of personality attributes. Testing for these effects was beyond the scope of this study.

Although the organizational variable technological complexity was found to be a significant antecedent to participative budgeting in the current study, other organization-level variables could provide significant antecedents as well. Most notably, organization size appears to be a likely candidate for antecedent status. However, it seems that the relevance of organization size would be more appropriately studied by using a field study or sample survey than an experimental design. The reasoning for this is straightforward. As organizations grow and evolve they often decentralize their operations. Consequently,

decentralization allows, and even requires, subordinates to have a more meaningful role in budgeting decisions and to participate in other decisions as well. However, this increased subordinate participation would more likely be the result of direct changes in the organization structure rather than the result of a perceived need for increased subordinate participation on the part of organization leaders.

Although the research could be extended by attempting to find a linkage between antecedents and consequences after the manner of Shields and Young (1993), such attempts may not be necessary. That is, in most cases it seems that consequence moderators have been studied at length. Therefore, a more fruitful approach may be to attempt to reconcile the results of previous studies by determining the antecedents to participation present at the time of these studies. This may prove to be a difficult endeavor however and makes the assumption that the antecedents in existence at the time that each of the studies were conducted could be determined ex post.

In establishing relative strength of associational effects of individual factors on participation, research clearly must be conducted in a field setting. Otherwise, results will continue to be threatened by confounding of the effects with the strength of individual manipulations. These efforts would continue to focus on descriptive versus normative inference.

Based on further descriptive results, research could aim toward identifying conditions suggesting participation and those precluding participation. This could ultimately result in the creation of a normative model correlating effectiveness of particular participation regimens with specific characteristics of budgeting systems and/or organizational structures.

The consummation of such a normative model might parallel the development process of the Vroom model while incorporating factors other than merely situational factors in the consideration of optimal participation levels. Ultimately, such a normative model might even be used in much the same way the Vroom model is currently being used; that is, to educate leaders regarding the importance of flexibility in the use of participative decision methods.

ILLUSTRATIONS

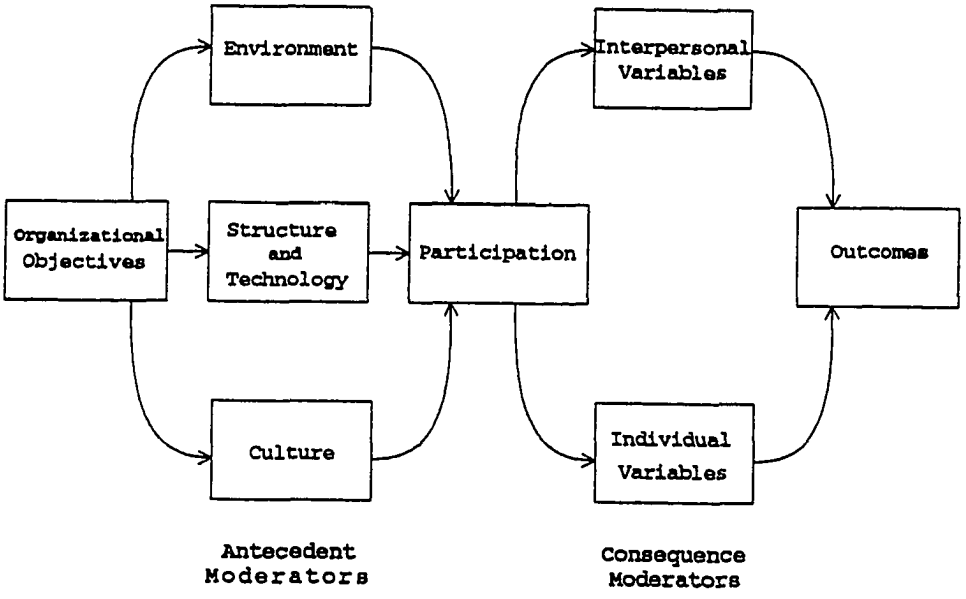


Figure 1

Antecedent and Consequence Moderators Per Brownell (1982c)

Source: Brownell, P. 1982c. Participation in the budgeting process: When it works and when it doesn't. *The Journal of Accounting Literature* 124-50.

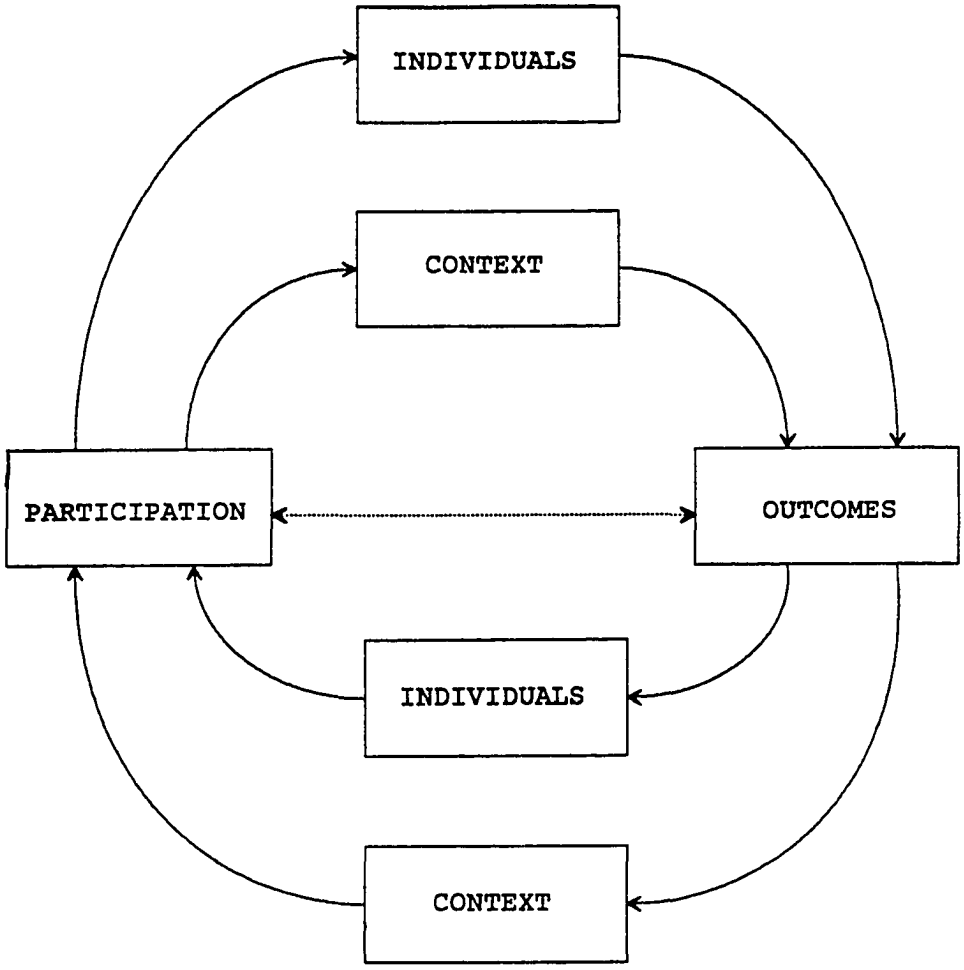
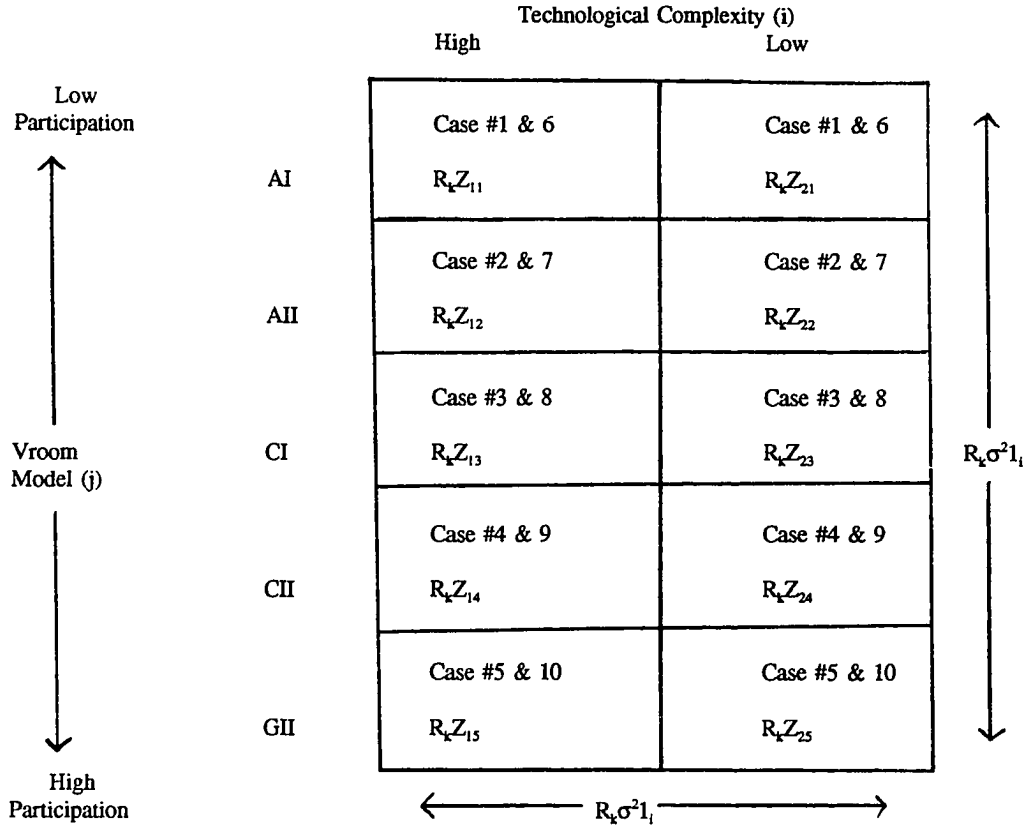


Figure 2

Antecedent and Consequence Moderators

As adapted from: Brownell, P. 1982c. Participation in the budgeting process: When it works and when it doesn't. *The Journal of Accounting Literature* 124-50.



i	=	Technological complexity (1=high; 2=low).
j	=	Vroom case (1=AI; 2=AII; 3= CI; 4=CII; 5=GII).
Z	=	Response variables (1=degree of participation; 2=information quantity; 3=media richness).
R_kZ_{ij}	=	Repeated measurement of response variable Z for all responses in the ith and jth conditions (i.e., case # = n).
K	=	subject (1, 2, 3,..., n).
$R_k\sigma^2l_i$	=	Percent of variance in the perceived need for subordinate participation explained by technological complexity conditions.
$R_k\sigma^2l_j$	=	Percent of variance in the perceived need for subordinate participation explained by the Vroom model.
$R_k\sigma^2l$	=	Percent of variance in the perceived need for subordinate participation explained by individual differences.

Figure 3

Experimental Design Matrix

Dependent Variable = Perceived Participation

Vroom Model (j)	Technological Complexity (i): High	Technological Complexity (i): Low	
AI	Case #1 & 6 Cell 1 $\bar{y}_{11} = 2.64$ n = 45	Case #1 & 6 Cell 2 $\bar{y}_{21} = 1.97$ n = 32	$\bar{y}_{.1} = 2.36$ n = 77
AII	Case #2 & 7 Cell 3 $\bar{y}_{12} = 3.07$ n = 99	Case #2 & 7 Cell 4 $\bar{y}_{22} = 2.21$ n = 68	$\bar{y}_{.2} = 2.72$ n = 167
CI	Case #3 & 8 Cell 5 $\bar{y}_{13} = 3.74$ n = 72	Case #3 & 8 Cell 6 $\bar{y}_{23} = 3.32$ n = 50	$\bar{y}_{.3} = 3.57$ n = 122
CII	Case #4 & 9 Cell 7 $\bar{y}_{14} = 3.59$ n = 74	Case #4 & 9 Cell 8 $\bar{y}_{24} = 2.90$ n = 51	$\bar{y}_{.4} = 3.31$ n = 125
GII	Case #5 & 10 Cell 9 $\bar{y}_{15} = 4.19$ n = 70	Case #5 & 10 Cell 10 $\bar{y}_{25} = 3.67$ n = 49	$\bar{y}_{.5} = 3.98$ n = 119
	$\bar{y}_{1.} = 3.48$ n = 360	$\bar{y}_{2.} = 2.83$ n = 250	$\bar{y}_{..} = 3.21$ n = 610

Low Participation ↑ High Participation

i = Technological complexity (1=high; 2=low).
j = Vroom case (1=AI; 2=AII; 3= CI; 4=CII; 5=GII).
$\bar{y}_{ij}$ = Sample mean of observations.

Figure 4

Cell Means

TABLES

Table 1

Experimental Research in Participative Budgeting

Study	Moderating Variables Examined	Significant Contributions and/or Findings
Cherington and Cherington (1973)	Reward Structure	Participation-outcome relations moderated by significance of the budget as a basis for rewards
Foran and DeCoster (1974)	Cognitive Dissonance, Authoritarianism, and feedback	Participation must be accompanied by positive feedback to provide worker commitment
Brownell (1981)	Locus of Control	Importance of considering individual-level (personality) variables as they influence participation-outcome relationships
Tiller (1983)	Cognitive Dissonance and Task Difficulty	Manipulated participation by allowing choice, yet in a way which provided for random assignment Participation has more impact when pay is lower and budget levels are more difficult to achieve
Daroca (1984)	Motivation and Goal Congruity	Differential leader behaviors suggests the importance of considering leader perceptions
Kim (1992)	Risk attitudes and Preferences	Risk preferences may not be as stable as typically believed, but may differ with the situation Implies that context is important in influencing decision styles used

Table 2

Prior Experimental Research and Enhancements of the Current Study

Study	*Importance/Relevance to Current Study*
Cherington and Cherington (1973)	Links reward structure to participation-outcome relations (reward structure is evidenced as an important antecedent to participation)
Foran and DeCoster (1974)	Implied importance of considering leader's perceptions
Brownell (1981)	Importance of individual-level variables shown (e.g., personality differences)
Tiller (1983)	Task difficulty enhances desire for participation and implies a technology-participation relation
Daroca (1984)	Implied importance of considering leader's perceptions
Kim (1992)	Implied importance of contextual factors

Research Enhancements Provided by Current Study

1. Examines leader perceptions and/or preferences (no prior studies listed did this).
2. Treats participation as a dependent variable (no prior studies listed did this).
3. Participation examined on 5 different levels (just 1 or 2 levels in prior studies).
4. Several potential moderators from listed prior studies retained in current study and new dependent variables are measured (i.e., media richness and leader perceptions).
5. All independent variables examined as antecedents to participation (prior studies only examined outcomes of participation).
6. Examines variables at all three levels (i.e., organizational, situational, and individual) (prior studies only examined one or two levels in a given study).

Table 3

Published Vroom Model Validation Studies

	Primary Dependent Variables Examined	
	(Descriptive) Predicting Degree of Participation Used	(Normative) Effectiveness Associated With Agreement
Description and Recall (Field)	Vroom and Yetton (1973) Tjosvold et al. (1986)	Vroom and Jago (1978) Jago and Vroom (1980) Pasewark and Welker (1990) Pasewark and Strawser (1994) (but objective measure used)
Contrived Scenarios and Response Regarding Degree of Participation Allowed (Lab)	Jago and Vroom (1978) (both description and recall and contrived) Vroom and Jago (1974) Jago (1978) Jago (1981) Jago and Vroom (1977) (but field setting)	Margerison and Glube (1979) (but field setting) Jago and Vroom (1975) Paul and Ebadi (1989) (but field setting) Heilman et al. (1984)
High Impact Manipulations (Lab)	none	Field (1982) (degree of participation=IV) Jago and Ettling (1982) (degree of participation=IV)

Table 4

Hypotheses

Effects of Technology, Situation, and Individuals

1. There is a significant positive effect of technological complexity on the perceived need for subordinate participation in budgetary decision making.

2. There is a significant positive effect of predictions of the Vroom model on the perceived need for subordinate participation in budgetary decision making. That is, the Vroom model is significant in describing the behavior of individuals regarding participative budgeting.

3. There is a significant difference between individuals regarding the perceived need for subordinate participation in budgetary decision making given a particular organizational and situational context.

Need for Information and Media Richness

4. There is a significant positive effect of technological complexity on the perceived need for information.

5. There is a significant positive effect of technological complexity on the perceived need for media richness.

Relative Importance of Organizational, Situational, and Individual Factors

6. Technological complexity is more important in explaining the variance in the perceived need for subordinate participation than situational factors.

7. Situational factors are more important in explaining the variance in the perceived need for subordinate participation than individual factors.

Correlation of Participation, Information Quantity, and Media Richness

8. There is a significant correlation between the perceived need for participation, the perceived need for information, and the perceived need for media richness.

Self-Insight Measures

9. The primary antecedents to allowing participation in budgetary decision making include (1) the positive motivation of subordinates and (2) the reduction of information asymmetry.

10. A primary constraint to allowing participation in budgetary decision making is time.

Table 5

Problem Attributes Systematically Manipulated

Cases to Use (see Appendix D for equations to predict optimal category below)

	Spreadsheet Case #	Switches CP	GC	CO	TC	GD
AI	24	Y	N	Y	Y	Y
AII	19	Y	N	N	Y	N
CI	2	N	N	N	N	Y
CII	5	N	N	Y	N	N
GII	13	N	Y	Y	N	N

Where, CP=commitment probability; GC=goal congruence; CO=subordinate conflict; TC=time constraint; GD=geographical dispersion.

Actual Cases and Scaled Values (see Appendix B-5 through B-9)

	Case 1 AI	2 AII	3 CI	4 CII	5 GII	6 AI	7 AII	8 CI	9 CII	10 GII
CP	5	5	1	1	1	5	5	1	1	1
GC	1	1	1	1	5	1	1	1	1	5
CO	5	1	1	5	5	5	1	1	5	5
TC	5	5	1	1	1	5	5	1	1	1
GD	5	1	5	1	1	5	1	5	1	1

Reader note: The first five cases repeat to provide two observations for each Vroom factor level to comprise the ten cases used for each subject.

Table 6

Vroom Factors

Vroom Factor Manipulations

1. If you were to make the decision yourself would the employees likely be committed to your decision?
2. Do the subordinates share organizational goals in solving this problem?
3. Are subordinates likely to disagree among themselves over the preferred course of action?
4. Does a critically severe time constraint limit your ability to involve subordinates?
5. Are the costs in bringing together geographically dispersed subordinates prohibitive?

(manipulated dichotomously where 1=no; 5=yes)

Vroom Factor Subject Responses

1. How important to you is the press of time to make the decision?
2. How important is it to you to maximize opportunities for subordinate development?

(5 point response scale where, 1=no importance; 2=low importance; 3=average importance; 4=high importance; 5=critical importance)

3. Do you have sufficient information to make a high quality decision yourself?
4. Do your subordinates have sufficient information to make a high quality decision?

(5 point response scale where 1=no; 2=probably no; 3=maybe; 4=probably yes; 5=yes)

Vroom Control Factors

1. The technical quality of the decision is critically important.
2. Subordinate commitment to the decision is critically important.

(i.e., fixed at 5=critical importance)

3. The problem is not well-structured.

(i.e., fixed at 1=no)

As adapted from: Vroom, V. H., and A. G. Jago. 1988. *The New Leadership: Managing Participation in Organizations*. Englewood Cliffs, NJ: Prentice Hall.

Table 7

Reliability Analysis

Case Measures *	Pearson Correlation Coefficients / Prob > R under H_0: Rho=0
MEDIA1 / MEDIA2	0.79145 / 0.0001
LI1 / LI2	0.65917 / 0.0001
SI1 / SI2	0.68349 / 0.0001

Post-Experiment Measures **	Pearson Correlation Coefficients / Prob > R under H_0: Rho=0
TECH1 / TECH2	0.90203 / 0.0001
MD1 / MD2	0.58183 / 0.0001
MT1 / MT2	0.31755 / 0.0171
INFO1 / INFO2	0.69700 / 0.0001

---

* Case measures are based on repeated measures responses for 61 subjects on each of ten cases (i.e., 610 observations).

** Post-experiment measures are based on responses for 56 subjects (i.e., 56 observations).

The following constructs of interest correspond to the variable names presented above: MEDIA1/ MEDIA2=perceived need for media richness; LI1/LI2=perceived leader information sufficiency; SI1/SI2=perceived subordinate information sufficiency; TECH1/TECH2=technological complexity; MD1/MD2=subordinate development motivation; MT1/MT2=time constraint motivation; INFO1/ INFO2=perceived need for information. Two questions were presented to the subjects for each variable measured corresponding to the "1" and "2" for each correlation shown in the table (e.g., MEDIA1=question 1; MEDIA2=question 2).

Table 8

Supervisory Versus Non-supervisory Significance Tests

Data From Supervisory Subjects:

DV = PART	Degrees of Freedom	F Value	P Value *
TECH	1	14.24	0.0006
VROOM	4	20.12	0.0001
SUBJECTS(TECH)	34	5.14	0.0001
TECH*VROOM	4	0.77	0.5472
VROOM*SUBJECT(TECH)	112	1.49	0.0074

DV = LI	Degrees of Freedom	F Value	P Value *
TECH	1	1.14	0.6377

DV = MEDIA	Degrees of Freedom	F Value	P Value *
TECH	1	1.30	0.5872

Data From Non-supervisory Subjects:

DV = PART	Degrees of Freedom	F Value	P Value *
TECH	1	3.85	0.0655
VROOM	4	13.10	0.0001
SUBJECTS(TECH)	18	3.15	0.0001
TECH*VROOM	4	1.47	0.2227
VROOM*SUBJECT(TECH)	62	1.96	0.0011

DV = LI	Degrees of Freedom	F Value	P Value *
TECH	1	5.56	0.0568

DV = MEDIA	Degrees of Freedom	F Value	P Value *
TECH	1	1.42	0.5527

---

* P values are adjusted for experiment-wise error. F values are unadjusted.

The following constructs of interest correspond to the variable names presented above: TECH=technological complexity; VROOM=Vroom model; SUBJECTS=individual effects; PART=perceived need for participation; LI=perceived leader information sufficiency; MEDIA =perceived need for media richness.

Table 9

Dependent Variable Correlations

Data From All Subjects:	Pearson Correlation Coefficients/ Prob > R under H_0: Rho=0
PART / LI	-0.16585 / 0.0001
PART / MEDIA	0.23809 / 0.0001
LI / MEDIA	-0.04508 / 0.2663

Data From Supervisory Subjects:	Pearson Correlation Coefficients/ Prob > R under H_0: Rho=0
PART / LI	-0.19398 / 0.0002
PART / MEDIA	0.12359 / 0.0190
LI / MEDIA	-0.08978 / 0.0889

Data From Non-supervisory Subjects:	Pearson Correlation Coefficients/ Prob > R under H_0: Rho=0
PART / LI	-0.03184 / 0.6545
PART / MEDIA	0.38510 / 0.0001
LI / MEDIA	0.07126 / 0.3160

The following constructs of interest correspond to the variable names presented above: PART=perceived need for participation; LI=perceived leader information sufficiency; MEDIA =perceived need for media richness.

Table 10

Crossed Nested Mixed Factor ANOVA Results

DV = PART	% of σ^2 Explained *	Degrees of Freedom	F Value	P Value
TECH	6.4	1	17.81	0.0001
VROOM	17.0	4	32.58	0.0001
SUBJECTS(TECH)	21.3	59	5.06	0.0001
TECH*VROOM	0.6	4	1.17	0.3259
VROOM*SUBJECT(TECH)	25.6	197	1.82	0.0001
Variance explained by model	70.9			

* Simple eta squared is presented here. When interpreting these percentages the reader should consider the degrees of freedom associated with each factor.

The following constructs of interest correspond to the variable names presented above: TECH=technological complexity; VROOM=Vroom model; SUBJECTS=individual effects; PART=perceived need for participation.

Table 11

Pre-planned Pairwise Comparisons

Technology-Participation Effects:

	F Value *	P Value *
TECH1 v TECH2:		
in VROOM1 (Cell 1 v Cell 2)	6.20	0.0162
in VROOM2 (Cell 3 v Cell 4)	16.62	< 0.0010
in VROOM3 (Cell 5 v Cell 6)	3.48	0.0659
in VROOM4 (Cell 7 v Cell 8)	10.71	0.0188
in VROOM5 (Cell 9 v Cell 10)	4.52	0.0598

Vroom-Participation Effects in TECH1:

	F Value	P Value
VROOM1 v VROOM2 (Cell 1 v Cell 3)	1.15	0.2848
VROOM1 v VROOM3 (Cell 1 v Cell 5)	24.52	0.0001
VROOM1 v VROOM4 (Cell 1 v Cell 7)	18.07	0.0001
VROOM1 v VROOM5 (Cell 1 v Cell 9)	52.55	0.0001
VROOM2 v VROOM3 (Cell 3 v Cell 5)	24.46	0.0001
VROOM2 v VROOM4 (Cell 3 v Cell 7)	16.38	0.0001
VROOM2 v VROOM5 (Cell 3 v Cell 9)	62.09	0.0001
VROOM3 v VROOM4 (Cell 5 v Cell 7)	0.78	0.3778
VROOM3 v VROOM5 (Cell 5 v Cell 9)	7.98	0.0049
VROOM4 v VROOM5 (Cell 7 v Cell 9)	13.79	0.0002

Vroom-Participation Effects in TECH2:

	F Value	P Value
VROOM1 v VROOM2 (Cell 2 v Cell 4)	0.04	0.8392
VROOM1 v VROOM3 (Cell 2 v Cell 6)	28.74	0.0001
VROOM1 v VROOM4 (Cell 2 v Cell 8)	11.61	0.0007
VROOM1 v VROOM5 (Cell 2 v Cell 10)	49.38	0.0001
VROOM2 v VROOM3 (Cell 4 v Cell 6)	43.06	0.0001
VROOM2 v VROOM4 (Cell 4 v Cell 8)	16.76	0.0001
VROOM2 v VROOM5 (Cell 4 v Cell 10)	74.58	0.0001
VROOM3 v VROOM4 (Cell 6 v Cell 8)	5.72	0.0171
VROOM3 v VROOM5 (Cell 6 v Cell 10)	4.13	0.0427
VROOM4 v VROOM5 (Cell 8 v Cell 10)	19.48	0.0001

---

* Computed and interpolated by hand using estimated denominator mean squares and synthetic degrees of freedom using Satterthwaite's Formula.

TECH1=High technological complexity; TECH2=low technological complexity; VROOM1 through VROOM5 represent the five levels of the Vroom model factor. Cell number comparisons correspond to the cell means presented in Figure 4.

Table 12

Pairwise Comparisons Excluding Interaction

Technology-Participation Effects:

	F Value *	P Value *
TECH1 v TECH2:		
in VROOM3 (Cell 5 v Cell 6)	3.99	0.0479
in VROOM4 (Cell 7 v Cell 8)	12.17	< 0.0010
in VROOM5 (Cell 9 v Cell 10)	5.50	0.0262

Vroom-Participation Effects in TECH1:

	F Value	P Value
VROOM3 v VROOM4 (Cell 5 v Cell 7)	1.18	0.2784
VROOM3 v VROOM5 (Cell 5 v Cell 9)	10.88	0.0011
VROOM4 v VROOM5 (Cell 7 v Cell 9)	19.21	0.0001

Vroom-Participation Effects in TECH2:

	F Value	P Value
VROOM3 v VROOM4 (Cell 6 v Cell 8)	7.64	0.0060
VROOM3 v VROOM5 (Cell 6 v Cell 10)	5.23	0.0228
VROOM4 v VROOM5 (Cell 8 v Cell 10)	25.32	0.0001

---

* Computed and interpolated by hand using estimated denominator mean squares and synthetic degrees of freedom using Satterthwaite's Formula.

TECH1=High technological complexity; TECH2=low technological complexity; VROOM1 through VROOM5 represent the five levels of the Vroom model factor. Cell number comparisons correspond to the cell means presented in Figure 4.

APPENDIX A

EXPERIMENT FORMS

Appendix A-1

Sample Experiment Sign Up Sheet

Please sign your name by the experiment time slot you are able to attend. When you have done this, take a reminder card from the packet and write down the date and time you have signed up for. Also take two "Informed Consent" forms. One is your copy to keep. You should read this consent form, sign one of the copies and place it back in the packet. Please remember to bring the reminder card with you to the experiment. If you find that you are unable to attend the time you have signed up for, please contact Doug Clinton at either 275-5880 or 273-3079 as soon as possible to arrange a make up time. If you forget or cannot call beforehand to reschedule, you will only be able to participate if other experiments are available. These steps are necessary to insure that you receive course credit for your participation in the experiment. Thank you for agreeing to participate.

Please show up well in advance of your session! Experimental control requires that everyone that is present begins the experiment at the same time. If you are late, you will not be admitted to the session. The experiment is expected to last about an hour, but please allow at least an hour and a half to complete the experiment.

ROOM	DATE	TIME	PRINT NAME, CLASS, AND INSTRUCTOR
Bus. 133	Monday, 4-19	9-10:30 PM	_____
Bus. 133	Monday, 4-19	10:30-12 PM	_____
Bus. 133	Thursday, 4-22	1-2:30 PM	_____
Bus. 133	Thursday, 4-22	2:30-4 PM	_____

Appendix A-2

Sample Reminder Card

Reminder Card
for Experiment
Room 133, Business

Date: _____

Time: _____

Instructor: _____

Class Time: _____

Your Name: _____

Remember: Please show up well in advance of your scheduled time! If you are late, you will not be admitted to the session. Please allow at least an hour and a half to complete the experiment.

Appendix A-3

Sample Informed Consent

This is an experiment involving your perceptions of the appropriate decision style to use in a given situation. During the experiment you will be asked questions concerning your perceptions regarding the task and task related activities. A full explanation of procedures will be given at the conclusion of the experiment.

No discomfort is anticipated except for possible boredom and fatigue normally associated with a pencil and paper task. The major benefits you will receive from participation in this research is increased familiarity with experimental research methods and exposure to a specific problem in this area.

If at any time you find the procedures objectionable you can withdraw your informed consent. Records of your participation in this study will be held strictly confidential. Your identity as a subject will not be disclosed to anyone beyond the investigators.

In the event that you are injured in the course of this study, you may go to the UTA Health Service Center and be treated in the usual way providing that you are a student currently registered at UTA. Otherwise, you may be covered under optional medical insurance that you carry. UTA does not offer any other compensation for injury.

This research is under the supervision of Dr. Bill Ross in the Accounting department. Dr. Ross's office is room 425, Business Building and his phone is 273-3047.

I hereby consent to participate in this experiment and understand the above procedures.

_____

Name Date

Appendix A-4

Sample Debriefing Form

This experiment was designed to examine perceptions regarding the appropriateness of various degrees of participation and communication in budgetary decision making contexts as affected by organizational and situational differences. The experiment did not involve deception in any way.

The results of this experiment should be available by the end of the semester. If you want to know those results, you can contact me through the accounting office on the fourth floor. My name is Doug Clinton.

By signing this document you are merely indicating that you have read this form and have been debriefed regarding the experiment.

Thank you for your participation.

I hereby acknowledge reading this debriefing form.

_____

Name Date

Appendix A-5

Sample Subject Title Page

SUBJECT 1

Appendix A-6

Experimental Overview

Experimental Overview:

1. Enclosed in your folders you should find five items: (1) an instruction packet with a subject number on the front, (2) seven case questions, (3) an answer sheet for the seven case questions, (4) ten cases, and (5) a number of post-experiment questions.

2. The first thing you will do is read through the instruction packet. This will provide general instructions, a general problem situation, and a plant description. After reading through these pages you will be ready to work on the cases.

In Summary:

1. You are presented with ten cases. For each case you are required to answer the same seven questions. A separate answer sheet is provided for this purpose. Also, post-experiment questions are included at the end of the ten cases.

2. You will be playing the role of a plant manager presented with a resource allocation problem. However, you don't actually have to solve the problem. What you are required to do is to indicate what you believe to be the most appropriate way to go **about** solving the problem by answering the seven questions for each case. There are not necessarily any right or wrong answers to the questions. However, your answers are extremely important to the evaluation of the experiment. So please try to carefully consider your responses based on what you believe to be most appropriate in each particular context.

3. You should keep in mind that the objective is to achieve the greatest overall effectiveness for your plant.

4. You should note that the cases may often sound very similar. Therefore, you should read each one carefully to note the differences. Please feel free to refer back to the general instructions or the plant's description as needed to answer the questions for each case.

5. I will be here to answer any questions you may have during the course of the experiment, but please do not talk to your neighbor. We will try to maintain the same type of conditions that would be typical of taking an exam. For example, to avoid the distraction of others, if you have a question, raise your hand and I will come over and we can discuss it quietly.

6. After you have completed the exercise, you will be asked to sign a debriefing form. If you have any questions regarding the nature of the exercise, I will be happy to discuss them with you at that time.

   Are there any questions before we begin...? If not, you may begin.

APPENDIX B

GENERAL INSTRUCTIONS, COVER STORY, AND CASES

Appendix B-1

General Instructions

In this exercise, you will be given the description of a general problem situation and ten different cases to which the problem applies. Immediately preceding the cases is a list of seven questions and an answer sheet to record your responses to the seven questions for each case. The questions ask about your perceptions of what you would do if you were the manager in the situation based on the information given. Please answer all questions for all cases as thoughtfully as possible. Be sure to check to make sure your answer sheet is completely filled out. You should continue working until you have completed the questions for all cases and the general questionnaire at the very end. After completing the entire exercise, you will be asked to read and sign a debriefing form and return all materials to the experimenter.

Appendix B-2

General Problem Situation

In each of the cases that follow, you will play the role of a plant manager in a computer manufacturing division of a large company. The division manager has allocated $100,000 to each plant this year to spend on tools, equipment, and the bonuses of twenty employees that are at each plant. Basically, these twenty employees are all at the same level (in terms of merit) at each plant. The division manager has told you that as plant manager, you are required to decide how the $100,000 is to be allocated among the tools, equipment, and employees. The objective, according to the division manager, is for you to allocate the money to achieve the greatest overall effectiveness for your plant. Therefore, the technical quality of the decision is very important. There is a general feeling of competitiveness between the other plant managers and yourself. Also, there is an expectation that the division manager will be assessing the performance of all plant managers to see which one will produce the best results. For this reason it is extremely important to carefully decide how the $100,000 will be distributed.

You have decided that the only viable investment alternative for tools and equipment for each plant is a particular package costing $95,000. The items in the package cannot be purchased separately, so the only decision is to purchase the package or not. The new tools and equipment would definitely be expected to enhance the performance of the plant, and the plant could purchase these tools and equipment leaving $5,000 to be paid in bonuses to the twenty employees ($250 each). On the other hand, financial performance of the company has been sluggish, and the employees have been working under conditions of a wage freeze for the past three years. With this in mind, it would be nice to give the employees the full bonus of $100,000 ($5,000 each), but that would mean foregoing the purchase of the tools and equipment. Either way, you could provide the employees with a bonus, but you are concerned that if you merely give them $250 each, they might be insulted at receiving such a small amount. Under normal conditions you believe that the purchase of the tooling and equipment would produce the best results for the firm. The employees have been asking for the equipment for a long time. However, the employees have been asking for salary adjustments and bonuses for a long time also. You are concerned, given these circumstances, that the decision (either way) could seriously affect employee morale thus affecting the performance of the plant. Therefore, employee commitment to the decision is very important and must be carefully considered. Although the two alternatives available to you are clear, the uncertainty regarding which action will produce the greatest overall effectiveness for the plant makes the problem extremely unstructured and difficult to resolve.

The information above and on the next page as well as the decision requirement will remain consistent from case to case. However, you will be asked to assume some additional information about the nature of the situation that will be different from case to case. Please consider this information when answering the questions immediately following each case.

Appendix B-3

High Technological Complexity Condition Plant Description

The plant you manage does new product development. Sophisticated production prototypes are produced using difficult to analyze processes which are not well-understood. Employees use general purpose tooling and equipment which does not constrain or regulate their activity. Also, the development process requires a substantial amount of judgment, craftsmanship, and creativity involving high sophistication and complex intricacy. These non-routine activities are designed to yield a variety of unique or customized products. The employees are highly-skilled engineers, scientists, and technicians and constantly interact. Their jobs are considered difficult and involve a large variety of important decisions. **Please consider this plant environment when answering questions for all of the following ten cases.**

Appendix B-4

Low Technological Complexity Condition Plant Description

The plant you manage assembles finished computers. Basic personal computers are assembled using a clear and orderly sequential process. The equipment used makes worker activity simple and repetitive and allows no deviation in procedures. Also, the assembly process requires no judgment, craftsmanship, or creativity on the part of the workers. These routine activities are designed to yield a single standardized product. The employees are low-skilled operators and rarely interact. Their jobs are considered simple and involve repetitive, routine decisions. **Please consider this plant environment when answering questions for all of the following ten cases.**

Appendix B-5

Case One

You believe that if you were to make the decision yourself at this plant, the employees would likely be committed to it. However, it is unlikely that the employees truly share the organization's goals in solving this problem. Also, the employees are likely to disagree among themselves over which of the alternatives is best. You are required to respond to the division manager by the end of the day, so the time constraint for the decision is severe. Also, you have a geographic constraint since several employees happen to be absent from the plant today.

Appendix B-6

Case Two

You believe that if you were to make the decision yourself at this plant, the employees would likely be committed to it. However, it is unlikely that the employees truly share the organization's goals in solving this problem. The employees are likely to be united among themselves, one way or the other, regarding which of the alternatives is best. You are required to respond to the division manager by the end of the day, so the time constraint for the decision is severe. You are not constrained geographically, since all employees are available for communication, direct or otherwise.

Appendix B-7

Case Three

You believe that if you were to make the decision yourself at this plant, the employees would probably not be very committed to it. Moreover, it is unlikely that the employees truly share the organization's goals in solving this problem. The employees are likely to be united among themselves, one way or the other, regarding which of the alternatives is best. You have several weeks to respond to the division manager regarding the problem, so the time constraint on the decision is not severe. However, you have a geographic constraint since several employees happen to be absent from the plant today.

Appendix B-8

Case Four

You believe that if you were to make the decision yourself at this plant, the employees would probably not be very committed to it. Moreover, it is unlikely that the employees truly share the organization's goals in solving this problem. Also, the employees are likely to disagree among themselves over which of the alternatives is best. You have several weeks to respond to the division manager regarding the problem, so the time constraint on the decision is not severe. You are not constrained geographically, since all employees are available for communication, direct or otherwise.

Appendix B-9

Case Five

You believe that if you were to make the decision yourself at this plant, the employees would probably not be very committed to it. However, it is likely that the employees share the organization's goals in solving this problem. Also, the employees are likely to disagree among themselves over which of the alternatives is best. You have several weeks to respond to the division manager regarding the problem, so the time constraint on the decision is not severe. You are not constrained geographically, since all employees are available for communication, direct or otherwise.

APPENDIX C

RESPONSE VARIABLES, MANIPULATION CHECKS,
AND GENERAL QUESTIONS

Appendix C-1

Participation Construct

1. Choose the method that you feel would be most appropriate.

    1. You choose to solve the problem by making the decision yourself using the information available to you at the time.

    2. You obtain any necessary information from subordinates, then make the decision yourself. You may or may not tell subordinates the purpose of your questions or give information about the problem or decision on which you are working.

    3. You share the problem with the relevant subordinates individually, getting their ideas and suggestions without bringing them together as a group. Then *you* make the decision. This decision may or may not reflect your subordinates' influence.

    4. You share the problem with your subordinates in a group meeting. In this meeting you obtain their ideas and suggestions. Then *you* make the decision, which may or may not reflect your subordinates' influence.

    5. You share the problem with your subordinates as a group. Together you attempt to reach agreement (consensus) on a decision. You do not try to "press" them to adopt "your" decision, and you are willing to accept and implement any decision that has the support of the entire group.

Appendix C-2

Media Richness Construct

2. Regarding your communications with subordinates, if any, regarding the two budget alternatives, select the medium you would most likely use for this case.

   1 = Formal memorandum
   2 = Handwritten note
   3 = Letter
   4 = Telephone
   5 = Face-to-Face

3. Regarding your interactions with subordinates, if any, in choosing among the two alternatives, indicate the number corresponding to that on the continuum which specifies the most appropriate form of medium to use in this case.

1	2	3	4	5
memo	note	letter	telephone	face-to-face

Appendix C-3

Information Quantity Construct

4. Do you have sufficient information in this case to make a high quality decision regarding the alternatives yourself?

   1 = no
   2 = probably no
   3 = maybe
   4 = probably yes
   5 = yes

5. Do you have an adequate amount of information in this case to make an effective decision without obtaining additional information from your subordinates?

   1 = no
   2 = probably no
   3 = maybe
   4 = probably yes
   5 = yes

Appendix C-4

Subordinate Information Construct

6. Would you think that your subordinates in this case would have sufficient information to make a high quality decision themselves regarding the budget alternatives?

   1 = no
   2 = probably no
   3 = maybe
   4 = probably yes
   5 = yes

7. Is it likely that your subordinates in this case have an adequate amount of information to make an effective decision without obtaining additional information elsewhere?

   1 = no
   2 = probably no
   3 = maybe
   4 = probably yes
   5 = yes

Appendix C-5

Post-Experiment Questions

Reader note: The following questions are designed to be considered by the subjects at the completion of the ten cases. They will be used to evaluate the antecedents and constraints of the perceived need for participation for all subjects across all cases and to provide demographic data.

The next set of questions relates to your feelings regarding your choices of the participative decision styles you selected for the ten cases and other general questions regarding the exercise. You should answer them in relation to the thought processes you used **for the whole exercise overall rather than for any one of the ten cases.**

Appendix C-5.1

Manipulation Check - Technological Complexity

1. In terms of job difficulty, sophistication, and task variety, how would you describe the relative level of technological complexity that the employees experience at this plant? (circle the appropriate number).

   1 = very low technological complexity
   2 = low technological complexity
   3 = moderate technological complexity
   4 = high technological complexity
   5 = very high technological complexity

2. Regarding the routine or non-routine nature of employee activity, how would you describe the relative level of technological complexity that characterizes this plant's environment? (circle the appropriate number).

   1 = very low technological complexity
   2 = low technological complexity
   3 = moderate technological complexity
   4 = high technological complexity
   5 = very high technological complexity

Appendix C-5.2

Motivation - Time Construct

3. An important reason why I personally chose to allow less participation for certain cases was due to the constraint of time in limiting my ability to involve the employees in making the decision. (circle the appropriate number).

   1 = definitely no
   2 = no
   3 = maybe
   4 = yes
   5 = definitely yes

4. Generally, how important was it to you personally to minimize the time it would have taken to make the decision regarding the allocation of funds by allowing less participation in certain cases? (circle the appropriate number).

   1 = no importance
   2 = low importance
   3 = average importance
   4 = high importance
   5 = critical importance

Appendix C-5.3

Motivation - Development Construct

5. An important reason why I personally chose to allow more participation for certain cases was to provide positive motivation for the employees, and thereby create the best environment for employee performance. (circle the appropriate number).

   1 = definitely no
   2 = no
   3 = maybe
   4 = yes
   5 = definitely yes

6. Generally, how important was it to you personally to maximize the opportunities to motivate your employees by allowing more participation for certain cases, and thereby create the best environment for employee performance? (circle the appropriate number).

   1 = no importance
   2 = low importance
   3 = average importance
   4 = high importance
   5 = critical importance

Appendix C-5.4

Information Asymmetry Construct

7. An important reason why I chose to allow more participation at certain times was to permit the gathering of information to make the best overall decision in the particular case. (circle the appropriate number).

   1 = definitely no
   2 = no
   3 = maybe
   4 = yes
   5 = definitely yes

8. Generally, how important was it to you personally to allow more participation in certain cases to enable you to gather more information so that the decision made would be of higher quality than otherwise? (circle the appropriate number).

   1 = no importance
   2 = low importance
   3 = average importance
   4 = high importance
   5 = critical importance

Appendix C-5.5

Demographic Questions

9. Please enter your age _____.

10. Please indicate your gender (1) male (2) female _____.

11. Please indicate your full-time work experience in years_____.

12. Please indicate your classification (e.g., senior, graduate)_____.

13. Are you currently, or have you been in the past, employed or actively involved in an organization where you assume a supervisory role? *(Y/N)* _____.

14. Are you currently employed or actively involved in an organization where you interact with others in such a way that you are involved in decisions that directly affect both you and at least one other person in the organization? *(Y/N)* _____.

15. How understandable were the instructions to the experiment? (circle the appropriate number).

    1 = not at all understandable
    2 = not very understandable
    3 = somewhat understandable
    4 = mostly understandable
    5 = very understandable

16. If you are receiving extra credit or course credit for participating in this experiment, how satisfied are you with the amount of course credit you are receiving, given the amount of effort you have put into this experiment? (circle the appropriate number).

    1 = not at all satisfied
    2 = not very satisfied
    3 = somewhat satisfied
    4 = mostly satisfied
    5 = very satisfied

17. Did you talk to any other participants during this experiment? (Yes/No--circle) If Yes, explain.

    _____

18. Please write any additional comments you have about this experiment.

    _____

    _____

    _____

APPENDIX D

VROOM GROUP MODEL EQUATIONS

Appendix D-1

Vroom Group Model Equations

$D_{qual} = QR - QR/2[(f_2)(LI) + (f_4)(LI)(ST) + (f_3)(GC) + (f_1)(LI)(1 + GC)(CO)/2 + (f_3)(SI)/2]$

$D_{comm} = CR - CR/2[(f1)(CP) - (f_3 + f_4 + 1)(CO)(CP)/2]$

$Cost = (MT/6)\ [(1 + f_1)(1 - ST) - (f_3 + f_4 - 1)(CO)/2] - 5(f_4 - 1)(GD)$

$D_{evpt} = (MD/24)(QR)\ [(1 + f_1) - (f_3 + f_4 - 1)(GC + 0.5)(CO)]$

$D_{tp} = (D_{qual} + D_{comm})(1 + f1)(TC)$

$D_{eff} = D_{qual} + D_{comm} - D_{tp}$

$O_{eff} = D_{eff} - Cost + D_{evpt}$

Where,

D_{qual}	=	Decision Quality	D_{comm}	=	Decision Commitment
Cost	=	Decision Costs	D_{evpt}	=	Developmental Benefits
D_{tp}	=	Decision Time Penalty	D_{eff}	=	Decision Effectiveness
O_{eff}	=	Overall Effectiveness			

f_1 through f_8 = functions that vary with the decision process

QR	=	Quality Requirement	CR	=	Commitment Requirement
MT	=	Motivation-Time	MD	=	Motivation-Development
LI	=	Leader Information	ST	=	Problem Structure
CP	=	Commitment Probability	GC	=	Goal Congruence
CO	=	Conflict	SI	=	Subordinate Information
TC	=	Time Constraints	GD	=	Geographical Dispersion

Source: Vroom, V. H., and A. G. Jago. 1988. *The New Leadership: Managing Participation in Organizations.* Englewood Cliffs, NJ: Prentice Hall.

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